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Functioning in institutionalized and noninstitutionalized older adults: a comparative study

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

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

41 **Results**

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

46 **Conclusions**

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

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

53

54

55 **Background**

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

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

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

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

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

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

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

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

128 **Methods**

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

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

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

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

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

157

158 *Ethical considerations*

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

163

164 **Results**

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

167 **Table 1:** Results of the goodness-of-fitness indices for the initial and adjusted first-order and second-order CFA
168 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≤0.05)	<.001	<.001	<.001
MECVI (Modified Expected Cross-Validation Index)	4.750	2.138	2.296

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

170

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

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

Table 2: The ENCS 22 factorial structure

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 Dressing
Self-Care - Activities of daily living (SC-ADL (b))	Eating Drinking
Mental functions (MF)	Consciousness Orientation Attention Memory Emotional functions Higher-level cognitive functions
Communication (COM)	Communicating with and receiving spoken messages Speaking Conversation
Support and relationships (SR)	Family relationships Immediate family Friends

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

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					

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

199 The left part lists the CR, AVE, and for the five functional domains, while the right part diagonally shows the
 200 square root of the AVE value for each domain, and the gray background shows the correlations between
 201 functional domains
 202

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

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

210 **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.

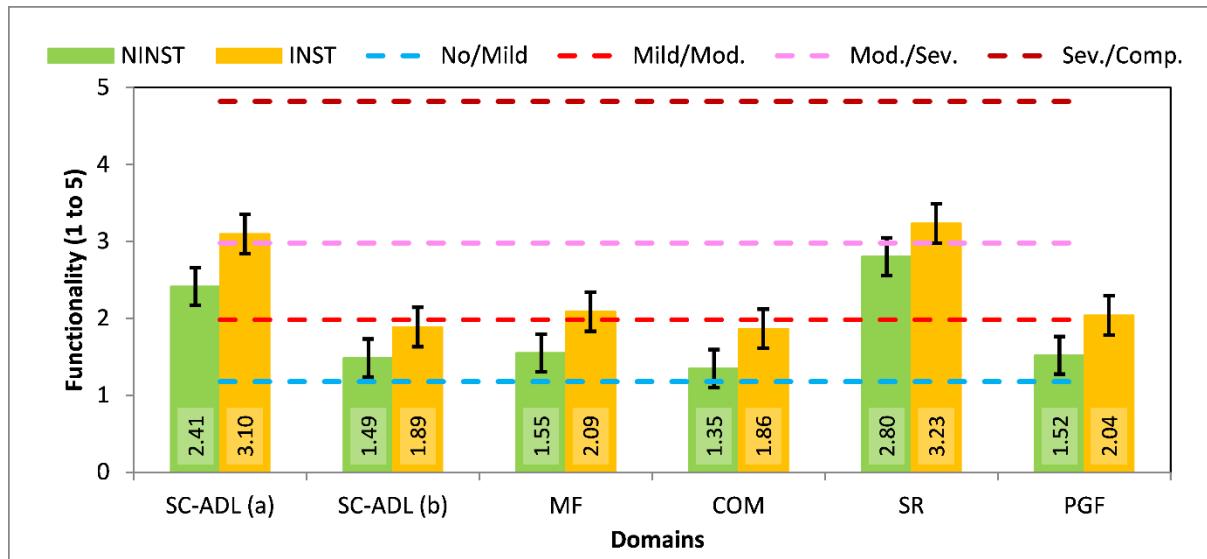


Figure 1: Mean scores of functionality in relation to functionality domains and PGF for both NINST and INST elderly people.

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, $\chi^2(3)=2.170, p=0.538$).

