The impact of gentle physical activity on psychophysical well-being in older adults: a longitudinal study

El impacto de la actividad física suave en el bienestar psicofísico de los adultos mayores: un estudio longitudinal

Authors

Giovanni Esposito [1]
Rosario Ceruso [1,2]
Gaetano Raiola [1]

[1] Pegaso Telematic University (Italy)
[2] University of Verona (Italy)

Corresponding author:
Giovanni Esposito
gioesposito@unisa.it

How to cite in APA

Esposito, G., Ceruso, R., & Raiola, G. (2025). The impact of gentle physical activity on psychophysical well-being in older adults: a longitudinal study. *Retos, 67*, 509–521. https://doi.org/10.47197/retos.v67.112757

Abstract

Background: Aging is associated with a decline in physical and functional abilities, increasing the risk of falls and negatively affecting quality of life. The Gentle Physical Activity, designed for older adults, aims to enhance muscle strength, balance, and flexibility while promoting psychophysical well-being and mitigating age-related physiological decline.
Objective: This longitudinal study evaluated the effectiveness of Gentle Physical Activity in improving physical performance and psychophysical well-being among older adults. The study also examined the relationship between objective physical improvements and subjective perceptions to understand their role in fostering long-term adherence to physical activity. Method: Fifteen participants aged 60 and above engaged in Gentle Physical Activity sessions over two years. Physical performance was assessed using the 30-Second Chair Stand Test and the Chair Sit and Reach Test at five intervals. A questionnaire was administered at the study's conclusion to capture participants' subjective perceptions of physical, social, and mental well-being. Quantitative data were analyzed using the Friedman and Wilcoxon tests, while qualitative responses provided additional insights.
Results: Significant improvements were observed in muscle strength (χ^2 = 48.21, p < 0.001) and flexibility (χ^2 = 25.35, p < 0.001) within 3–5 months of activity. Participants also reported enhanced physical (87.1%), social, and mental well-being, demonstrating a strong association between physical improvements and psychophysical satisfaction.
Conclusions: Gentle Physical Activity effectively enhances muscle strength, flexibility, and psychophysical well-being in older adults, highlighting its value as a safe and holistic intervention for promoting health and quality of life in later years.

Keywords

Aging; gentle physical activity; longitudinal study; psychophysical well-being.

Resumen

Antecedentes: El envejecimiento está asociado con un deterioro de las capacidades físicas y funcionales, lo que aumenta el riesgo de caídas y afecta negativamente la calidad de vida. La Actividad Física Suave, diseñada para adultos mayores, tiene como objetivo mejorar la fuerza muscular, el equilibrio y la flexibilidad, al tiempo que promueve el bienestar psicofísico y mitiga el declive fisiológico relacionado con la edad.
Objetivo: Este estudio longitudinal evaluó la efectividad de la Actividad Física Suave en la mejora del rendimiento físico y el bienestar psicofísico en adultos mayores. Además, examinó la relación entre las mejoras físicas objetivas y las percepciones subjetivas para comprender su papel en la adherencia a largo plazo a la actividad física.
Método: Quince participantes de 60 años o más realizaron sesiones de Actividad Física Suave durante dos años. El rendimiento físico se evaluó utilizando la Prueba de Sentarse y Levantarse en 30 Segundos y la Prueba de Sentarse y Alcanzar en cinco intervalos. Al final del estudio, se administró un cuestionario para recopilar las percepciones subjetivas de los participantes sobre su bienestar físico, social y mental. Los datos cuantitativos se analizaron mediante las pruebas de Friedman y Wilcoxon, mientras que las respuestas cualitativas proporcionaron información adicional.
Resultados: Se observaron mejoras significativas en la fuerza muscular (χ^2 = 48.21, p < 0.001) y en la flexibilidad (χ^2 = 25.35, p < 0.001) en un período de 3 a 5 meses de actividad. Los participantes también reportaron mejoras en el bienestar físico (87.1%), social y mental, demostrando una fuerte asociación entre las mejoras físicas y la satisfacción psicofísica. Conclusiones: La Actividad Física Suave mejora eficazmente la fuerza muscular, la flexibilidad y el bienestar psicofísico en adultos mayores, resaltando su valor como una intervención segura e integral para promover la salud y la calidad de vida en la vejez.

Palabras clave

Envejecimiento; actividad física suave; estudio longitudinal; bienestar psicofísico.

