

## **Effects of interventions on the practice of physical activity, sedentary behavior, physical exercise and physical fitness related to health and of these about different health indicators**

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**Abstract:** This study aimed to evaluate the performance of physical fitness on the strength, aerobic endurance, flexibility, agility and dynamic balance with the practice of hydrogymnastics and associate it to the variables gender, age and health self reported condition. The tests used in this study were described by Rikli and Jones with pre-test / post-test design in a group composed of 20 elderly, featuring a pre-experimental study. The assessment instruments were applied before and after 18 sessions of a hydrogymnastics program. The age of the participants ranged from 61 to 80 years, mean 70,9 years, most of them were women. The results relating to health self reported condition and performance of physical fitness were higher for all variables in the post-test when compared with the result of the pre-test. When comparing the changes "before-after" in scores of health and physical fitness among age groups, it was obtained significant results in the Upper Limbs Strength and Inferior limbs force and resistance. Thus, we can say that the practice of hydrogymnastics for elderly helps to improve the performance of all the variables of physical fitness.

**Key Words:** Physical Fitness. Water Aerobics. Aging.

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### **I. INTRODUCTION**

The practice of physical activities contributes beneficially to the changes due to aging, helping to maintain muscular, respiratory and joint functions, contributing to delay the decline of physiological systems. Such stimuli corroborate a different lifestyle, since they can lead to the resumption of independence, making people enjoy their lives<sup>1</sup>. In this context, to maintain cardiovascular capacity in a satisfactory situation, interacts directly with physical fitness, reducing functional declines and contributing to a healthier and independent lifestyle, with a lower incidence of disease risk<sup>2</sup>.

Among various physiological changes caused by aging and physical inactivity, changes in the musculoskeletal system are very important. Remembering that muscular strength have a predominant role in reducing the risk of falls, in addition to the relation with autonomy, functionality and mobility. Consequently, there is a reduction in the risk of fractures caused by typical bone demineralization in the elderly<sup>3,4</sup>.

The strength maintenance should be priority work with elderly. The decline in muscle strength can reach 50% after age 65 and many people to begin to lose their ability to perform everyday functions early in the aging process. Current research shows that with physical exercise, it is possible at any age to regain most of the strength and muscle mass lost, resulting in improved functional mobility<sup>5</sup>.

Another segment of physical fitness that deserves evidence refers to the reduction of the range of motion, which, coupled with a decrease in the flexibility of the spine, may favor the appearance of a flexed posture. Such posture causes changes in postural alignment<sup>1</sup>. For Baum<sup>6</sup>, the painless posture and the muscle mobility without discomfort, depend on the maintenance of the range of motion in all joints. The elderly, without this regular practice, are more susceptible to injuries to joints and muscles.

Certain changes in motor strategies result in adaptations of movements according to the change in task and environment, interfering in the agility of the individual to practice daily activities<sup>1</sup>. Agility is included in a range of basic requirements for achievement. It denominates the favoring of activities that stimulate the quick gestures and abrupt changes of direction. Aging also affects the ability of the central nervous system to perform the processing of the visual, vestibular and proprioceptive signals responsible for the maintenance of the body balance, as well as the ability to change the reflexes, leaving the ability to be agile deficient<sup>7</sup>.

Some people think that the older they are, the less able they are to practice certain activities, since there actually is a decline in physical abilities, which can be reversed / attenuated from regular physical exercise<sup>8</sup>. For Baum<sup>6</sup> the aquatic exercises gained a greater recognition of the elderly population, by the numerous advantages that it offers. Some older people, who are no longer able to exercise comfortably on the ground, can do this in the water due to reduced joint, muscle, ligament and bone and tendon stresses, thereby reducing the risk of injury. All this in a refreshing and pleasant environment<sup>6,9</sup>. It is an activity that causes low impact on the joints and helps both cardio-respiratory and muscle toning. It is an ideal program of conditioning, aiming at the improvement of physical and mental well-being<sup>10</sup>.

