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Functioning in older adults

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ABSTRACT

Abstract

Background

It is important to characterize the functioning of elderly adults in different care contexts and evaluate their suitability to the condition of the elderly population. Therefore, the present study aimed to compare the functional profiles of institutionalized and noninstitutionalized older adults; to evaluate the effect of biological and sociodemographic factors on the determination of functional profiles and to evaluate the probability of an older adults obtaining a certain overall functional profile based on his/her age.

Methods

This is a cross-sectional study that included 476 participants over 65 years old who were divided into two groups: noninstitutionalized elderly living in their homes and attending day care

centers (100) and institutionalized elderly living in nursing homes (376). The data were collected using the semi-structured interview method and it was applied the Elderly Nursing Core Set.

Results

The Elderly Nursing Core Set model tested consisted of 22 items in five domains: “Self-Care - Activities of daily living (a)”; “Self-Care - Activities of daily living (b)”; “Mental Functions”; “Communication” and “Support and Relationships”. Women, older participants, illiterate elderly and institutionalized participants had worse functional profile results.

Conclusions

Age, female sex, lack of education, and institutionalization are negatively related to the functional profile. Given the association between education level and functioning, it is necessary to promote the training of elderly individuals throughout life. The implementation of social and health responses should allow elderly individuals to remain in their homes, given the influence of functioning on self-care and quality of life.

Keywords: Elderly; Functioning; Disability; Long-Term Care; Nursing Homes

Background

Various international organizations have demonstrated the magnitude of population aging and noted that it is particularly notable in more developed countries. In Portugal this phenomenon will continue to worsen over the next 30 to 40 years¹ and will be characterized mainly by the decrease in mortality in the young population; increased average life expectancy; and the replacement of communicable diseases with chronic diseases. Portugal is the European Union country with the third highest rate of population aging among residents².

Although the aging process is inevitable, epidemiological studies clearly show that diseases and functional disabilities, which are often associated with aging, are not inevitable (3). However, it has been found that the increase in average life expectancy does not necessarily equate to an increase in years lived in good health. From the perspective of life cycle epidemiology (4–6), aging is largely determined by the lifestyles one adopts throughout life. In addition to individual factors, indirect factors – such as organizational, community and political factors that support individual behavior – also contribute to these lifestyles (7), and the social environment has a predominant role (3). Thus, lifestyle is associated with the physiological changes that are characteristic of aging and often create conditions conducive to the development of multimorbidity. Multimorbidity, in turn, is often associated with the development of functional limitations, which may result in dependence for self-care and the need for some degree of supplementation or substitution through health and social care services.

Dependence always results from the interaction between a given health condition and a given context. That is, multimorbidity itself does not necessarily mean that a person will become dependent for his/her self-care, and it always depends on the context in which the individual exists in terms of both environmental and social resources, as well as his/her relational level.

According to the United Nations, approximately 46% of the world population aged 60 years or older has disabilities, and 250 million people in that age group experience moderate to severe functional problems (8). In turn, the empirical evidence (9–11) seems to demonstrate that the years lived with dependence have increased. Regarding Portugal, a study developed in the context of primary health care (12) found that 72.7% of the Portuguese adult population has multimorbidity (two or more chronic diseases), and that percentage increases as age advances. In another study (13) based on the National Health Survey with Physical Examination, the prevalence of multimorbidity in the Portuguese population was 38.3%. In turn, regarding dependence for self-care, a set of studies developed in several municipalities of the country suggests that there are approximately 110,000 people who are dependent for self-care, approximately 48,000 of whom are highly dependent (14).

Multimorbidity and dependence are thus a complex combination of genetic, physiological, environmental and behavioral factors (15) that have important implications for the provision of care. In turn, health care aimed at people with multimorbidity produces better results when it is structured according to a previous evaluation of functioning (16).

Functional capacity is considered an important indicator of the health of the elderly, since its decline brings a risk of loss of autonomy and independence, especially at the level of self-care, which directly affects the quality of life of affected individuals (17). However, dependence for self-care arises when an individual's functional capacity decreases to the point that they need support to perform activities of daily living and/or instrumental activities of daily living due to either physical or psychosocial dependence. People who are dependent for self-care should remain in their homes (18), which gives meaning to aging in the home and community context (19).

Thus, the phenomenon of demographic aging requires the adoption of a strategy with two complementary vectors: One focused on promoting active and healthy aging, and the other focused on increasing long-term care (20). The latter will have the objective of preserving functioning or slowing its loss and consequently promoting well-being and quality of life. For this purpose, a systematic evaluation of functioning is indispensable to ensure that care and contextual conditions are adapted to the health situation of the individual.

