Functional and cognitive changes in community-dwelling elderly: Longitudinal study

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ABSTRACT | Background: The relationship between aging and increased life expectancy in the overall population likely contributes to a higher frequency rate and incidence of illnesses and functional disabilities. Physical dependence and cognitive impairment might hinder the performance of activities and result in an overload of care duties for the patient's family and the healthcare system. **Objective:** The aim of this study was to compare the functional and cognitive changes exhibited by the elderly over a 6-month period. **Method**: This longitudinal and observational study was conducted in a sample of 167 elderly people, who were selected from the database of the Network of Studies on Frailty in Brazilian Elderly, *Universidade Federal de Minas Gerais* - UFMG. The participants submitted to the Mini Mental State Examination (MMSE), Katz Index, Lawton and Brody's scale and responded to items on Advanced Activities of Daily Living (AADLs). We analyzed the data using multivariate regression models. **Results:** The participants' functional capacity exhibited reduced performance of specific instrumental activities of daily living (IADLs), p=0.002, and basic activities of daily living (BADLs), p=0.038. Living alone (odds ratio (OR), 2.53; 95% confidence interval (CI), 1.09-5.87) and work status (OR, 2.52; 95% CI, 1.18-5.41) were associated with changes in the IADLs. The scores in the AADL scale (p=0.163) and MMSE (p=0.059) did not exhibit any significant difference during the study period. The participants with better cognitive function were more independent in their performance of AADLs and IADLs. **Conclusion:** The results depict specific patterns of loss and stability of functional capacity in community-dwelling elderly.

Keywords: elderly; activities of daily life; cognition; rehabilitation.

• Introduction

During recent decades, the world population entered a process of aging. In Brazil, the aging process is occurring rapidly in association with advanced life expectancy in the overall population, which might result in an increased prevalence and incidence of diseases and functional disabilities[1].

According to the literature, functional limitations comprise one of the most important prognostic factors for mortality of the elderly[2,3]. From the epidemiological point of view, disability is usually measured based on reported difficulties or the need for assistance in the performance of the basic activities of daily living (BADLs) and instrumental activities of daily living (IADLs)[4]. As a rule, the greater the difficulty is to perform BADLs, the more severe the disability is[5], thus suggesting a linear correlation between the severity of disability and the functional performance potential, which must be subjected to empirical confirmation.

BADLs consist of self-care tasks, such as eating and bathing[6], whereas IADLs relate to the management of one's environment and involve the links between home and the external environment and tasks such as buying food, cooking meals, and managing one's finances[7]. The advanced activities of daily living (AADLs) comprise a third category, which includes voluntary social, occupational, and leisure activities[8]. Although the difficulty in participating in AADLs might not indicate the actual presence of functional impairment, this difficulty might denote the conditions for a future loss of function that might be actualized.

Cognitive dysfunction might interfere with the individual's ability to understand and integrate the

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various steps of the activities of daily living (ADL). Individuals with cognitive dysfunction might have problems with decision-making, performing individual tasks, and connecting information, in addition to requiring an excessive amount of time to perform tasks. Cognitive dysfunction is also related to the reduction of social relationships, which favors the development of isolation and depression[9]. To summarize, cognitive dysfunction might interfere negatively with the functional performance in every area of human life, including ADL (both social and interpersonal), work, and leisure activities.

There are few studies on the association between cognition and functional performance in the elderly in Brazil[10-12]; the studies generally have cross-sectional designs as a rule. Longitudinal studies are required to produce evidence on the changes in the cognitive and functional performance of the elderly, conduct tests to assess how these changes occur over time to guide interventions and preventive actions, and, eventually, to contribute to the planning of public policies.

The aims of this study were to compare the functional and cognitive changes occurring in community-dwelling elderly over a 6-month period and to analyze the demographic variables associated with the increase, maintenance, and reduction of functional and cognitive outcomes.