Introduction

Aging is a gradual and continuous process characterized by a decline in physical, mental, and social capacities (Franceschi et al., 2018; Moody & Sasser, 2020). One potential consequence of this decline is an increased risk of falls (Montero-Odasso et al., 2022). According to data from the World Health Organization (WHO), approximately 30% of individuals aged 65 and older experience at least one falls each year, with the percentage rising to about 40% in those aged 70 and above (WHO, 2008). Furthermore, 60% of falls occur within the home, as older adults tend to spend significant amounts of time in their residences. The kitchen, identified as the site of falls in 25% of cases, is particularly high-risk (Kim et al., 2023). Possible causes of falls include sensory impairments, cognitive or mental state alterations, chronic diseases, and mobility dysfunctions (Meyer et al., 2021). The consequences of falls range from minor bruises to severe fractures that significantly impair mobility. Falls in older adults often result in injuries that permanently affect their ability to live independently (Aliberti & Raiola, 2021). Specifically, they lead to severe injuries, with approximately 5% resulting in significant fractures, such as those of the hip and wrist, which can severely compromise mobility (Salari et al., 2022). Hip fractures account for 2-5% of falls among older adults, and half of these cases do not fully recover their ability to walk (Carro et al., 2021). The Centers for Disease Control and Prevention (CDC) reports that approximately 20% of falls among older adults result in severe injuries, including fractures that may lead to long-term loss of autonomy (CDC, 2021). Additionally, there is a risk of developing a fear of falling, which can significantly reduce activity levels, causing individuals to withdraw from daily activities they previously performed before fall (Su et al., 2021). Regular physical activity plays a crucial role in preventing falls and maintaining overall health. Exercise improves muscle strength, joint flexibility, proprioception, and balance, all of which are essential for mobility and fall prevention (Papalia et al., 2020). Engaging in targeted physical activity leads to neuromuscular adaptations, enhancing postural control and reaction time, which are key factors in reducing fall risk (Zhong et al., 2024). Additionally, exercise influences cognitive function, as movement coordination and motor learning are closely linked to brain plasticity and executive function, which also contribute to fall prevention (Wollesen et al., 2020).

Physical activity is essential for maintaining health. According to the WHO, health is not simply the absence of disease but a state of complete physical and mental well-being (Leonardi et al., 2022). Physical activity programs tailored for older adults, such as Gentle Physical Activity (GPA) classes, should aim to maintain muscle strength, balance, and coordination, which help reduce the risk of falls (Castellanos-vega et al., 2023). GPA is a structured and progressive form of adapted physical activity that focuses on improving flexibility, muscle strength, and balance through low-intensity exercises (D'Elia, F, 2021; D'Isanto, 2023). It incorporates a variety of movement techniques, including bodyweight exercises, proprioceptive training, and the use of tools such as resistance bands, balls, and sticks to facilitate coordination and joint mobility. The core principles of GPA involve gradual muscle activation, controlled breathing, and mindful movement, all of which contribute to reducing the risk of falls and promoting overall functional independence (Esposito et al., 2021). Additionally, GPA aids in correcting poor posture and preventing or alleviating symptoms of cardiovascular and metabolic diseases (Aliberti et al., 2020). GPA also offers several psychological benefits, including improved mood, which leads to reduced stress, promotes a sense of mental well-being, enhances socialization with peers, and helps counteract cognitive decline (Aliberti & Raiola, 2021; Pratiwi et al., 2024). This discipline involves progressive and natural muscle stimulation through bodyweight exercises and other forms of physical activity, utilizing tools such as proprioceptive cushions, sticks, resistance bands, and balls. GPA aims to reduce the risk of falls by increasing stability and improving flexibility and muscle strength. For this reason, it is essential to conduct specific tests and measurements with the goal of monitoring the physical development of older adults (Chica et al., 2022). Previous studies highlight the significant benefits of GPA for older adults. Additionally, Nyman (2020) conducted a meta-analysis on exercise interventions for fall prevention, confirming that tai chi and other gentle activities significantly reduce fall risks among the elderly. These findings emphasize the importance of GPA as a safe and effective approach to improving health outcomes and maintaining independence in aging populations.

In older adults, the reduction of physical abilities, such as strength and flexibility, is common and can limit autonomy and quality of life. GPA represents a potential intervention to improve physical function and psychophysical well-being, but its long-term effects require further investigation. Moreover, it remains unclear whether and how the quantitative improvements achieved through GPA are reflected in

older adults' qualitative perceptions of their physical, social, and mental well-being (D'Elia et al., 2022; Lanzara et al., 2021; Castañeda-Lechuga et al., 2023). This longitudinal study aims to assess the effectiveness of GPA in improving specific physical parameters in older adults, such as strength and flexibility, and to explore whether these quantitative improvements are associated with a perceived increase in overall well-being (physical, social, mental) as reported by the older adults themselves.

