Advanced activities of daily living and incidence of cognitive decline in the elderly: the SABE Study

Atividades avançadas de vida diária e incidência de declínio cognitivo em idosos: Estudo SABE

Actividades avanzadas de la vida diaria y la incidencia de deterioro cognitivo en los ancianos: Estudio SABE

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Abstract

The objective of this study was to evaluate the association between advanced activities of daily living (AADL) and incidence of cognitive decline. The sample consisted of non-institutionalized older adults who participated in the second (2006) and third (2010) waves of the Health, Wellbeing, and Aging *(SABE) cohort study in São Paulo, Brazil. Cognitive decline was measured using a modified* Mini-Mental State Examination. *Advanced activities of daily living covered 12 social, productive, physical, and leisure-time activities that involve higher cognitive functions. Other covariates included socio-demographic conditions, overall health, lifestyle, and functional disability. The association between the independent variables and incidence of cognitive decline was assessed by multiple Poisson regression. Incidence of cognitive decline was 7.9%. Mean number of AADL in 2006 was significantly higher among elders who had not developed cognitive decline. Multivariate analysis showed that the number of AADL performed was a significant inverse predictor of cognitive decline.*

Activities of Saily Living; Aged; Dementia; Health of the Elderly; Occupational Therapy

Resumo

O objetivo deste trabalho foi avaliar o impacto das atividades avançadas de vida diária (AAVD) na incidência de declínio cognitivo. A amostra foi composta por idosos participantes do estudo longitudinal Saúde, Bem-estar e Envelhecimento *(SABE). O declínio cognitivo foi avaliado por meio do* Mini-Exame do Estado Mental *abreviado. As AAVD compreenderam 12 atividades sociais, produtivas, físicas e de lazer que envolvem funções cognitivas superiores. Foram considerados grupos de covariáveis do estudo: fatores sociodemográficos, saúde geral, estilo de vida e funcionalidade. A associação entre a incidência de declínio cognitivo e as variáveis independentes foi avaliada usando-se o modelo de regressão de Poisson múltiplo. A incidência de declínio foi de 7,9%. A média de desempenho de AAVD em 2006 foi significativamente maior entre os idosos que não desenvolveram o declínio. Após análise multivariada os resultados mostraram que quanto maior o número de AAVD realizadas menor a chance de declínio cognitivo no período estudado.*

Atividades Cotidianas; Idoso; Demência; Saúde do Idoso; Terapia Ocupacional

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Introduction

Among the disabling syndromes, dementia is one of the leading causes of functional impairment and declining quality of life in the elderly [1]. According to the most recent report by the World Health Organization, more than 35 million persons in the world presented some degree of dementia, a number that may triple by the year 2050, affecting more than 115 million persons [1]. Approximately 60% of cases of dementia occur in low and medium-income countries, posing a major challenge for healthcare planning due to the economic and social impact of this group of diseases on governments and family members [1]. Caregivers and family members frequently suffer depressive symptoms due to the overload of chores and burnout, negatively affecting their physical and psychological health, quality of life, and life expectancy [1]. Thus, the identification of factors impacting the prevention and treatment of these diseases has raised growing interest among researchers.

According to the evidence, heavier demand on functional capacities over the course of life exerts a protective effect on the health of the elderly, postponing potential functional alterations resulting from cognitive decline [2]. The literature shows that elderly that maintain normal cognitive performance are younger [3], have higher levels of schooling and income [1,4], display higher levels of community participation [5], and perform activities that involve physical, mental, and social stimulation [6]. In addition, alterations in functional capacity can precede cognitive impairment [7,8].

Functional status is commonly defined as the performance of activities of daily living. These can be divided didactically into three groups of activities: basic – daily tasks directly related to survival; instrumental – tasks involved in maintaining life in community; and advanced – more complex activities, subdivided into the physical, leisure-time, social, and productive domains, requiring higher levels of cognitive, physical, and social functions and that are influenced by motivational and cultural patterns [9].

Advanced activities of daily living (AADL) are based on intentional conducts involving the physical, mental, and social functioning that allow the individual to develop multiple social roles and maintain good mental health and quality of life [10,11].

