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Antropometric Measures and Physical Habilities for Elders Practioners of Physical Activities Programs on West of Parana

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Abstract

Aging is the last phase of adulthood characterized by the set of physiological changes, reduced physical abilities and basic skills such as strength and balance. However studies show that physical exercise is highly important in improving and maintaining physical fitness. Thus this study aimed to correlate the strength of arms and legs with circumference of left and right leg and balance. This study included elders participants of exercise projects for seniors existing in Cascavel and Four Bridges - Paraná, during the year of 2013. It was collected a sample of 167 individuals, who were classified separated between gender and age. In this study it was found that during the aging process elders experience significant losses in the physiological aspects such as SSL, SIL, ERL and ELL increasing the losses as they get older, being the 65 years group most influenced mainly in the lower limbs.

Keywords

Aging, Physical fitness, Exercise

Introduction

The increased number of elder people has become a worldwide phenomenon. Predictions have shown that by 2030, around 1/8 or the population in the world will be elderly [1,2]. Thus discussions on public health for elders have became an important topic, due to increased necessity of hospitals and specialised institutions to work with these patients during their aging process [3]. However this increased healthcare demand will require large amounts of investment on public health and materials for treatments [2]. Hence the better the prevention programs and health promotion for elders the latter will be the onset of diseases and health impairments and consequently a delay on the need for hospitalizations or health care [3].

The aging process is associated with several changes, such as decline on physical performance, skeletal muscle mass, strength, balance and others [4,5]. In order to avoid early onset of disturbs and diseases or hospitalisation due to fractures, for example, in this population, it is necessary maintain of certain levels of physical activity and correct execution of exercises [3]. A healthy lifestyle is shown to slow the aging deterioration process and to improve the capacity of executing daily life activities as well as reducing the rates of falls [2,6,7].

Physical health is understood as the capacity to execute daily activities requiring minimal levels of exertion without excessive tiredness (Guedes, 1996) these capacities can be divided into two groups that include different dimensions of abilities. These abilities are classified into health aptitude including general aerobic capacity, local muscle strength, flexibility and BMI and into performance including velocity, power, agility, motor coordination and reaction time (Leite, 2000).

Since aging is associated with a loss of abilities and functional conditions, especially due to increased number of sedentary people, it is crucial an evaluation of aptitudes for prescription of exercises in order to maintain the motor ability and physical health of this population [8]. Hence the aim of this study was to evaluate strength of superior and inferior limbs and correlate this measure with circumference of left/right leg and their balance capacity.

Development

Materials and Methods

The national ethics commission involving humans, 466/12 resolution, approved the realisation of the research. The project was evaluated and approved by the Ethics Comission of Assis Gurgacz Foundation, acceptance number 089/2013.

The data was collected in 2013, from an elderly population participant of groups of physical exercise programs in the cities of Cascavel and Quatro Pontes – Parana – Brazil. All participants were volunteers to the research. Data was collected from 167 individuals, which were divided into sex and age. Two classes for sex (male and female), and three classes for age (60 to 65, 66 to 70 and +71). The composition of the data size between combinations of sex and age

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Table 1: Means and standard deviation (SD) of strength of superior limbs (SSL), strength of inferior limbs (SIL), circumference of left leg (CLL), circumference of right leg (CRL), equilibrium on the left leg (ELL), and equilibrium on the right leg (ERL) by combination of sex class and age [(1)].

Variable			Class			
	Female 60 a 65	Female 66 a 70	Female ≥71	Male 60 a 65	Male 66 a 70	Male ≥71
SSL	**16,1(± 3,12)**	15,2(± 3,21)	15,2(± 3,69)	**17,6(± 3,69)**	15,9(± 2,15)	16,0(± 3,37)
SIL	12,5(± 2,34)	12,3(± 2,78)	12,5(± 3,91)	14,9(± 2,67)	13,2(± 2,73)	13,6(± 3,08)
CLL	36,2(± 3,65)	36,3(± 4,03)	35,8(± 3,34)	35,9(± 2,80)	36,1(± 3,65)	36,3(± 2,22)
CRL	35,9(± 3,74)	35,7(± 3,62)	35,3(± 4,00)	36,3(± 3,19)	36,5(± 4,13)	36,1(± 2,42)
ELL	16,2(± 11,2)[a]	9,96(± 9,48)[bB]	10,3(± 8,70)[b]	12,3(± 13,4)[ab]	21,5(± 11,8)[aA]	10,5(± 8,91)[b]
ERL	15,0(± 10,8)[a]	13,9(± 11,5)[a]	8,55(± 8,35)[b]	17,0(± 13,7)[ab]	19,9(± 13,1)[a]	8,88(± 9,76)[b]

were 49 women on category A, 33 women on category B, 53 women on C category. For men the distribution of age was 7 men on category A, 9 men on category B and 16 men on category C.