Method

In this longitudinal, observational study, we performed measurements at two different time points with a 6-month interval between the time points. The study was based on data retrieved from the database of the FIBRA Network (Network of Studies on Frailty in elderly Brazilians, a health center of the Federal University of Minas Gerais/Rede de Estudo da Fragilidade em Idosos Brasileiros, Universidade Federal de Minas Gerais, UFMG) and a FIBRA Network subproject[13]. The FIBRA Network is a multicenter, multidisciplinary project, which involves four research groups that are linked to Brazilian universities (University of São Paulo at Ribeirão Preto, USP-RP; Federal University of Minas Gerais, UFMG; State University of Rio de Janeiro, UERJ; and University of Campinas, UNICAMP) and other partners.

A total of 613 elderly individuals, who were randomly selected by the lottery method, applied to the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística, IBGE) census sectors and were interviewed at the health center of the UFMG. The data from the IBGE 2000 census were used to calculate the number of participants in each sector based on the proportion of elderly people in the census sectors that corresponded to the city of Belo Horizonte. In this study, the sample comprised 167 community-dwelling elderly of both genders, aged ≥ 65 years, who were randomly selected from FIBRA Network´s original database and were reassessed 6 months later.

Individuals who were excluded from the study had the following conditions: cognitive impairment; transient or permanent bedridden status; wheelchair confinement; severe sequelae of stroke; and neurological disorders that hindered their performance on tests.

The FIBRA Network study was approved by the Research Ethics Committee (Comitê de Ética e Pesquisa, COEP) of UFMG, Belo Horizonte, MG, Brazil, protocol ETIC 187/07. All of the participants signed an informed consent form.

Instruments and procedures

The cognitive function of the elderly who were recruited from the FIBRA Network database was screened using the Mini Mental State Examination (MMSE). The MMSE scores ranged from 0 to 30; a lower value indicated a greater degree of cognitive impairment[14]. In the present study and in agreement with the work of Brucki et al.[15], the participants who scored above the cut-off point corresponding to their schooling level minus 1 standard deviation (SD) remained in the study, whereas those who scored below the cut-off point on the MMSE were excluded from the study.

We collected the participants' sociodemographic data related to their physical health, habits (tobacco smoking and use of alcohol), perceived health, use of healthcare services, nutrition, level of physical activity, and functional capacity (performance of BADLs, IADLs, and AADLs), in addition to measurements of physical activity, anthropometric parameters, fatigue, and global life satisfaction. For this study, we used the data collected on sociodemographic parameters, functional capacity, and cognition.

The Katz Index of independence in ADL was used to collect the data on BADLs[6]. The total score of this scale ranged from 0 to 6; the lower value indicated a greater level of independence.

Lawton and Brody's scale was used to assess the degree of independence in the performance of IADLs[7]. The score for each item ranged from 1 to 3, where 3 indicated independence. The total score ranged from 7 to 21; the higher value indicated the

greater level of independence in the performance of activities.

The data on AADLs were collected from a 12-item list related to participation in social activities, such as visiting friends and relatives; participation in social groups and meetings; cultural activities; political activities, such as participation in the board of organizations; religious activities, such as attending church; trips; work; and driving vehicles. This list of items was elaborated by one of the FIBRA Network researchers based on the questionnaire of the Berlin Ageing Study[16]. The score for each item ranged from 1 to 3; 1 meant that the individual never performed the investigated activity; 2 meant that he discontinued that activity; and 3 meant that he currently performs that activity. The total score ranged from 12 to 36; the higher scores pointed to greater levels of independence[17].

The examiners received specific training for conducting interviews in a uniform and standard manner to collect data and ensure quality and pertinent information.

Statistical analysis

The Wilcoxon test was used to compare the scores on the MMSE, BADL, IADL, and AADL scales between time points 1 and 2, as well as the differences in the various categories of demographic variables over time. The Mann-Whitney (two categories) or Kruskal-Wallis test (more than two categories) was used to compare the various categories of demographic variables between time points 1 and 2 in each dependent variable. Nonparametric tests were used because the data exhibited an asymmetric distribution[18]. The effect size was calculated using 95% confidence intervals (CIs).

The Spearman's rank correlation coefficient was calculated to investigate the association between the MMSE scores and the various functional scales in time points 1 and 2.