Cognitive decline is associated with a specific pattern of functional losses, beginning with impaired performance of AADL, followed by losses in instrumental activities of daily living (IADL) and progressing to basic activities of daily living (BADL) [12,13]. Thus, some studies suggest that minor alterations in the performance of AADL are the first signs of mild cognitive impairments [12,13,14]. AADL, also known as complex activities of daily living, require multiple intact physical, psychological, social, and cognitive functions for their performance and involve activities within dimensions of participation in social, productive, and leisure-time activities, such as: skills to maintain working and planning trips, participation in community groups or movements, driving, planning events, or playing games [10,11,12,13].

Longitudinal studies in Brazil [15,16] have reported a significant association between performance of social, productive, physical, and leisure-time activities and maintenance of functional capacity and cognitive functioning. Other studies [12,13] have shown an association between cognitive decline and performance of AADL, but most of the evidence comes from cross-sectional studies, and there are few studies on this subject, thus hindering the establishment of causal relations between these factors. The current study thus aimed to investigate the impact of performance of AADL on the incidence of cognitive decline in a representative sample of community-living elderly in the city of São Paulo, Brazil.

Methods

A longitudinal study was performed with data from the SABE Study (*Health, Well-Being, and Aging*) collected in the years 2006 and 2010.

Study population and sample

The SABE Study was launched in 2000 under the coordination of the Pan-American Health Organization (PAHO) and was developed in seven cities in Latin America and the Caribbean: Buenos Aires (Argentina), Bridgetown (Barbados), Havana (Cuba), Montevideo (Uruguay), São Paulo (Brazil), Santiago (Chile), and Mexico City (Mexico), with the objective of drawing a profile of living and health conditions of elderly persons in the region. In Brazil, the study population consisted of a probabilistic sample of elderly living in the urban area of the city of São Paulo in 2000, calculated on the basis of the population count performed in 1996 by the Brazilian Instutute of Geography and Statistics (IBGE Foundation). The final sample in 2000 included 2,143 elderly persons (cohort A) interviewed at home using a standardized questionnaire (http://www.fsp.usp.br/sabe/quetionario.php, accessed on 08/Jan/2013). A second wave of the study was conducted in 2006, when we located and re-inter-

viewed 1,115 elderly persons from the first cohort and added a new cohort of 298 persons 60-64 years of age (cohort B) to maintain the representativeness of these individuals in the sample. The current study considered as its study population the 1,413 individuals interviewed in 2006 (cohorts A + B) that did not present cognitive decline, resulting in an initial sample of 1,152 elderly.

Ethical aspects

As part of the SABE study, the current study was approved by the Institutional Review Board of the School of Public Health, São Paulo University, and all the participants signed a free and informed consent form just prior to the interview.

Study variables

- Dependent variable

Incidence of cognitive decline in 2010 (no/yes) was assessed with the abbreviated version of the *Mini-Mental State Examination* (MMSE) [17]. The instrument has been used for cognitive screening since the first wave of the SABE study. This version was validated in a study by the World Health Organization (WHO) entitled *Age-Associated Dementias*, for populations with low schooling, with the aim of minimizing possible effects of schooling. The abbreviated MMSE has thirteen items (with a maximum score of 19 points), while the cutoff point used for positive screening of cognitive decline was 12 points or fewer, with sensitivity of 93.8 and specificity of 93.9 [17].

Longitudinal studies have reported a direct association between baseline scores on the MMSE and better cognitive function [14,18] and inverse association with cognitive decline in elderly with dementia [19,20], reinforcing the importance of MMSE as a screening test for detecting alterations in cognitive functions. The MMSE shows good accuracy for distinguishing persons with mild Alzheimer from normal controls, but it is not indicated for distinguishing between various subtypes of mild cognitive impairment, thus corroborating the use of other forms of neuropsychological screening and assessment [21].

