Ciencia y Deporte

Volume 9 issue 1; 2024

Universidad de Camagüey "Ignacio Agramonte Loynaz"

Ciencia y Deporte
ISSN 2223-1773, RNPS: 2276
Vol. 9. No. 1, January-April, 2024 p-e223

Original artícle

DOI: https://doi.org/10.34982/2223.1773.2024.V9.No1.006

Effects of Aquagym Strength Fitness Program on Older Women

[*Efectos de un programa de condición física de fuerza en mujeres mayores en la actividad de aquagym*]

[*Efeitos de um programa de condicionamento físico de força em mulheres idosas em atividade aquática*]

Eulisis Smith Palacio[1*] , *Pello Egaña Abrego*[1]

[1]The Francisco de Victoria University. Faculty of Health Sciences Spain.

*Correspondence: e.smith@ufv.es

***Received**: 09/04/2023*
***Accepted**: 10/24/2023*

ABSTRACT

Introduction: Despite the spread of beliefs in strength development in the older population, this capacity must be considered in reference to physical health in the elderly. In that sense, this study conducted an intervention consisting of a new program design to improve the explosive strength in older women through Aquagym activities.

Aim: To analyze the differences in variables body weight and scale of perceived effort following the implementation of an aquagym program to enhance physical condition in elderly women.

Materials and methods: A total of 16 women, averaging 66, were selected. The subjects were surveyed using initial data. The methodology used was quantitative-qualitative, with a pre-experimental design and pre and post-tests. The strength program was implemented for 10 weeks, in 20 sessions.

Results: The intervention was performed in a sports facility in northeastern Spain, according to the SFT protocol by Rikli and Jones. The tests consisted of vertical jumping, horizontal jumping, getting up, and sitting, while the perceived effort was assessed through a 1-10. scale. The inferential results of the student-t test for paired samples were not significant (t=-0.248; p=0.408).

Conclusions: These studies have revealed improvements in aerobic and anaerobic performance, concerning strength, improvements in body proportion, indicators of functional preparedness, etc.

Keywords: aquagym, intervention, strength, elderly women.

RESUMEN

Introducción: a pesar de las falsas creencias sobre el desarrollo de la fuerza en mayores, esta capacidad se debe tener en cuenta cuando se habla de salud física en la tercera edad. Teniendo esta referencia, en el presente estudio se ha pretendido llevar a cabo una intervención consistente en una programación para la mejora de la fuerza explosiva en mujeres mayores a través de actividades de Aquagym.

Objetivo: analizar la diferencia en las variables peso corporal y escala de esfuerzo percibido después de la aplicación de un programa de aquagym para la mejora de la condición física en mujeres de la tercera edad.

Materiales y métodos: para ello, fueron seleccionadas un total de 16 participantes con una Edad Media *EM*= 66 años. Se administró una encuesta con los datos básicos iniciales. Este trabajo sigue una metodología mixta cuantitativa-cualitativa de corte

preexperimental con una evaluación pre y post. Se implementó un programa de fuerza durante diez semanas, 20 sesiones en total.

Resultados: la intervención se realizó en un centro deportivo al norte-este de España y tomando las indicaciones del protocolo SFT de, las pruebas consistentes fueron: salto vertical, salto horizontal, levantarse y sentarse en silla, y valoración de esfuerzo percibido a través de una escala del 1 al 10. Los resultados inferenciales de la prueba *t*-estudent para muestras emparejadas indican (t=-0,248; p=0.408) no significativa.

Conclusiones: estos estudios han señalado mejoras en el rendimiento aeróbico y anaeróbico, en las facultades de fuerza, en mejoras de la proporción corporal, en indicadores de preparación funcional, entre otras mejoras.

Palabras clave: aquagym, intervención, fuerza, mujeres de la tercera edad.

RESUMO

Introdução: apesar das falsas crenças sobre o desenvolvimento da força em idosos, esta habilidade deve ser levada em consideração quando se fala em saúde física em idosos. Tendo esta referência, no presente estudo procurou-se realizar uma intervenção que consiste numa programação para melhorar a força explosiva em mulheres idosas através de atividades de Aquagym.

