

# Relevant Factors on Cognitive Evaluation of the Portuguese Population

## Fatores Relevantes na Avaliação Cognitiva da População Portuguesa



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### ABSTRACT

**Introduction:** Aging is an inevitable process that has a social impact in the forecoming decades, and it will present a great challenge regarding public health. An efficient health system requires a reflection on the preventive measures to be implemented.

**Material and Methods:** The study population comprised a total number of 2672 individuals of both genders, aged 55 years and over, residents in continental Portugal, to whom a questionnaire was applied that included the following sections: Social network; Locomotion; Physical autonomy; Instrumental autonomy; Cognitive assessment; Physical activity.

**Results:** The study of aging in the Portuguese population found that physical autonomy for tasks related to daily life are associated with better cognitive evaluation. A statistically significant association was found between performance in cognitive assessment and gender, age, schooling, the fact of living alone, the number of hours being alone, autonomy to walk in the street, washing, dressing, eating, preparing meals, doing shopping, managing money and taking medications and washer / treat clothing.

**Discussion:** Cognitive evaluation is negatively influenced by the number of hours that an individual is alone.

**Conclusion:** Activities of daily life must be valued, since they require the ability to plan and carry out tasks and their preservation is a key component in successful aging.

**Keywords:** Activities of Daily Living; Aging; Cognition Disorders; Education

### RESUMO

**Introdução:** O envelhecimento é um processo inevitável que tem um impacto social e será nas próximas décadas o grande desafio em termos de saúde pública. Um sistema de saúde eficiente requer uma reflexão sobre as medidas preventivas a aplicar.

**Material e Métodos:** A amostra em estudo englobou 2672 indivíduos de ambos os géneros, com idade igual ou superior a 55 anos, residentes em Portugal continental, ao qual foi aplicado um questionário que incluiu as seguintes secções: Rede social; Locomoção; Autonomia física; Autonomia instrumental; Avaliação cognitiva; Atividade física.

**Resultados:** O estudo do perfil de envelhecimento da população Portuguesa revelou que a autonomia física para tarefas relacionadas com o quotidiano, se associam a um melhor desempenho cognitivo. Verificámos uma associação estatisticamente significativa entre o desempenho na avaliação cognitiva e o género, a idade, a escolaridade, o facto de a pessoa viver sozinha, o número de horas que está sozinha, a autonomia a andar na rua, lavar-se, vestir-se, comer, preparar refeições, fazer compras, gerir dinheiro, tomar medicamentos e lavar/tratar a roupa.

**Discussão:** A avaliação cognitiva é influenciada negativamente pelo número de horas que um indivíduo vive sozinho.

**Conclusão:** As atividades da vida diária devem ser valorizadas, uma vez que requerem capacidade para planear e realizar tarefas e a sua preservação é uma componente chave num envelhecimento de sucesso.

**Palavras-chave:** Atividades da Vida Diária; Alterações da Cognição; Educação; Envelhecimento; Portugal

### INTRODUCTION

Ageing is an unavoidable process with obvious social impact and should become the major challenge in terms of public health over the coming decades. It is estimated that, over the coming five years and for the first time, the number of people aged 65 or above will outnumber all children aged under five. A quarter of the world population will be aged over 65 in 2020 and the age group over 85 will show the highest growth rate.<sup>1</sup> This demographic change is a challenge to management and healthcare policies as ageing is associated with physiological and psychological changes. Mortality and morbidity related to infectious diseases have been reduced by social and economic development and by improvements in medicine whilst the incidence and prevalence of chronic diseases have been

increased by lifestyle and risk factors associated with higher life expectancy and lower mortality. Nine out of ten people aged 60 or above live with at least one cardiovascular risk factor and, when living with at least two of those, also have a higher susceptibility for the development of cognitive impairment, particularly affecting the attention and executive function domains.<sup>2</sup>