The World Health Organization (WHO) developed several tools in its creation of an international standardized system of health data. Of particular note is the International Classification of Functioning, Disability and Health (ICF) (21), which is used to evaluate the results of health interventions. In addition, as an internationally applicable instrument, it allows national and international comparisons (22). The ICF includes biological, psychological, social and environmental factors because it classifies the functioning, disability and health of the person and interrelates those factors with the individual's health status; body functions and structures; activity, which includes the execution of individual tasks or actions; participation, that is, involvement in real-life situations; and context, i.e., environmental and personal factors that can act as barriers or facilitators (23–25). Based on the ICF, a 31-item instrument called the Elderly Nursing Core Set (ENCS) was developed to evaluate the functional profile of institutionalized individuals aged 65 years or older in the Alentejo region (25,26). Subsequently, the ENCS31 was used to evaluate the functional profile of elderly people living in their homes in the same region of Portugal, thus resulting in the ENCS25 (27). The innovation of this study is the fact that the authors applied the ENCS25 simultaneously to institutionalized participants (INST) and noninstitutionalized participants (NINST) elderly individuals who received supported self-care through day centers throughout mainland Portugal (North, Center and South). The aims of this study are: to compare the functional profiles of institutionalized and noninstitutionalized older adults; to evaluate the effect of biological and sociodemographic factors on the determination of functional profiles and to evaluate the probability of an older adults obtaining a certain overall functional profile based on his/her age.

Methods

The study involved a sample of 476 older adults divided into two groups: the first, composed of noninstitutionalized older adults (NINST), living in their homes and attending day centers (100); and the second, composed of institutionalized older adults (INST) living in nursing homes (376). The inclusion criteria, cumulative, are as follows: 65 years of age or older; and able to sign the informed consent form or have a legal representative available to do so.

Data were collected between July 2019 and February 2020 at 18 social support institutions for older adults, which comprised residential homes, day care centers and/or home support services, along Portugal mainland. Data were collected using semi-structured interviews. All researchers/collaborators involved in the study received prior training on how to conduct the interviews, in addition to providing all necessary clarifications regarding the contents of the

instrument used. Before each interview, each researcher/collaborator provided an informed consent form to the respondent or his/her family. Information on the study objectives was provided in full to the respondents and/or their families, and they were informed of the confidentiality and anonymity of the data. Data on the total number of valid interviews (n=476) were subsequently uploaded in the Multidimensional Integrated Assessment Platform for Elderly (MIAPE)¹⁹.

The instrument used to assess functioning, the Elderly Nursing Core Set 31 (ENCS31) developed in previous research works²⁰, comprises a first section that collects sociodemographic data (age, sex, marital status, education, medical diagnosis and date of admission to the institution (if institutionalized)), followed by 31 questions based on the ICF and categorized on a five-points Likert scale. The higher the score, the worse the respondent's functional profile is²⁰.

The core-set factorial validity to the ENCS31 questionnaire was confirmed through confirmatory factor analysis (CFA) using SPSS AMOS software version 24.0.0 (IBM, Armonk, NY): internal consistency and construct validity (factorial validity, convergent validity and discriminant validity). The method used to estimate the model parameters is maximum likelihood, the assumption of data normality was verified through the analysis of asymmetry (*sk*) and kurtosis (*ku*) values.

Ethical considerations

Authorization of the Ethics Committee for Scientific Research in the Areas of Human Health and Welfare of the University of Évora (report number 19013) was obtained for the present study. All the principles defined in the Declaration of Helsinki of 1964 and its subsequent amendments were fulfilled.

Results

As suggested by Marôco (2014)²¹, the overall goodness-of-fit of the model was based on the analysis of the indexes listed in Table 1, left column.

Table 1: Results of the goodness-of-fitness indices for the initial and adjusted first-order and second-order CFA models.

Indices	Adjusted model	Second-order
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	Initial model		
χ^2/df (χ^2 statistics with correction for degrees of freedom)	8.034	4.582	4.897
CFI (Comparative Fit Index)	.861	.942	.936
GFI (Goodness-of-Fit Index)	.760	.844	.810
TLI (Tucker-Lewis Index)	.842	.932	.833
PCFI (Parsimony Comparative Fit Index)	.760	.796	.658
PGFI (Parsimony Goodness-of-Fit Index)	.589	.651	.926
SRMR (Standardized Root Mean Square Residual)	.1078	.0948	.100
RMSEA (Root Mean Square Error of Approximation)	.122	.087	.091
RMSEA - IC _{95%} (Low)	.117	.081	-
RMSEA - IC _{95%} (High)	.127	.093	-
PCLOSE (p-value for the null hypothesis of RMSEA \leq 0.05)	<.001	<.001	<.001
MECVI (Modified Expected Cross-Validation Index)	4.750	2.138	2.296

The significance level for all correlations was $p < 0.001$.

A statistical analysis was performed to describe the biological and sociodemographic variables and scores for the overall functional profile of the sample elements using absolute and relative frequencies. An ordinal regression model was developed to assess whether the variable “respondent age” had a statistically significant effect on the overall functional profile. Regarding the different statistical hypotheses considered in the study based on the average score of the functional profiles, the nonparametric Mann-Whitney U and Kruskal-Wallis methods were used, both applied to independent samples.