The difference between the scores was calculated (score in time point 2 minus score in time point 1) in all of the variables that exhibited significant changes between the two investigated time points and classified under the following categories: increase (difference >0), no change (difference = 0), and reduction (difference <0).

We performed univariate analyses (chi-square and Kruskal-Wallis tests) to test the association of independent variables that were likely to be included in the multivariate model with the three categories of each dependent variable.

The multivariate ordinal logistic regression models were used to test the association of these factors: gender; marital status; work status; living alone; schooling; number of children; and monthly income with the categories of change in MMSE, AADL, IADL, and BADL scales. Among the various ordinal regression models available, we selected the proportional-odds model[19] because the response variable is a continuous variable clustered in categories, as in the present study. This model provided one single odds ratio (OR) estimate for all of the compared categories due to the proportional-odds assumption. This assumption was tested for each individual variable, as well as in the final model. The model goodness-of-fit was assessed by means of a deviance statistic[19].

The variables that exhibited p≤0.25 in the univariate analysis were initially used to build the multivariate models. The OR of each covariable was calculated.

In all of the statistical tests, the significance level was established as α=0.05. The statistical analysis was performed using SPSS software, version 15.0 (SPSS Inc., Chicago, IL, USA).

• Results

From a sample of 167 participants, 67.1% were females, and the average age was 73.1 years (SD, 5.7; range, 65-95 years). Approximately 54.5% of the participants were married or lived with a partner, whereas only 16.8% lived alone. Most participants were not working (77.8%) and were pensioners (70.7%). The median schooling was 4 years, with an average of 7.44 years among the males and 5.89 years among the females. The median monthly income was R$ 800.00 (Brazilian currency), and the median family income was R$ 1,500.00.

Table 1 describes the total scores on the MMSE, AADL, IADL, and BADL scales at the two investigated time points, the mean, and the 95% CI of the effect size to compare the differences in the scales scores.

We found a significant difference between the two investigated time points in the following items of scale IADL: meal preparation (p=0.041) and housekeeping (p=0.002). In both instances, the percentage of independence decreased, and the percentage of need for assistance increased. In the BADL scale, only the item continence exhibited a significant difference between the two investigated time points, with an increase observed in the reported dependence.

Table 2 describes the group's performance based on the correlation of the scale scores at time points 1 and 2 and the following variables: gender; educational level; and age range.

We compared the scale scores between the investigated time points and obtained the following results: Relative to the MMSE scores, 34.7% of the sample exhibited reduced scores; in 19.8%, the scores exhibited no change; and the scores increased in 45.5%. Relative to the AADL scale, 46.1% of the sample exhibited reduced scores; in 17.6%, the scores exhibited no change; and the scores increased in 36.4%. Relative to the IADL scale, 28.5% of the sample exhibited reduced scores; in 58.8%, the scores exhibited no change; and the scores increased in 12.7%. Relative to the BADL scale, 12.3% of the sample exhibited reduced scores; in 63.6%, the scores exhibited no change; and the scores increased in 24.1%.

The factors associated with the changes found in the MMSE, AADL, IADL, and BADL scales, including marital status, work status (no income, working, retired/pensioner), living alone, age, schooling (number of years), number of children, and monthly income, were subjected to a univariate analysis. The results are described in Table 3.

Only the variable schooling exhibited a significant correlation with the changes found in the MMSE scale (p=0.036). Although the three variables, namely, marital status, living alone, and schooling, were initially included in the multivariate model (p<0.25), none of them remained in the final model.

No variable exhibited a significant correlation with the changes found in the AADL scale. Only the variable monthly income was initially included in the multivariate model (p<0.25) but was not significant in the multivariate analysis.

Work status exhibited a significant correlation with the changes found in the IADL scale. On the BADL scale, only the variable age exhibited a significant correlation with the changes found (p<0.05). To assess the factors associated with increased scores in the BADL scale, we included the following variables in the model: gender; age; and income (p<0.25); however, none remained in the final model.