Healthcare systems need to find efficient strategies aimed at adapting healthcare to the needs of people aged over 60. Taking into account an ageing population and a high percentage of the world population living with economic deprivations, the application of preventive measures and their associated financial burden should be taken into consideration in any efficient healthcare system in order to

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define targets in terms of global health. The heterogeneity of functional changes in ageing populations shows the cumulative effect of lifelong inequalities in healthcare.<sup>3</sup>

There are different examples of successful ageing (cognitive as well as physical) related to the search for an active lifestyle. An effort to delay the cognitive decline has been the object of a new approach in research over the past decade, showing that neuroplasticity is increased by different daily activities such as regular physical activity and cognitive stimulation, even in the elderly.<sup>4</sup>

Activity of daily living (ADL) questionnaires have been frequently used for the assessment of functional status of the elderly as an indicator of the cognitive function, namely when focused on complex activities.<sup>5-7</sup> The record of a range of activities easily performed by elderly people is included in these questionnaires. ADLs can be referred to as self-care related 'basic ADLs' (b-ADL) such as bathing and dressing and 'instrumental ADLs' (i-ADL) related to more advanced activities such as shopping and money and medication management.<sup>8</sup>

It has been generally assumed that at least four factors may have a crucial role in the way humans adapt to ageing: social interaction, nutrition, cognitive stimulation and physical activity.<sup>4,9</sup>

Loneliness refers to a subjective state of mind reflecting a deep sensation of emotional solitude. It is a common feeling among elderly people and is closely related to the reduction in the number of social contacts and subsequent detachment from social network. These facts are associated with a decline in health status of the elderly population and has been suggested as predictive of a subsequent functional decline and increased mortality. In addition, successful ageing is related to the maintenance of an active social network.<sup>10</sup>

The benefits of physical activity and improved autonomy and the cognitive status of the elderly should be carefully analysed due to the differing and vague definition of physical activity.<sup>11</sup> As regards ageing, it is known that preventing any muscle mass reduction and fat mass increase is associated with greater ADL autonomy and higher life expectancy.<sup>12</sup>

The study of the ageing profile of the Portuguese population (*Estudo do Perfil de Envelhecimento da População Portuguesa* - EPEPP) aimed at the definition of the ageing profile of the Portuguese population for the determination of dependency ratios and the characterisation of functional factors.<sup>14,16-23</sup> In this study, the analysis of the possible associations between lifestyle and cognitive decline was carried out, considering that the definition of risk groups would lead to an early intervention with impact in terms of public health policies.

The influence of any factors leading to successful ageing is crucial for a country currently facing a financial crisis, such as Portugal. Working conditions, occupational class, career trajectories and occupational complexity at work are relevant predictive factors of later-life cognitive function.<sup>13</sup>

## MATERIAL AND METHODS

### Study sample

Participants from both genders, aged 55 or above, living in mainland Portugal, whose name were on the national telephone book and having given a written informed consent (2004 Helsinki Declaration) have been involved in the study. This study has been approved by the Ethics Committee of the Faculty of Medicine of the University of Coimbra. Data allowing for the identification of any participant were coded previous to the information handling and data allowing for any personal identification were not recorded or handled.

All non-compliant with these criteria as well as bedridden or wheelchair users unable to come to the survey location and those who were unable to respond (written or orally) to the questionnaire were excluded from the study.<sup>14</sup>

The dimension of our group of participants was calculated based on previous studies considering standard ageing profile heterogeneity.<sup>15,16</sup> In total, 2,672 participants aged 55 or above (1,533 female – 57.4%) were involved in the study, a sample considered as representative of the Portuguese population, namely regarding the age group, gender and geographic region. A stratified tendentially proportional sampling based on the 2001 census of the *Instituto Nacional de Estatística (INE)* was obtained. A 2% maximum precision error of the estimated relevant prevalence for the study was found with this sample, with a 95% confidence interval.

From the total sample, 1,000 respondents (37.4%) were aged 55-64, 978 (36.6%) 65-74 and 694 (26.0%) were aged 75 or above.