Assuming the functional domains developed by Goes et al. (2020)²² (Table 2, left column), the results of the initial CFA (first-order model), without correlating the error of any item, showed a poor model goodness-of-fit (Table 1). The fitting was determined in two stages: started with the removal of the items presenting factor weights lower than 0.4; and followed with correlating the measurement errors of the items, as suggested by the modification indices values higher than 11²¹, thus allowing a model with a better fit to be obtained (Table 1). The data normality assumption was evaluated positively: $-0.556 < sk < 1.857$ and $-1.567 < ku < 2.364$.

Domains	Items
Self-Care - Activities of daily living (SC-ADL (a))	Carrying out daily routines
	Changing basic body position
	Maintaining a body position
	Moving around using equipment
	Washing oneself
	Caring for body parts
	Toileting
Self-Care - Activities of daily living (SC-ADL (b))	Dressing
	Eating
Mental functions (MF)	Drinking
	Consciousness
	Orientation
	Attention
	Memory
	Emotional functions
Communication (COM)	Higher-level cognitive functions
	Communicating with and receiving spoken messages
	Speaking
Support and relationships (SR)	Conversation
	Family relationships
	Immediate family
	Friends

187

188 The individual reliability of the items was evaluated positively (factor weights ranged
189 from 0.4 to 0.99). The construct reliability (latent factor or functional domain) was evaluated
190 positively through Cronbach's alpha ($\alpha > 0.6$), and an alternative measure called composite
191 reliability (CR), with "SR" exhibiting a marginal measure (Table 3) (CR > 0.7 as suggested in
192 Marôco (2014)²¹). Regarding the construct validity, the factorial validity was evaluated
193 positively as the items shown to reflect each latent factor to be measured. The first-order CFA
194 model showed favorable convergent validity (AVE > 0.5), although somewhat marginal for the
195 case of "SR" (Table 3). Regarding discriminant validity, some limitations were observed with
196 respect to "Mental Functions" (MF) and "Communication" (COM) (Table 3).

197 **Table 3:** CFA first-order model validation results.

Domains	CR	AVE	α	SC-ADL (a)	SC-ADL (b)	MF	COM	SR
SC-ADL (a)	.964	.768	.965	.877*				
SC-ADL (b)	.981	.963	.980	.745	.981*			
MF	.910	.637	.891	.704	.801	.798*		
COM	.961	.891	.959	.687	.826	.950	.944*	
SR	.693	.448	.658	.422	.362	.385	.350	.669*
22 items	-	-	.961					

198 * The significance level for all correlations was $p < 0.001$

The left part lists the CR, AVE, and for the five functional domains, while the right part diagonally shows the square root of the AVE value for each domain, and the gray background shows the correlations between functional domains

A second-order CFA model was implemented, and factor score weights (f_{sw}) were extracted, which allowed the calculation of the overall functional profile (OFP) score, weighted by the weight (f_{sw}) of each item within the model. A very favorable fit indices were again obtained (Table 1).

The sample considered was characterized by a predominance of women, a majority of widowers, and a high percentage of people who did not attend school (24% in the case of the NINST group and 31% in the case of the INST group) (Table 4).

Table 4: Biological and sociodemographic characteristics and the proportions of GPF taken from the ENCS22.

Variables	<i>n</i>	%	General profile of functionality				
			None 0-4%	Mild 5-24%	Moderate 25-49%	Severe 50-95%	Complete 96-100%
<i>Sex (NINST):</i>	-	-	-	-	-	-	-
Male	37	37.0	40.6%	48.6%	8.1%	2.7%	0.0%
Female	63	63.0	27.0%	58.7%	11.1%	3.2%	0.0%
<i>Sex (INST):</i>	-	-	-	-	-	-	-
Male	114	30.3	33.3%	35.1%	18.4%	10.5%	2.6%
Female	262	69.7	20.6%	41.6%	18.3%	11.5%	8.0%
<i>Age group, years (NINST):</i>	-	-	-	-	-	-	-
65-74	14	14.0	28.6%	57.1%	14.3%	0.0%	0.0%
75-84	43	43.0	37.2%	46.5%	9.3%	7.0%	0.0%
85 and older	43	43.0	27.9%	62.8%	9.3%	0.0%	0.0%
<i>Age group, years (INST):</i>	-	-	-	-	-	-	-
65-74	20	5.3	40.0%	35.0%	5.0%	20.0%	0.0%
75-84	114	30.3	22.8%	42.1%	17.5%	11.4%	6.1%
85 and older	242	64.4	24.0%	38.8%	19.8%	10.3%	7.0%
<i>Marital status (NINST):</i>	-	-	-	-	-	-	-
Single	10	10.0	20.0%	50.0%	30.0%	0.0%	0.0%
Married	27	27.0	37.0%	44.4%	11.1%	7.4%	0.0%
Widowed	56	56.0	32.1%	60.7%	5.4%	1.8%	0.0%
Divorced	7	7.0	28.6%	57.1%	14.3%	0.0%	0.0%
<i>Marital status (INST):</i>	-	-	-	-	-	-	-
Single	48	12.8	25.0%	39.6%	10.4%	20.8%	4.2%
Married	61	16.2	24.6%	37.7%	26.2%	9.8%	1.6%
Widowed	252	67.0	24.6%	38.5%	18.7%	10.3%	7.9%
Divorced	15	4.0	20.0%	66.7%	6.7%	0.0%	6.7%
<i>Educational level (NINST):</i>	-	-	-	-	-	-	-
Does not know how to read or write	24	24.0	25.0%	58.3%	12.5%	4.2%	0.0%
Knows how to read and write	7	7.0	42.9%	42.9%	14.3%	0.0%	0.0%
Attended school	67	67.0	32.8%	55.2%	9.0%	3.0%	0.0%
Higher education	2	2.0	50.0%	50.0%	0.0%	0.0%	0.0%
<i>Educational level (INST):</i>	-	-	-	-	-	-	-
Does not know how to read or write	117	31.1	17.1%	37.6%	16.5%	15.4%	13.7%
Knows how to read and write	17	4.5	35.3%	17.6%	23.5%	11.8%	11.8%
Attended school	229	60.9	25.8%	44.1%	19.2%	8.7%	2.2%
Higher education	13	3.5	53.8%	7.7%	15.4%	15.4%	7.7%