To assess the factors associated with increased scores in the IADL scale, we included the following variables in the model: marital status; work status; living alone; number of children; and monthly income (p<0.25). The variables living alone and work status remained in the final model. The results are described in Table 4.

The scores on the MMSE did not exhibit a significant correlation with the scores in the functional scales when the difference of scores between the two investigated time points was considered. However, a separate assessment of the correlation of the scores in the MMSE with the scores in the functional scales at each investigated time point (Table 5) revealed a significant correlation with AADL at both investigated time points and IADL at time point 2.

Discussion

The results quantified and described the direction of the changes in the functional capacity of community-dwelling elderly over a 6-month period. The functional capacity associated with IADL (food preparation and housekeeping) and BADL (continence) decreased. The cognitive function did not exhibit a significant difference between the investigated time points.

The results of the IADL scale indicated increased dependence in the domains of food preparation and housekeeping over the investigated time period. Such an increase was greater among males, participants with >5 years of schooling, and age up to 79 years. The elderly are often prevented from performing these types of tasks to spare them the physical exertion required, and in the case of males, they may be unable to perform these tasks because of cultural reasons. A study conducted in São Paulo showed that males exhibited a reduced capacity to perform tasks, such as cleaning the house, cooking meals, and doing the laundry and ironing clothes, which indicates the interference of sociocultural factors, because those tasks are usually performed by women[20]. In this study, the analysis of the factors associated with the changes in IADL pointed out two variables regarding independence, namely, living alone and work status. The participants who lived alone exhibited odds that were 2.5 times higher of increasing their independence in the performance of IADLs. According to the literature, living alone might be an appropriate option for the elderly who strive to maintain their independence and autonomy[21], in addition to motivating them to remain independent as a function of the lack of a partner to share in the ADLs. A study conducted with the elderly found a strong correlation between work and better indicators of autonomy and physical mobility, even after adjustments for age and other sociodemographic factors[22].

On the BADL scale, the participants exhibited an increased dependence relative to the item continence,

Table 1. Comparison of the total scores in the MMSE. AADL. IADL, and BADL scales at the two investigated time points.

	Time Point 1								Time Point 2										
	N	Mean	SD	Minimum	Maximum	Quartile 1	Median	Quartile 3	N	Mean	SD	Minimum	maximum	Quartile 1	Median	Quartile 3	p*	Size Effect	95% CI
MMSE	167	25.8	3.0	17.0	30.0	24.0	26.0	28.0	167	26.1	2.7	18.0	30.0	24.0	27.0	28.0	0.059	0.17	-0.17[a] 0.52
AADL	165	26.8	3.3	18.0	36.0	24.0	27.0	29.0	167	26.3	3.3	16.0	35.0	24.0	26.0	28.0	0.163	-0.31	-0.77[a] 0.14
IADL	165	20.4	1.3	11.0	21.0	20.0	21.0	21.0	167	20.1	1.8	8.0	21.0	20.0	21.0	21.0	**0.002**	**-0.70**	-1.26[a] -0.13
BADL	162	0.2	0.6	0.0	5.0	0.0	0.0	0.0	167	0.3	0.6	0.0	4.0	0.0	0.0	1.0	**0.038**	**0.11**	0.02[a] 0.24

*Wilcoxon test.

Table 2. Comparison of the scores in the MMSE, AADL, IADL, and BADL scales between the two investigated time points per gender, educational level and age range.