Method

Participants

The study was conducted at a sports association in the province of Salerno, Italy, offering various GPA courses at different locations. The experimental sample consisted of 15 older adults (age: 72.33 ± 6.22) enrolled in a GPA course. To reduce the risk of bias, data were collected by independent evaluators. Additionally, the training sessions were supervised by a certified instructor, who ensured the correct execution of exercises and the progression of the load. The data were treated anonymously, and confidentiality was maintained throughout the study. Inclusion criteria included being over 60 years of age, frequent participation in GPA courses, and a medical certificate confirming the participants' ability to engage in physical activity. The sample was selected through simple randomization, ensuring compliance with the inclusion criteria. All participants were informed in advance about the study's objectives, methodology, and duration, and they provided written informed consent before participation.

Procedure

The study design is experimental and longitudinal. The Chair Sit and Reach Test and the 30-Second Chair Stand Test were administered five times over two study periods, from September to June. These tests are part of a battery developed and validated by California State University, designed for individuals over 60 years old, with the goal of measuring the physiological capacity required for daily activities. The first assessment was conducted in October 2022, approximately one month after the start of the courses, to ensure full participation and allow participants to gradually resume physical activity following the summer break. A second assessment was carried out between late January and early February 2023, after a series of review sessions following the Christmas holidays. The third assessment took place between late May and early June 2023, just before the courses ended for the summer break. The fourth assessment occurred in October 2023, and the fifth in January 2024. At the end of the experimental period, a paper questionnaire was administered to explore the participants' perceptions.

GPA Training course

The GPA Training Course was designed as a structured, progressive program aimed at promoting health, well-being, and physical functionality among elderly participants. This initiative ran from September 2022 to January 2024 and was specifically tailored to address the unique physiological and psychological needs of older adults. The course was implemented in partnership with local community centers and healthcare professionals, with a focus on creating a supportive and inclusive environment for participants. Sessions were held twice weekly and included low-impact exercises such as stretching, balance training, light resistance work, and cardiovascular activities suitable for varying levels of physical fitness. Such activities have been shown to enhance functional mobility, reduce the risk of falls, and improve overall well-being among older adults. To enhance engagement and effectiveness, the program incorporated evidence-based practices that emphasized gradual progression, safety, and the prevention of injury. Exercises were designed to improve core strength, joint mobility, flexibility, and postural alignment, addressing common challenges such as decreased muscle tone, joint stiffness, and balance instability. These elements are critical for maintaining independence and reducing the risk of age-related musculoskeletal conditions (Muramatsu & Yin, 2019). Additionally, mindfulness techniques and relaxation practices were included to foster mental well-being and alleviate stress, aligning with findings that highlight the psychological benefits of physical activity in aging populations (Martínez et al., 2020). Participants underwent initial fitness assessments to establish baseline measures and ensure individualized exercise prescriptions. Regular follow-up evaluations were conducted to monitor progress and adapt the program to meet participants' evolving needs. Participants were encouraged to maintain their

habitual physical activity levels outside of the study but were asked to refrain from additional flexibility or resistance training programs.

Chair Sit and Reach test

The Chair Sit and Reach Test is a variation of the traditional Sit and Reach Test, distinguished by the use of a chair for support instead of performing the test while sitting on the floor. Developed to assess the functional fitness of older adults, it is part of the Senior Fitness Test Protocol. The test measures lower body flexibility, an important factor in preventing lower back pain, maintaining good posture, improving balance, and potentially reducing falls (Jones et al., 1998). The test requires a chair with a standard height of 43 to 47 cm, placed against a wall for safety. The participant sits at the edge of the chair with one leg extended and the other bent, ensuring the foot of the bent leg is firmly on the floor. The heel of the extended leg should stay on the floor, with the ankle positioned at a right angle. The hands are stacked, with the fingertips of the top hand resting on the bottom hand. The participant is instructed to take a deep breath, then exhale while bending forward and attempting to reach the toes of the extended leg, keeping the leg straight. Several trial attempts are allowed, including alternating the extended leg, as the test does not specify which leg to use. The goal is to reach the toes, or, if possible, to surpass them. The score is based on the distance reached: if the fingertips touch the toes, the score is zero; if the toes are not reached, a negative distance is recorded; and if the participant surpasses the toes, a positive distance is noted. The final score is then compared to a reference table. The reference values for the test, shown in Table 1, are expressed in centimeters and derived from a conversion of values originally expressed in inches. A higher score indicates greater flexibility and, therefore, greater independence in daily activities. It is important to note that individual variations in morphological characteristics may influence test results. Therefore, monitoring individual score progression is crucial, considering an upward trend as positive, even if the result remains below average, rather than a decline in score despite remaining above average.