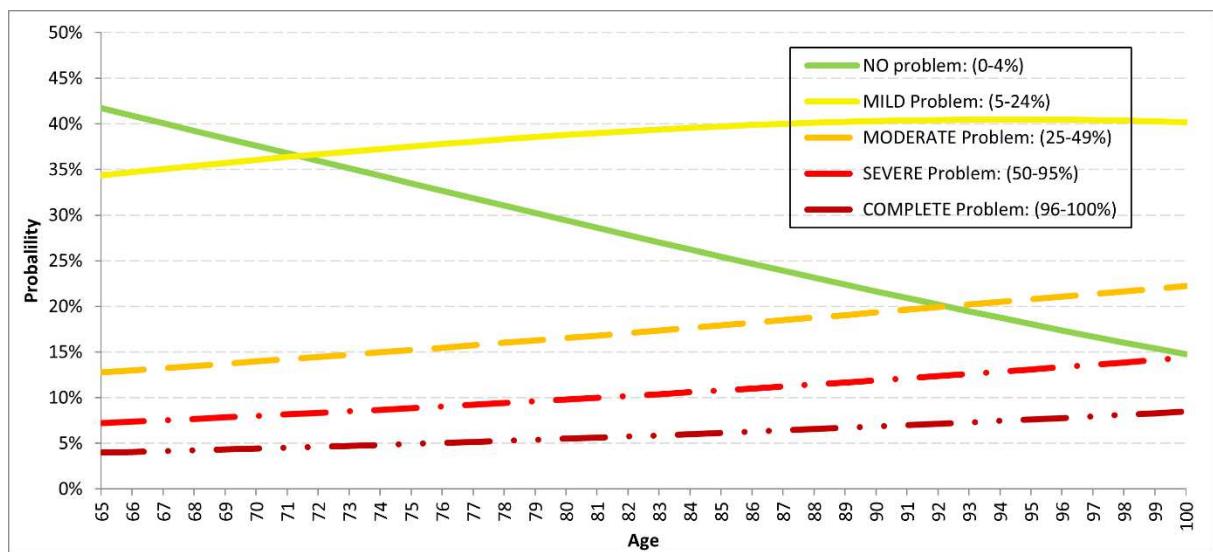


Figure 2: Probability evolution of the general profiles of functionality as a function of the ages of the respondents. The plot shows a person older than 71 years has a greater probability of presenting a “mild problem” functional profile than a “no problem” profile, and the result is statistically significant.

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258 **Discussion**

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

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

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

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

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

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

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

340 Another result that reinforces the importance of the model proposed in this article is the
341 fact that the INST older than 71 years old had a higher probability of a “Mild problem (5%-
342 24%)” profile than a “No problem” (0%-4%)” profile (Figure 2). It should be noted that in the
343 Portuguese study conducted²², which involved older adults living in their homes, this
344 probability was noted three years later than in our sample, i.e., at the age of 74 years²². The
345 finding that the probability of functional decline increases with age is not new, and the
346 knowledge presented here is crucial, i.e., the indication that institutionalized older adults are
347 likely to present functional decline 3 years earlier than older adults residing in their own
348 household. In addition, within the group of INST in the present study, the greater the duration
349 of institutionalization was, the greater the individual’s likelihood was of having a “Complete
350 problem (96%-100%)” profile. We must examine these results carefully given the effect of the
351 contexts in which the studies were conducted; however, these data reinforce the importance of
352 keeping people in their homes to the greatest possible extent and maintaining their self-care
353 abilities and social support. However, other variables in addition to the duration of
354 institutionalization should be considered, such as associated multimorbidity, although it is
355 important to emphasize that institutionalization itself does not mean dependence for self-care.
356 This result highlights the need to continue to deepen and test the model proposed here through
357 longitudinal studies. Therefore, it is important to understand the extent to which
358 institutionalization and risk factors contribute to the worsening of the functioning in INST older

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

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

363 **Conclusions**

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

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

378

379 **List of Abbreviations**

380 CFA - Confirmatory factor analysis

381 COM - Communication

382 CR - Composite Reliability

383 ENCS – Elderly Nursing Core Set

384 ICF - Classification of Functioning, Disability and Health

385 INST – Institutionalized participants

386 MF - Mental Functions

387 MIAPE - Multidimensional Integrated Assessment Platform for Elderly

388 NINST – Noninstitutionalized participants

389 OFP - Overall Functional Profile

390 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

394

395 **References**

396 1. INE – Instituto Nacional de Estatística. The demographic ageing will continue to

397 increase in Portugal, and only stabilises in about 40 years. Published online 2017.

