

Original Article (short paper)

## Perception of memory decline in physically active elderly: comparison between practitioners of systematized and non-systematized physical exercises

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**Abstract — Aim:** To investigate the perception of memory decline in elderly physically active, practicing and non-practicing systematized physical exercises. **Methods:** Participants were 159 elderly practitioners of systematized and non-systematized physical exercises of Maringá-PR. The instruments used were the International Physical Activity Questionnaire (IPAQ), Cognitive Decline Initiative (SCD-I) and a sociodemographic questionnaire. Data analysis was conducted through Chi-Square test and Binary Logistic Regression ( $p < 0.05$ ). **Results:** Non-retired elderly and who reported that memory troubles made difficult to perform the activities of daily living presented more chances to practice systematized exercises. Further, very active elderly and who do not realize that the memory is below the expected for the age have 56% and 75% more chance of being systematized exercises practitioners, respectively. Furthermore, men and elderly who practice non-systematized exercise have 60% and 63% more chance of perceive the memory lower than expected for the age, respectively. **Conclusion:** Men and the elderly who do not practice systematized exercises are more likely to perceive memory lower than expected for age. Moreover, retirement and the satisfactory memory perception are associated with the practice of systematized exercises.

**Keywords:** aging; physical activity; cognition.

### Introduction

The increase expectancy of life carries the burden of the functional and cognitive impairments. Functional impairment is defined as the difficulty in activities of daily living, especially related to self-care and homecare. Estimates of physical disability in the elderly (>65 years) indicate prevalence between 9%<sup>1</sup> and 25%<sup>2</sup> for basic activities of daily living, reaching 55% among the instrumental activities of daily living<sup>2,3</sup>. These estimates reveal a heterogeneous context, strongly influenced by the socioenvironmental indicators of evaluated populations. In addition, it suggests that functional impairment is more perceptible as the complexity of the task increases<sup>1-3</sup>.

Physical impairment and cognitive decline are processes resulting from the interaction of risk factors such as advanced age, low schooling<sup>4</sup>, multimorbidity<sup>5</sup>, inadequate diet<sup>6</sup> and sedentarism<sup>7</sup>. It was estimated that between 25%<sup>8</sup> and 34%<sup>9</sup> of the elderly population has a cognitive deficit, which could increase in the more vulnerable socioeconomically populations. Regarding the perception of cognitive decline, memory is a cognitive complaint often reported by the elderly, especially about remembrance of recent events<sup>10</sup>. Opposing this, practice of physical exercises improves

the functionality<sup>11</sup> and cognitive function<sup>12</sup>, preventing the deficit progression and the decline of other abilities, such as attention, executive functions and learning<sup>11,12</sup>. Studies show that physical exercise improves cognitive abilities of older people healthy<sup>7</sup>, with mild cognitive impairment and Alzheimer's disease<sup>13</sup>.

The dissemination of the benefits of movement in the neural environment and the consequent reduction of the risk of neurodegenerative diseases<sup>11-13</sup>, could stimulates the elderly population to practice physical exercises with specialized professionals, following a systematized training routine. However, because of low income or lack adherence to traditional training methods<sup>14</sup>, many older people choose to practice in public locations such as outdoor gyms and natural parks, without any professional guidance. This context differs from the clinical trials about physical exercise and cognitive health<sup>13</sup>, whose positive effects of exercise can be derived from parameters such as frequency, intensity and training load. In addition, the literature has not demonstrated if sporadically exercise is enough to delay the cognitive declines characteristic of senescence. Therefore, the objective of this study was to investigate the perception of memory decline in elderly physically active, practicing and non-practicing systematized physical exercises.

## Methods

### Participations

The sample consisted of elderly (60 years or older), of both genders, practitioners of systematized physical exercises (bodybuilding and/or functional training) in private academies of the municipality of Maringá, PR, as well as elderly practitioners of non-systematized physical exercises in the Third Age academies (ATI, as per its Portuguese acronym) of the same municipality. The sample was chosen in a non-probabilistic and intentional way, which consisted of 149 elderly, of which 80 elderly were practitioners of physical exercises and 59 non-practitioners.

We included elderly practitioners of only one of the types of exercises (systematized or non-systematized) living for, at least, three months in the municipality of Maringá, PR. The elderly with perceptible speech and hearing difficulties were excluded, as well as those with possible cognitive deficits, evaluated by the Mini-mental state examination<sup>15,16</sup>.

### Instruments

In order to characterize the demographic and health profile of the elderly, the authors applied a questionnaire containing questions regarding age, age group, gender, monthly income, marital status, ethnicity, schooling, retirement, frequency of practice of physical exercise, modality of exercise practiced (systematized or non-systematized).

