

Profiles of ageing in the South of Portugal: education and cognitive functioning in elderly persons living in institutionalized and community contexts

Jacinto Gaudêncio¹ and Maria Eugénia Duarte Silva²

¹ HSEC¹, University of the Algarve, Portugal

² FP², University of Lisbon, Portugal

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Abstract

The region of the Algarve shows huge differences between the coastline where population in the urban areas grows, and the inland rural areas, in some cases very isolated, which frequently have high ageing indexes. This general scenario, with an elderly population with very different economic and social conditions, frames the ongoing PhD research designed as a cross-sectional study of an intentional sample of elderly persons. The basic theoretical framework departs from the perspective of developmental psychology of life-span and the model of selection, optimisation and compensation for optimal ageing (Baltes & Baltes, 1990; Freund & Baltes, 2002).

The present study is a first step in the analysis of empirical data collected in the PhD sample (N=156; age range 65 to 97 years; $M = 80.4$ years; $SD = 7.2$ years). Its purpose is to assess the cognitive functioning of participants, screening for cognitive impairment and examine the relations between the cognitive status of the subjects and a number of selected variables including educational level, age, physical activity and living contexts of the subjects.

We accessed the cognitive status of the participants with the Portuguese version of Mini Mental State Examination (MMSE) finding a 10.3% prevalence of positive cases with cognitive impairment. The results also show significant relationships between the cognitive status accessed by the MMSE and educational level, professional qualification, age, living arrangement and activity level of the participants. The relationship verified between educational level and cognitive status of the participants was the largest correlation found in the study with the variability in educational level accounting for 44.8% of the variability in MMSE score. This results points in the same direction of several lines of research that corroborate the strong intercorrelation between education and cognitive functioning in old age.

¹ Higher School of Education and Communication

² Faculty of Psychology

Cognitive functioning as a criterion of successful ageing

The ageing of the human population is a truly global phenomenon at present times and it represents a challenge to the 21st century nations and societies. This phenomenon led to an exponential growth of research on ageing. Given its scientific and social importance, the criteria and conditions for determining positive patterns or profiles of ageing is an issue highlighted in gerontological research.

The conceptualization of successful ageing is not new (e.g. Havighurst, 1963), but only in the last decades of the twentieth century has become a guiding theme in gerontological research. For P. B. Baltes and M. M. Baltes (1990) successful ageing can be defined, on a very abstract level, as the simultaneous maximization of gains and minimization of losses related with the ageing process. They listed a more extensive set of criteria including longevity, biological and mental health, optimal cognitive functioning, personal control and life satisfaction. An essential characteristic of successful ageing is multidimensionality, and only multiple assessments in several life domains can contribute to differentiate normal and successful ageing profiles (Freund & Riediger, 2003). There is also evidence of the strong connection between functional ability, intellectual functioning, and social involvement in the more positive and desirable profiles of old age (e.g. the Berlin Ageing Study: Mayer et al., 2001). The importance of good cognitive functioning in the process of ageing successfully was early highlighted from different perspectives and theories (e.g. Rowe & Kahn, 1987; Baltes & Baltes, 1990).

Life-span theory of intellectual development acknowledges that, as individuals age, a series of biological changes underlie the progressive degradation of the nervous system and the development of cognitive inefficiencies. However, life-span researchers sustain that the increment of age related losses does not imply that there is no opportunity for growth at all in the second half of life in some domains (Baltes, Staudinger, & Lindenberger 1999). This perspective emphasizes that cognitive plasticity is preserved among healthy older adults and can be activated through coping strategies and socio-cultural mechanisms. At present, there is a strong consensus that cognitive enrichment activities, maintaining a lifestyle that is intellectually stimulating, having meaningful

social engagement and physical activity predict better maintenance of cognitive skills and it is associated with a reduced risk of developing Alzheimer's disease in late life (Fernández-Ballesteros, 2008; Hertzog, Kramer, Wilson, & Lindenberger, 2009).

Education and cognitive functioning in older adults

Longitudinal research examining cognitive development has revealed that cognitive abilities vary in their developmental trajectories across adulthood (e.g., the Seattle Longitudinal Study: Schaie and Willis, 2005; the Berlin Aging Study: Smith and Baltes, 1999). A substantial number of longitudinal studies that have examined the effects of education on the cognitive vitality of older adults showed that low levels of education was the strongest predictor of cognitive decline in measures of verbal and nonverbal memory, conceptualization and nonverbal abilities, but not speed of processing (Kramer, et al., 2004). In spite of the existing debate regarding the extent and the mechanisms by which early educational benefits continue to manifest in later years, numerous cross-cultural studies have found greater levels of formal education to be associated with decreased risk of cognitive impairment in later life (Willis & Margrett, 2001). A neuropsychological research comparing Portuguese illiterate and literate Alzheimer's patients performance on cognitive tests, with the performance of healthy people illiterate and literate concluded that there is a greater variability among illiterate people, and that their cognitive functions are more severely altered with dementia (Guerreiro, Castro-Caldas, Reis, & Garcia, 1996). With a 55.1% rate of illiteracy among the elderly (INE, 2002), the Portuguese policy makers cannot ignore the negative implications that this high value of illiteracy has on mental health and quality of life of older citizens.