The questionnaire was validated by the deployment of a pre-test applied to a small number of respondents living in rural and urban municipalities involving the selected age groups in order to assess the questionnaire's intelligibility and the need for any further modification. The pre-test has been re-applied one month later by the same inquirer to the same respondents (double test method) and Cohen's kappa test has been used for the assessment of the agreement between categorical variables. Inquirers were selected and previously trained at Eurotrials.

The following sections of the questionnaire were analysed: Social network; Locomotion; Physical autonomy; Instrumental autonomy; Cognitive assessment; Physical activity.

### Statistical analysis

SPSS® version 18.0 software has been used for the statistical analysis and a 5% level of significance has been considered in inferential statistics. Any  $p$ -value  $\leq 0.05$  has been considered as a statistically significant difference in comparative analysis between relevant groups.

Scores were defined based on the responses to the questionnaire, according with the number and type of items. Different variation intervals have been considered for each score, even though all were coded as 0 or 1, 0 corresponding to the unfavourable situation and 1 to the favourable.

Table 1 – Cognitive assessment score

Score parcels	Cognitive assessment score	Classes of cognitive assessment score
$\begin{aligned} \text{Ac-C} = & \text{OT}_{q1} + \text{OT}_{q2} + \text{OT}_{q3} + \text{OT}_{q4} \\ & + \text{OT}_{q5} + \text{OE}_{q1} + \text{OE}_{q2} + \text{OE}_{q3} + \\ & \text{OE}_{q4} + \text{OE}_{q5} + \text{Ret}_{q1} + \text{Ret}_{q2} + \\ & \text{Ret}_{q3} + \text{Ac}_{q1} + \text{Ac}_{q2} + \text{Ac}_{q3} + \text{Ac}_{q4} + \\ & \text{Ac}_{q5} + \text{Ev}_{q1} + \text{Ev}_{q2} + \text{Ev}_{q3} + \text{Nom}_{q1} \\ & + \text{Nom}_{q2} + \text{Rep}_{q1} + \text{Comp}_{q1} + \\ & \text{Comp}_{q2} + \text{Comp}_{q3} + \text{Leit}_{q1} + \text{Esc}_{q1} \\ & + \text{Des}_{q1} \end{aligned}$	Range – 0 - 30	<p>Ac-C = 0 with</p> <ul style="list-style-type: none"> <li>Score 0 - 15 when ESCOL* = 0</li> <li>0 - 22 when ESCOL* = 1, 2, 3</li> <li>0 - 27 when ESCOL* = 4</li> </ul> (unfavourable) <p>Ac-C = 1 with</p> <ul style="list-style-type: none"> <li>Score 16 - 30 when ESCOL* = 0</li> <li>23 - 30 when ESCOL* = 1, 2, 3</li> <li>28 - 30 when ESCOL* = 4</li> </ul> (favourable)

\* ESCOL = 0 se Q.11 ≤ 3 anos; ESCOL = 1 se Q.11 ≥ 4 e Q.11 ≤ 6 anos; ESCOL = 2 se Q.11 ≥ 7 e Q.11 ≤ 9 anos; ESCOL = 3 SE Q.11 ≥ 10 e Q.11 ≤ 11; ESCOL = 4 se Q.11 ≥ 12 ESCOL = 0, ≤ 3 years of education; ESCOL = 1, 4-6 years; ESCOL = 2, 7-9 years; ESCOL = 3, 10-11 years; ESCOL = 4, ≥ 12 years; Ac-C – cognitive assessment score

### Descriptive analysis

An initial univariate descriptive analysis of all the variables has been carried out: living alone, number of hours living alone each day, mobility (walking on the street), bathing, dressing, eating, meal preparation, shopping, money and medication management, laundry and favourable/unfavourable cognitive assessment score.

Binary variables related to mobility (walking on the street), bathing, dressing, eating, meal preparation, shopping, money and medication management and laundry were developed and recoded into binary variables (0/1) as for non-autonomy vs. autonomy.