Objetivo: analisar a diferença nas variáveis peso corporal e escala de percepção subjetiva de esforço após a aplicação de um programa de hidroginástica para melhoria da condição física em idosas.

Materiais e métodos: para isso foram selecionados um total de 16 participantes com Média de Idade MS = 66 anos. Uma pesquisa foi administrada com dados básicos iniciais. Este trabalho segue uma metodologia mista pré-experimental quantitativa-qualitativa com avaliação pré e pós-avaliação. Um programa de força foi implementado durante 10 semanas, 20 sessões no total.

Resultados: a intervenção foi realizada num centro desportivo do nordeste de Espanha e seguindo as indicações do protocolo SFT, os testes consistentes foram: salto vertical, salto horizontal, levantar-se e sentar-se numa cadeira e avaliação da percepção esforço

através de uma escala de 1 a 10. Os resultados inferenciais do teste t-student para amostras pareadas indicam (t=-0,248; p=0,408) não significativo.

Conclusões: estes estudos apontaram melhorias no desempenho aeróbio e anaeróbio, nas habilidades de força, na melhoria da proporção corporal, nos indicadores de preparação funcional, entre outras melhorias.

Palavras-chave: hidroginástica, intervenção, força, mulheres idosas..

INTRODUCTION

Presently, evaluations and improvements in physical condition in early adult women are part of several studies (Toledo Sánchez *et al.*, 2020). A review of recent publications about the impact of physical training on women's bodies has shown that the practice of physical activities to improve health levels cannot be done without solid scientific implementation through modern innovating fitness methodologies (Andrieieva *et al.*, 2020).

Physical Education (PE) researchers believe that the volume of weekly physical activity (PA) must be 6-10 hours for people over 25; 10-14 hours for people 18-25; 14-21 hours for school students; and 21-28 hours for pre-school children (Andrieieva *et al.*, 2020; Toledo Sánchez *et al.*, 2020). Data from the World Health Organization (WHO) demonstrated that adults between 18 and 64 must perform at least 150-300 minutes of aerobic PA moderately, or at least 75-150 minutes of aerobic PA vigorously, or an equivalent combination of moderate-vigorous PA throughout the week (Bull *et al.*, 2020).

Many experts in the area of PA (Drozdovska *et al.*, 2020; Goncharova *et al.*, 2020) point out that considering factors such as professional activity and health state is critical when designing workout routines to improve health in early adult women. Besides, the methods suggested for exercises in women must rely on the biological logic determined by the characteristics of women's bodies.

Considering the health of women in the first stage of maturity as the most important value of society for human reproduction, PA and sports experts are trying to find the most effective means to improve women's health and find ways to encourage them to increase motor activity (Goncharova *et al.,* 2020).

Drozdovska *et al.* (2020) pointed out that in-water exercise plays a relevant role in the prevention and correction of posture disorders, and assures its positive impact on joints and spine. Today, aquatic aerobic exercise has become increasingly popular among women (Kashuba *et al.,* 2020). It is a system of physical in-water exercises taken from gymnastics, choreography, sports, and artistic swimming, which are performed at the based on rhythmic and intense music in deep, mid, and shallow pools, promoting good shape.

Programs to improve women's health not only differ in the parameters of physical exercise but also in their objectives and efficacy. Studies on the impact of several fitness programs on health are relevant, though the least developed research in this area, so far (Balatska *et al.,* 2020). Programs of in-water fitness to improve health are the most popular among women. Some findings state that water exercise may be favorable to the functional state of the muscle-skeletal system, and the development of the respiratory and psycho-emotional systems. Besides, recent observations have shown a growing interest in women in aquafitness as a means to recover strength and maintain good sports performance, and good health (Kashuba *et al.,* 2020).