Using the OFP score calculated based on *fsw* and adjusting it to the present sample (Figure 1), the statistical hypothesis that the INST would show, on average, higher functional profiles scores than the NINST was evaluated by the nonparametric Wilcoxon-Mann-Whitney method, with $p<0.05$. The results always led to the rejection of the null hypothesis.

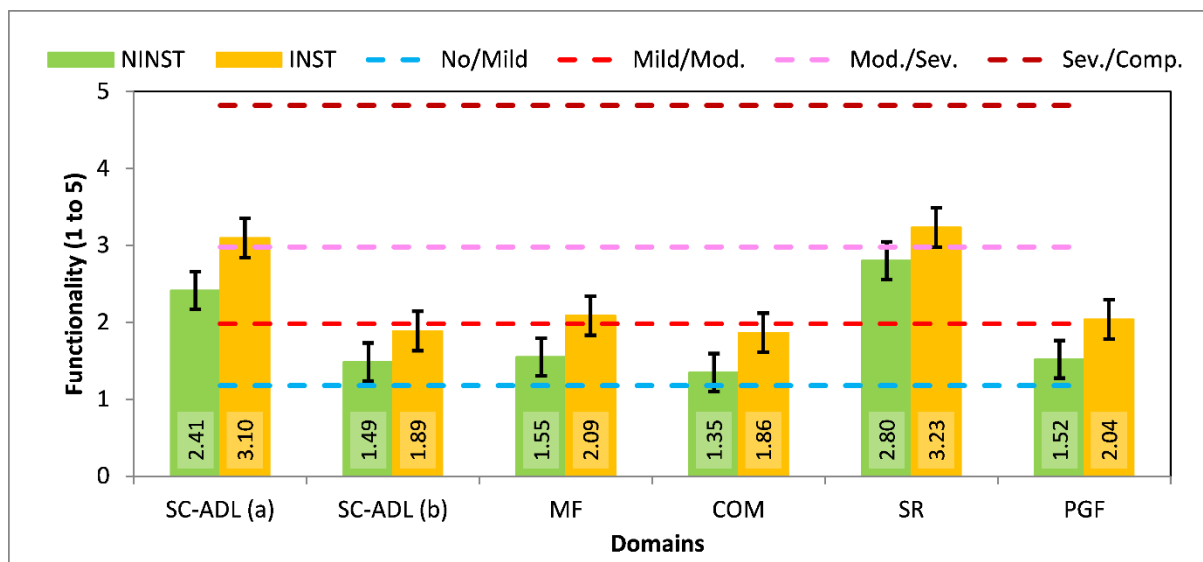


Figure 1: Mean scores of functionality in relation to functionality domains and PGF for both NINST and INST elderly people.

Regarding the variable “sex”, the result of the nonparametric Wilcoxon-Mann-Whitney test suggests that women had, on average, higher scores than men regarding the five domains and OFP (always $p<0.05$). The exception was “SR” ($U=25,842.50$; $W=78,817.50$; $p=0.384$). To understand the effect of “education level” over the five functional domains and OFP, the nonparametric Kruskal-Wallis test was used, followed by multiple comparisons of the order means. The results were only statistically significant for: “SC-ADL(a)” ($F_{KW}(3)=8.231$; $p=0.041$); “MF” ($F_{KW}(3)=19.637$; $p<0.001$); “COM” ($F_{KW}(3)=13.514$; $p=0.004$); and OFP ($F_{KW}(3)=14.172$; $p=0.005$). According to the multiple comparisons of the order means, results only showed statistical significance for the relationship between the categories “Did not attend school and does not know how to read or write” and “Attended school but did not attend higher education” ($p=0.002$). Regarding the “marital status”, none effect on any of the five functional domains and OFP was found (nonparametric Kruskal-Wallis, with $p>0.05$).