In this context, this research aims to evaluate the performance of physical fitness in elderly who practice hydrogymnastics, regarding lower and upper limb strength, aerobic resistance, lower limb and upper limb flexibility, agility and dynamic balance and associate it with the gender variables, age and self-reported health condition.

## **II. MATERIAL AND METHODS**

The study presents a quantitative, pre-experimental design. The study was approved by Ethics Committee of Feevale University, obtained the number 4.09.02.11.2088 and met the determinations of the Declaration of Helsinki.

### **Sample**

The sample was constituted by convenience, represented by 20 elderly, of both genders, who did not attend regular physical activities. Regarding inclusion criteria, it was established that the elderly could not be regularly attending physical activities; who should voluntarily participate in the study and submit a medical certificate authorizing the practice of regular physical activity.

### **Data collection instruments**

Initially, the data of the elderly were recorded in relation to gender, age and self-reported health condition, then the procedures were explained and physical fitness data were collected, characterized by the evaluation of the strength of the lower and upper limbs, aerobic resistance, flexibility of lower and upper limbs, agility and dynamic balance, described by Rikli and Jones<sup>11</sup>.

The evaluations used in this study were as follows: Assessment of lower limb strength - Chair Lift and Sit (maximum number of executions in 30 seconds without the aid of arms); Assessment of upper limb strength - Elbow flexion and extension (maximum number of executions in 30 seconds); Assessment of aerobic resistance - Stationary walking of 2 minutes (number of steps taken in two minutes); Assessment of flexibility of lower limbs - Sit and reach feet (centimeters closer to feet); Assessment of flexibility of upper limbs - Reach back (centimeters closer to hands); Evaluation of agility and dynamic balance - Raise and walk (shorter time).

### **Procedure**

The intervention program occurred during six weeks, corresponding to 18 sessions of hydrogymnastics, with weekly frequency of three times. Each session occurred during 45 minutes and was performed in a thermal pool with a temperature range of 31° to 32°. The activities were organized through a program recommended by Aboarrage<sup>12</sup>, which involves the following structural characteristics: 5 to 10 minutes of warm-up activities, to increase body temperature and joint lubrication, 20 to 25 minutes of specific content, involving the work of aerobic conditioning and localized muscular resistance; 10 final minutes of muscle relaxation activities, through light exercises and last stretching. The methodology used followed the model proposed by the author, characterized by interval training, in which the exercise series were repeated, with recovery intervals and rest periods. To verify the exercise intensity, the Subjective Effort Perception Scale, known as the Borg scale, was used. The scale ranges from 6 to 20 and is related to work intensity and heart rate<sup>13</sup>. After the implementation of the program of activities, the post-test was performed using the same procedure used in the pre-test to measure the study variables.

## **III. RESULT AND DISCUSSION**

Regarding the characterization of the sample, the participants' ages ranged from 61 to 80 years, with a mean of 70,9 years. In the gender variable, the participation of women elderly were predominant, with 90%, thus evidencing the feminization of old age, characterized by the increase in the number of women in the elderly population. The highest percentage of women in the research comes from their greater longevity, since, among other causes, they have less exposure to risk factors such as smoking and alcoholism, as well as differences in behavior between men and women in relation to the control and treatment of diseases<sup>14</sup>.

The feminization of old age is also noted by the relative increase in older women who are responsible for family support and who are part of the economically active population. And this number tends to grow even more in the coming years, according to data from Brazilian research institutes, which shows that life expectancy at birth is about nine years higher for women than for men and that at 60 is about four years longer than the male, creating new demands for institutions and social agents<sup>15</sup>.