The variables analysed were: weight (kg), height (cm), BMI, superior and inferior limbs strength, legs circumferences and equilibrium in one leg (right and left side). For the collection of the data it was utilized a scale graduated with capacity of 200kg, with 100g of precision. The subjects were placed on top of the scale on a longitudinal plane with feet spaced facing forward. To evaluate height was utilized a tape measure fixed on a wall. The tape was graduated in cm and the subject was positioned on a orthostatic position in a Frankfurt plan parallel to the ground, with feet joint together and after a deep breath the measure was taken with help of a cursor placed 90 degrees in relation with the scale. For the nutritional evaluation of the elders was utilized BMI measures calculated by the correlation BMI = weigh (kg)/ height (m^2). For the classification of nutritional state the following concepts were considered: utilizing BMI calculated from each elder < 22 kg/ m^2 low weigh; > 22 and < 27kg/ m^2 normal weight; > 27 kg/ m^2 overweight. The cut points utilized for classification of nutritional state of elder were proposed by the north-American dietetic association (ADA).

For the mensuration of strength of superior limbs was adopted the test of elbow flexion, which is an alternative test to measure indirectly the strength of superior limbs, when the manual dynamometer is not available [9]. For this test was utilized a chronometer, a chair and 2kg dumbbells for women and 4kg for men. For the procedure of the test the subject should be seated on the chair with the back fully touching the backboard of the chair and feet parallel and fully touching the ground. The dumbbells were hold on the side of the body with the hands closed. The test started with a full extension of the arm and with a sign the subject should flex the arm completely and then returning to the initial position, the participant was encouraged to complete the max of repetitions possible on a time of 30 seconds, the result obtained was the number of correct repetitions executed during the time proposed. The reference of strength for superior limbs for women at the age of 60-64 years old is approximately 16, 1 repetitions in 30 seconds; 65-69 years is approximately 15, 2 repetitions; 70-74 years is aprox. 14, 5 reps; 75-79 years is aprox. 14 reps; 80-84 years is aprox. 13, 0 reps; 85-89 years is aprox. 12, 2 reps; 90-94 years is aprox 10, 9 repetitions.

The reference of strength for superior limbs for men at the age of 60-64 years old is approximately 19, 0 repetitions in 30 seconds; 65-69 years is approximately 18, 4 repetitions; 70-74 years is aprox. 17, 4 reps; 75-79 is aprox. 16, 2 reps; 80-84 years is aprox. 16, 0 reps; 85-89 years is aprox. 13, 6 reps; 90-94 years is aprox. 12, 0 repetitions.

To evaluate the strength of inferior limbs, it was conducted the sit and rise test from a chair during 30 seconds, which has been an alternative method to measure indirectly the strength of inferior limbs [9]. For the realisation of the test a chronometer and a chair with a backboard were used. For security measures the chair was fixed on the wall during the test. The test began with the subject sitting on the chair with the back in a straight position and foot on the flor. The arms were positioned in a crossed position with hands over the shoulders. By the sign the subject stands up getting on their feet and then sitting again. They were encouraged to repeat this movement for as many times as they were capable in 30seconds. In case the evaluated subject was in the middle of the execution of the movement when the time was up it was counted as a complete movement.

To evaluate static balance the subjects, with help of their visual control, stood on a standing position with their hands around their waist, looking for a fix point approximately placed 2 meters from them. One of the legs should then rise to a flex position and by the sign of the tester the subject should keep on the position for 30 seconds, the chronometer was stoped, allowing the subject to rest before performing the test with the other leg.

Statistical tests such as ANOVA, t-test and square root were conducted in order to evaluate the correlations between each age group and sex. It was also estimated the level of association between variables pairs (BMI, Strength of superior limbs, strength of inferior limbs, circumference of legs and static equilibrium), considering each combination between sex classes and age classes, by the *Pearson's* correlation. The significance level of 5% was adopted on every hypothesis. The analyses were all conducted utilizing the *R Development Core Team (2013)*.