This type of training causes a significant reduction of tension in the joints and spine, and normalization of blood pressure (Kashuba *et al.,* 2020). Aquafitness offers a chance for jumping and running exercises. It stands out for leading to a body weight reduction, with a lower possibility of blood clots and varicose vein formation. Water training has a favorable impact on the cardiovascular and respiratory systems. It could help reduce body weight and stop spine problems a great deal (Vysotskaya *et al.,* 2020).

Aquafitness is a PA type that has been gaining ground lately (Pirohova *et al.*, 2021). The uniqueness of the water training owes to several factors. High water density permits the use of this environment as a natural simulator. In water, the effects of exercise may be directed to the development of strength, strength endurance, and general endurance (Miroshnichenko *et al.*, 2021).

Aquafitness affects the body's functional state, and the level of the physical-emotional state, and it is a significant factor in slowing down aging, maintaining good health, and increasing PA (Shutova and Golubnichy, 2020). The scientific analysis and systematization of modern fitness programs about the physical culture of health in elderly women were evaluated in a series of research studies that corroborate the opinions associated with the process differentiation of sports activities in different groups of people. Among the differentiation criteria, the experts point out the following: low adaptative capacity of the body, genetic factors, and biological and physical development rate (Krutsevich *et al.*, 2021).

Although water exercise seems to adjust for adults and the elderly, studies have shown certain shortcomings, like the possible physiological effect of immersion in water, the range of intensities and duration, and differences in program designs, creating doubts about its real effects. However, most programs have been designed by researchers, and/or use few exercises; besides, further research should be done upon real life implementation. Most studies were based on external validation, in extremely controlled settings that do not represent real life.

Accordingly, the aim of this research study was to analyze the effects of an aquagym program to enhance physical condition, particularly body weight and scale of perceived effort, in elderly women.

MATERIALS AND METHODS

The methodology used was quantitative-qualitative, with a pre-experimental design and pre- and post-tests, to generate a set of quantitative and qualitative values. The program lasted ten weeks, covering twenty sessions (two sessions per week) The study was face-to-face, and evaluated the results and proper data collection. Besides, the study aimed to provide a theoretical rationale for this phenomenon, and conducted a bibliographic review to gather information used in the Introduction, and to contrast the results with similar studies, in the Discussion.

Participants

A total of *n*=16 women engaged in the study (*ME*=66). The population was from Valle de Baldizarbe. They took the program completely and uniquely at the El Molino de Mendigorria Camping site (carretera Larraga s/n, Mendigorria, Navarra). The participants were selected through a survey to see if they met the inclusion criteria to conduct the evaluation program (Table 1).

Table 1 *- Opinions established and considered for the program*

CRITERIA	YES	NO
Be over 60	x	
Have a medical certificate accrediting the person's optimum health state, with special attention to the program's development.	x	
To have a pathology that hinders the program development.	x	
Attendance to 90% of classes, minimum.	x	
Having some sort of blood pressure or cardiac frequency.	x	
Having some psychic problem that hinders proper program development.	x	

Before the program's sessions started, all the participants were informed about the purposes of the program and were asked to sign an authorization to use their data for scientific and academic use.

Anthropometric measures and physical condition

The subjects were weighed on a Dietfarma digital scale. Physical condition was evaluated through SFT. This application matches and confirms usage by people over 60 and 94. There has been a decrease in the physical condition with age; however, strength is the physical capacity that decreases the least. The SFT exercises consisted of vertical jumping (quadriceps), horizontal jumping (gemelli); getting up and sitting on a chair, and numbering the repetitions every 20 seconds.

Intervention

The program lasted ten weeks, between March and May 2023, and consisted of twenty sessions, two sessions per week. The training program's sessions had the same structure: warm-ups, a main part, and resting. During the warm-ups, the subjects exercised sitting on the edge, using their lower limbs (abductors, quadriceps, ischiotibials, and glutei) for activation. Then, the main part, starting with a low intensity and progressing to higher intensity. No problems were observed in the subjects, so no adjustments were necessary.