The statistical hypothesis that the distribution of the variable “days of institutionalization” would differ among the OFP categories only for the INST, was evaluated by the nonparametric Kruskal-Wallis method, followed by multiple comparisons of the order means. The statistical

significance test, adjusted by the Bonferroni correction, led to the rejection of the null hypothesis ($F_{KW}(4)15.059; p = 0.005; n = 361$). According to the multiple comparisons of the order means, “COMPLETE Problem (96-100%)” showed a significantly different distribution from the remaining four profiles ($p < 0.05$), and a longer institutionalization time was also observed for older adults with this profile. In the case of the INST group, results of Kruskal-Wallis parametric method led to reject the null hypothesis.

To assess whether the age of the respondents had a statistically significant effect on the OFP, an ordinal regression model was performed. The model obtained was considered statistically significant only for the INST ($-2LL=347.197, \chi^2(1)=5.518, p=0.019$), although the effect size was somewhat reduced ($R_{CS}=0.122; R_N=0.122; R_{MF}=0.071$). According to the model obtained, as age increases, the probability of observing responses that correspond to functional profiles indicating greater impairment increases, as the parameter estimate for the variable “age” is positive ($b_{Age}=0.022; p=0.015$), as illustrated by the analysis of the plot curves represented in Figure 2. Regarding the quality of Pearson’s chi-square and deviance tests, the null hypotheses that the model fits the data ($\chi^2_{Pearson}(135)=90.232, p=0.081$ and $\chi^2_{Deviance}(135)=0.073, p=0.918$) was not rejected. The assumption of slope homogeneity was also validated ($-2LL=345.027, \chi^2(3)=2.170, p=0.538$).

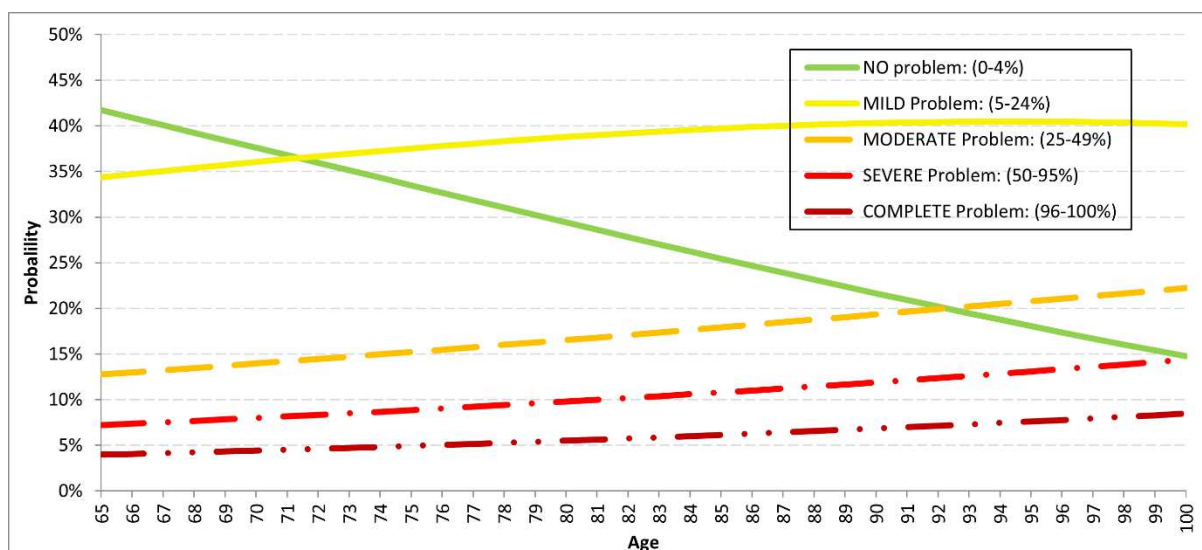


Figure 2: Probability evolution of the general profiles of functionality as a function of the ages of the respondents. The plot shows a person older than 71 years has a greater probability of presenting a “mild problem” functional profile than a “no problem” profile, and the result is statistically significant.

Discussion

The “SR” is the domain with the highest score, followed by the domains Self-Care - Activities of daily living (a) “SC-ADL (a)”, “MF”, Self-Care - Activities of daily living (b) “SC-ADL(b)” and “COM”, both groups (INST and NINST). The poor results for “SR” domain highlight the importance of promoting social support for the older adults and have implications at the level of institutionalization, as explained below. A study of people over 60 years of age, older adults with insufficient communication ability are more likely to exhibit functional dependence for instrumental activities of daily living²³. Communication is important for social relationships, which in turn affect functioning. Regarding mental functions, a domain that ranked second as a predictor of the overall functional profile, the literature reports that the prevalence of dependence in activities of daily living and instrumental activities of daily living is higher in older adults with cognitive impairment²⁴.