Results

In relation to body mass, height and BMI for females at ages 60-65 years in a total of 49 elderly the average weight was 72.3 ± 13.8 with coefficient of variation (CV) of (19.1%), height 160.4 ± 6.79 CV (4.23%) and BMI 28.1 ± 5.10 CV (18.1%). As for the age group 66-70 years in a total of 33 elderly weights average was 74.9 ± 16.6 with coefficient of variation (CV) of (22.1%), height 160.0 ± 8.94 CV (5.59%) and BMI 29.3 ± 6.06 CV (20.7%). As for the age group of older aged greater than or equal to 71 years, a total of 53 elderly weight averages was 69.0 ± 13.3 with coefficient of variation (CV) of (18.8%), height 157.0 ± 7.65 CV (4.85%) and BMI 27.7 ± 4.39 CV (15.9%).

For males the body mass, height and BMI at ages 60-65 years in a total of seven elderly weight average was 81.9 ± 9.8 with coefficient of variation (CV) of (12.0 %), height 168.7 ± 7.36 CV (4.36%) and BMI 28.7 ± 2.47 CV (8.61%). As for the age group 66-70 years in a total of nine elderly weights average was 80.2 ± 14.8 with coefficient of variation (CV) of (18.5%), height 169.2 ± 6.14 CV (3.63%) and BMI 28.0 ± 4.63 CV (16.6%). As for the age group of elderly aged greater than or equal to 71 years, a total of 16 elderly the average weight was 76.6 ± 9.99 with coefficient of variation (CV) of (13.1%), height 167.5 ± 2.98 CV (1.78%) and BMI 27.3 ± 3.43 CV (12.6%).

Table 1 shows the effect between categories of age, whereas females and the three right columns refer to meaningful comparisons between average ages categories, for males. There was no difference between the mean age for each sex, i.e., as aging occurs, the values were not changed (no worsening with advancing age that is, maintaining the same shape).

Age class average in each class of sex, followed by different small letters on the line, differ between each other by the *t test* post unbalanced ANOVA, at the 5% level of probability; Sex classes averages in each age class, followed by different capital letters on the line, differ by F test at 5% level of probability. SSL-Strength Superior limb, SIL- Strength inferior limb, CLL- circumference of left leg, CRL- circumference of right leg, ELL- left leg balance, ERL- right leg balance.

Table 2: Means and standard deviations (in parentheses) of upper limb strength (SSL), strength of the lower limbs (SIL), circumference of the left leg (CLL), circumference of right leg (CRL), left leg balance (ELL) and right leg balance (ERL) for nutritional status category of seniors, regardless of sex and age [(1)]

Variable	Nutritional State		
	Low weight (IMC ≤ 22,0)	Normal weight (22,0 < IMC < 27,0)	Overweight (IMC ≥ 27,0)
FMS	14,2 (± 4,02)	16,0 (± 3,70)	15,6 (± 2,95)
FMI	12,4 (± 4,12)	13,3 (± 3,58)	12,3 (± 2,56)
CPE	**31,4 (± 2,56)[c]**	**34,3 (± 2,13)[b]**	**37,9 (± 3,10)[a]**
CPD	**31,5 (± 2,38)[c]**	**33,7 (± 2,69)[b]**	**37,7 (± 3,15)[a]**
EPE	14,5 (± 12,3)	12,9 (± 10,3)	12,3 (± 10,4)
EPD	17,2 (± 13,5)	13,2 (± 11,1)	11,5 (± 10,2)

[(1)] Average of nutritional status categories, followed by different small letters on the lines; differ between each other after t test post unbalanced ANOVA at the level of 5% probability.

Table 3: Pearson correlation coefficients (lower diagonal) between pairs of variables measured in female subjects aged between 60 and 65 and their significance levels (upper diagonal)

IMC	NS	NS	***	***	NS	**
0,24	**FMS**	***	NS	NS	NS	NS
-0,10	0,51	**FMI**	NS	NS	NS	**
0,71	0,20	0,05	**CPE**	***	NS	NS
0,61	0,18	0,06	0,95	**CPD**	NS	NS
-0,20	0,23	0,35	0,13	0,26	**EPE**	**
-0,38	0,25	0,42	-0,18	-0,17	0,55	**EPD**
-0,21	-0,11	0,31	0,02	0,09	0,22	0,29

Significance codes: * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$; NS $p > 0.05$; n = 49 pares of observation.