Table 1. Chair Sit and Reach test reference values.

Age (years)	Below average	Average	Above average
60-64	<-6.35	From -6.35 to 10.16	>10.16
65-69	<-7.62	From -7.62 to 7.62	>7.62
70-74	<-8.89	From -8.89 to 6.35	>6.35
75-79	<-10.16	From -10.16 to 5.08	>5.08
80-84	<-13.97	From -13.97 to 3.81	>3.81
85-89	<-13.97	From -13.97 to 1.17	>1.17
90-94	<-16.51	From -16.51 to -1.17	>-1.17

30-Second Chair Stand test

The 30-Second Chair Stand test is used to assess lower limb strength and endurance (Jones et al., 1999). During the test, participants are asked to stand up from a seated position and return to a seated position as many times as possible within 30 seconds. The examiner starts the stopwatch at the signal and stops it after 30 seconds, recording the number of completed repetitions. Participants should sit at the center of a sturdy chair without armrests and with a straight back. The arms should be crossed over the chest (left hand on the right shoulder and right hand on the left shoulder), with the feet flat on the floor and the back straight. At the end of the test, the number of repetitions is compared to a reference table that classifies results according to age groups (Table 2). A "poor" score indicates an increased risk of falling.

Table 2. Reference values of the 30-Second Chair Stand test.

Age (years)	Poor	Good	Excellent
60-64	< 14	14-19	> 19
65-69	< 12	12-18	> 18
70-74	< 12	12-17	> 17
75-79	< 11	11-17	> 17
80-84	< 10	10-15	> 15
85-89	< 8	8-14	> 14
90-94	< 7	7-12	> 12

Perceptions questionnaire

After choosing the target population, data collection was carried out considering both methodological implications and available economic and human resources. On this basis, it was decided to administer a questionnaire, the writing of which was based on the conceptual dimensions and related indicators identified during the definition of the research objective. Some studies in literature have demonstrated the validity of the questionnaire in detecting the perceptions of stakeholders (Raiola et al., 2022; Syaukani et al., 2024). It consists of two open-ended questions and eight closed-ended questions. The open-ended questions focused on age and years of participation in the courses. The closed-ended questions aimed to assess the frequency of participation, physical limitations experienced during the exercises, and the perceived benefits of GPA, categorized into physical, social, and mental well-being. Before the main phase of the research, a pilot phase was conducted with a small group of participants to assess and optimize the clarity and relevance of the questions. The feedback gathered during this phase guided targeted modifications that led to the definitive version of the questionnaire. The questionnaire is presented in Table 3.

Table 3. Questionnaire on perceptions of GPA and its impact on physical, social, and mental well-being.

Question	Answer Options
1. What is your age?	Numeric response (e.g., 70)
2. How long have you been attending GPA classes?	Numeric response (e.g., 5)
3. Do you actively and regularly participate in GPA classes?	Rarely (1), Occasionally (2), Frequently (3), Always (4)
4. Are there any exercises you are unable to perform due to physical limitations?	Rarely (1), Occasionally (2), Frequently (3), Always (4)
5. What do you consider to be the primary benefit of GPA?	Regaining and/or maintaining physical well-being (e.g., improvement in flexibility, strength, balance, fitness)
6. How helpful do you think GPA is for maintaining balance and coordination?	Regaining and/or maintaining social well-being (e.g., being part of a group)
7. How helpful do you think GPA is for maintaining good physical fitness?	Regaining and/or maintaining mental well-being (e.g., stress reduction)
8. How helpful do you think GPA is for performing daily activities?	Not at all, Slightly, Moderately, Very much
9. How helpful do you think GPA is for improving social well-being (relational aspects)?	Not at all, Slightly, Moderately, very much

Data analysis

To validate the questionnaire, we first assessed its internal consistency through Cronbach's α and associated 95% confidence intervals (CI). A Cronbach's α of 1 indicated perfect reliability, with a cut-off of 0.70 indicating an acceptable internal consistency. Then, a Repeated Measures Analysis of Variance (ANOVA) was chosen as the statistical tool to determine significant differences between the mean measurements at different time points (October 2022, January 2023, June 2023, October 2023, January 2024). However, since the Shapiro-Wilk test showed that the data did not follow a normal distribution, the assumption of normality for the repeated measures ANOVA was not satisfied. Therefore, the Friedman test, a non-parametric test that does not require the data to be normally distributed, was applied. The Wilcoxon rank test was used for multiple comparisons (Aliberti et al., 2023). Statistical significance was determined at $p \leq 0.05$. All data analyses were conducted using IBM SPSS Statistics (version 27.0, IBM, SPSS Inc., Armonk, NY, USA).