The level was progressively increased as the program advanced. That way, the initial exercises were pedaling to rise in the water using the float rubber sticks, imitating the crawl kick, while floating on the rubber stick, knees on the chest lying face up horizontally on the float rubber, then more complex exercises, like fartlek combined with pedaling, and skipping. These exercises were similar to the initial activities but shorter and more intense. In the first weeks, the subjects performed general upper and lower limb exercises, whereas in the last weeks, specific lower limb exercises were done. The latter consisted of using the crawl kick, the floating rubber stick (Figure 1 and Figure 2), like pedaling on a static bicycle, combining positions, and kicking on the water surface. Some of them were sitting on the edge, with hand support, to engage all the lower limbs.

Fig. 1. - *The participants using float rubber sticks*

Fig. 2 - *Group photo (One of the groups in the study)*

For instance, session twelve started with the warm-ups: on the edge and then in the water for full activation of the lower limb muscles. The edge exercises consisted of making circles with both legs and changing the spinning direction. Spreading and tightening folded and stretched legs; kicking laterally, as if hitting with the ankles' malleoli, kicking as if riding a static bicycle. The water exercises consisted of putting the knees on the chest laterally; tiptoeing with tight legs (gemelli), and opening and closing (abductors).

Data analysis

T student-t test was run for paired samples, considering $p<0.05$ as the confidence interval. MO Excell was used to analyze the inferences of comparative process (Veiga, Otero, and Torres, 2020), in teaching and sports practice, in different populations. The quality analysis consisted of an interview containing three questions, in which the participants could respond freely based on their post-training sensations.

RESULTS

Quantitative analysis

The table shows the results of the means in the first and second measurements (Table 2), as well as the differences between the means.

Table 2 *- Summary of the results of variables by means and differences*

Variables	Pre	Post	Differences
Horizontal jumping	104.67	106.24	1.57
Sitting and getting up repetitions	14	16	2
Scale of perceived effort	5.25	4.45	0.8
Vertical jumping	17.56	17.84	0.28
Body weight	69.35	67.24	2.09

The statistical results of student-t for the paired test showed that pre- and post-horizontal jumping was 104.67 and 106.24, respectively; in the sitting and getting up variable, pre- was 14 and post- was 16. The scale of perceived effort showed that pre- and post- were 5.25 and 4.25, respectively. Lastly, vertical jumping showed 17.56 for pre- and 17.84 for post. The inferential results of the student-t test for paired samples were not significant (t = -0.248; p = 0.408). Thus, indicating that the program did not have the expected results (Table 3).

Table 3 *T -test for the means of paired samples*

	Variable 1	***Variable 2***
Mean	42.166	42.354
Variance	1851.82243	1858.22918
Observations	5	5
Pearson coefficient correlation	0.999229352	
Hypothetical mean differences	0	
Degrees of freedom	4	
T Statistics	-0.248373668	
P(T<=t) one tailed	0.40803784	
Critical T value (one tailed)	2.131846786	
P(T<=t) two tails	0.81607568	
Critical T value (two tailed)	2.776445105	

Firstly, it shows the progression of the participants' mean weight before and after the intervention (Table 4). As shown, the mean (kg) of the participants before the intervention was 69.33 kg, while the mean after the intervention was 67.24. Therefore, the mean weight difference generated after the intervention was 2.09 kg.

Table 4. *- Pre-Post body weight comparison*

(n=16)	PRE (mean)	POST (mean)	Difference (mean)
Weight (kg)	69.33	67.24	2.09

Below are the results of the vertical jumping test (cm), also showing the participants' means before and after the intervention (Table 5). As shown, the vertical jumping mean of the participants before the intervention was 17.56 cm, while the mean after the intervention was 17.84 cm, with a post-mean difference of 0.28 cm.