The study thus included the elderly from cohorts A and B in 2006 who presented an initial score of more than 12 points on the abbreviated MMSE [17]. Incident cases of cognitive decline in 2010 were defined as elderly persons who presented a score below the cutoff point in the study follow-up.

- Target covariate

Performance of AADL was assessed in 2006 using 12 questions involving higher cognitive functions and social participation. Due to the high subjectivity involved in the performance of these activities and the lack of a single instrument for their assessment, the AADL included in the SABE Study were selected from the literature [9,10]. Domains of activities were thus proposed, aimed at greater comparability of the information. The activities included in this study are representative of the social, productive, and physical/leisure-time domains [9,10].The following activities were included in 2006: (1) contact with other persons through letters, telephone, or e-mail; (2) visits to friends and family members at their homes; (3) care or assistance to other persons (including personal care, transportation, shopping for family members or friends); (4) volunteer work away from home; (5) trips out of town, staying over at least one night; (6) participation in some regular exercise program (e.g., sports, physical exercise, walks, and groups of physical practices); (7) inviting persons to visit for meals or leisure; (8) going out with others to public places like restaurants or movie theaters; (9) performance of some manual activity, handicrafts, or artistic activity; (10) participation in organized social activities (clubs, community or religious groups, fellowship centers for the elderly, bingo); (11) using the computer, including Internet; (12) driving a motor vehicle. All the questions were answered with a scale with 5 possible answers (always, frequently, occasionally, rarely, and never). The answers always, frequently, and occasionally were defined as performance of the activity. The score obtained by the sum of the performance of activities (always/frequently) varied from 0 to 12 and was considered the target variable.

- Covariates

a) Socio-demographic

Gender (male/female), age bracket (60-74 versus ≥ 75 years), schooling (0-3 years, 4-7 years, ≥ 8), marital status (with or without a partner), living alone (no/yes), income sufficient for basic expenses (no/yes).

b) Health conditions and lifestyle:

Self-rated health was assessed with the question "How do you rate your health: very good, good, fair, bad, or very bad?" The answers very good, good, and fair were regrouped as "good" and bad and very bad were regrouped as "bad".

The variable *number of self-reported diseases* was constructed with the questions "Has a doctor or nurse ever told you that you have....?" including the diseases hypertension, diabetes, chronic obstructive pulmonary disease (COPD), heart disease, cerebrovascular diseases, joint disease, and osteoporosis. The final variable was obtained as the sum of the positive answers on the diseases. The answers were reclassified as no disease, one disease, or two or more diseases.

Presence of depressive symptoms was assessed with the abbreviated *Geriatric Depression Scale* (GDS) [22]. This scale contains 5 items and is one of the most widely used instruments for detecting severe and mild depressive symptoms in the elderly. Presence of depressive symptoms was defined as ≥ 6 points on the GDS.

Tobacco consumption was assessed with the following question: "Do you now have or have you ever had the habit of smoking?" Answers were categorized as never smoked, currently smokes, or previously smoked but no longer smokes.

Alcohol consumption was based on the geriatric version of the *Michigan Alcoholism Screening Test* (MAST) [23]. The test defines elderly with scores ≤ 1 point as not having a risk of excessive alcohol consumption, while elderly with ≥ 2 points are defined as at risk. Elders that reported drinking alcohol at least once a week were subdivided according to the MAST score, resulting in the final categorization of the variable: no alcohol consumption, social drinking, or alcohol abuse.

Functional performance was obtained as the report of difficulties in performing one or more BADL [24] and IADL [25].

Impaired mobility was assessed with the *Short Physical Performance Battery* (SPPB) [26], based on the following three tests: (1) walking three meters at normal speed; (2) getting in and out of a chair as quickly as possible with arms crossed; and (3) static balance (the latter subdivided into standing with feet together, semi-tandem stance, and tandem stance). Each task received a score from 0 (cannot perform) to 4 points (best performance). The final score was obtained as the sum of the scores from the three tests, varying from 0 to 12 points. Mobility performance was classified as moderate/good with 7-12 points and bad/very bad with 0-6 points, indicating impaired mobility.