From the perspective of life-span development, early education provides the access to more educational and career opportunities during the lifetime, thus facilitating better access to social and health care resources, which, in turn, contribute to the maintenance of cognitive functioning in later life (Willis & Margrett, 2001). Moreover, as Kruse and Schmitt (2001) pointed out, education and learning is associated with the development of a sense of control in one's own life, not only in young people but also in adulthood.

In that sense, even in old age, “adult education can contribute to healthy ageing by motivating health producing behaviours and lifestyles” (Kruse & Schmitt, 2001, p.143).

Method

Participants

The cooperation of the staff of local community centres, day care centres and residential care homes in three cities near the coastline of Algarve and in six small villages located in rural areas was asked in order to reach the participants for this study. Two psychologists conducted individual interviews to collect socio-demographic data and apply the instruments with the informed consent of participants and in private places.

Table 1. Socio-Demographic Characteristics of Participants

Characteristic	(N=156)	
	Frequency	Percent
Sex		
Women	101	64.7
Men	55	35.3
Age Group		
65-74	36	23.1
75-84	68	43.6
≥85	52	33.3
Marital Status		
Single	16	10.3
Married	35	22.4
Divorced	5	3.2
Widowed	100	64.1
Professional Qualification		
Low qualification	96	61.5
Medium qualification	50	32.1
High qualification	10	6.4
Educational Level		
Illiterate	44	28.20
1 to 11 years	103	66.02
>11	9	5.76

As we can see in Table 1, 156 elderly persons (range 65 to 97) were studied, with a mean age of 80.4 years and a standard deviation of 7.2 years. Age group 75-84 years is the most represented in the sample and the very old with 85 or more years amounts to one third of the sample. The majority of the subjects are women and widowed. Regarding professional qualifications, the majority has low qualifications and only a

small part of the subjects have high professional status. Concerning the educational level, there is a high rate of illiteracy and the majority of the subjects have 1 to 11 years of formal education. In this educational category, the largest group has an elementary school degree (41%), corresponding to 3 to 4 years of instruction at the time of the dictatorship, and 20.4% of the subjects have studied some years in a secondary school or have a high school diploma. Only a small number of participants have more than 11 years of formal education.

Table 2. Ecological and Psychosocial Characteristics of Participants

Characteristic	(N=156)	
	Frequency	Percent
Home Setting		
Urban area	78	50
Rural area	78	50
Living Arrangement		
Independently in their home	50	32.1
In their home with everyday care	52	33.3
Residential care home	54	34.6
Living with others or alone		
With others	109	69.9
Alone	47	30.1
Number of hours per day alone		
≥8 per day	49	31.4
<8 per day	107	68.6
Have a confidant		
Yes	139	89.1
No	17	10.9
Hours of physical activity per week		
0 hours	28	17.9
< 2 hours	29	18.6
2 to 4 hours	22	14.1
>4 hours	77	49.4

What the home setting and living arrangements of the participants concerns, as we can observe in Table 2, the sample is equally distributed between urban and rural areas. The majority of the participants live in the community (65.4%), with everyday care or they live on their own in their home, and the remaining participants live in institutions such as residential care homes. As expected, subjects who live in the community on their own are younger ($M = 76.82$, $SD = 5.58$) than the older ones living in their home with everyday care ($M = 82.38$, $SD = 7.38$) or in residential care homes. In relation to their social relationships, the majority lives with other people, they stay less than 8 hours alone and they have a person they can trust and who serves as a confidant. Almost half

of the participants have reported that they do more than 4 hours of physical activity per week.

Instruments

We used some sections of The Biopsychosocial Assessment Method (Botelho, 2005), which is a standard questionnaire in Portugal for the assessment of functionality in older individuals, for the data-collection in socio-demographic and psychosocial characteristics of the participants summarized in Tables 1 and 2.

We applied the Portuguese version of the Mini-Mental State Examination (MMSE) (Guerreiro et al., 1994) in order to assess the cognitive functioning of the participants and to screen for cognitive impairment and dementia. Since its development (Folstein et al., 1975), MMSE has become a widely used cognitive screening instrument for cognitive impairment and dementia in both clinical and research settings, due to factors including its brevity and straightforward administration. Its quotation can vary from zero (0) points up to thirty (30) points. The MMSE has 11 questions and includes the following cognitive domains: orientation (10 points), registration (3 points), attention and calculation (5 points) memory (3 points), language (8 points) and constructive praxis (1 point). An MMSE score ≤ 23 is generally accepted as indicating cognitive impairment and is associated with the diagnosis of dementia (Small et al.1997).