Table 5 *- Pre- and post-mean comparison in vertical jumping*

(n=16)	PRE (mean)	POST (mean)	Difference (mean)
Vertical jumping (cm)	17.56	17.84	0.28

Below are the results of the horizontal jumping test (cm), also showing the participants' means before and after the intervention (Table 6). As shown, the horizontal jumping mean of the participants before the intervention was 104.67 cm, while the mean after the intervention was 106.24 cm, with a post-mean difference of 1.57 cm. The increase observed in horizontal jumping was greater than in vertical jumping.

Table 6 *- Pre- and post-mean comparison in horizontal jumping*

(n=16)	PRE (mean)	POST (mean)	Difference (mean)
Horizontal jumping (cm)	104.67	106.24	1.57

Concerning the number of repetitions of sitting and getting up from a chair, measurements included the values before and after the intervention. Table 7 shows the mean value of repetitions (14) before the intervention, whereas after the intervention it was 16 repetitions; the difference showed 2 more repetitions.

Table 7 *- Pre-post mean comparison of repetitions (sitting and getting up from a chair)*

(n=16)	PRE (mean)	POST (mean)	Difference (mean)
Number of repetitions	14	16	2

Lastly, there was an analysis of the scale of perceived effort (1-10), with 1 being the lowest value and 10, the highest. The scale was used to measure the total mean before and after the intervention. Table 8 shows the participants with a 5.25 before the intervention, then after the intervention, that value dropped to 4.45, with a 0.8 less difference.

Table 8. *- Pre- and post-mean comparison of the scale of perceived effort score*

(n=16)	PRE (mean)	POST (mean)	Difference (mean)
Scale value	5.25	4.45	0.8

Quantitative analysis

Several questions were presented to the subjects looking to raise the reliability of the results. How do you feel at the end of the aquagym sessions? What skills have you acquired after the aquagym sessions, that you did not have before? Why do you think that the aquagym sessions help you improve your health? (Table 9).

Table 9. *- Responses*

Questions	Post-test responses (P)
1- How do you feel at the end of the aquagym sessions?	P1: I feel great, more relaxed, motivated, with a higher spirit, though a little tired. P2: I have more muscle strength, less stiffness in the joints, and more flexibility and coordination. I can rest much better. P3: I have systemic erythematosus lupus, chronic renal insufficiency, and antiphospholipid syndrome. Aquagym has helped me improve a great deal. This activity has little impact and has helped me improve joint movements, and we work every muscle, it improves blood circulation. I have much less joint and muscle pain

The responses to this question were quite general since most participants said that they felt satisfaction at the end of every session. The effect of training was remarkable, though tiredness resulting from a long time of inactivity and exercise in the sessions in this group of people led to a reduction in the pulsations, according to the subjects. The fact that the sessions were performed in water was stimulating, despite the tiredness, and the participants expressed feelings of overall well-being (Table 10).

Table 10. *- Responses*

Questions	Post-test responses (P)
2 What skills have you acquired after the aquagym sessions, that you did not have before?	P1: I feel good and fulfilled after taking these exercises. I want to thank you for taking care of us so well. P2: Many skills, I couldn't tell them all now, but one thing is true: I feel I'm more agile. P3: To me, this exercise is crucial, especially in the water, for people our age. P4: I'm tired, but feeling good to myself. P5: I can move better now. P6: When we started my left leg had little mobility and pain, now I have improved so much and have no discomfort, so this is fantastic.

Since the objective of the intervention was to improve strength, particularly the lower limbs' quadriceps, the new skills were associated with improvements in everyday activities, such as getting up from bed or a chair, moving faster, and better joint movements, both in the knees and hips, as well as improvements in the cardiac frequencies in activities that required a great effort previously (Table 11).

Table 11. *- Responses*

Questions	Post-test responses (P)
3 Why do you think that the aquagym sessions help you improve your health?	P1: I have the satisfaction of performing a good job and I'm very relaxed. P2: I feel more agile, and I noticed improvements in my leg injury. P3: We work the body and the sensation when done in water for older people like us, has a great impact, and therefore, it is more beneficial. P4: I'm tired, but feeling very good. P5: In the water, I managed to touch my heel, something I couldn't do before; I can raise my legs higher than before. I can see that when I get in the shower, I'm more agile now. P6: Because it helps me move muscles, I could not move outside the water so I can't go out, now we did cardio.