398 https://www.ine.pt/xportal/xmain?xpid=INE&xpgid=ine_destaque&DESTAQUESdestaques&t_boui=277695619&DESTAQUESmodo=2&xlang=en

400 2. PORDATA. Ageing Index. Published 2018.

401 <https://www.pordata.pt/en/Europe/Ageing+index-1609>

402 3. Ashida S, Schafer EJ. Social Networks, Social Relationships, and Their Effects on the
403 Aging Mind and Brain. In: Matthew Rizzo, Anderson S, Fritzsch B, eds. *The Wiley*
404 *Handbook on the Aging Mind and Brain*. Wiley-Blackwell; 2018:19-36.

405 4. Ben-Shlomo Y, Kuh D. A life course approach to chronic disease epidemiology:
406 Conceptual models, empirical challenges and interdisciplinary perspectives. *Int J*
407 *Epidemiol*. 2002;31(2):285-293. doi:10.1093/intjepid/31.2.285

408 5. Burton-Jeangros C, Cullati S, Sacker A, Blane D, eds. *A Life Course Perspective on*
409 *Health Trajectories and Transitions*. Vol 4. Springer International Publishing; 2015.
410 doi:10.1007/978-3-319-20484-0

411 6. Kuh D, Ben-Shlomo Y, Lynch J, Hallqvist J. Life course epidemiology. *J Epidemiol*
412 *Community Heal*. 2003;57:778-783. doi:10.1136/jech.57.10.783

413 7. McLeroy KR, Bibeau D, Steckler A, Glanz K. An ecological perspective on health
414 promotion programs. *Health Educ Q*. 1988;15(4):351-377.

415 8. Birtha M, Rodrigues R, Zólyomi E, Sandu V, Schulmann K. *From Disability Rights*
416 *towards a Rights-Based Approach to Long-Term Care in Europe: Building an Index of*
417 *Rights-Based Policies for Older People*. European C.; 2019.

418 9. Jagger C, Jagger C, Reyes-Frausto S. *Monitoring Health by Healthy Active Life*

- 419 *Expectancy—A User’s Guide*. University of Leicester; 2003.
- 420 10. Kingston A, Robinson L, Booth H, Knapp M, Jagger C. Projections of multi-morbidity
421 in the older population in England to 2035: estimates from the Population Ageing and
422 Care Simulation (PACSim) model. *Age Ageing*. 2018;47:374-380.
423 doi:10.1093/ageing/afx201
- 424 11. Kingston A, Wohland P, Wittenberg R, et al. Is late-life dependency increasing or not?
425 A comparison of the Cognitive Function and Ageing Studies (CFAS).
426 www.thelancet.com *Artic Lancet*. 2017;390:1676-1684. doi:10.1016/S0140-
427 6736(17)31575-1
- 428 12. Observatório Português dos Sistemas de Saúde. Relatório Primavera 2015. Published
429 2015. <http://opss.pt/relatorios/relatorio-primavera-2015/>
- 430 13. Reis S, Cardoso S. Multimorbidity em cuidados de saúde primários: o que há de novo?
431 *Rev Port Med Geral e Fam.* 2015;31(3):230-232.
432 http://www.scielo.mec.pt/scielo.php?script=sci_arttext&pid=S2182-51732015000300012
- 434 14. Lesende MI, Crespo LI, Manzanares S, et al. Functional decline and associated factors
435 in patients with multimorbidity at 8 months of follow-up in primary care: the
436 functionality in pluripathological patients (FUNCIPUR) longitudinal descriptive study.
437 *BMJ Open*. 2018;8(7):e022377. doi:10.1136/bmjopen-2018-022377
- 438 15. Aguiar V, Santos B, Gomes D, Tavares T. Assessment of the functional capacity and
439 quality of life of Brazilian elderly people living in a community. *Rev Enferm Ref*.
440 2019;IV Série(Nº 21):59-66. doi:10.12707/RIV19011
- 441 16. Colombo F, Llena-Nozal A, Mercier J, Tjadens F. Help Wanted? Published online May
442 18, 2011. doi:10.1787/9789264097759-en
- 443 17. World Health Organization. International Classification of Functioning, Disability and
444 Health (ICF). Published 2020. <https://www.who.int/classifications/icf/en/>
- 445 18. Madden RH, Dune T, Lukersmith S, et al. The relevance of the International
446 Classification of Functioning, Disability and Health (ICF) in monitoring and evaluating