Table 4: Pearson correlation coefficients (lower diagonal) between pairs of variables measured in female subjects aged between 66 and 70 years and their significance levels (upper diagonal)

IMC	NS	NS	***	***	*	*
0,22	**FMS**	***	NS	NS	NS	NS
0,08	0,55	**FMI**	NS	NS	NS	NS
0,85	0,33	0,20	**CPE**	***	NS	NS
0,85	0,29	0,06	0,91	**CPD**	NS	NS
-0,48	-0,10	0,12	-0,23	-0,25	**EPE**	***
-0,42	-0,14	0,03	-0,22	-0,22	0,84	**EPD**
-0,32	-0,20	-0,10	-0,38	-0,36	0,32	0,04

Significance codes: * $p \leq 0.05$; *** $p \leq 0.001$; NS $p > 0.05$; n = 33 pares of observation.

Table 5: Pearson correlation coefficients (lower diagonal) between pairs of variables measured in female subjects with age greater than or equal to 71 years and their significance levels (upper diagonal)

IMC	NS	*	***	***	NS	NS
-0,18	**FMS**	***	NS	NS	NS	NS
-0,31	0,69	**FMI**	*	NS	*	NS
0,73	-0,12	-0,28	**CPE**	***	NS	NS
0,65	-0,14	-0,14	0,85	**CPD**	NS	NS
0,16	0,32	0,34	0,08	0,16	**EPE**	***
0,04	0,17	0,17	-0,05	-0,11	0,75	**EPD**
-0,36	0,09	0,24	-0,00002	0,14	0,22	-0,01

Significance codes: * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$; NS $p > 0.05$; n = 53 pares of observations.

Table 2 shows the relationship between nutritional status and the strength indexes of the upper limbs (SSL), strength of the lower limbs (SIL), circumference of the left leg (CLL), circumference of right leg (CRL), left leg balance (ELL) and right leg balance (ERL) for nutritional status category of seniors, regardless of sex and age. A significant correlation was only found between circumference of left and right leg with nutritional status for all age groups without distinction of sex. Noting that the BMI increases the circumference of right and left leg increases.

Table 3 shows the correlation between variables estimated for females at ages 60-65 years. Which found a significant correlation between BMI and left leg and right leg circumference with great magnitude ($p \leq 0.001$) and BMI with right leg balance with an average magnitude ($p \leq 0.01$). Strength of the lower limbs was correlated with right leg balance with an average magnitude ($p \leq 0.01$), and the left leg balance was correlated with the right leg balance with an average magnitude ($p \leq 0.01$).

Table 6: Estimates of Pearson correlation coefficients (lower diagonal) between pairs of variables measured in males aged 60 and 65 and their significance levels (upper diagonal)

IMC	NS	NS	*	NS	NS	*
0,18	**FMS**	NS	NS	NS	NS	NS
0,61	0,72	**FMI**	NS	NS	NS	NS
0,76	-0,11	0,52	**CPE**	***	NS	*
0,69	-0,15	0,45	0,98	**CPD**	NS	NS
0,59	0,15	0,21	0,52	0,42	**EPE**	NS
0,83	-0,04	0,43	0,77	0,66	0,89	**EPD**
-0,39	0,57	0,46	-0,21	-0,24	-0,43	-0,28

Significance codes: * $p \leq 0.05$; *** $p \leq 0.001$; NS $p > 0.05$; n = 7 pairs of observation.

Table 7: Estimates of Pearson correlation coefficients (lower diagonal) between pairs of variables measured in males aged between 66 and 70 years and their significance levels (upper diagonal)

IMC	NS	NS	**	**	NS	NS
-0,38	**FMS**	*	*	*	NS	NS
-0,35	0,69	**FMI**	*	*	NS	NS
0,84	-0,69	-0,76	**CPE**	***	NS	NS
0,81	-0,71	-0,76	0,98	**CPD**	NS	NS
0,16	-0,20	0,47	-0,08	-0,09	**EPE**	**
-0,08	0,41	0,62	-0,37	-0,37	0,96	**EPD**
-0,09	0,37	0,53	-0,26	-0,37	0,18	-0,007

Significance codes: * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$; NS $p > 0.05$; n = 9 pairs of observation.