The aquagym activities have to do with general improvements in physical capacities, in health, and therefore life quality. There are several benefits and no negative impact, since water maintains the body lighter; it is an ideal activity for people with back problems, joint pain, or if you are recovering from injuries or have other limb conditions, particularly the legs. It not only is good for improving health but also for maintaining and shaping your figure. Movements in the water act on the skin, through a draining massage that helps stimulate circulation, favoring a reduction in liquid retention, and cellulitis. Another important benefit of aquagym is in mental health. The relaxing effect

of water, and the feeling of lightness when exercising, are pros of this aquatic sport. Likewise, as in many other sports, this one causes endorphin secretion, also known as the pleasure hormone, which contributes to a fulfilling sensation after a big effort.

DISCUSSION

This experimental study looked to check the differences in variables body weight and scale of perceived effort following the implementation of an aquagym program to enhance physical condition in elderly women. In this direction, many studies were reviewed for a comparison study, and the results have been significant.

Quite a few studies demonstrated the efficacy of aquagym-based training programs, with improvements in physical capacities similar to the ones in our intervention. For instance, Andrieieva et al. (2020), evaluated the efficacy of a combined exercise program to improve physical condition in women, based on 35 indicators selected through factorial analysis and they characterized the physical condition of women whose opinions were used to measure the effectiveness of the exercise program suggested. The study confirmed the effectiveness of the combined exercise program, according to the selected criteria. There were significant positive changes ($p < 0.05$) in the physical condition components, including physical development, physical condition, the functional state of the cardiorespiratory system, and body balance.

Likewise, Kashuba *et al.* (2021) evaluated the effects of health improvements of an aquagym program on the functional indicators and physical aptitudes of early adult women. The subjects took part in an aquatic gymnastic program that lasted six months, with 60-minute sessions, three times a week. The program included aquatic stretching exercises, body modeling, aquadance, aquatic gymnastics, and aquataebo. Although these activities had similar findings to this research, the studies done by Kashuba *et al.* (2021) showed improvements upon participation in the program, such as vital capacity increase (45.96±4.69 to 48.88±0.68); higher strength index (35.80±1.07 to 43.26±0.71).

Overall, the evaluation of somatic health in women evidenced a significant improvement ($p<0.05$). As to this intervention, it can be concluded that the aquagym program developed could be used as an effective tool for improvements in health and body weight control in young adult women.

Meanwhile, Miroshnichenko et al. (2021) tried to identify the characteristics of the impact of aquafitness training on aerobic and anaerobic productivity. In that case, the subjects were part of an aquatic gymnastics program, and the training sessions were aerobic and strength. Likewise, in this intervention, aquafitness was shown to be a popular means to correct functional training indicators. Although in this case, the program combined strength and aerobic training, there was an increase in aerobic productivity, lactic anaerobic productivity, and alactic anaerobic productivity. These parameters are not part of the current study, the improvements reported in this intervention are similar.

Besides, Miroshnichenko *et al.* (2021) found that all the functional preparedness indicators increased, similar to the current study. Vysotskaya et al. (2020) searched for effective aquafitness means to correct the functional state of 35-45-year-old women. In this intervention, the control group trained for 40-min sessions, three times a week, with aquatic aerobics twice a week and swimming once a week. The experimental group took aquatic gymnastics three times a week for 40 minutes. Finally, the method proved to be effective, with more significant favorable changes in the results of the experimental group compared to the control group, in terms of functional state, fat, and muscular components of the body.

It aimed to determine the effectiveness of a different approach in aquafitness classes, with 30 women in the first period of adult age (Pirohova *et al.*, 2021), which demonstrated the efficacy of a different approach in aquatic fitness classes, improving women's bodies. At the end of the study, there were no reports of type II obesity in the women, as well as low weight. The number of type I obesity in women dropped by 3.33%. The number of women with normal body weight increased by 13.37%, according to the authors.