Statistical analysis

Statistical analysis included measures of frequency, bivariate analysis, and Poisson multivariate regression analysis. Bivariate analysis used the chi-square test with Rao Scott correction for complex samples. Cumulative incidence and incidence density were calculated. To calculate incidence density, the numerator was the number of cases of cognitive decline during the period and the denominator was the number of person-years assessed during the period. The observation periods were computed as follows: (1) for those that died, the time transpired between the interview date in 2006 and the date of death; (2) for persons that developed cognitive decline, half the time between the interview date in 2006 and 2010; (3) for elderly that did not develop decline, the time between the interview date in 2006 and 2010.

Variables with $p < 0.20$ in the bivariate analysis were added stepwise to the Poisson model, according to the following blocks: socio-demographic, health status/lifestyle, and functionality. Variables with $p < 0.05$ or that adjusted the incidence ratio by at least 10% were kept in the final Poisson multivariate model. Multivariate analysis was controlled for the effects of socio-demographic, health status, lifestyle, and functionality variables. The model's results were presented as incidence ratios and their respective 95% confidence intervals (95%CI). Probability curves for cognitive decline were constructed from the results obtained in the logistic regression model.

The analysis used Stata 11.0 (Stata Corp., College Stations, USA), with the svy command, which allows considering the sample's complex structure, including the assignment of sampling weights.

Results

The final sample consisted of 819 elderly, representing 676,722 elderly from the city of São Paulo. Incidence of cognitive decline was 7.9% in a mean period of 4 years follow-up. Incidence density was 16/1,000 person-years (95%CI: 12.7-20.5). Incidence in men was 15.3/1,000 person-years (95%CI: 10.1-24.1) and in women 16.5/1,000 person-years (95%CI: 12.5-22.2).

Table 1 compares the population included (1,152 persons without cognitive decline) and losses to follow-up in this study (death, institutionalization, change of address, refusal, and incomplete data for the study target covariates). The excluded showed higher prevalence of individuals with worse health status and functionality. Among the excluded, there were proportionally more men (49%) than in the sample (36.9%) and higher prevalence of disabling diseases such as cerebrovascular diseases (9%), COPD (15.7%), and cancer (7.4%). There was a higher prevalence of smokers (17.9%) and lower mean number of

Table 1

Distribution of covariates in the final study sample and in the excluded population. SABE Study, city of São Paulo, Brazil, 2006.

Covariates	Final sample (%)	Excluded population (%)	Total population (%)	p-value
Gender *				< 0.001
Female	63.1	49.8	59.6	
Male	36.9	50.2	40.4	
Schooling (years)				0.37
0-3	39.8	35.0	38.5	
4-7	39.9	41.5	40.3	
≥ 8	20.4	23.4	21.1	
Lives alone				0.41
No	87.1	84.9	86.5	
Yes	12.9	15.1	13.5	
Marital status				0.79
Without partner	41.2	40.2	40.9	
With partner	58.8	59.8	59.1	
Self-rated income sufficiency				0.62
Insufficient income	54.1	52.4	53.7	
Sufficient income	45.9	47.6	46.3	
Age (years) *				< 0.001
60-74	83.4	72.1	80.4	
≥ 75	16.6	27.9	19.6	
Self-reported diseases				
Hypertension				0.36
No	36.3	39.7	37.2	
Yes	63.7	60.3	62.8	
Diabetes				0.36
No	80.0	77.5	79.3	
Yes	20.0	22.5	20.7	
Heart disease				0.20
No	79.1	75.1	78.1	
Yes	20.9	24.9	21.9	
Cerebrovascular diseases **				0.03
No	94.8	91.0	93.8	
Yes	5.2	9.0	6.2	
COPD **				0.01
No	89.7	84.3	88.3	
Yes	10.3	15.7	11.7	
Joint disease				0.10
No	65.0	72.2	66.9	
Yes	35.0	27.8	33.1	
Osteoporosis				0.12
No	76.4	81.2	77.7	
Yes	23.6	18.8	22.3	
Cancer **				0.02
No	96.5	92.6	95.5	
Yes	3.5	7.4	4.5	