Results

The results of the Chair sit and reach test are shown in Table 4.

Table 4. Total score and descriptive statistics of Chair sit and reach test.

		Season 2022/2023			Season 2023/2024	
Subjects (n=15)	Age	October 2022	January 2023	June 2023	October 2023	January 2024
Mean	72.33	-1.47	-1.67	0.80	0.20	2.27
SD	6.22	5.15	6.59	4.99	4.14	3.65

The Friedman test was used to assess differences in scores obtained by participants at different time points: October 2022, January 2023, June 2023, October 2023, and January 2024. The results indicated a statistically significant difference between the mean scores across the five measurement periods ($\chi 2$

= 25.35, p < 0.001). These findings suggest significant variations in the Chair Sit and Reach Test scores at least between two of the considered time points. A post-hoc analysis using the Wilcoxon signed-rank test was conducted to further investigate the differences between the various time points, with the detailed results presented in Table 5.

Table 5. Post-hoc with the Wilcoxon test.

Comparison	Z	p
Oct-22 vs Jan-23	-1.027[b]	.304
Jan-23 vs Jun-23	-2.967[b]	.003
Jun-23 vs Oct-23	-1.089[b]	.276
Oct-23 vs Jan-24	-2.353[b]	.019

a. Wilcoxon sign ranks test, *b*. Based on negative ranks.

The results of the 30 Second Chair Stand Test are shown in Table 6.

Table 6. Total Score and descriptive statistics of 30 Second Chair Stand Test.

Subjects (n=15)	Age	Season 2022/2023			Season 2023/2024	
		October 2022	January 2023	June 2023	October 2023	January 2024
Mean	72.33	10.13	12.86	14.73	15.2	16.8
SD	6.22	1.76	2.32	1.79	2.45	2.11

The Friedman test was used to assess differences in the scores obtained by the subjects at five different time points: October 2022, January 2023, June 2023, October 2023, and January 2024. The results showed a statistically significant difference between the mean scores across the five measurement periods (χ^2 = 48.210, p < 0.001). These findings suggest significant variations in the 30 Second Chair Stand Test scores in at least two of the considered periods. A post-hoc analysis using the Wilcoxon signed-rank test was performed to further explore the differences between the time points, with a detailed description provided in Table 7.

Table 7. Post-hoc with the Wilcoxon test.

Comparison	Z	p
Oct-22 vs Jan-23	-3.432[b]	.001
Jan-23 vs Jun-23	-2.318[b]	.020
Jun-23 vs Oct-23	-1.135[b]	.256
Oct-23 vs Jan-24	-2.827[b]	.005

a. Wilcoxon sign ranks test, b. Based on negative ranks.

A detailed description of the responses obtained from the questionnaire is presented in Table 8.

Table 8. Responses to the perceptions questionnaire.

Items	Responses	Considerations according to age group
Frequency of participation in the classes	Rarely: 0%, Occasionally: 2.2%, Frequently: 31.2%, Always: 66.7%	85-89: 80% "Always", 65-69: 52% "Always"
Difficulty performing exercises due to physical limitations	No problems: 67.7%, Occasionally: 21.5%, Frequently: 3.2%, Always: 7.5%	59-64: 100% "No problems", 65-69: 52% "No problems", 70-79: approximately 67% "No problems"
Main benefit of gentle physical activity	Physical well-being: 87.1%, Social well-being: 6.5%, Mental well-being: 6.5%	85-89: 40% physical well-being, 40% social well-being, 20% mental well-being; 5 9-64: 85.7% physical well-being, etc.
Usefulness for balance and coordination	Not at all: 0%, Slightly: 0%, Somewhat: 24.7%, A lot: 75.3%	85-89: 60% "Somewhat", 75-79: 80% "A lot"
Usefulness for maintaining good physical condition	Not at all: 0%, Slightly: 0%,	85-89: 80% "A lot", 65-69: 70%, 59-64: 42.9%