The program developed by Pérez Fuentes (2021) lasted 12 weeks of training, with 2 sessions (60 min each) a week. Each session kicked off with warm-ups (joint mobility and movements around the pool). The main part was split into 3 blocks; block No. 1 was targeted for comparison with the current intervention, associated with strength in the water, with the following exercises: pushing a board/floating rubber stick with knee flexes and activated core, pushing the water forward with the implement; pulling a board/floating stick in the same way, but pulling; lifting the board/floating stick just like the previous, but lifting the floating stick over the head; sitting; and lunge.

Finally, Goncharova *et al.* (2020) tried to develop and test the effectiveness of an aquafitness exercise program to improve the posture of women during the first period of mature age having different body types. Hence, women were distributed depending on their types of posture disorders and their changes under the influence of aquafitness classes. The improvements were also evident; the study confirmed the efficacy of aquafitness for the promotion of health to prevent and correct posture disorders. In that sense, Kashuba et al. (2020) reported similar results.

CONCLUSIONS

The intervention proposed in this study showed improvements in all the physical capacities upon its implementation in the women selected for the study, though the results were not significant. There have been improvements in measurements before and after the intervention, in the vertical jumping test (0.28 cm improvement increase); the horizontal jumping (1.57 cm improvement increase); the number of sitting and getting up repetitions, with a two-repetition improvement; and finally, the test on the analysis of the scale of perceived effort (1-10), with a 0.8 improvement.

It can be concluded that the strength training programs using aquagym are effective. Likewise, several studies reviewed and discussed provided a similar conclusion. All have stressed the efficacy of the suggested methods for the adult woman population.

These studies have revealed improvements in aerobic and anaerobic performance, concerning strength, improvements in body proportion, indicators of functional preparedness, etc.

Study limitations

First of all are the risks of bibliographic reviews, such as the large variety of studies, in terms of physical activity programs, which creates a personal bias, when using certain programmatic models. Moreover, there are many variables left out, serious joint and muscle problems, each person's diet, and the use of supplements, along with potentially severe conditioning psychological aspects, sleep quality, and more. Though they were not determinants for the program, they may have influenced the results.

Another limitation is the short number of sessions. A greater number could have produced more considerable changes in body composition, strength improvements, explosiveness, etc.

Lastly, the studies and programs reviewed were dissimilar in aspects related to the target population (only elderly women), the size of the sample, set exercises, etc.

Further research lines

Considering the limitations expressed above, the following lines of research may be established in the future.

Similar programs with more sessions and participants. These programs should be developed with greater control of certain variables, such as diet, psychological aspects, joint-related problems, muscle or mobility issues, and others. Thus, the adaptations observed are reduced to the duration of our intervention. A longer intervention could have brought about more adaptations. Consequently, it is important to consider the variables pointed out as limitations.

Finally, the addition of questionnaires about the health state, with an assessment of qualitative and quantitative aspects linked to the evaluation was a very valuable tool.

BIBLIOGRAPHIC REFERENCES

Andrieieva, O., Yarmak, O., Kashuba, V., Drozdovska, S., Gineviènienë, V., Blagii, O. y Akimova-Ternovska, M. (2020). Eficiencia de un programa combinado de acondicionamiento físico para mejorar la condición física en mujeres jóvenes. Teorìâ ta metodika fìzièngogo vihovannâ [*Teoría y métodos de la educación física*], *20*(4), 195-204. https://doi.org/10.17309/tmfv.2020.4.01

Balatska, L., Liasota, T., Nakonechnyi, I., Hakman, A., Bezverkhnia, H., Kljus, O. y Semenov, A. (2020). *Actividadde diferentes grupos sociales. Monografía Colectiva.* Baltija Publishing. https://doi.org/10.30525/978-9934-588-60-0