(continues)

Table 1 (continued)

Covariates	Final sample (%)	Excluded population (%)	Total population (%)	p-value
Number of self-reported diseases				0.48
None	15.9	17.5	16.3	
1	29.5	25.3	28.4	
≥ 2	54.7	57.2	55.3	
Presence of depressive symptoms				0.18
No	86.8	83.3	85.9	
Yes	13.2	16.7	14.1	
Self-rated health				0.14
Excellent/Very good/Good	48.6	42.2	46.9	
Fair/Bad	51.4	57.8	53.1	
MMES abbreviated				0.72
Mean	17.0	16.9	17.0	
Tobacco consumption ***				0.003
Never smoked	55.2	42.9	51.9	
Used to smoke	32.7	39.2	34.4	
Currently smokes	12.1	17.9	13.7	
Alcohol consumption				0.14
None	67.5	68.9	67.9	
Moderate	26.8	21.9	25.5	
Alcohol abuse	5.7	9.2	6.6	
Difficulty in ≥ 1 ADL (BADL+IADL)	30.8	35.8	32.1	0.12
Number of AADL in 2006 (mean) *	5.0	4.3	4.8	< 0.001
Performance of AADL *				< 0.001
0-5	57.7	69.6	60.8	
≥ 6	42.3	30.4	39.2	
Impaired mobility ***				0.001
No	89.0	81.6	87.1	
Yes	11.0	18.4	12.9	

AADL: advanced activities of daily living; ADL: activities of daily living; BADL: basic activities of daily living; COPD: chronic obstructive pulmonary disease; IADL: instrumental activities of daily living.

* p < 0,001;

** p < 0,05;

*** p < 0,01.

AADL performed (3.5). Impaired mobility also showed a statistically significant difference between the included and excluded, with the latter showing a higher prevalence of impaired mobility (18.4%).

Table 2 shows the study population's characteristics in the association between the independent variables and incidence of cognitive decline. The majority of the elderly were females, and approximately 40% had 0-3 years of schooling. As for health status, the majority had two or more diseases, and self-rated overall health was bad. Mean AADL was 4.7 (95%CI: 4.5-4.9).

Bivariate analysis showed that two sociodemographic variables (schooling and age), two related to health and lifestyle (alcohol consumption and self-rated health), and two related to functionality in ADL (difficulties with ADL and number of AADL) were significantly related to cognitive decline. Elderly with cognitive decline in 2010 had presented significantly low mean AADL in 2006 (3.3; 95%CI: 2.8-3.8; p < 0.001), compared to those that did not develop decline (5.1; 95%CI: 4.8-5.4).

Table 3 shows the final Poisson regression model for variables associated with incidence of cognitive decline in 2010. More schooling reduced the risk of decline by 62% and 89%, for elders with 4-7 and ≥ 8 years of schooling, respectively. Age 75 years or older increased the incidence of decline by 3.29 times. Meanwhile, risk of cognitive decline was 2.15 times higher in elderly

Table 2

Sample distribution and bivariate analysis of incidence of cognitive decline according to study covariates. SABE Study, city of São Paulo, Brazil, 2006.

	Total sample (%)	Decline in 2010 (%)		p-value
		No	Yes	
Gender				
Female	63.1	92.0	8.0	0.952
Male	36.9	92.2	7.8	
Schooling (years)				
0-3	39.8	86.2	13.8	< 0.001
4-7	39.9	94.8	5.2	
≥ 8	20.4	98.4	1.6	
Marital status				
Without partner	58.5	92.1	7.9	0.983
With partner	41.5	92.1	7.9	
Sufficient income				
No	54.1	92.1	7.9	0.983
Yes	45.9	92.1	7.9	
Age (years)				
60-74	83.4	95.0	5.0	< 0.001
≥ 75	16.6	77.5	22.5	
Number of self-reported diseases				
None	15.9	90.9	9.1	0.065
1	29.5	95.6	4.4	
≥ 2	57.3	90.5	9.5	
Tobacco consumption				
Never smoked	55.2	92.3	7.7	0.188
Used to smoke	32.7	90.4	9.6	
Currently smokes	12.1	95.8	4.2	
Alcohol consumption				
None	67.5	90.5	9.5	0.004
Moderate	26.8	97.4	2.6	
Alcohol abuse	5.7	85.7	14.3	
Self-rated health				
Excellent/Very good/Good	48.6	94.0	6.0	0.037
Fair/Bad	51.4	90.3	9.7	
Presence of depressive symptoms				
No	86.8	92.5	7.5	0.266
Yes	13.2	89.7	10.3	
Difficulty in ADL				
No	69.2	95.7	4.3	< 0.001
Yes	30.8	83.9	16.1	