**Table 1:** Comparison of study variables between "before" and "after" moments (n = 20)

Variable		Mean	Standard Deviation	p
Health (points)	Before	2,9	0,6	<0,001
	After	4,5	0,5	
Strength LL (repetitions)	Before	13,3	1,5	<0,001
	After	16,2	2,2	
Strength UL (repetitions)	Before	19,0	4,4	<0,001
	After	22,5	5,4	
Resistance (steps)	Before	62,7	7,1	<0,001
	After	77,3	10,1	
Flexibility LL (centimeters)	Before	-4,3	2,4	<0,001
	After	6,8	4,8	
Flexibility UL (centimeters)	Before	-15,6	5,7	<0,001
	After	-11,2	5,6	
Agility (second)	Before	6,9	1,0	<0,001
	After	5,8	0,93	

The Table 1 shows the results regarding health and physical fitness variables in the pre and post test. In this segment it is observed that the surveyed elderly presented a superior result in all the variables in the post-tests, when compared with the pre-test result. Wilcoxon's non-parametric test showed significant differences between the values of the above tests, since there was a significant increase in the post-test period (p = 0,001).

Regarding the variable health self reported, at the time before, were obtained 2,95 points and after 4,55 points, showing a great satisfaction with health after the application of the program of activities. Considering the findings, it is important to highlight the research of Martins, Silva, Figueiraset al.<sup>16</sup>, whose objective was to analyze the association between self-perception of health and functional aptitude in the elderly, which had 167 participants. The results found point to reports of improvement in self-perception of health and that perceived health was more positive among the elderly with moderate to good physical fitness, being evidenced in the study, higher levels of functional aptitude, demonstrating a significant relationship specifically in the tests that involved the ability to locomotion.

Similar results were found in the study of Sobral<sup>17</sup>, whose objective was to investigate the self-perception of health of 162 women attending a sports practice center, and the result showed that 87% had a good or excellent perception of their health.

In the variable Strength of Lower Limbs, a pre-test result obtained a mean of 13,20 repetitions and in the post-test 16,20. Considering the average age of the study sample (70,9 years), the findings shows scores above the normal in the post-test, taking into account the standards pre-established by Rikli and Jones<sup>11</sup>. Considering the studies of Araújo and Barbosa<sup>18</sup>, regarding the strength of the lower limbs, the results obtained by the sample of 26 elderly women, with a mean age of 71 years, were superior in relation to the reference data of Rikli and Jones<sup>11</sup>. In a general analysis, both the elderly gymnasts and the elderly women practicing hydrogymnastics in this study, obtained satisfactory results when compared to the reference values of Rikli and Jones<sup>11</sup>.

Already in the study of Elias, Gonçalves, Moraes, Moreira e Fernandes<sup>19</sup>, which aimed to verify the functional physical fitness of elderly hydrogymnastics practitioners, the strength levels of the lower limbs found were low. One possible explanation explained by the authors is that the elderly present a decrease in muscular strength in the lower limbs, due to the lower utilization of the musculature over the years, mainly of the lower limbs, since the elderly decrease the daily activities, with low locomotion.

Silva, Costa e Guerra<sup>20</sup> analyzed in his study the strength of lower limbs of elderly who practicing and non-practicing a recreational gymnastics program, and the results obtained in the sit and stand up in 30 seconds test, clearly indicate superior strength of lower limbs of the group practicing gymnastics in relation to non-

practitioners. Physical inactivity among the elderly in the study has become a potentiating factor for lower limb functional decline.

In the study by Almeida, Veras and Doimo<sup>21</sup> statistical differences were observed, although not significant, comparing a group of women elderly who practiced hydrogymnastics and other gymnastics, and it was possible to improve the performance of the hydrogymnastics group in the "sit and stand in 30 seconds test". One of the reasons may be due to the resistance that the water provides, since such resistance is dependent on the speed and shape of the moving part, for the same pattern of movement, therefore the exercises performed in that medium require more force than the exercises in the ground.

In the Strength of Upper Limbs segment, it was observed that the subjects surveyed presented a superior result in the post-test (22,55 points) when compared to the result of the pre-test (19,00 points). In the study of Araujo and Barbosa<sup>18</sup>, it was found that in relation to the strength of upper limbs, the findings became superior to those referenced and recommended by Rikli and Jones<sup>11</sup>, and the sample was composed of 26 elderly women, with a mean age of 71 years, hydrogymnastics and gymnastics.