Bull, F. C., Al-Ansari, S. S., Biddle, S., Borodulin, K., Buman, M. P., Cardon, G., y Willumsen, J. F. (2020). Directrices de la Organización Mundial de la Salud 2020 sobre actividad física y comportamiento sedentario. *Revista británica de medicina deportiva,* *54*(24), 1451-1462. https://www.who.int/es/publications/i/item/9789240014886

Drozdovska, S., Andrieieva, O., Yarmak, O. y Blagii, O. (2020). *Personalización de programas de acondicionamiento físico que promueven la salud para mujeres jóvenes basado en el factor genético. Journal of Physical Education and Sport 20(1):331-337* DOI:10.7752/jpes.2020.s1046; https://www.researchgate.net/publication/342083426_Personalization_of_health -promoting_fitness_programs_for_young_women_based_on_genetic_factors

Goncharova, N., Kashuba, V., Tkachova, A., Khabinets, T., Kostiuchenko, O. y Pymonenko, M. (2020). Corrección de trastornos posturales de mujeres de edad madura en el proceso de aquafitness teniendo en cuenta el tipo de cuerpo. *Teoría y metodología de la educación física, 20*(3), 127-136.

Kashuba, V., Andrieieva, O., Hakman, A., Grygus, I., Smoleńska, O., Ostrowska, M., y Zukow, W. (2021). Impacto del entrenamiento de aquafitness en la condición física de las mujeres adultas tempranas. *Teoría y metodología de la educación física, 21*(2), 152-157. https://doi.org/10.17309/tmfv.2021.2.08

Kashuba, V., Tomilina, Y., Byshevets, N., Khrypko, I., Stepanenko, O., Grygus, I., ... y Savliuk, S. (2020). Impacto de Pilates en la intensidad del dolor en la columna vertebral de mujeres de primera edad madura. *Teoría y metodología de la educación física, 20*(1), 12-17. https://doi.org/10.17309/tmfv.2020.1.02

Krutsevich, T., Marchenko, O., Trachuk, S., Priymak, S., Panhelova, N. y Kholodova, O. (2021). *Consecuencias de la autoevaluación del desarrollo físico de los escolares que tienen en cuenta sus características de género*, Sport Mont. 19(52), 195-199. DOI 10.26773/smj.210933

Miroshnichenko, V. M., Brezdeniuk, O. Y., Holovkina, V. V., Romanenko, O. I. y Chekhivska, I. S. (2021). Preparación funcional de mujeres del primer período de edad madura bajo la influencia del entrenamiento de aquafitness. *Salud, deporte, rehabilitación, 7*(1), 19-27. https://doi.org/10.34142/HSR.2021.07.01.02

Pérez Fuentes, R. (2021). Propuesta de entrenamiento multicomponente y cognoscitivo en mayores de 65 años en piscina poco profunda. Universidad de Alemría. *España.* https://repositorio.ual.es/bitstream/handle/10835/13591 /PEREZ%20FUENTES%2C%20RAMON.pdf?sequence=1&isAllowed=y

Pirohova, K., Ì y êytchyk, Î., Afanasiev, S., Omelchenko, O., Sydorchuk, T., Stepanova, I. y Kosheleva, O. (2021). Dinámica de los indicadores de tipo corporal de mujeres

adultas bajo la influencia de la aptitud acuática. *Teoría y metodología de la educación física, 21*(2), 129-135.

Vysotskaya, T., Shutova, T. y Golubnichy, S. (2020). *Los medios efectivos de aquafitness en la corrección del estado funcional de las mujeres maduras. 15*(2proc), 189-S199. doi: https://doi.org/10.14198/jhse.2020.15.Proc2.09

Toledo Sánchez, M., Concha Chávez, E., & Ruíz Campos, V. B. (2020). Programa de actividad física para la mejora de la fuerza de brazos en adultos mayores. *Conrado, 16*(72), 217-221. https://conrado.ucf.edu.cu/index.php/conrado/article/view/1234/1233

Conflict of interest statement:

The authors declare having no competing interests.

***Author contribution statement*:**

The authors have participated in the redaction of the manuscript and the documentary review.