- Community-based Rehabilitation (CBR). *Disabil Rehabil.* 2014;36(10):826-837.
doi:10.3109/09638288.2013.821182

19. Mendes DJM, Lopes MJ, García-Alonso JM, Santos J, Sousa LMM. Resilient Software Architecture Platform for the Individual Care Plan. In: Mendes D, Fonseca C, Lopes MJ, Garcia-Alonso J, Murillo JM, eds. *Exploring the Role of ICTs in Healthy Aging*. ; 2020:13-32. doi:10.4018/978-1-7998-1937-0.ch002

20. Lopes MJ, Fonseca C. Processo de construção do elderly nursing core set. *J Aging Inov.* 2013;2(1):121-131.

21. Marôco J. *Análise de Equações Estruturais: Fundamentos Teóricos, Software e Aplicações*. 6^a ed. (ReportNumber, ed.); 2014.

22. Goes M, Lopes MJ, Oliveira H, Fonseca C, Marôco J. A Nursing Care Intervention Model for Elderly People to Ascertain General Profiles of Functionality and Self Care Needs. *Sci Rep.* 2020;10(1). doi:10.1038/s41598-020-58596-1

23. Coutinho AT de Q, Vilela MBR, Lima MLLT de, et al. Social communication and functional independence of the elderly in a community assisted by the family health strategy. *Rev CEFAC.* 2018;20(3):363-373. doi:10.1590/1982-0216201820313417

24. Safak ED, Kizilcay HD, Arguvanli S, et al. The Relationship Between Daily Living Activities and Cognitive Function in the Elderly: Cross-Sectional Study. *Yaşlılarda Günlük Yaşam Akt ve Bilişsel Fonksiyon İlişkisi Kesitsel Çalışma*. 2019;11(1):30-35. <http://10.0.72.89/ktd.483727>

25. Abalo EM, Mensah CM, Agyemang-Duah W, et al. Geographical Differences in Perceived Health Status Among Older Adults in Ghana: Do Gender and Educational Status Matter? *Gerontol Geriatr Med.* 2018;4:233372141879666. doi:10.1177/2333721418796663

26. Fonseca C, Lopes M, Mendes D, Parreira P, Mónico L, Marques C. Psychometric properties of the elderly nursing core set. In: *International Workshop on Gerontechnology*. Springer; 2018:143-153.