In another study involving muscular strength of upper limbs, Mazo, Cardoso, Dias, Simas and Luft<sup>22</sup>, found that after a period of three years, 13 women, with a mean age of 66 years, practiced hydrogymnastics, obtained significant gains of 63% in the muscular strength level of upper limbs. The classes took place on a weekly frequency of two times and lasted around 50 minutes. It was observed that even with the vacation period, the elderly did not show losses in strength levels when they returned to the program of activities. The results found in the study by Elias et al.<sup>19</sup>, resemble the research, and can then compare that, in the elderly population, hydrogymnastics has effects similar to resistance exercises of muscular strength, often performed in academies.

In the resistance question, it was found that the surveyed elderly had a higher mean, with 77,35 steps in the post-test, when compared to the pre-test result of 62,75. Compatible results were found in the study by Krause, Buzzachera, Hallage, Pulner and Silva<sup>23</sup>, as they obtained different values of cardiorespiratory fitness reduction in 960 women over 60 years. These women were divided into two categories: sports and non-practitioners. The non-practicing subgroup showed greater cardiorespiratory decline compared to exercise practitioners, revealing the positive influence of moderate exercise on cardiorespiratory fitness. Therefore, the more sports physical activity is performed, the more it attenuates the decline in cardiorespiratory fitness in the elderly.

In relation to the variable Flexibility of Lower and Upper Members, the respective results were -4,35 (pre test) and 6,85 (post test), -15,60 (pre test) and -11,25 (post test). Similar results were found by Etcheparete al.<sup>10</sup>, whose mean age of the sample subjects was 64 years. In relation to the physical tests of the study, there was improvement in all the physical valences tested, with a statistically significant improvement of the flexibility variable of lower limbs. The author states that 20 hydrogymnastics sessions collaborate rapidly causing improvement in all physical qualities.

In the study by Blessmann, Santiago, Griebler, Bregagnol and Meneses<sup>24</sup>, 35 women and 5 men aged over 60 who were part of a university extension project were included. It was verified that in the flexibility of upper limbs and balance / agility there were better results in the post tests.

Other findings that are worth mentioning refers to the study by Almeida, Veras and Doimo<sup>21</sup>, which evaluated the flexibility of lower limbs of gymnastic and hydrogymnastics women, showing that gymnastics achieved significantly better results than the hydrogymnastics group. These results were explained by the greater frequency and volume of work with exercises of flexibility and stretching at the end of the gymnastics classes, whereas in the hydrogymnastics there is predominance of relaxation exercises.

In the flexibility test, the study by Elias et al.<sup>19</sup> found similar results. They also obtained positive results regarding flexibility in the study with older women who participated in a 24-week flexibility and stretching activity program.

Regarding agility, it was observed that the elderly surveyed had higher post-test results (06.90), when compared to the pre-test results (05.85). The study by Etchepare, Pereira, Group and Zinn<sup>10</sup> with 15 women over 55 years old aimed to assess the level of flexibility, balance and agility after 20 sessions of water aerobics. They had different results, noting improvement in post-test agility. However, this result was not statistically significant, demonstrating that 20 water aerobics sessions are inefficient to obtain relevant results. Alves, Mota, Costa and Alves<sup>25</sup> found similar results, as they obtained a positive effect of water aerobics classes on the participants' performance in the agility variable. A controlled trial was performed on 74 elderly women without regular physical activity: a group of 37 women performed two weekly aerobics classes for three months and another 37 women were the control group. The post-test result was satisfactory compared to the pre-test.

The results showed that the variation of the physical fitness variables before and after does not depend on the variations of self-perception of health. The correlations performed by the Spearman test resulted in low or close to zero values, showing that these relationships tend to be null.

#### IV. CONCLUSION

Based on the objective of this study to evaluate the performance of physical fitness and health self-perception in water aerobics practitioners for the elderly, it can be concluded that physical exercise promotes a series of benefits for the elderly, covering both physiological and psychosocial aspects, reflecting the quality of life of this population. Comparing the results of this research with the existing studies, it can be concluded that the practice of water aerobics is beneficial for the elderly, since it provides significant gains for individuals who did not practice regular physical exercises, thus achieving a progressive improvement of functional physical skills.

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