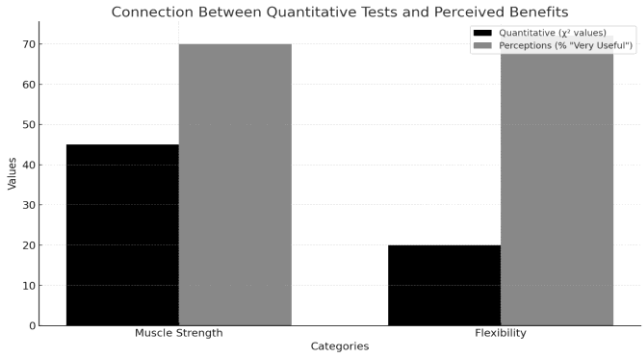
	Somewhat: 31.2%, A lot: 68.8%	
Usefulness for performing daily activities	Not at all: 0%, Slightly: 0%, Somewhat: 31.2%, A lot: 68.8%	-
Usefulness for improving social well-being	Somewhat: 40.9%, A lot: 53.8%	Increases with age, from 42.9% in the 59-64 age group to 60% in older age groups
Usefulness for improving mental well-being	Slightly: 0.5%, Somewhat: 33.3%, A lot: 65.6%	80-84 and 85-89: 80% "A lot"

A summary table linking the significance of the purely quantitative parameter increases with the corresponding qualitative-quantitative significance of perceptions and opinions is presented in Table 9 and depicted in Figure 1.

Table 9. Summary significance of quantitative and qualitative data.

Quantitative Parameter	Statistical Significance	Qualitative-Quantitative Perceptions	Utility
Muscle Strength (30-Second Chair Stand Test)	$\chi^2 = 48.21$, $p < 0.001$	Perceived physical well-being (87.1%)	Very useful for maintaining good physical condition (68.8%) and performing daily activities (68.6%)
Flexibility (Chair Sit and Reach Test)	$\chi^2 = 25.35$, $p < 0.001$	Perceived social and mental well-being (65.6% mental, 53.8% social)	Very useful for balance and coordination (75.3%) and performing daily activities (68.6%)

Figure 1. Connection between quantitative tests and perceived benefits.



Discussion

The results of the study demonstrated the effectiveness of GPA over time, showing significant improvements both physically and psychologically in older adults. Specifically, an increase in muscle strength and flexibility was observed, accompanied by a greater perception of physical, social, and mental well-being. The data suggests a clear connection between the quantitative improvements observed through physical tests and the qualitative perceptions expressed by the participants, indicating that the physical benefits of GPA have a positive impact on overall psychophysical well-being. The results of the Chair Sit and Reach Test for the 2022/2023 and 2023/2024 seasons were analyzed by considering the average scores obtained by participants at different time points: October 2022, January 2023, June 2023, October 2023, and January 2024. The average scores were then compared with age-specific reference values to assess the level of lower limb flexibility in the elderly participants. According to the reference values, a participant , aged 62, began with a score of -14 in October 2022, which placed them below the average. However, he showed consistent improvement, reaching a score of -2 in January 2024, thus falling within the average range. Within the 65-69 age group (n = 6), one participant consistently performed above average, starting with a score of 6 (average) and improving to 11 (above average). The remaining participants began with scores within the average range and either maintained or improved their flexibility, with some reaching the "above average" category during specific periods (January 2023 and January 2024). In the 70-74 age group (n=3), two subjects maintained stable scores around 0, consistently within the average range, while another one initially scored slightly below average but improved to 5 by January 2024, bringing them into the average range. In the 75-79 age group (n=3), a subject showed

notable progress from -12 (below average) to 1 (within the average range) by January 2024, while the other two remained mostly within the average range, with scores ranging from 0 to 3. Lastly, in the 80-89 age group (n=2), a subject started with a particularly low score (-16) but improved to -5, still within the low category, while the other one maintained a stable score of 0 or 1, staying within the average range. When examining the overall averages across all time points, it can be concluded that over the 15-month study period, the group's average scores showed a positive trend, improving from a slightly negative value to a steady improvement that ultimately brought the group within the average reference values for all age groups considered.

From the post-hoc analysis, it was found that between October 2022 and January 2023, there was no significant difference in scores after three months of GPA, indicating that three months of training did not lead to significant improvements in lower limb flexibility among the elderly. However, between January 2023 and June 2023, a significant improvement was observed after five months of activity, suggesting that a longer training period (five months) was effective in improving lower limb flexibility. No significant improvements were observed between June and October 2023, indicating a stabilization of the progress made. Finally, significant improvements in scores were observed between October 2023 and January 2024, indicating further gains in flexibility after a three-month period.