### Inferential analysis

Comparative analyses between favourable/unfavourable cognitive assessment score and the variables living alone, number of hours living alone each day, mobility (walking on the street), bathing, dressing, eating, meal preparation, shopping, money and medication management and laundry were developed, using chi-square test.

Comparative analyses were also developed regarding binary variables (living alone, number of hours living alone each day, mobility (walking on the street), bathing, dressing, eating, meal preparation, shopping, money and medication management, laundry) using chi-square test and odds ratio were calculated.

### Multivariate analysis

Adjusted odds ratio and 95% confidence intervals were calculated through multiple logistic regression analysis for the variables having shown a statistically significant association with favourable/unfavourable cognitive assessment in the inferential analysis.

### Score of physical autonomy, instrumental autonomy and cognitive assessment

The variable 'score of physical autonomy (AFs)' has been developed according with the sum of the variables 'bathing, dressing/undressing, lying down/getting up, sitting down/standing up, toilet use, urinary incontinence, faecal incontinence, eating'.

The score of instrumental autonomy was related to the variables 'using the phone, shopping, money management,

medication management over the past month/year, using public transports, meal preparation, domestic tasks, laundry'.

The variable 'score of cognitive assessment (Sc-AC)' was obtained with the sum of the variables 'Temporal orientation (OT), Space orientation (OE), Retention (Ret), Attention and calculation (Acl), Evocation memory (Ev), Naming (Nom), Repetition (Rep), Comprehension (Comp), Reading (Leit), Writing (Esc), Drawing (Des)' in addition to the variable 'cognitive assessment score (Ac-C)', according with criteria shown in Table 1, considering respondent's education (ESCOL).

The numerical variable 'education' (ESCOL) was divided into five levels, according with the number of complete years of education: 0 = up to three years, 1 = 4 to 6 years, 2 = 7 to 9 years, 3 = 10 to 11 years, 4 = 12 years and more.

## RESULTS

### Comparative analysis of variables found to have an influence on cognitive assessment

A comparative analysis has been made using chi-square test between the variables in the study and the score of cognitive assessment, as shown in Table 2.

A statistically significant association has been found between patient's gender ( $p < 0.001$ ), age ( $p < 0.001$ ), education ( $p < 0.001$ ) and living alone and the cognitive assessment ( $p = 0.001$ ). The same has been found when the association between the number of hours left alone each day and the cognitive assessment was analysed ( $p = 0.025$ ).

The patients with lower bathing autonomy showed a higher prevalence of an unfavourable score and this was a statistically significant association ( $p < 0.001$ ). The same  $p$ -value has been found regarding the association between the score and level of autonomy for meal preparation, shopping and money management and a higher prevalence of an unfavourable score has been globally found, with lower level of autonomy.

A statistically significant association has also been found between the level of autonomy for laundry management and the score of cognitive assessment ( $p = 0.028$ ). The lowest prevalence of unfavourable score was found in patients with lower autonomy for laundry of large items (sheets, table

towels, for instance [3.8%]).

### Comparative analysis of variables found to have an influence on cognitive assessment with category aggregation

Upon recodification of non-binary variables, chi-square test has been re-applied and odds ratio and confidence intervals were obtained for each association. The results are shown in Table 3.

A statistically significant association has been found between the cognitive assessment and the fact that the patient is living alone, the time that the patient is left alone each day (OR = 1.476; 95% CI: 1.047 – 2.080), mobility (walking on the street) (OR = 4.996; 95% CI: 3.370 – 7.407), bathing autonomy (OR = 2.250; 95% CI: 1.559 – 3.246), dressing (OR = 3.683; 95% CI: 2.327 – 5.831), eating (OR

= 2.471; 95% CI: 1.442 – 4.234), meal preparation (OR = 1.833; 95% CI: 1.301 – 2.581), shopping (OR = 2.500; 95% CI: 1.779 – 3.515), money (OR = 2.993; 95% CI: 2.129 – 4.207) and medication management (OR = 3.450; 95% CI: 2.353 – 5.060).