The older adults functional profile is interrelated with sociodemographic context and with the biological, cultural and environmental characteristics, which was generally observed in the present study and is in line with the findings of other authors^{22,25,26}. The sample included a greater number of women than men, a phenomenon that was called the “feminization of old age”²⁷ and was reported by the World Health Organization²⁸. Women showed, on average, higher functional profile scores than men, which indicates greater functional dependence. This results are in line with another studies^{22,24}. Other study concluded that women had higher rates of functional dependence, cognitive deficit and depression and worse family functioning³⁸. This scenario can be interpreted by greater multimorbidity in older women than in men³⁹, along with the fact that women have a higher average life expectancy⁴⁰.

With regard to education, the participants who did not attend school and did not know how to read or write had worse general profile of functionality and in the domains “SC-ADL(a)”, “MF” and “COM” than those who had attended school but did not pursue higher education. This results are similar with another Portuguese study²². A Brazil study, illiterate individuals were more dependent for instrumental activities of daily living²³. In addition, since functioning is associated with well-being and health and since higher levels of education are related to better physical or mental health, the results obtained in other studies^{34,49-50} are also aligned with those of the present study. Additionally, multimorbidity is higher in people with lower educational levels³⁹. We highlight the fact that for the acts of eating and drinking (“SC-ADL(b)”) and the support of family and friends (“SR”), these differences were not observed and are not related to education. Regarding communication, mental functions and life activities

that relate to self-care hygiene and comfort, mobility, elimination and daily routines, the differences are evident. In a contextual analysis of the current Portuguese reality, older adults who have not had the opportunity to attend school are those who had greater socioeconomic difficulties during childhood, and, for the most part, throughout life – the women often were removed from the family as children to work as maids in the homes of more affluent families until adulthood, and the men worked in low-paying jobs (when there were jobs available) and began to work at an early age. Low socioeconomic status combined with low literacy influences lifestyles throughout the life cycle. A recent study concluded that a healthy lifestyle benefits physical, psychological, cognitive and social functioning until old age⁴³, which, in turn, is related to functioning and, consequently, to self-care. This, therefore, is a possible contextual explanation for the levels of dependence of illiterate people during the aging process. It is therefore necessary to promote opportunities for lifelong learning and the development of skills so that an active and healthy life is possible⁴⁴.

Regarding marital status, no statistically significant differences were obtained. In fact, the literature points to the importance of the quality of social relationships, stating that the existence of bonds does not guarantee the availability of supportive social resources³. This means that being married or having children does not necessarily mean that social relationships are satisfactory and of quality or that this network offers support for activities of daily living or for instrumental activities of daily living. Regarding spouses, as a rule, they are similar in age to one another, which may limit their ability to provide support in activities of daily living when necessary; these are factors that also contribute to institutionalization.

Older adults living at home had better scores than institutionalized individuals in all domains (Figure 1). Although there are no similar studies using the ENCS, in a study conducted in Turkey comparing INST and NINST, the authors concluded that INST had greater physical and social disability and a higher risk of psychiatric disorders, particularly depression, than those who lived in their homes²⁹. Furthermore, a recent meta-analysis concluded that older adults INST had a worse QoL than those who lived at home³⁰. The same study also concluded that there is a need to conduct more research in this area, given the limited scientific literature available. Another studies concluded that functional and cognitive impairment, as well as lack of support and assistance with activities of daily living for the older adults, were considered predictive factors for institutionalization^{31,32}. Additionally, a recent longitudinal study concluded that a lack of social support, living alone, nonparticipation in recreational and social activities, and not visiting family or friends were strong predictors of institutionalization among older adults³³. These conclusions are in line with our results, that indicate the “SR” domain,

which refers to support from family and friends, had the lowest scores. In the INST group, the scores for the “SR” domain were between the “Severe problem” and “Complete problem” levels. So, it is necessary to invest in interventions that promote support for older adults that focus on social relationships, given their strong influence on health and longevity. Moreover, an absence of social relationships is a risk factor for premature death³⁴. Thus, the results presented here add scientific knowledge to the limited existing literature and reinforce the importance of a person-centered care model focused on close relationships to avoid likely institutionalization³⁵. Person-centered care is an essential aspect of the quality of health care for three reasons: older adults have the right to be treated with dignity and respect when using health services; the person-centered care is associated with better health care utilization and outcomes; and it allows the assessment of efforts to improve health care quality and hold health systems accountable to those who seek their services³⁶. The proposed model is based on the implementation of an individual care plan, which is a person-centered tool; constitutes a space for dialogue among all caregivers; supports and facilitates route management; and integrates care services³⁵.