The results of the second administered test, the 30-Second Chair Stand Test for the 2022/2023 and 2023/2024 seasons, showed further improvements in the physical abilities of elderly participants. Specifically, in the 60-64 age group (n=1), a subject of 62 years began with a score of 8 (poor) in October 2022 but showed significant improvement over time, reaching 17 by January 2024, placing in the "Good" category. In the 65-69 age group (n=6), a subject achieved a score of 17 as early as January 2023, placing in the "Good" category and maintained high performance until January 2024. The other two subjects, who initially scored high (13), improved further, reaching scores of 19 and 21, respectively, placing themselves in the "Excellent" category. The other three participants, maintained scores between 12 and 17, staying in the "Good" category throughout the period. In the 70-74 age group (n=3), a subject showed notable improvement, moving from 10 (poor) to 20 (excellent) by October 2023, maintaining this performance until January 2024. Another who started with a score of 9 (poor), improved to 16 (good) by January 2024. The others progressed from 8 (poor) to 17 (good), showing significant progress. In the 75-79 age group (n=3), all subjects began with scores in the "poor" or "good" range (e.g., 9-10) and showed consistent improvements, with a subject reaching the "Excellent" category with a score of 18 by October 2023. Finally, in the 80-89 age group (n=2), subjects maintained a stable score in the "Good" category, improving to 17 by January 2024, thus moving into the "Excellent" category. By examining the overall averages for all participants, it can be concluded that the entire group demonstrated consistent performance improvement, progressing from an initial "poor" category in October 2022 to "good" by January 2023. Progress stabilized within the "good" range, with several age groups reaching values close to the "excellent" threshold by January 2024. From the post hoc analysis, a significant improvement was observed between October 2022 and January 2023 after three months, indicating that three months of GPA led to measurable improvements in the lower limb strength of the elderly participants. Between January 2023 and June 2023, a further significant improvement was noted after five months, suggesting that a longer training period continued to enhance strength. No significant improvements were observed between June 2023 and October 2023, indicating a stabilization of the progress achieved. Finally, significant improvements were recorded between October 2023 and January 2024, indicating further enhancement in strength after another three-month period.

The questionnaire administered to the participants of the GPA classes provided valuable insights into the perceived benefits of physical activity, attendance patterns, and the difficulties participants may face. The results reveal significant differences between age groups and suggest that perceptions and expectations of GPA evolve with age. 66.7% of participants reported attending the lessons regularly, with a significant portion attending consistently, while only 2.2% attended occasionally. This finding is particularly interesting as it indicates a strong commitment from participants, who likely view the activity as crucial to improving or maintaining their health. When analyzing the results by age group, an interesting trend emerges. Older participants tend to attend more frequently. For instance, in the 85-89 age group, 80% of participants reported attending all the lessons. This suggests that, with advancing age, GPA is increasingly perceived as essential for maintaining health, leading to greater consistency in attendance. The question about the difficulty in performing physical exercises revealed that most participants (67.7%) have no difficulty with the exercises, but a significant percentage (32.5%) occasionally

or frequently face difficulties. This could reflect the physical limitations some participants experience, although not systematically. Surprisingly, the data by age group do not show a clear linear trend. In the 59-64 age group, for instance, no one reported difficulties, while in the 65-69 age group, the percentage of those encountering problems increases significantly. However, in the older groups, such as 70-74 and 75-79 years, the percentage of those without difficulties tends to rise again. This phenomenon suggests that age-related physical difficulties are not always directly linked to the chronological age in a linear fashion, but also influenced by other variables such as prior levels of physical activity or overall health status. An important aspect that emerged from the questionnaire is the perception of the benefits associated with GPA.