Based on these data, we found that living alone is statistically related to an unfavourable cognitive assessment and that autonomy for most of the activities that were analysed is associated with a favourable cognitive assessment. Mobility (autonomy to walk on the street), in which autonomous patients have the greatest probability (OR = 4.996) to obtain a favourable score when compared to non-autonomous patients, has shown the highest level of association.

Laundry management autonomy was statistically unrelated to cognitive assessment.

Table 2 – Comparative analysis of variables found to have an influence on cognitive assessment

	Total sample (n = 2,672)				p-value (Chi-square)
	Cognitive assessment				
	Favourable score		Unfavourable score		
	n	%	n	%	
<b>Gender</b>					
Male	1,036	96.2%	41	3.8%	< 0.001
Female	1,319	92.8%	102	7.2%	
<b>Age</b>					
55 - 64	941	96.1%	38	3.9%	< 0.001
65 - 74	868	96.4%	32	3.6%	
75 - 84	546	88.2%	73	11.8%	
<b>Education</b>					
≤ 3 years	547	94.6%	31	5.4%	< 0.001
4 - 6 years	1,272	94.8%	70	5.2%	
7 - 9 years	266	97.8%	6	2.2%	
10 - 11 years	82	98.8%	1	1.2%	
≥ 12 years	166	87.4%	24	12.6%	
<b>Living alone</b>					
No	1,921	95.0	102	5.0	0.001
Yes	394	90.8	40	9.2	
Total	2,315	94.2	142	5.8	
<b>Nº hours left alone each day</b>					
> 8	774	92.8	60	7.2	0.025
< 8	1,580	95.0	83	5.0	
Total	2,354	94.3	143	5.7	
<b>Mobility (walking on the street)</b>					
Unable	1	100	0	0.0	n.a.
With regular assistance from someone	34	75.6	11	24.4	
Assistance with devices	140	82.4	30	17.6	
Walking without assistance	2,175	95.5	102	4.5	
Total	2,350	94.3	143	5.7	
<b>Bathing</b>					
With regular assistance from someone	67	79.8	17	20.2	< 0.001
Assistance with devices	343	92.2	29	7.8	
Washing without assistance	1,945	95.2	97	4.8	
Total	2,355	94.3	143	5.7	
<b>Dressing</b>					
With regular assistance from someone	66	82.5	14	17.5	n.a.
Assistance with devices	68	85.0	12	15.0	
Dressing without assistance	2,221	95.0	117	5.0	
Total	2,355	94.3	143	5.7	

(Table 2 continues on the next page)

A logistic regression has been carried out with all the variables that have shown a significant association with the score of cognitive assessment. The final model is shown in Table 4.

Mobility autonomy, in which autonomous patients have shown 3.196 times the probability of obtaining a favourable cognitive assessment when compared to non-autonomous patients, showed the greatest probability to lead to a favourable score (95% CI: 2.005 – 5.092) followed, in decreasing order, by the autonomy for meal preparation (OR = 2.796; 95% CI: 1.715 – 4.560), money (OR = 2.163; 95% CI: 1.422 – 3.290) and medication management (OR = 1.927; 95% CI: 1.211 – 3.065).

Female patients (OR = 0.333; 95% CI: 0.200 – 0.554), patients aged 75 or above (OR = 0.540; 95% CI: 0.332 – 0.877) and patients with 4-6 years of education (OR = 0.557;

95% CI: 0.343 – 0.905) or  $\geq 12$  years (OR = 0.145; 95% CI: 0.075 – 0.280) have shown a higher risk for obtaining an unfavourable cognitive assessment.