ADL: activities of daily living;

with difficulties in ADL. The higher the number of AADL performed, the lower the risk of cognitive decline. Alcohol abuse increased the risk of cognitive decline by 2.44 times.

Figure 1 shows the probabilities of cognitive decline adjusted by the participants' AADL and schooling. Elders with less schooling showed a higher likelihood of decline when compared to individuals with ≥ 8 years of school. Performance of ≥ 8 activities rendered the likelihood of decline insignificant between the two groups.

Table 3

Final Poisson model for factors associated with incidence of cognitive decline. SABE Study, city of São Paulo, Brazil, 2006.

	Incidence of decline in 2010	
	Crude	Adjusted
	IR (95%CI)	IR (95%CI)
Schooling (years) [reference = 0-3 years]		
4-7	0.38 (0.22-0.65) *	0.50 (0.31-0.81) **
≥ 8	0.11 (0.04-0.31) *	0.20 (0.06-0.62) **
Gender [male]	1.02 (0.56-1.840	0.91 (0.46 -1.83)
Age (years) [reference = 60-74 years]		
≥ 75	4.51 (2.74-7.42) *	3.29 (2.03-5.33) *
Alcohol consumption [reference = none]		
Moderate	0.27 (0.12-0.60) **	0.61 (0.29-1.29)
Alcohol abuse	1.50 (0.63-3.61)	2.44 (1.04-5.72) ***
Tobacco consumption [reference = never smoked]		
Currently smokes	0.53 (0.21-1.32)	0.46 (0.17-1.24)
Used to smoke	1.24 (0.75-2.03)	0.99 (0.77-1.76)
Number of self-rated diseases [reference = none]		
1	0.48 (0.23-1.02)	0.58 (0.28-1.18)
≥ 2	1.04 (0.53-2.02)	0.86 (0.42-1.77)
Presence of depressive symptoms [reference = no]		
Yes	1.37 (0.79-2.37)	0.80 (0.49-1.30)
Difficulty in ADL (reference = no)		
Yes	3.76 (2.24-6.31) *	2.15 (1.26-3.65) **
Number of AADL	0.74 (0.67-0.81) *	0.85 (0.76-0.96) ***

AADL: advanced activities of daily living; ADL: activities of daily living; IR: incidence ratio.

* p < 0,001;

** p < 0,01,

*** p < 0,05.

Discussion

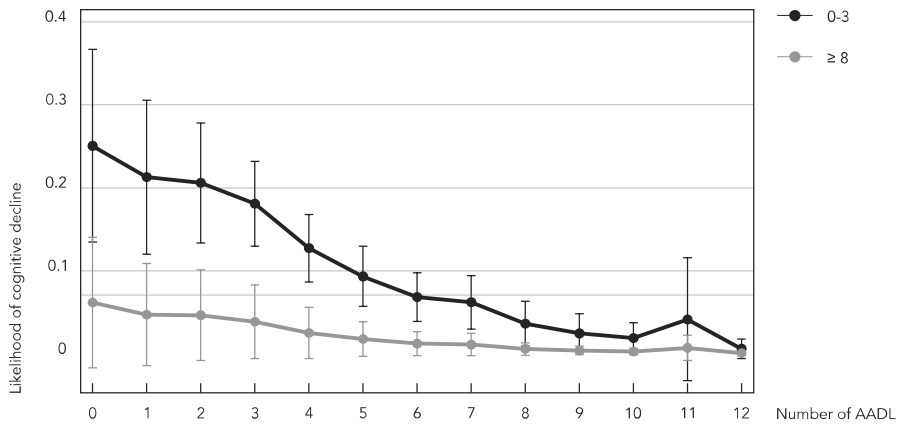
The current study's results show that performance of advanced activities of daily living was a protective factor against the development of cognitive decline, independently of socioeconomic status, overall health status, lifestyle, and functional incapacity in activities of daily living.