The International Physical Activity Questionnaire (IPAQ), short version, was used to evaluate the physical activity level of the elderly. The IPAQ is a questionnaire that enables us to estimate the weekly time spent on light-intensity (hiking), moderate and vigorous physical activities in different contexts of everyday life, such as: work, transportation, domestic tasks, and leisure, besides the time spent on passive activities, held in the sitting position<sup>17,18</sup>.

In order to evaluate the perception of memory decline, we used the Subjective Cognitive Decline Initiative (SCD-I). This instrument in older adults is increasingly recognized as a potential indicator of non-normative cognitive decline and eventual progression to dementia<sup>19</sup>.

### Procedures

This study was approved by the ethics committee in research through the opinion number 2789375.

First of all, we made contact with the Regional Council of Physical Education of Paraná (CREF9-PR), with the purpose of obtaining the list of academies accredited by this body, located in the municipality of Maringá, PR. The academies were divided into four regions of the city (north, south, east and west), and drawn three by region, totaling 12 academies. We came into contact with those responsible for each academy for the authorization for the execution of the research.

In order to collect the data of the elderly practitioners of non-systematized physical exercises, we came into contact with the Department of Sports and Leisure, where it was possible to acquire the list of ATI located in the municipality, divided also into four regions, and drawn three by region, totaling 12 ATI.

The collection of data, in both places, was conducted according to the availability of the researcher, as well as the presence of elderly at the time of this procedure. Those who agreed to participate signed a Free and Informed Consent (FIC).

### Statistical analysis

The descriptive analysis characterized the variables of the study. Chi-Square test was used to compare categorical variables. Binary Logistic Regression was used to examine associations of sociodemographic variables and memory decline with physical exercise practice (dependent variable). In this regression model, initially were considered only the variables that presented significance statistical equal or less than 0.20 in chi-square test. Hosmer-Lemeshow test defined the fit of the model. In the adjusted analysis, all variables were inserted into the regression model. The level of statistical significance adopted was 5%.

## Results

There was no significant difference ( $p > 0,05$ ) in the comparison of the proportions of male and female elderly according to sociodemographic variables of sex, age, marital status, breed, schooling, retirement and income (Table 1).

The comparison of the proportions of practitioners and non-practitioners of systematized physical exercises according to sociodemographic variables (Table 1) found a statistically significant difference only for the schooling, evidencing a higher proportion of elderly with completed high school in the group of systematized exercises (68.3%). This result indicates that the groups showed no difference in relation to the other sociodemographic variables.

Table 1. Comparison of the proportions of elderly practitioners and non-practitioners of systematized physical exercises according to sociodemographic variables.

Variables	Systematized (n=80)		Non-systematized (n=59)		$\chi^2$	p
	N	(%)	N	(%)		
Sex						
Male	23	(54.8)	19	(45.2)	0.192	0.661
Female	57	(58.8)	40	(41.2)		
Age group						
60-69	77	(58,8)	54	(41.2)	1.397	0.237
70+	3	(37.5)	5	(62.5)		

(To be continued)

Table 1. Comparison of the proportions of elderly practitioners and non-practitioners of systematized physical exercises according to sociodemographic variables.

Variables	Systematized (n=80)		Non-systematized (n=59)		$\chi^2$	p
	N	(%)	N	(%)		
Marital status					0.793	0.373
With partner	40	(61.5)	25	(38.5)		
Without partner	40	(54.1)	34	(45.9)		
Breed					0.213	0.644
White	61	(56.0)	48	(44.0)		
Black	14	(66.7)	7	(33.3)		
Other	5	(55.6)	4	(44.4)		
Schooling					7.473	0.006
Unlettered	3	(33.3)	4	(66.7)		
Incomplete elementary	10	(40.0)	15	(60.0)		
Complete elementary	25	(55.6)	20	(44.4)		
Complete high school or +	43	(68.3)	20	(31.7)		
Retirement					2.133	0.144
Yes	58	(54.2)	49	(45.8)		
No	22	(68.8)	10	(31.3)		
Income (number of salary)					1.351	0.245
1-2	25	(49.0)	26	(51.0)		
2,1-3	37	(63.8)	21	(36.2)		
>3	18	(60.0)	12	(40.0)		

Variables compared using Chi-Square test.

Table 2 shows the groups comparison of physical exercise practitioners in relation to the level of physical activity and the perception of the memory decline. There was a statistically significant difference for the level of physical activity (p=0.005) and the perception of memory (p=0.016) in relation to age, suggesting that the practitioners of systematized exercises were more physically active (71.2%) and perceived the memory as adequate for the age (63.2%).