	MMSE			AADL			IADL			BADL		
	Time Point 1	Time Point 2	p[1]	Time Point 1	Time Point 2	p[1]	Time Point 1	Time Point 2	p[1]	Time Point 1	Time Point 2	p[1]
Gender												
Male	27 (28-28)*	27 (25-28)*	0.800	27 (24-29)*	27 (25-29)*	0.670	21(20-21)*	21(20-21)*	**0.013**	0 (0-0)*	0 (0-0)*	0.985
Female	26 (23-28)*	27 (24-28)*	**0.035**	26 (24-28)*	26 (24-28)*	0.132	21(20-21)*	21 (20-21)*	0.055	0 (0-0)*	0 (0-1)*	**0.007**
p[2]	**0.021**	0.257		0.280	0.130		0.955	0.315		0.409	0.246	
Schooling												
None	19 (18-22)*	22 (20-24)*	**0.035**	25 (23-28)*	23 (22-26)*	0.204	21 (18-21)*	20 (18-21)*	0.914	0 (0-1)*	0 (0-1)*	0.414
1-4 years	25 (24-27)*	25 (24-28)*	0.118	26 (24-28)*	26 (24-28)*	0.714	21 (21-21)*	21 (20-21)*	**0.050**	0 (0-0)*	0 (0-1)*	**0.023**
≥5 years	28 (26-29)*	28 (27-29)*	0.937	28 (26-30)*	27 (25-30)*	0.268	21 (20-21)*	21 (20-21)*	**0.005**	0 (0-0)*	0 (0-0)*	0.627
p[3]	**<0.001**	**<0.001**		**0.003**	**<0.001**		0.083	0.291		0.128	0.699	
Age range												
<79 years old	26 (24-28)*	27 (24-28)*	0.106	27 (25-29)*	27 (24-28)*	0.325	21 (21-21)*	21 (20-21)*	**0.005**	0 (0-0)*	0 (0-0)*	**0.045**
>80 years old	24 (23-26)*	25 (23-28)*	0.374	26 (23-28)*	24 (23-26)*	0.155	20 (18-21)*	20 (18-21)*	0.240	0 (0-1)*	0 (0-1)*	0.614
p[2]	**0.023**	**0.029**		0.363	**0.009**		**0.001**	**0.005**		**0.042**	0.176	

*Median (1st quartile – 3rd quartile); [1]Wilcoxon test; [2]Mann–Whitney test; [3]Kruskal-Wallis test.

Table 3. Univariate analysis of the factors associated with the changes found in the MMSE, AADL, IADL, and BADL scales.

	Changes in MMSE Valor-p				Changes in AADL Scale				Changes in IADL Scale				Changes in BADL Scale			
	Reduction	No Change	Increase	p	Reduction	No Change	Increase	p	Reduction	No Change	Increase	p	Reduction	No Change	Increase	p
Gender																
Male	19	13	23	0.647*	22	10	23	0.509*	19	29	7	0.454*	10	33	11	0.219*
	32.8%	39.4%	30.3%		28.9%	34.5%	38.3%		40.4%	29.9%	33.3%		50.0%	32.0%	28.2%	
Female	39	20	53		54	19	37		28	68	14		10	70	28	
	67.2%	60.6%	69.7%		71.1%	65.5%	61.7%		59.6%	70.1%	66.7%		50.0%	68.0%	71.8%	
Marital status																
With partner	30	23	38	0.144*	43	15	33	0.904*	30	53	8	0.141*	11	60	20	0.752*
	51.7%	69.7%	50.0%		56.6%	51.7%	55.0%		63.8%	54.6%	38.1%		55.0%	58.3%	51.3%	
Without partner	28	10	38		33	14	27		17	44	13		9	43	19	
	48.3%	30.3%	50.0%		43.4%	48.3%	45.0%		36.2%	45.4%	61.9%		45.0%	41.7%	48.7%	
Work status																
No income	5	3	4	0.762*	4	2	6	0.718*	5	5	2	**0.029***	0	7	5	0.317*
	8.6%	9.1%	5.3%		5.3%	6.9%	10.0%		10.6%	5.2%	9.5%		.0%	6.8%	12.8%	
Working	14	5	18		15	8	14		3	29	5		4	26	6	
	24.1%	15.2%	23.7%		19.7%	27.6%	23.3%		6.4%	29.9%	23.8%		20.0%	25.2%	15.4%	
Retired/ pension	39	25	54		57	19	40		39	63	14		16	70	28	
	67.2%	75.8%	71.1%		75.0%	65.5%	66.7%		83.0%	64.9%	66.7%		80.0%	68.0%	71.8%	
Living alone																
No	49	30	60	0.239*	61	26	50	0.517*	44	77	16	0.069*	15	88	33	0.504*
	84.5%	90.9%	78.9%		80.3%	89.7%	83.3%		93.6%	79.4%	76.2%		75.0%	85.4%	84.6%	
Yes	9	3	16		15	3	10		3	20	5		5	15	6	
	15.5%	9.1%	21.1%		19.7%	10.3%	16.7%		6.4%	20.6%	23.8%		25.0%	14.6%	15.4%	
	Median (Q1 – Q3)				Median (Q1 – Q3)				Median (Q1 – Q3)				Median (Q1 – Q3)			

Table 3. Continued...