The difference between methodologies used in the studies hinders the comparison of results as to measuring the effects of AADL. Unlike BADL and IADL, which are relatively stable between populations, AADL are culturally dependent and gender-specific, thus making their assessment difficult [9,10]. Studies highlight the need for diverse stimuli and high levels of involvement in activities [27,28]. In the current study, the separate analysis of each AADL did not prove significant in the multivariate model. However, when assessing the score resulting from the number of AADL, the effects proved to be enhanced.

The findings show not only that the number of AADL performed is important for maintaining cognitive capacity, but that fewer AADL performed are a predictor of cognitive decline. There was a 22% absolute difference in the adjusted probability of decline between elderly that did not perform AADL and those that performed 12 activities (data not shown). The findings thus provide evidence that these activities can be used as an ancillary instrument in the assessment of cognitive function in the elderly [13]. There is evidence that patients with mild cognitive decline display lower scores on the MMES and on performance of complex activities, especially tasks that involve memory or complex reasoning [14]. Corroborating our results, Sörman et al. [29] found that risk of dementia at 15 years was lower among elderly that performed more activities at baseline. However, this association was not maintained when the authors analyzed the effect of these activities in show intervals. The association

Figure 1

Likelihood of cognitive decline in 2010 according to number of advanced activities of daily living (AADL) performed and schooling (years of school) in 2006. SABE Study, city of São Paulo, Brazil, 2010.



was only observed between baseline and the first 5-year follow-ups. The authors thus highlight that the protective effect of these activities may be small when they begin at more advanced ages. On the other hand, the same authors do not rule out the possibility of reverse causality, since limited involvement in activities could be due to preexisting decline.

There is no consensus concerning the mechanism by which AADL protect against cognitive decline [30,31,32,33]. The literature suggests that patterns of activity and related neural networks that are established in early life may be more important for maintaining cognitive health in old age, in the sense of minimizing the effects of decreasing velocity of cognitive processing in aging [30,34]. Exposure to complex environments with stimulating brain experiences throughout life, related to socio-demographic and functionality variables, such as more schooling and more complex work activities and leisure-time activities, are believed to promote neuronal growth and favor neuroplasticity. These factors contribute to the construction, formation, and maintenance of better levels of cognitive reserve, fostering greater resistance to brain damage [35,36,37,38] and potentially postponing the emergence of cognitive deficits [39,40].

In addition, AADL involve volitional activities, influenced by the sociocultural context and motivational factors, with pleasurable relations in the performance of activities, transposing the meanings of independent community living [10,11,12,29]. Characteristics related to AADL allow visualizing individuals' social roles and interests, in addition to the integrity of important physical and social functions that indicate more complex functional levels.

Longitudinal studies report on the importance of maintaining activities over time among the elderly, especially preserving individual preferences. The maintenance of work-related and leisure-time activities in old age has been associated with better cognitive functioning in European elderly [41]. In addition, a population-based study with French elderly found that postponing the age of retirement was associated with a significant reduction in the risk of Alzheimer's disease [42].

The emergence of functional incapacities appears to be the principal factor in decreasing and/or abandoning activities [16,43,44]. Impairment of AADL, observed as alterations in quality of performance or a decrease in the number of activities usually performed throughout life could be related to the beginning of physical or cognitive functional decline, depressive symptoms, contextual barriers, weak support network, and/or more significant impairments related to chronic non-communicable diseases and conditions (NCDs) [16,43,44].