Table 4 shows the estimated correlation between variables for females at ages 66-70 years. Which found a significant correlation between BMI with left leg and right leg circumference of great magnitude for a ($p \leq 0.001$), and BMI with left leg and right leg balance of low magnitude ($p = 0.05$). The upper limb strength variable correlated to a large extent on the strength of lower limbs ($p \leq 0.001$). The left leg circumference correlated with the right leg circumference with great significance ($p \leq 0.001$). And the left leg balance variable correlated with strongly with right leg balance ($p \leq 0.001$).

Table 5 shows the estimated correlation between variables for females in the same age or above 71 years. Which correlations between BMI and lower limb strength were found with little significance ($p = 0.05$), and BMI circumference of the left leg and right with great significance ($p \leq 0.001$). For the variable of strength of the upper limbs was observed to be correlated with lower limb strength with great significance ($p \leq 0.001$). The variable of strength of lower limbs were correlated in small proportion with the circumference of the left leg and left leg balance ($p \leq 0.05$). Left leg circumference variable correlation with circumference right leg strong significance ($p \leq 0.001$). And the left leg balance correlated with right leg balance in large proportion ($p \leq 0.001$).

Table 6 shows the estimated correlation between the variables studied for the male group at ages 60-65 years. Which found a significant correlation between low BMI and circumference of the left leg and right leg balance ($p \leq 0.05$). And left leg circumference variable was observed to have a strong correlation with the right leg circumference ($p \leq 0.001$) and low dimension with right leg balance ($p \leq 0.05$).

Table 7 shows the estimated correlation between the variables studied for the male group at ages 66-70 years. Which was found a significant correlation between BMI and circumference of the left leg and right with average ratio ($p \leq 0.01$). To strength variable of upper limbs no correlation was found with lower limb strength or circumference of the left leg and right ($p = 0.05$). The lower limb strength variable was correlated with the circumference of the left leg

Table 8: Pearson correlation coefficients (lower diagonal) between pairs of variables measured in males with age greater than or equal to 71 years and their significance levels (upper diagonal)

IMC	NS	NS	**	**	NS	NS
-0,07	**FMS**	**	NS	NS	NS	NS
0,30	0,71	**FMI**	NS	NS	NS	NS
0,69	-0,05	0,04	**CPE**	***	*	NS
0,67	0,05	0,13	0,96	**CPD**	*	NS
-0,29	0,13	0,25	-0,66	-0,60	**EPE**	NS
-0,03	0,14	-0,03	-0,06	-0,11	0,52	**EPD**
0,07	0,27	0,40	0,16	0,27	0,06	-0,43

Significance codes: * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$; NS $p > 0.05$; n = 16 pairs of observation.

and right ($p = 0.05$). Left leg circumference was strongly correlated with right leg circumference ($p \leq 0.001$). And there was average correlation between left leg balances with right leg balance ($p \leq 0.01$).

Table 8 shows the estimated correlation between the variables studied for the male group in the same age or above 71 years. Which found a significant correlation between BMI and circumference of the left leg and right with average ratio ($p \leq 0.01$). For the variable of upper limb strength it was correlated with lower limb strength with a medium significance ($p \leq 0.01$). Left leg circumference correlated with circumference of right leg with a large significance ($p \leq 0.001$) and with left leg balance ($p \leq 0.05$). The right leg circumference variable correlated with left leg balance ($p \leq 0.05$).

Discussion

Looking at the data collected, it is clear that most of the sample was composed of females, with 135 women and 32 men (n = 167). It appears then that women are more likely to be participating in physical activity programs. For the analysis of the referent study data, it was considered that all individuals have begun the regular practice of physical activity between the ages of 60 and 65 years.

With regard to body mass, height, and BMI it was found that with increasing age there was a decrease in body weight in both sexes. But for the female group there was, between the first two categories of age, a statistically significant increase in body mass of 2.6 points and the third category a decrease of 5.9 points between the second categories. As for the male group there was a progressive reduction in body mass values of 1.7 and 3.6 points respectively between the three age categories. However there has been a trend towards decreased body mass index to the extent that occurs with increasing age.

The increase in BMI that occurred between the first two age classes of the female sample is explained by the fact that women only reach the peak body mass between the ages 60-70 years and only after that, a decrease in body mass takes place. Spirduso relates that women take 20 years more than men to stabilize their body mass value, that on men it occurs between the ages of 45 and 49 years.

Losonczy et al. (1995) analyzed 6,000 individuals over 70 years, founding that individuals with a higher BMI at age 50 have a higher risk of mortality, as for the elderly population the situation is reversed, with individuals with lower BMI having a higher risk of mortality [10].