## DISCUSSION

Lifelong intellectual enrichment in patients aged 55 or above keeping apart both components (education and cognitive activity) has shown that the benefit of baseline stimulation of cognitive activity is not significantly influenced by higher education. Overall, higher levels of education were associated with the highest levels of cognition. However, as shown in Table 4, this is a non-linear relationship and extreme levels of education have shown an unfavourable cognitive assessment, suggesting that cognitive stimulation may have different effects according with age at which it is carried out. It has been described by some authors that

Tabela 2 - Análise comparativa de variáveis capazes de influenciar a avaliação cognitiva (continuação)

	Total sample (n = 2,672)				p-value (Chi-square)
	Cognitive assessment				
	Favourable score		Unfavourable score		
	n	%	n	%	
<b>Eating</b>					
Unable	5	100	0	0.0	n.a.
With regular assistance from someone	6	54.5	5	45.5	
Assistance with devices	112	90.3	12	9.7	
Eating alone	2,217	94.7	124	5.3	
Total	2,340	94.3	141	5.7	
<b>Meal preparation</b>					
Unable	361	89.8	41	10.2	< 0.001
Partial assistance	293	94.5	17	5.5	
Inadequate preparation	38	90.5	4	9.5	
Adequate preparation	1,657	95.3	81	4.7	
Total	2,349	94.3	143	5.7	
<b>Shopping</b>					
Unable	125	81.2	29	18.8	< 0.001
Shopping delivered at home	43	84.3	8	15.7	
Small shopping or with assistance	610	93.6	42	6.4	
Shopping alone	1,576	96.1	64	3.9	
Total	2,354	94.3	143	5.7	
<b>Money management</b>					
Unable	38	58.5	27	41.5	< 0.001
Regularly	88	83.3	17	16.2	
Occasionally	495	94.3	30	5.7	
Managed alone	1,733	96.2	69	3.8	
Total	2,354	94.3	143	5.7	
<b>Medication management</b>					
Unable	8	50.0	8	50.0	n.a.
Regularly	48	75.0	16	25.0	
Occasionally	196	91.6	18	8.4	
Medication taken with the right dose and timing	2,091	95.4	101	4.6	
Total	2,343	94.2	143	5.8	
<b>Laundry</b>					
Unable	583	92.0	51	8.0	0.028
Regularly all items	309	94.5	18	5.5	
Regularly only large items	179	96.2	7	3.8	
Managed alone	1,281	95.0	67	5.0	
Total	2,352	94.3	143	5.7	

n/a: Not applicable. Row percentages

cognitive stimulation at lower ages (between 55 and 64 years of age) is associated with lower cognitive decline. In addition, it has also been found that cognitive activity remains unchanged for a longer time in patients with higher education.<sup>17</sup>

The EPEPP Study has shown that the number of daily hours left alone is negatively associated with the cognitive status. Frailty of the elderly patients is increased by the lack of a well-structured support social network and may

be enhanced by the combination of physical decline with impaired mobility and with ageing-related cognitive decline. The involvement of the elderly in intellectual, social and physically stimulating activities is crucial for successful ageing.<sup>18-20</sup>

Univariate analysis has shown that all the variables were significantly associated with better cognitive assessment (except regarding the fact of living alone and laundry autonomy).

Table 3 – Comparative analysis of variables found to have an influence on cognitive assessment with category aggregation