Several studies pointed out that education and cultural and socioeconomic background can cause a considerable bias in the MMSE's scores (Ponton, & Ardila, 1999). Guerreiro, Botelho, Leitão, Castro-Caldas, and Garcia (1994) in the Portuguese version set different cutoff scores according to the educational level of subjects for differentiation of individuals with intact cognitive function from patients with dementia. Thus, the authors consider that cognitive impairment exists in the Portuguese population when the MMSE score is ≤ 15 for the illiterate, ≤ 22 points for subjects with 11 or fewer years of education and ≤ 27 points for people over 11 years of education. In our study, we also recorded education levels and illiteracy using the same cutoff scores to select the participants with and without cognitive impairment.

As the present study can be considered a first approach in the analysis of empirical data collected in the sample of older adults, we conducted descriptive statistics with SPSS.18 statistical software to examine the frequency distribution, calculate percentages rates

and correlations. To conduct bivariate correlations between the variables and MMSE scores, we used the non-parametric statistic Spearman's correlation coefficient rho (ρ) and the coefficient of determination "R Squared" as a measure of the amount of variability in one variable that is shared by the other (Field, 2009).

Results and Discussion

Table 3. MMSE mean scores, standard deviations in sample subgroups and correlations found between variables and MMSE scores

	N	M	SD	ρ
Total sample	156	24.47	4.62	
Without Cognitive Impairment	140	25.16	4.26	
With Cognitive Impairment	16	18.44	2.96	
Variables				
Educational level				.67*
Illiterate	44	19.32	3.60	
1 to 11 years	103	26.28	3.20	
>11	9	28.89	1.69	
Age group				-.36*
65-74	36	26.86	3.39	
75-84	68	24.34	4.62	
≥ 85	52	22.98	4.76	
Professional qualification				.38*
Low qualification	96	23.24	4.75	
Medium qualification	50	25.90	3.72	
High qualification	10	29.10	1.59	
Living arrangement				.30*
Independently in their home	50	26.52	4.00	
In their home with everyday care	52	23.65	4.61	
Residential care home	54	23.35	4.62	
Hours of physical activity per week				.26*
0 hours	28	22.43	4.81	
<2 hours	29	24.48	4.25	
2 to 4 hours	22	23.14	5.28	
>4 hours	77	25.58	4.20	

*Spearman Correlation is significant at the 0.01 level (1-tailed)

In Table 3, we summarize the main results of our study. In the first section, we present the total MMSE mean score and standard deviation of the total sample followed by MMSE mean score and standard deviation of the subjects without and with cognitive impairment. In the second section we present the MMSE mean score and standard deviations in sample subgroups and Spearman's correlations found between the variables of our study and MMSE scores.

As we can observe in the first section of Table 3, results showed a 10.3% (n=16) prevalence of positive cases with cognitive impairment. As expected, given the small number of positive cases, no significant relationships were found between cognitive impairment and the categorical variables showed in Table 3. Only age, measured as ratio variable is significantly related with the prevalence of cognitive impairment ($\rho = .17, p < 0.05$). In general, in our sample cognitive impairment is higher in very old people ($M = 84.38, SD = 6.06$), living in urban areas in their home with everyday care or in residential care homes.

Although our research is based on an intentional sample, results have a few points of contact with other studies in the field. A study with a nationally stratified sample of 2672 individual's ≥ 55 years with the Portuguese version of MMSE observed a 4.6% prevalence of cognitive impairment in Algarve and a national average of 6%, worse in 75 year-old or above, in women and in old people living in the Northern Region of Portugal (Oliveira et al.2010). The Portuguese version of MMSE was also used to assess cognitive impairment in a sample of 1266 old community-dwellers in Portugal, mean age 70.3 years, standard deviation 8.7 years. Findings showed a 9.6% prevalence of positive cases with cognitive impairment higher in women, older people, widows (ers), and in people with difficulties in basic and in instrumental activities of daily living (Paúl et al. 2010).

In all the study variables, it was in the educational level categories that the largest relationship with MMSE performance was found. As we can see in Table 3, the MMSE mean score of illiterate participants is much lower than the mean score of participants with 1 to 11 years or more of education. The magnitude of the difference observed in this variable between MMSE mean scores of illiterate and literate participants is greater than all others verified in the study. Even the differences in MMSE mean scores between participants with and without impairment have such magnitude. As expected, educational level of the participants was significantly related to its MMSE performance ($\rho = .67, p < 0.01$). We estimate the coefficient of determination "R Squared" (Field, 2009) as a measure of the amount of variability in one variable that is shared by the other: $R^2 = (.67)^2 = 0.448$. Hence, we can conclude that variability in educational level accounts for 44.8% of the variability in MMSE score. This main finding of the study seems corroborate the strong intercorrelation between education and cognitive

functioning in old age that has been sustained in different fields of research, ranging from sociological studies in adult education to gerontological sciences.