Productive and leisure-time social activities (AADL) favor the full development of potentialities in elderly, with exchange of experiences, sup-

port, and affection among members of the social network. There is a substitution of roles and persons, with a view towards building a stable network that fosters belonging, but simultaneously allows new actors to enter and leave, thus becoming more flexible [45].

The cognitive reserve theory appears to provide the main explanation for the effects of performing complex activities throughout life and for lower odds of developing cognitive decline. Patterns of activity and related neural networks established in early life may be more important for maintaining cognitive health in old age [29]. Evidence shows that more schooling, participation in complex work activities, and leisure-time activities that involve cognitive processes are associated with building and maintaining cognitive reserve [2,30,35,36,46,47].

As for socio-demographic factors, corroborating other studies [6,20,32,40,47,48,49], we found that more schooling significantly reduced the odds of cognitive decline.

Importantly, the odds of decline estimated as the number of AADL and stratified by schooling showed that even for elderly with little schooling (0-3 years), performing 8 or more AADL reduced the probability of decline to levels close to those found for individuals with ≥ 8 years of school (Figure 1). This information pertains particularly to the supply of strategies to promote physical and cognitive health among the elderly in developing countries, which have low mean levels of schooling.

According to the literature [6,46], age is the factor most closely associated with cognitive decline, due to the accumulation of disease processes and exposure to other risk factors over the course of life and with aging [50]. Data from the literature show that elders begin reducing their advanced activities of daily living at around 75 years of age, when functional incapacities emerge, especially in performing activities away from home. An Australian cross-sectional study found that elders 75 years and older spent more time alone and were less involved in work-related activities and use of transportation. Older persons presented more serious functional losses and abandonment of occupational roles [51].

The study's strengths feature the longitudinal design of the SABE study, with the use of a complex representative sample of the elderly population in the city of São Paulo and systematic collection of different factors known to be associated with cognitive decline, thus aiding the identification of the role of AADL in the outcome, independently of these characteristics. The study's limitations are related to the lack of a gold standard to confirm the results obtained with the modified version of the MMSE. Another limitation was the lack of use of a validated questionnaire for assessing AADL and lack of information on the initial period of involvement in these activities over the course of life. In addition, as reported by other longitudinal studies [19], one cannot rule out some reverse causality effect, since a low number of AADL at baseline could be due to preexisting mild decline, undetected by cognitive screening tests. These issues emphasize the need for validation of an instrument to assess AADL and on-going follow-ups, aimed at assessing the effect's stability over time.

In conclusion, practicing more advanced activities of daily living can be a protective factor against cognitive decline in non-institutionalized elderly. The effects of AADL on incidence of cognitive decline were maintained even after adjusting for covariates commonly reported in the scientific literature on cognitive decline.

Resumen

El objetivo de este estudio fue evaluar el impacto de las actividades avanzadas de vida diaria (AAVD) en la incidencia del deterioro cognitivo. La muestra estuvo compuesta por ancianos participantes en el estudio longitudinal Salud, Bienestar y Envejecimiento *(SABE). El deterioro cognitivo se evaluó mediante el* Mini-Examen del Estado Mental *abreviado. Las AAVD comprendieron 12 actividades sociales, productivas, físicas y de ocio que involucran funciones cognitivas superiores. Se consideraron grupos de covariables del estudio: factores sociodemográficos, salud general, estilo de vida y funcionalidad. La asociación entre la incidencia de deterioro cognitivo y las variables independientes fue evaluada mediante la plantilla de regresión de Poisson múltiple. La incidencia de deterioro fue de un 7,9%. La media de desempeño de AAVD en 2006 fue significativamente mayor entre los ancianos que no desarrollaron el deterioro. Después de un análisis multivariado los resultados mostraron que cuanto mayor es el número de AAVD, más pequeña es la incidencia del deterioro cognitivo en el periodo estudiado.*

Actividades Cotidianas; Anciano; Demencia; Salud del Anciano; Terapia Ocupacional

Contributors

E. G. Dias, F. B. Andrade, J. L. F. Santos and M. L. Lebrão Study participated on the conception and project, data analysis and interpretation, writing of the article, and approval of the final version for publication.

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