	Total sample (n = 2,672)				p-value (Chi-square)	OR	OR (95% CI)
	Cognitive assessment						
	Favourable (1)		Unfavourable (0)				
n	%	n	%				
<b>Living alone</b>							
No – reference class	1,921	95.0	102	5.0	<b>0.001</b>	1	
Yes	394	90.8	40	9.2		0.523	(0.357 - 0.766)
Total	2,315	94.2	142	5.8			
<b>No. hours left alone each day</b>							
≥ 8 hours – reference class	774	92.8	60	7.2	<b>0.025</b>	1	
< 8	1,580	95.0	83	5.0		1.476	(1.047 - 2.080)
Total	2,354	94.3	143	5.7			
<b>Mobility (walking on the street)</b>							
No – reference class	175	81.0	41	19.0	<b>&lt; 0.001</b>	1	
Yes	2,175	95.5	102	4.5		4.996	(3.370 - 7.407)
Total	2,350	94.3	143	5.7			
<b>Bathing</b>							
No – reference class	410	89.9	46	10.1	<b>&lt; 0.001</b>	1	
Yes	1,945	95.2	97	4.8		2.250	(1.559 - 3.246)
Total	2,355	94.3	143	5.7			
<b>Dressing</b>							
No – reference class	134	83.8	26	16.2	<b>&lt; 0.001</b>	1	
Yes	2,221	95.0	117	5.0		3.683	(2.327 - 5.831)
Total	2,355	94.3	143	5.7			
<b>Eating</b>							
No – reference class	123	87.9	17	12.1	<b>0.001</b>	1	
Yes	2,217	94.7	124	5.3		2.471	(1.442 - 4.234)
Total	2,340	94.3	141	5.7			
<b>Meal preparation</b>							
No – reference class	692	91.8	62	8.2	<b>&lt; 0.001</b>	1	
Yes	1,657	95.3	81	4.7		1.833	(1.301 - 2.581)
Total	2,349	94.3	143	5.7			
<b>Shopping</b>							
No – reference class	778	90.8	79	9.2	<b>&lt; 0.001</b>	1	
Yes	1576	96.1	64	3.9		2.500	(1.779 - 3.515)
Total	2354	94.3	143	5.7			
<b>Money management</b>							
No – reference class	621	89.4	74	10.6	<b>&lt; 0.001</b>	1	
Yes	1,733	96.2	69	3.8		2.993	(2.129 - 4.207)
Total	2,354	94.3	143	5.7			
<b>Medication management</b>							
No – reference class	252	85.7	42	14.3	<b>&lt; 0.001</b>	1	
Yes	2,091	95.4	101	4.6		3.450	(2.353 - 5.060)
Total	2,343	94.2	143	5.7			
<b>Laundry</b>							
No – reference class	1,071	93.4	76	6.6	0.076	1	
Yes	1,281	95.0	67	5.0		1.357	(0.967 - 1.903)
Total	2,352	94.3	143	5.7			

OR: odds ratio. Row percentages. OR was obtained for the favourable condition.

Literature has shown that the lack of social interaction is associated with an increased incidence of dementia, comparable to other already established risk factors, including lower education, physical inactivity and depression.<sup>21</sup>

The number of hours that patients are left alone each day is often associated with loneliness, considered as an unpleasant experience mostly related to suboptimal social network. According with some authors, suboptimal social network doubled the risk for the development of dementia, particularly Alzheimer's disease and patients have shown a faster cognitive decline when compared to patients with an active social network.<sup>18</sup> Loneliness, considered in this study as the time that patients are left alone each day is used for the subjective assessment of the quality of patient's social support. Loneliness is reduced by a good performance in i-ADL and emotional support, preserving cognitive functioning. A stronger protective effect of emotional support has been found in patients aged 65 or above.<sup>18</sup> Social inactivity and loneliness, in combination or alone, are indicators of the risk of mortality in the elderly.<sup>22,23</sup>

The EPEPP Study has shown that physical autonomy for activities of daily living, such as walking on the street, bathing, dressing, eating, preparing meals, shopping, money, medication and laundry management is associated

to better cognitive assessment. As seen before, this is negatively influenced by the number of hours that a patient is left alone each day. These correlations are reinforced by the analysis with variable category aggregation, particularly as regards the autonomy to walk on the street (mobility).