Against initial expectations, younger participants (particularly those aged 59-64) tend to view physical well-being as the main benefit, with 85.7% of the responses indicating this, while in older age groups, such as the 85-89 group, participants are evenly split between physical and social well-being. The 80-84 age group showed a strong interest in physical well-being, with 100% of respondents identifying this as the primary benefit. These data suggest that, as people age, there is a shift in the benefits they perceive. While younger participants remain primarily focused on fitness, older participants seem to place greater value on social well-being, possibly reflecting a desire for socialization and continued participation in a group (Ramírez-Gomez et al., 2024). This could be due to an increased awareness of the social benefits of GPA, which, in addition to improving physical health, also provides an opportunity to meet others and break from the daily routine. The responses to the question regarding the usefulness of GPA for balance and coordination show a clear preference for the "A lot" option, with 75.3% of participants recognizing this as a significant benefit. However, the 85-89 age group showed a deviation from this general trend, with most participants responding "fairly". This may suggest that older participants perceive a more modest improvement in these areas, which could be related to maintaining rather than significantly improving balance or coordination (Dunsky, 2019). Similarly, the question about maintaining physical fitness saw a very high response rate (68.8%). Older participants, especially those in the 85-89 and 75-79 age groups, more frequently indicated that GPA is very useful for maintaining physical fitness, with 80% of responses in the 85-89 group choosing "A lot". This suggests that, despite physical activity not being particularly intense, GPA plays a significant role in preserving mobility and strength in elderly participants. The results of the questions concerning social and mental well-being underscore the increasing importance of these aspects in older age groups. Younger participants tend to consider GPA more useful for physical well-being, whereas with age, the value attributed to social well-being increases. Specifically, in the 85-89 age group, 40% of participants believe that GPA is beneficial for social well-being, which is consistent with the interest in physical well-being. However, in the older age groups, the importance placed on relational aspects gradually grows, suggesting that GPA also becomes an opportunity for socializing and maintaining interpersonal relationships. Regarding mental well-being, the most common response was "very useful" (65.6%), with an increase in this percentage in the older age groups. In the 80-89 age group, 80% of participants indicated a significant positive effect on stress reduction. This confirms that GPA not only helps keep the body in shape but also contributes to reducing anxiety and stress levels, thereby enhancing participants' overall quality of life (Churchill et al., 2022; Lin, 2024). This study's findings on psychological benefits align with those of Zhang et al. (2021), who highlighted the positive impact of exercise on stress reduction and mental health in older adults. The data from this study further confirms that GPA helps reduce anxiety and improve mental well-being, particularly in the oldest age groups (80-89).

Finally, a connection emerges between quantitative data and participants' perceptions. Specifically, similarly to other studies, the most significant perceived benefit was physical well-being, encompassing strength, balance, and functional capacity, which were linked to improvements in the lower limb muscle strength test (Giardullo et al., 2024; Yen & Lin, 2018). Muscle strength is also associated with the perceived usefulness of maintaining physical fitness and the ability to perform daily activities, both of which depend on strong lower limbs. Participants also consider GPA very useful for improving social and mental well-being, dimensions that were connected to progress in flexibility, due to its indirect impact on mobility and social participation. The perceived usefulness of balance and coordination, as well as the ability to perform daily activities, was also linked to improvements in flexibility. This supports Son et al., (2021), who observed that as individuals age, the social benefits of physical activity become increasingly significant.

Despite the promising results, the study has some limitations. The relatively small sample size could limit the generalizability of the results to a broader elderly population. Additionally, the absence of a control group makes it challenging to rule out external factors that may have influenced the observed outcomes. Another area for improvement is the frequency of evaluations. Although assessments were conducted five times over two years, the lack of a more continuous follow-up may leave gaps in the analysis of individual evolution among participants. Future studies should focus on expanding the sample size, including a control group, and increasing the frequency of evaluations to gain a deeper understanding of GPA's long-term effects on older adults. Additionally, exploring the clinical and practical implications of these results is crucial, particularly concerning the application of exercise programs in various settings, such as senior care centers and community health promotion initiatives. Moreover, exploring the relationship between physical activity and quality of life across different functional levels will help in designing more tailored exercise programs that meet the specific needs of diverse elderly populations, including those with varying physical abilities or health conditions. Lastly, the psychosocial benefits of exercise should also be explored. Specifically, how social interactions during exercise programs contribute to mental well-being and reduce feelings of isolation in older adults. Continued research in these areas will further enhance our understanding of how exercise programs can positively affect the overall health and well-being of aging populations.

Conclusions

The results of this study demonstrated the effectiveness of GPA courses in im-proving both the physical and psychological well-being of older adults in the long term. The intervention led to significant improvements in lower limb flexibility among participants, particularly after periods of five months (Jan-Jun 2023) and three months (Oct-Jan 2024), as shown by the previous results. While some participants started with below-average scores, many reached or exceeded the average reference values during the study. Furthermore, all participants benefited from a progressive improvement in lower limb strength and endurance thanks to the GPA. The most notable improvements occurred between January and June 2023, and again between October 2023 and January 2024, suggesting that training periods of five and three months were especially effective. Finally, the questionnaire's results suggest that GPA offers numerous benefits, which vary according to the participants' age and physical needs. While younger participants tend to focus on physical benefits, older participants have a more complex view, recognizing also social and mental benefits. The objective of establishing logical connections between quantitative and qualitative-quantitative data in the discussions has been achieved. Future studies could involve a larger sample and monitor perceptions not only in the final evaluation, but also throughout the study, including initial and interim assessments.

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Authors' and translators' details:

Giovanni Esposito	gioesposito@unisa.it	Author
Rosario Ceruso	rosario.ceruso@univr.it	Author
Gaetano Raiola	gaetano.raiola@unipegaso.it	Author
Sara Aliberti	s.aliberti17@gmail.com	Translator