27. Davidson PM, DiGiacomo M, McGrath SJ. The Feminization of Aging: How Will This

- 475 Impact on Health Outcomes and Services? *Health Care Women Int.* 2011;32(12):1031-
476 1045. doi:10.1080/07399332.2011.610539
- 477 28. World Health Organization. *World Health Statistics 2019: Monitoring Health for the*
478 *SDGs, Sustainable Development Goals.*; 2019.
479 <https://apps.who.int/iris/bitstream/handle/10665/324835/9789241565707-eng.pdf>
- 480 29. Maral I, Bakar C, Durukan E, et al. General health and disability status: a comparative
481 study between nursing home residents and elderly living at their own homes. *Turkish J*
482 *Geriatr.* 2012;15(4):363-370. doi:<http://hdl.handle.net/11424/101431>
- 483 30. de Medeiros MMD, Carletti TM, Magno MB, Maia LC, Cavalcanti YW, Rodrigues-
484 Garcia RCM. Does the institutionalization influence elderly's quality of life? A
485 systematic review and meta-analysis. *BMC Geriatr.* 2020;20(1):44.
486 doi:10.1186/s12877-020-1452-0
- 487 31. Luppa M, Luck T, Weyerer S, Konig H-H, Brahler E, Riedel-Heller SG. Prediction of
488 institutionalization in the elderly. A systematic review. *Age Ageing.* 2010;39(1):31-38.
489 doi:10.1093/ageing/afp202
- 490 32. Del Duca GF, Silva SG da, Thumé E, Santos IS, Hallal PC. Indicadores da
491 institucionalização de idosos: estudo de casos e controles. *Rev Saude Publica.*
492 2012;46(1):147-153. doi:10.1590/S0034-89102012000100018
- 493 33. Oh A, Patel K, Boscardin WJ, et al. Social Support and Patterns of Institutionalization
494 Among Older Adults: A Longitudinal Study. *J Am Geriatr Soc.* 2019;67(12):2622-2627.
495 doi:10.1111/jgs.16184
- 496 34. Holt-lunstad J. Why Social Relationships Are Important for Physical Health : A Systems
497 Approach to Understanding and Modifying Risk and Protection. Published online 2018.
- 498 35. Lopes MJ, Fonseca C, Barbosa P. The Individual Care Plan as Electronic Health Record.
499 In: ; 2020:1-12. doi:10.4018/978-1-7998-1937-0.ch001
- 500 36. Larson E, Sharma J, Bohren MA, Tunçalp Ö. When the patient is the expert: measuring
501 patient experience and satisfaction with care. *Bull World Health Organ.* 2019;97(8):563-
502 569. doi:10.2471/BLT.18.225201

- 503 37. Flores-Martin D, Pérez-Vereda A, Berrocal J, Canal C, Murillo JM. Interconnecting IoT
504 Devices to Improve the QoL of Elderly People. In: ; 2020:148-165. doi:10.4018/978-1-
505 7998-1937-0.ch009
- 506 38. Campos ACV, Ferreira EF e, Vargas AMD. Determinantes do envelhecimento ativo
507 segundo a qualidade de vida e gênero. *Cien Saude Colet.* 2015;20(7):2221-2237.
508 doi:10.1590/1413-81232015207.14072014
- 509 39. Quinaz Romana G, Kislaya I, Salvador MR, Gonçalves SC, Nunes B, Dias C.
510 Multimorbilidade em Portugal: Dados do Primeiro Inquérito Nacional de Saúde com
511 Exame Físico. *Acta Med Port.* 2019;32(1):30-37. doi:10.20344/amp.11227
- 512 40. Ministério da Saúde. Health System Review PORTUGAL - Phase 1 Final Report.
513 Published online 2018. <http://www.euro.who.int/en/about-us/partners/observatory/activities/research-studies-and-projects/review-of-the-portuguese-health-system>
- 516 41. Cui S, Wang R, Lu L, Wang H, Zhang Y. Influence of Education Level on Mental Health
517 and Medical Coping Modes: A Correlation Analysis in the Elderlies. *Am J Nurs Sci.*
518 2019;8(6):324. doi:10.11648/j.ajns.20190806.16
- 519 42. Quach A, Levine ME, Tanaka T, et al. Epigenetic clock analysis of diet, exercise,
520 education, and lifestyle factors. *Aging (Albany NY).* 2017;9(2):419-446.
521 doi:10.18632/aging.101168
- 522 43. Visser M, Wijnhoven HAH, Comijs HC, Thomése FGCF, Twisk JWR, Deeg DJH. A
523 Healthy Lifestyle in Old Age and Prospective Change in Four Domains of Functioning.
524 *J Aging Health.* 2019;31(7):1297-1314. doi:10.1177/0898264318774430
- 525 44. UNECE. A Sustainable Society for All Ages: Realizing the potential of living longer.
526 Published online 2017.
527 http://www.unece.org/fileadmin/DAM/pau/age/Ministerial_Conference_Lisbon/Documents/2017_Lisbon_Ministerial_Declaration.pdf
- 529 45. Petronilho F, Pereira C, Magalhães A, et al. Evolution of self-care dependent individuals
530 admitted to the National Network for Integrated Continuous Care. *Rev Enferm Ref.*
531 2017;IV Série(Nº14):39-48. doi:10.12707/RIV17027

532 46. World Health Organization. *World Report on Ageing And Health.*; 2015.