The results allowed for the estimation with multicollinearity removal of the association between the dependent 'cognition' variable and the variables that were included in the study and were considered as predictive, namely walking autonomy, money management, medication management and meal preparation. The limitations of the methodology used in the study (cross-sectional study) only allowed for the description that higher involvement in ADLs is associated to lower cognitive decline, in line with other authors.<sup>24-27</sup>

Patient's autonomy to carry activities of daily living may become a powerful instrument for the prevention not only of cognitive impairment but also of neurodegenerative disorders such as Alzheimer's disease, the most common form of dementia affecting elderly patients, for which ageing is a risk factor. Physical and cognitive autonomy, associated with lifestyle and daily activities also have a protective effect regarding cerebrovascular pathology.<sup>28-34</sup> Cognition considered in a broad sense has an impact on physical and social interaction between patients and surrounding

Table 4 – Multiple logistic regression analysis regarding the favourable cognitive assessment

	OR	95% CI	p-value
<b>Gender</b>			
Male – reference class	1		
Female	0.333	<b>0.200 - 0.554</b>	< 0.001
<b>Age</b>			
55 - 64 – reference class	1		
65 - 74	1.298	0.779 - 2.164	0.317
75 - 84	0.540	<b>0.332 - 0.877</b>	0.013
<b>Education</b>			
≤ 3 years – classe de referência	1		
4 - 6 years	0.557	<b>0.343 - 0.905</b>	0.018
7 - 9 years	1.290	0.510 - 3.266	0.590
10 - 11 years	1.370	0.178 - 10.523	0.762
≥ 12 years	0.145	<b>0.075 - 0.280</b>	< 0.001
<b>Living alone</b>			
No – reference class	1	-	-
Yes	0.662	0.412 - 1.064	0.089
<b>Mobility (walking on the street)</b>			
No – reference class	1	-	-
Yes	3.196	<b>2.005 - 5.092</b>	< 0.001
<b>Meal preparation</b>			
No – reference class	1	-	-
Yes	2.796	<b>1.715 - 4.560</b>	< 0.001
<b>Money management</b>			
No – reference class	1	-	-
Yes	2.163	<b>1.422 - 3.290</b>	< 0.001
<b>Medication management</b>			
No – reference class	1	-	-
Yes	1.927	<b>1.211 - 3.065</b>	<b>0.006</b>
<b>p-value of the model</b>	< 0.001		
<b>Hosmer-Lemeshow test</b>	0.723		
<b>Model validity ratio</b>	94.5		

environment, i.e. cognition and autonomy are linked with each other and cannot be separated from patient's social condition and surrounding environment.<sup>35</sup>

## CONCLUSION

An association between the number of hours that patients are left alone each day and adverse health outcomes has been found in this study and should call for the deployment of health policies involving the reduction of social isolation, improving intergenerational relationships and social networks of the most vulnerable groups of elderly patients.

The preservation of physical autonomy and the cognitive status are crucial for the maintenance of the autonomy in activities of daily living requiring the ability to plan and carry out tasks and are subsequently a key component in successful ageing. The early detection of functional disabilities will allow for the development of compensatory exercises according with patient's physical ability reducing the loss of physical autonomy and indirectly the cognitive decline of the elderly.

The fact that a group of healthy volunteers with the physical ability to attend the interview was involved in the study and, in addition, the fact that simplified versions of the questionnaire for the functional assessment of elderly patients were applied to respondents and test-retest validated on a small sample were the two main limitations of this study. However, the dimension of our group of respondents, representative of the Portuguese population, has shown the importance of a systematic data collection

from elderly patients and their families and friends, associated with activities of daily living and regarding the relationship with the cognitive function.

In conclusion, maintaining an active social network is crucial for an active and healthy ageing. The early detection of a decline in physical and instrumental autonomy, assessed by the ability to carry out activities of daily living is usually associated with cognitive impairment and may serve as an indicator for the need of the implementation of measures aimed at the promotion of a good autonomy within the ageing process.

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## HUMAN AND ANIMAL PROTECTION

This study has been approved by the Ethics Committee of the Faculty of Medicine at the University of Coimbra. The authors declare that they have followed the protocols of their work centre on the publication of patient data.

## CONFLICTS OF INTEREST

The authors declare that there were no conflicts of interest in writing this manuscript.

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