Table 2. Comparison of the proportions of elderly practitioners and non-practitioners of systematized physical exercises according to level of physical activity and perception of the memory.

Variables	Systematized (n=80)		Non-systematized (n=59)		$\chi^2$	p
	N	(%)	N	(%)		
Level of physical activity					7.799	0.005
Very active	42	(71.2)	17	(28.8)		
Active	38	(47.5)	42	(52.5)		
Memory decline in relation to youth					0.138	0.711
No	56	(56.6)	43	(43.4)		
Yes	24	(60.0)	16	(40.0)		

(To be continued)

Table 2. Comparison of the proportions of elderly practitioners and non-practitioners of systematized physical exercises according to level of physical activity and perception of the memory.

Variables	Systematized (n=80)		Non-systematized (n=59)		$\chi^2$	p
	N	(%)	N	(%)		
People say that memory is bad					0.401	0.526
No	63	(56.3)	49	(43.8)		
Yes	17	(63.0)	10	(37.0)		
Memory is below expected for age					5.842	0.016
No	67	(63.2)	39	(36.8)		
Yes	13	(39.4)	20	(60.6)		
Memory impairs activities of daily living					3.743	0.059
No	60	(53.6)	52	(46.4)		
Yes	20	(74.1)	7	(25.9)		
Memory decline in the last year					0.446	0.504
No	72	(56.7)	55	(43.3)		
Yes	8	(66.7)	4	(33.3)		
Difficulties of memory worry					0.026	0.871
No	74	(57.4)	55	(42.6)		
Yes	6	(60.0)	4	(40.0)		

Variables compared using Chi-Square test.

Table 3 shows the factors associated with the type of physical activity in elderly. Initially, there was a statistically significant association with the level of physical activity, the perception of memory below that expected for age and the perception that memory difficulties make it difficult to perform activities of daily living (p<0.05). In the adjusted analysis for all variables, retirement was also statistically significant (p<0.05). We emphasize that non-retired elderly who reported that memory difficulties made difficult to perform the activities of daily living presented, respectively, 2.658 [CI 95% = 1.006 to 7.022] and 3.685 [CI 95% = 1.226 to 11.081] more chances to practice systematized exercises. In summary, elderly very active and who do not realize that the memory is below the expected for the age have 56% and 75% more chance of being systematized exercises practitioners, respectively.

Table 3. Factors associated with the practice of systematized physical activity in the elderly.

Predictors	OR	[CI 95%]	OR <sub>adjusted</sub>	[CI 95%]
Level of physical activity				
Very active		1		1
Active	0.366	[0.179 to 0.748]*	0.439	[0.200 to 0.962]*
Schooling				
Unlettered		1		1
Incomplete elementary	1.333	[0.204 to 8.708]	1.628	[0.180 to 14.765]
Complete elementary	2.500	[0.415 to 15.069]	2.560	[0.303 to 21.643]

(To be continued)

Table 3. Factors associated with the practice of systematized physical activity in the elderly.

Predictors	OR	[CI 95%]	OR <sub>adjusted</sub>	[CI 95%]
Schooling				
Complete high school or +	4.300	[0.726 to 25.456]	5.861	[0.694 to 49.501]
Retirement				
No	1		1	
Yes	1.859	[0.803 to 4.300]	2.658	[1.006 to 7.022]*
Memory is below expected for age				
No	1		1	
Yes	0.378	[0.170 to 0.844]*	0.251	[0.093 to 0.674]*
Memory impairs activities of daily living				
No	1		1	
Yes	2.496	[1.007 to 6.323]*	3.685	[1.226 to 11.081]*

Results of the binary logistic regression having as a dependent variable the practice of systematized physical exercises. OR adjusted by all the variables.

OR = Odds Ratio. CI = Confidence Interval. \* = Statistically significant association (p<0.05).

Table 4 shows the factors associated with the memory lower than expected for age in the elderly. Initially, there was a statistically significant association (p<0.05) with the type of exercise and sex. In the adjusted analysis for all variables, only type of exercise and sex were statistically significant (p<0.05) again. We emphasize that men and elderly who practice non-systematized exercise have 60% and 63% more chance of perceive the memory lower than expected for the age, respectively.

Table 4. Factors associated with the memory lower than expected for age in the elderly.