Another result that reinforces the importance of the model proposed in this article is the fact that the INST older than 71 years old had a higher probability of a “Mild problem (5%-24%)” profile than a “No problem” (0%-4%)” profile (Figure 2). It should be noted that in the Portuguese study conducted²², which involved older adults living in their homes, this probability was noted three years later than in our sample, i.e., at the age of 74 years²². The finding that the probability of functional decline increases with age is not new, and the knowledge presented here is crucial, i.e., the indication that institutionalized older adults are likely to present functional decline 3 years earlier than older adults residing in their own household. In addition, within the group of INST in the present study, the greater the duration of institutionalization was, the greater the individual’s likelihood was of having a “Complete problem (96%-100%)” profile. We must examine these results carefully given the effect of the contexts in which the studies were conducted; however, these data reinforce the importance of keeping people in their homes to the greatest possible extent and maintaining their self-care abilities and social support. However, other variables in addition to the duration of institutionalization should be considered, such as associated multimorbidity, although it is important to emphasize that institutionalization itself does not mean dependence for self-care. This result highlights the need to continue to deepen and test the model proposed here through longitudinal studies. Therefore, it is important to understand the extent to which institutionalization and risk factors contribute to the worsening of the functioning in INST older

adults to a complete state of disability and to assess whether this worsening is similar to that of older adults who reside in their own homes.

The limitations of the present study include its cross-sectional nature, which does not allow conclusions regarding causality.

Conclusions

Age, female sex, lack of education and institutionalization are negatively related to the functional profile. Although it is not possible to intervene directly in terms of age and sex, it is necessary to intervene by providing life-long training and implementing social and health responses that allow people to remain in their homes, because doing so affects the functioning of self-care and the QoL of older adults. If it is not possible to proceed as described above, it is suggested to improve institutional responses so that they can promote the functioning of individuals of this age group. The model of providing care at home that is based on an individual care plan centered on the person and his/her close relationships and is associated with new artificial intelligence technologies for supporting older adults may be a relevant solution. Thus, it is suggested that experimental studies test this hypothesis.

We highlight and emphasize the importance of resilience and the ability to adapt to the new reality that is imposed on the current society. Thus, it is urgent to respond to this challenge with a model focused on self-care that prioritizes interpersonal relationships and the provision of care in the home.

List of Abbreviations

CFA - Confirmatory factor analysis

COM - Communication

CR - Composite Reliability

ENCS – Elderly Nursing Core Set

ICF - Classification of Functioning, Disability and Health

INST – Institutionalized participants

MF - Mental Functions

MIAPE - Multidimensional Integrated Assessment Platform for Elderly

NINST – Noninstitutionalized participants

OFP - Overall Functional Profile

SC-ADL (a) – Self-care Activities of daily living (a)

391 SC-ADL (b) – Self-care Activities of daily living (b)

392 SR – Social Relationships

393 WHO – World Health Organization

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Declarations

Ethics approval and consent to participate

The study was approved by the Ethics Committee for Scientific Research in the Areas of Human Health and Welfare of the University of Évora (report number 19013).

Consent for publication

Not applicable.

Availability of data and materials

The data that support the findings of this study are available from <http://35.181.116.247:4200/> but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

LP, ML e CF conceived the present study within the scope of 4IE project. MG and CF conceived the ECNS25 and ENCS31, respectively, under the supervision of ML. HO contributed to the statistical analyses for all data, including the CFA, ordinal regression and standard means in terms of functionality domains. All authors drafted and revised the manuscript for important intellectual content. LP, ML and CF are the guarantors of all data and assume responsibility for its integrity, while HO was the guarantor of the accuracy of the data analysis. ML was the senior guarantor that supervised the proposed methodology.