	Changes in MMSE Valor-p				Changes in AADL Scale				Changes in IADL Scale				Changes in BADL Scale			
	Reduction	No Change	Increase	p	Reduction	No Change	Increase	p	Reduction	No Change	Increase	p	Reduction	No Change	Increase	p
Age (in years)	72 (68-76)	73 (69-75)	73 (69-77)	0.747**	73 (69-77)	71 (67-76)	73 (68-77)	0.527**	74 (70-77)	72 (68-76)	73 (69-79)	0.272**	75 (73-80)	72 (69-75)	73 (68-77)	0.032**
Years of schooling	4 (4-8)	8 (3-15)	4 (2-7)	0.036**	4 (2-8)	4 (3-10)	4 (4-8)	0.613**	4 (3-8)	4 (4-8)	4 (3-9)	0.902**	5 (2-11)	4 (4-8)	4 (2-8)	0.356**
Number of children	3 (1-5)	3 (2-5)	4 (2-6)	0.423**	4 (2-6)	3 (2-5)	3 (2-6)	0.392**	4 (2-7)	3 (2-4)	3 (2-5)	0.089**	3 (2-4)	3 (2-5)	4 (2-6)	0.396**
Monthly income (R$)	900 (460-1.800)	1.400 (415 – 3.500)	600 (465-1.600)	0.557**	900 (465-2.000)	600 (465-2.275)	700 (415-1.600)	0.240**	465 (415-1.650)	900 (465-1.800)	1.095 (494-6.000)	0.102**	1.250 (566-2.850)	800 (465-1.600)	600 (415-1.900)	0.099**

Q1, 1st quartile; Q3, 3rd quartile; *chi-square test; **Kruskal-Wallis test.

Table 4. Multivariate analysis (final proportional-odds model for ordinal logistic regression) of the factors associated with increased scores in the IADL scale.

	OR	OR 95% CI
Living alone		
No	1.00	
Yes	2.53	1.09; 5.87
Work status		
No income	1.00	0.31; 3.25
Working	2.52	1.18; 5.41
Retired/pensioner	1.00	

Deviance statistic p value = 0.139; parallel lines test p value = 0.067; CI = Confidence Interval; OR = Odds Ratio.

Table 5. Correlation between the MMSE scores and scores in the activities of daily living scales.

		MMSE	
		Time Point 1	Time Point 2
AADL	Correlation coefficient*	**0.26**	**0.20**
	P	**0.001**	**0.012**
IADL	Correlation coefficient*	0.07	**0.16**
	P	0.364	**0.038**
BADL	Correlation coefficient*	0.06	–0.10
	P	0.434	0.221

*Spearman's correlation coefficient.

which corroborates the results of the study conducted by Nunes et al.[23]. Aging might associate with pelvic floor weakness, which is one of the main factors associated with incontinence. Incontinence might lead to social isolation and low self-esteem; it might also interfere with the performance of IADL. The increased dependence related to continence was significantly greater among the women, participants with 1 to 4 years of schooling, and age up to 79 years. Virtuoso et al.[24] observed that the prevalence of urinary incontinence was greater among women. Regarding schooling, Fiedler and Peres[25] asserted that low levels of education were associated with a greater dependence in the performance of BADLs. In this study, the univariate analysis showed that the participants with increased independence in the performance of BADLs had a higher median age (75 years), which disagrees with the findings in the study by Lebrão and Laurenti[26], who pointed to the higher odds of difficulty in the performance of BADLs together with increased age. The chronological age does not represent a precise marker of the changes associated with senescence because the elderly of a

similar chronological age exhibit a wide variation in their health status, frequency of activities performed, and independence level. Additionally, the individual lifestyle and environmental features exert a substantial influence, which might facilitate or hinder the performance of BADLs. In the present study, no investigated factor exhibited an association with increased dependence in the performance of BADLs on the multivariate analysis.