Predictors	OR	[CI 95%]	OR <sub>adjusted</sub>	[CI 95%]
Age	0.986	[0.873 to 1.114]	0.995	[0.870 to 1.138]
Type of Physical Exercise				
Non-systematized	1		1	
Systematized	0.378	[0.170 to 0.844]*	0.398	[0.163 to 0.970]*
Sex				
Male	1		1	
Female	0.345	[0.153 to 0.779]*	0.374	[0.150 to 0.932]*
Income (number of salary)				
< 1	1		1	
1-2	0.402	[0.159 to 1.013]	0.436	[0.159 to 1.197]
2 >	0.795	[0.292 to 2.167]	0.710	[0.222 to 2.267]
Level of physical activity				
Very active	1		1	
Active	1.977	[0.858 to 4.556]	1.140	[0.444 to 2.922]
Schooling				
Unlettered	1		1	
Incomplete elementary	0.389	[0.063 to 2.407]	0.644	[0.080 to 5.181]

(To be continued)

Table 4. Factors associated with the memory lower than expected for age in the elderly.

Predictors	OR	[CI 95%]	OR <sub>adjusted</sub>	[CI 95%]
Schooling				
Complete elementary	0.184	[0.031 to 1.105]	0.311	[0.042 to 2.321]
Complete high school or +	0.340	[0.062 to 1.860]	0.823	[0.122 to 5.562]

Results of the binary logistic regression having as a dependent variable Memory is below expected. OR adjusted by all the variables.

OR = Odds Ratio. CI = Confidence Interval. \* = Statistically significant association (p<0.05).

## Discussion

We investigated the perception of memory decline in elderly people who had an active lifestyle, practitioners of systematized and non-systematized exercises. As the main findings, older adults with high schooling were more likely to perform systematized exercises and less likely to present negative perceptions about their own memory.

Previous studies have shown that regular practical of physical exercise stimulates the secretion of neurotrophic factors<sup>20,21</sup> and improves cerebral vascularization<sup>22-24</sup>. Furthermore, the practice of physical exercises also reduces sedentarism and cardiovascular risk<sup>22</sup>, favoring cognitive health<sup>22</sup>. In this context, our results suggest that it is not enough to have a more active lifestyle, because specific components of the systematized training such as frequency, intensity and volume could be associated with the better cognitive performance.

Despite this, we should take parsimony when consider the influence of systematized training, because it is possible that result was strongly influenced by the participants' schooling. It has been demonstrated that schooling is protective factor for neuronal health<sup>25,26</sup>, since older adults with more years of schooling present better cognitive performances<sup>26</sup>. It is possible that schooling is a mediator between physical exercise and cognitive function, which would explain the difference in the perception of memory decline.

Another possible explanation is that volunteers of more schooling tend to adopt healthier habits<sup>27</sup>, such as balanced diet, better social relationships<sup>27</sup> and greater adherence to health treatments, which would also explain the low prevalence of memory deficit in the group of systematized exercise. Although the results indicate that the systematized training is superior to the non-systematized training, we still cannot affirm this precisely because of the bias of schooling described previously.

It is important to emphasize that in the logistic regression model, schooling was not a statistically significant predictor of memory decline. We believe that this happened because the less scholarly categories (i.e., "unlettered" and "incomplete elementary") were not representative in our sample, consisting a selection bias. Despite this, we do not group

categories of schooling, because individuals “unlettered” and “incomplete elementary” are different in reserve and performance cognitive<sup>26</sup>, which would modify the accuracy of prediction model.

Regarding sex, there is no consensus in the scientific literature about its influence on cognitive abilities. Previous studies have found an increased risk of cognitive impairment for women<sup>28,29</sup> and also in men<sup>30</sup>. This divergence may reflect methodological differences, in which particular characteristics of each population could influence the presence or absence of association between sex and cognitive decline. In this study, it is possible for women had a more active and healthier lifestyle compared to men, which would explain the low prevalence of women with memory negative perceptions.

Despite the important results of this research, some limitations must be pointed out, such as: the lack of training information (frequency, intensity, volume); the presented bias of schooling; the transversal research design, which prevents a causality inference. Further, this study was carried out in a single municipality, which prevents the data generalization. We suggest, therefore, new studies with larger samples, which will allow comparing the effect of systematized physical exercise on the memory perception of the elderly.

It is pointed out a certain possible novelty with this study in the gerontology and physical education area, which showed the smallest complaint of memory loss in the elderly practicing systematized physical exercises, when compared to their peers

## Conclusion

We conclude that men and the elderly who do not practice systematized exercises are more likely to perceive memory lower than expected for age. Moreover, retirement and the satisfactory memory perception are associated with the practice of systematized exercises. From a practical standpoint, it is pointed out the importance of systematized physical exercise, given that it may possibly have an impact on the memory and quality of life of the elderly.

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