563

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568

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Figures

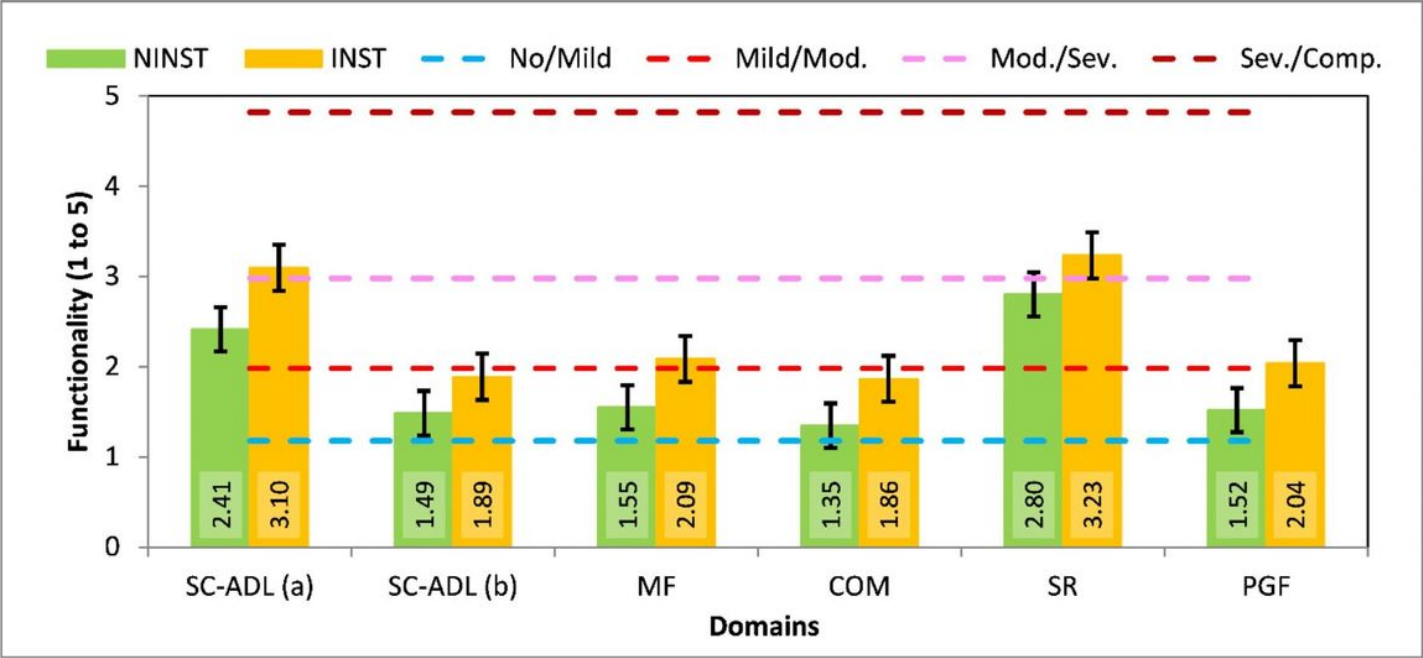


Figure 1

Mean scores of functionality in relation to functionality domains and PGF for both NINST and INST elderly people.

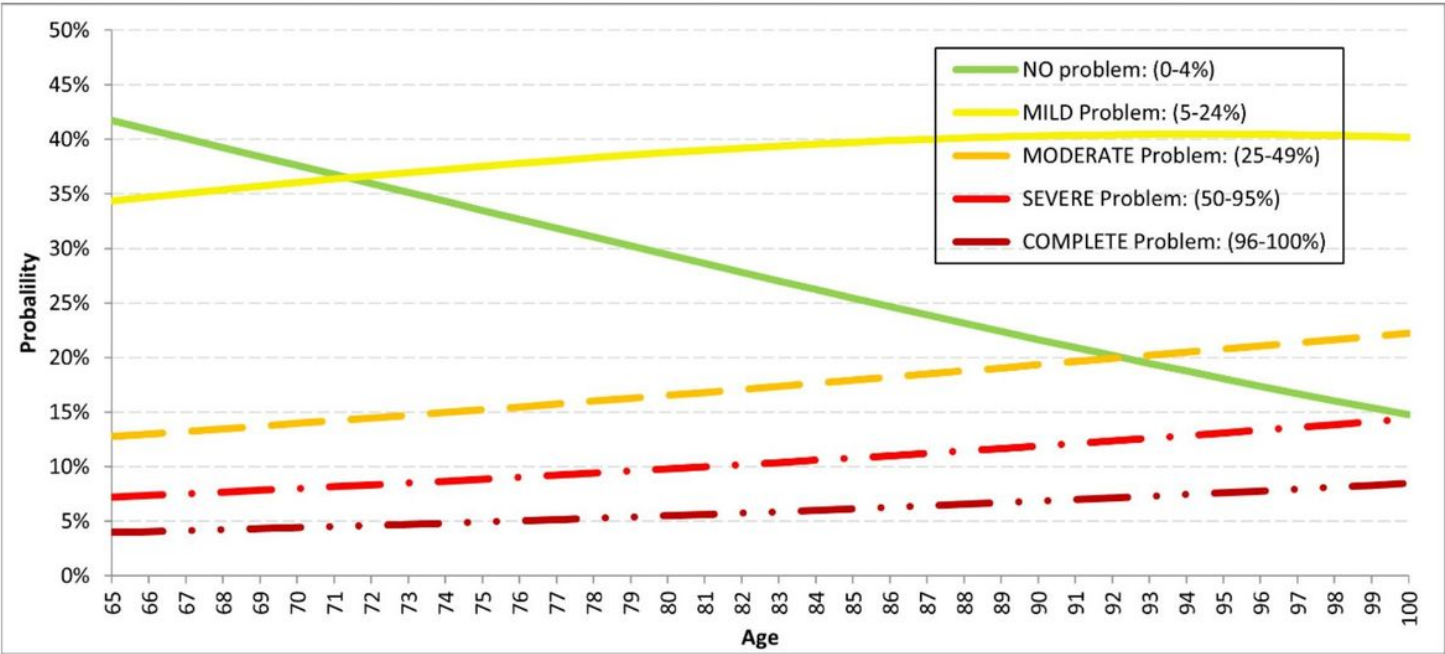


Figure 2

Probability evolution of the general profiles of functionality as a function of the ages of the respondents. The plot shows a person older than 71 years has a greater probability of presenting a “mild problem” functional profile than a “no problem” profile, and the result is statistically significant.