As the data presented it was found that the height shows a tendency to decrease with the advancement of age. The literature justifies this fact due to vertebral discs that most often lose a quantity of water, which is extremely important for shock absorption, making it more fibrous. These changes along with the changes in bone mineral density in the vertebrae cause a compression of the discs, which directly influences on the reduction of the spine, resulting in further reduction in height (GALLAHUE; OZMUN; Goodway, 2013).

Although this study verified many physical fitness variables, it was decided to bring those that had relevance in their results, which were: BMI, CRL and CLL; SSL with SIL; CRL with CLL and ERL with ELL. Further it was observed on the correlation between age and CRL and CLL that with increasing age there is a change in the measures in these variables. A positive correlation between BMI and right and left leg circumference, as increased BMI was observed. Corroborating with this studies with individuals of both sexes showed that BMI is correlated with anthropometric indicators of subcutaneous body fat, and are directly related to total body fat mass. Thus, consequently having an increase in perimeter measures [11].

It was observed that there was also a strong correlation between SSL and SIL. But this strength index had only a weak correlation, with a small decline in strength values with increasing age, and had no statistically significant correlation with increasing BMI, but the eutrophic individuals had higher levels of SSL and SIL.

The female group showed SSL values within the stated average, since the male group showed values below average, according to the protocol used as a reference. As for the SIL, both sexes presented values below the average established by the reference protocol. In addition, both groups showed slight decrease in the level of SSL and SIL as a result of age. However, it is assumed that this group may have lost muscle mass and is currently in this variable stabilization period, as the literature indicates that after 40 years there is a reduction in muscle mass by 5% every decade passed after reaching 65 years, this decline is accentuated arguably to the lower limbs [12].

The force has a fundamental influence on the functional capacity of the elderly population; it is primarily used in the execution of activities of daily living [13-15]. However, there are other authors that show that there is a decrease in muscle mass starting on the age of 50, also noticing that this decline is 1.9 kg per decade for men and 1.1 kg for women [16].

To balance the variables noted in relation to age, on the female sample, a significant constant reduction was observed on the right leg, however, for the first left leg was observed a decline in the first age class and an increase to third class. In the male sample for both the left leg and to the right leg, it was noted a significant increase for the second age category, and then a significant decline for the third category. It was noted that due to the increase in BMI a reduction in the balance of power in both legs occurred.

Body balance is a component of physical fitness, defined as a set of receptions and integration of sensory input, planning and execution of movements to control the centre of gravity on the support base, performed by integrating information from the vestibular system, the receivers' visual and somatosensory system [17].

Considering that on the aging process there is a significant loss on automatic senses, impaired balance would be a natural fact in development. Another consequence of the declining on balance lies on the influence of sarcopenia, since more fibers achieved through this process are type II fibers (fast twitch) that are responsible for the reaction time and response in emergency situation, interfering then on the recovery and maintenance of balance (Ribeiro, 2003).

Being balance a component of physical fitness, it is directly connected to force variable. Once the strength variable degrades with increasing age there is a loss in the execution of movements and control the of the centre of gravity on a support base, so a natural impaired control on the sensory system occurs, impairing the capture for equilibrium.

However, the results obtained with the analysis of this study, were not enough to get answers to significant improvements in the variables. However maintenance of quality of life can be reached with daily physical activity programs. But analysing only the effects of physical activity are not enough to obtain an effective conclusion on these variables, as they also depend on nutritional and hormonal stimuli.

Conclusions

In this study it was found that during the aging process elders experience significant losses in the physiological aspects such as SSL, SIL, ERL and ELL increasing the losses as they get older. The decreased levels of SSL and SIL that was found in the group, is possibly explained by the sarcopenia process which is the reduction in muscle mass that begins at 40 years of age with a decline of 5% per decade, being the 65 years group most influenced mainly in the lower limbs.

Being a component of physical fitness, balance is directly connected to force variable, because once the strength degrades with increasing age there is a loss in the execution of movements by the centre control of gravity on a support base, so there a natural impaired sensory capture from equilibrium.

However, the results obtained with the analysis of this study, were not enough to get answers to significant improvements in the variables, but maintenance and quality of life with physical activity programs. Further analyses only on the effects of physical activity are not enough to obtain an effective conclusion on these variables, as they also depend on nutritional and hormonal stimuli.

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