No significant difference was found between the investigated time points in the AADL and MMSE scales. However, the p value was borderline in the latter, pointing to a tendency for increased scores among the women and less educated participants, who might have benefited from the learning opportunity provided by the tests because the present sample did not include individuals with cognitive disorders. Learning after the application of MMSE was also reported in the study by Lourenço et al.[27] with 105 community-dwelling elderly. According to those authors, the attention paid by people to their own performance might be awakened by their repeated participation in tests, thus contributing to the test-enhanced learning effect. In the present study, we observed that variable schooling was associated with the changes found in MMSE on the univariate analysis. The scores of the participants with the highest education did not change, which agrees with the findings in the longitudinal study conducted by Argimon and Stein[28], in which the elderly with the highest level of education maintained their high scores in the MMSE after 3 years of follow-up. These findings might be explained by the fact that the elderly with high levels of education tend to keep themselves informed and up-to-date on current events because they have access to newspapers and the Web. Because the MMSE assesses cognitive functions related with orientation, the elderly tend to maintain their cognitive performance levels. Nevertheless, no factor analyzed in the present study was associated with the changes in the MMSE on the multivariate analysis.

An analysis of the score difference as a function of schooling at each investigated time point showed that the scores on the MMSE and AADL increased at both time points together with an increase in schooling. The elderly with high levels of education might be more interested in and motivated to participate in several activities investigated in the present study, such as the cultural and political activities and driving vehicles, which might account for their higher scores on the AADL scale. Analysis of the score difference per gender at each investigated time point showed that the males scored higher on the MMSE at time point 1. Those findings might be explained by the fact that

males had a more than average schooling and that the women in the investigated generation had less access to education. With regard to variable age, the participants >80 years of age exhibited significantly lower scores in the MMSE. Those results agreed with the findings by Diniz et al.[29], in which schooling was one of the most influential factors on cognitive performance, males scored better on the MMSE, and the oldest participants exhibited poorer cognitive performance. In the present study, the participants >80 years of age exhibited a greater dependence in the performance of IADLs (both time points), AADLs (time point 2), and BADLs (time point 1) compared to the younger ones. Those results agreed with the findings in other studies, according to which the increase in age correlated with a greater functional disability[10,25].

An analysis of the correlation between the total MMSE score and the scores in the ADL scales at each investigated time point showed that the individuals with better cognitive performance were more independent in the performance of AADLs (both time points) and IADLs (time point 2). Those results agreed with the findings by Yassuda and Silva[30], in which the participation in social activities (AADLs) might demonstrate beneficial effects in cognitive functions.

Among the limitations of the present study, there is the possibility of error in the classification of functional capacity because the information was self-reported. However, because the sample comprised community-dwelling elderly and those individuals with cognitive impairment were excluded from this study, the error resulting from self-reporting was most likely minimized. Another limitation is the lack of information on the accomplishment of the intervention, as well as on the development shown by the participants during activities, which might influence the cognitive and functional outcomes.

We conducted this study with community-dwelling elderly and found reduced functional capacity over a 6-month period. These results are relevant because such a short period of time was sufficient to identify the changes in the functional capacity of community-dwelling adults. Such functional decline was independent of sociodemographic factors in the case of the BADLs. These results might contribute to future planning that focuses on the prevention of disability.

The changes in functional capacity associated with definite tasks identified in the present study give additional support to the fact that aging cannot be equated to disability by default and calls

for the attention of healthcare and rehabilitation professionals to the need for planning interventions aimed at maintaining the functional capacity of the elderly. The results showed that working and living alone are predictors of higher scores on scales of functional capacity. These results might guide rehabilitation professionals to specific areas of intervention, simultaneously stressing the relevance of keeping the elderly active within the community.

Acknowledgments

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