The other correlations found in our study are not as significant as those seen in relation to the educational level. After educational level, it is the variable professional qualification (Table 3) that presents a more meaningful relationship with the participants' performance in the MMSE ($\rho = .38, p < 0.01$), with the variability in professional qualification accounting for 14.9% of the variability in MMSE score. In fact, it is in this small subgroup of the sample where a higher mean in MMSE was found, followed closely, as expected, by the mean obtained in the small subgroup with more than 11 years of education. The third subgroup with the highest scores in MMSE was the younger elderly subjects with 65-74 years (Table 3). This result is in contrast to the result obtained by the subgroup of older people, with 85 years or more, the one which got the third worst MMSE mean score after the participants with cognitive impairment and the illiterate subgroup. In our study, a negative correlation was observed between subjects' age and MMSE score ($\rho = -.36, p < 0.01$) with the variability in age accounting for 13% of the variability in MMSE performance. The relation between advanced age and low performance in MMSE is well established in literature (e.g. Berroa et al., 2009) and age related decline in cognitive functioning, especially in the fourth age, is an evidence widely reported in the literature (e.g. Baltes et al., 1999).

Although smaller than in the other variables, we also verified in our findings significant relationships between the variables living arrangement and hours of physical activity per week and MMSE performance of the participants (Table 3). The elderly persons living independently in their homes had higher MMSE scores than those living in the community with everyday care or those living in residential care homes. The participants with more than 4 hours of physical activity per week also had higher MMSE scores than those with less activity level per week. The importance of environmental domains in the development of positive profiles of ageing, including housing and neighborhood resources, social support, and formal service support have been emphasized by environmental gerontologists. This approach was used in the ENABLE-AGE project, a European study conducted between 2001 and 2004 to explore the influence of objective and subjective aspects of the home environment on healthy ageing. The need to promote independent living and enable older people to stay in their

home for longer is one of the key recommendations of the ENABLE-AGE project (Cross-National Report M12, 2011). The importance of regular physical activity and exercise for elderly persons has also been emphasized in numerous observational studies and intervention programs among older people, pointing to great benefits in cognitive, emotional and social functioning (Phillips, Kiernan & King, 2001;WHO, 2003).

Conclusion and Implications

The different conditions of elderly population of the Algarve are reflected in the analysis of empirical data collected in an intentional sample of older people. As we observed, the sample had subgroups with different characteristics in terms of age, education, socio- economic status, living arrangement, geographical area of residence, and levels of formal and informal support.

In our study, we assessed the cognitive status of the participants with the Mini Mental State Examination (MMSE) finding a 10.3% prevalence of positive cases with cognitive impairment. Given the expressive number of very old, illiterate and poorly educated participants in the sample, this prevalence rate does not seem inappropriate in relation with prevalence rates found in other studies with Portuguese elders. Concerning the cognitive status of the participants without cognitive impairment, and in spite of the differences observed between the subgroups, in general, the results show a MMSE mean score suggesting an adequate profile of cognitive functioning in the majority of the participants. The results also show significant relationships between the cognitive status accessed by the MMSE and educational level, professional qualification, age, living arrangement and activity level of the participants. The relationship verified between educational level and cognitive status of the participants was the largest correlation found in the study, pointing in the same direction of several lines of research that corroborate the strong intercorrelation between education and cognitive functioning in old age. Various studies have also demonstrated the considerable bias in MMSE'scores caused by education and cultural and socioeconomic background. In our perspective, in spite of this limitation, shared indeed by most assessment tools of cognitive functioning, MMSE has shown to have positive aspects. Among others, it has been able to detect some optimal profiles of cognitive functioning in very old and

poorly educated participants of the study, which is an important issue in the ongoing investigation.

As a first analysis of a sample of older people living in Algarve, the present research has several limitations such as the possible bias of some results due to limitations of the instruments, lack of representativeness of the sample or the absence of inferential statistics. Otherwise, from our point of view, various implications of this study are related with the necessity of integrated policies and approaches at regional and community level able to meet the needs of a very differentiated population as the elderly. In a time of scarce resources and social and economic crisis it is necessary to optimize all available means with the aim of facilitating normal or successful ageing profiles. Continuing education programmes interconnected with the specific needs of elderly persons and with the support of local authorities is an adequate strategy to prevent cognitive decline and enhance the continuous exercise of social practices in the elderly.

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