533

534 **Declarations**

535

536 **Ethics approval and consent to participate**

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

539

540 **Consent for publication**

541 Not applicable.

542

543 **Availability of data and materials**

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

547

548 **Competing interests**

549 The authors declare that they have no competing interests.

550

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554

555 **Authors' contributions**

556 LP, ML e CF conceived the present study within the scope of 4IE project. MG and CF conceived
557 the ECNS25 and ENCS31, respectively, under the supervision of ML. HO contributed to the
558 statistical analyses for all data, including the CFA, ordinal regression and standard means in
559 terms of functionality domains. All authors drafted and revised the manuscript for important
560 intellectual content. LP, ML and CF are the guarantors of all data and assume responsibility for
561 its integrity, while HO was the guarantor of the accuracy of the data analysis. ML was the senior
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563

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568

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575 of aging under the supervision of ML, having both contributed to the construction of the ENCS.
576 HO is PhD in Electrical and Computer Engineering and he is an expert in statistics. JGA is PhD
577 in Software Engineering and he has been investigating in the area of gerontechnology.

578

579

Figures

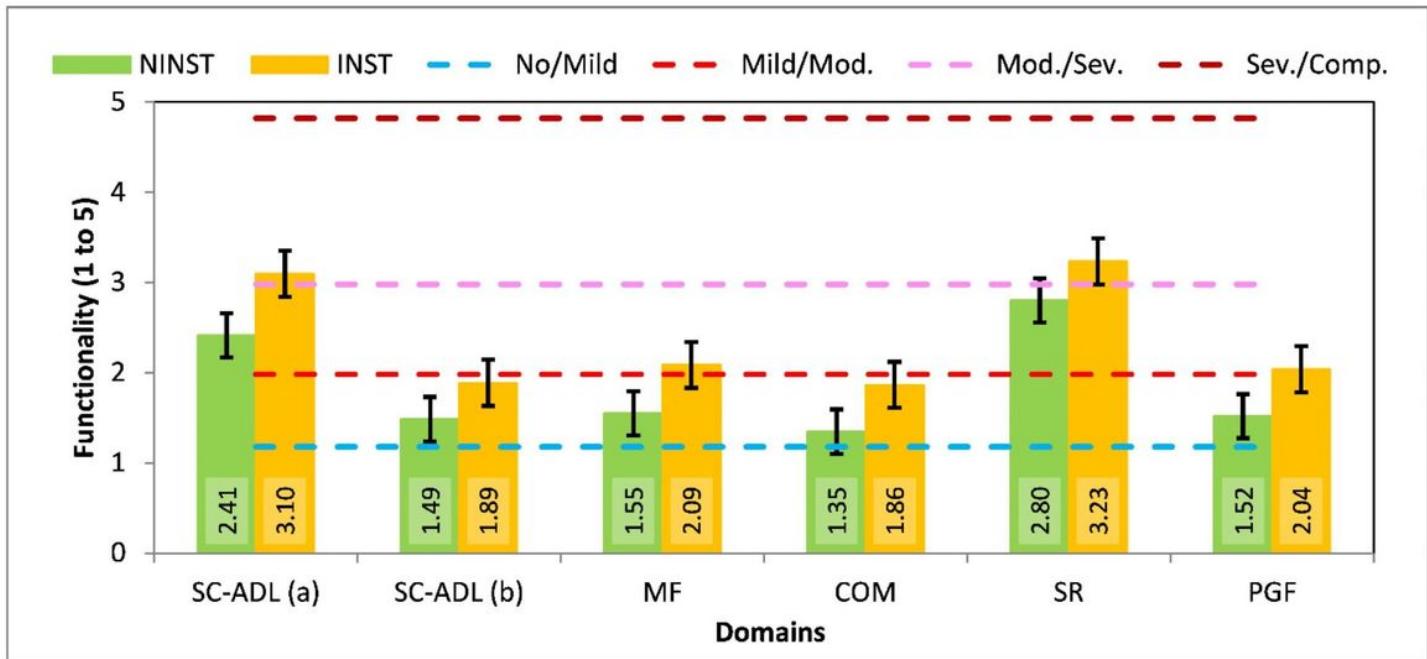


Figure 1

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

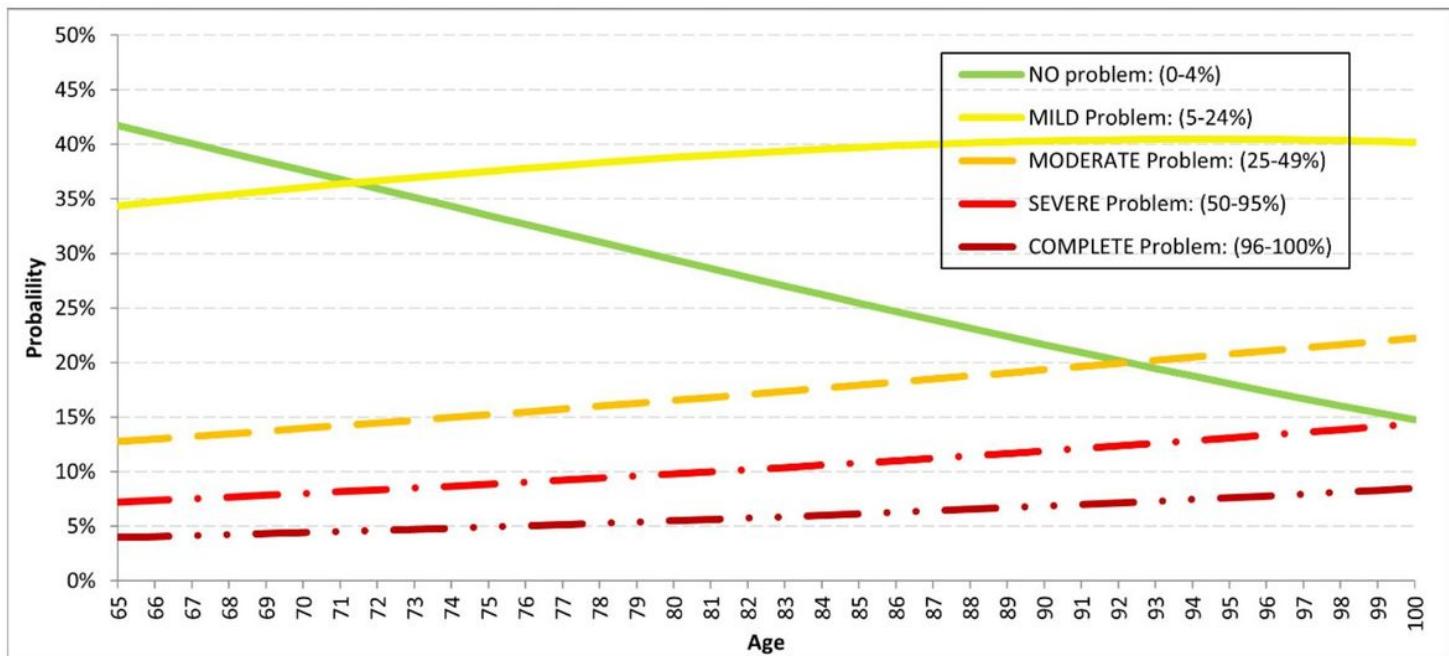


Figure 2

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.