

Vulnerability and cognitive protection factors in older persons

Summary

Estimates from the Portuguese Statistics reveal that 19.0% of the resident population in Portugal is in the age group with 65 years or older. By 2020, it is expected that the proportion of the elderly (≥ 65 years old) will increase to 20.6%. Cognitive plasticity and reserve capacity are central in studies addressing the ageing process, thus it is extremely important to identify the vulnerability and protection factors.

OBJECTIVE. To identify vulnerability and cognitive protection factors in older persons.

METHODOLOGY. Epidemiological and transversal study, conducted with a population of 151 persons, with an average age of 70.8 (± 5.4), in the metropolitan area of Porto.

RESULTS. The results indicate that lifestyles involving physical exercise; eating habits; sleep and rest patterns; leisure activities; satisfactory emotional life and the use of health services can act as vulnerability factors or protective factors.

The Mini-Mental State Examination (MMSE) has an average of 26.6 (± 4.4) and the questionnaire of cognitive reserve of 6.3 (± 4.6).

The dimensions of the MMSE show an association between items, with emphasis on MMSE guidance and MMSE attention and calculation, with a correlation of $r = .75$; $p = 0.001$ and $r = .89$; $p = 0.001$ respectively.

CONCLUSION. The healthy lifestyles, involving physical exercise; proper nutrition; the regular sleep pattern; engagement in leisure activities; a satisfactory emotional life and the use of health services can function as protective factors (present) or vulnerability (absent).

KEYWORDS: COGNITION; AGEING; OLDER PEOPLE; AUTONOMY.

Introduction

According to data from Portugal, has a population of 10.561.614 inhabitants, with an ageing index of 129¹. In 2009 the ageing index was 117.60 and in 2010 of 120.10. These data mean that for every 100 young people there are currently 129 elderly. These statistics show that there is clearly a phenomenon of the double ageing of the population, with the of the older population and a decrease of the younger population. The 2011 Census¹, (2011), reveals that 15% of the Portuguese population is included in the youngest age group, aged 14 years or less, and about 19% is included in the age group of older people, with 65 years or older. By 2020, it is expected that the proportion of young women (0-14 years) will decrease to 13.8%, and the elderly (≥ 65 years) increase to 20.6%¹.

The prevalence of Mild Cognitive Impairment (MCI) in the population,

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according to several studies^{2,3} in individuals over 60 years old, ranges between 3% and 17% and the incidence rate of new cases per year in people over 65 years old, diagnosed with amnesic MCI ranges between 9.9% and 21.5%³.

Several studies demonstrate that the MCI is constituted as a diagnostic entity⁴, which tends to progress to a dementia condition. Several studies show progression rates to dementia of 3% to 48%, from 1 to 5 years^{5,6}, so it is essential to develop appropriate interventions targeted at this population with such specific characteristics⁶.

The changes and the impairments caused by the cognitive decline lead to functional decline, with reduction and/or loss of skills essential for the development of the activities of daily living, with significant impact on performing these activities (ADL). In this context, to identify the cog-

nitive and functional abilities of the elderly is fundamental to identify risk groups.

As potential modifiable vulnerability factors for the development of cognitive changes at the pathological level, it is possible to point out the education and professional achievement, cardiovascular risk factors, psychosocial factors and lifestyles involving smoking habits, alcohol abuse, hypertension, diabetes, obesity, physical activity and depression⁷, highlighting the importance of positive emotions⁸, sleep patterns and active cognitive stimulation⁹.

The set of physiological and pathological changes experienced by the elderly will very likely lead to increased dependency, and subsequent need for aid, essential to perform the activities of daily living. However, this is not a definite dependence, but a dynamic process and its evolution may even be prevented or reduced with a proper identification and specific assistance¹⁰.

Thus, the purpose of this study is to characterize the population at cognitive and functional levels, its associated comorbidities that change the cognitive potential and to analyse the impact of the cognitive deterioration vulnerability factors in older persons, contributing to an effective improvement of the quality of the care provided.

Cognitive potential

Since 1960 many classifications were developed in order to describe mild manifestations of cognitive impairment. Recently, the MCI emerged as a new category describing the transition phase between regular and pathological ageing, with an increased risk of developing Alzheimer Disease or another type of dementia¹¹.

Despite unexisting consensus as to the criteria for MCI, the diagnostic criteria¹² represent the most recent attempt of standardization. In this way, Petersen, *et al.* have defined five essential criteria for the MCI¹²:

- Memory complaints, in particular when confirmed by a family member.
- Object memory deficit as to age and school level.
- Overall regular cognitive function.
- No changes reported in the activities of daily living.
- Dementia symptoms absence.

The most recent diagnostic criteria set by the Work Group of MCI of the European Alzheimer Disease Consortium EADC¹³, suggest that the person with MCI can show mild changes at the level of instrumental and more complex activities of daily living, such as cooking, use public transport or planning trips. To maintain the criterium of deficit absence in the activities of daily living (ADL) would be highly restrictive, and most likely underestimate the prevalence of MCI¹⁴.

The continuous research enabled to clarify that not all the persons experiencing MCI will develop the Alzheimer Disease, so the concept has evolved in order to include deficits in other cognitive domains¹². In particular, two subtypes have emerged: amnesic, (includes memory deficit) and non-amnesic (if there is no memory deficit)⁴.

Within the amnesic MCI⁴ has defined two subtypes:

- The amnesic MCI of a single domain (when memory is the only domain with deficit).
- The amnesic MCI of multiple domains (in cases that besides the memory, deficits can also be identified in other cognitive domains, such as speech, attention, or the ability to perform some task).

Similarly, the author described the non-amnesic MCI of a single domain or multiple domains, whether it refers to a deficit in one or several domains, except for memory.

These criteria can be complemented with a thorough interview to the

elderly or accompanying person that corroborates the presence of cognitive changes, screening for other possible casual comorbidities and through the use of tests that will determine the existence of cognitive deficits related to age and school level. The maintenance of the activities of daily living must also be tested in the interview and by using appropriate assessment instruments.

This study purpose is focused on the importance of maximizing intervention strategies, based on the promotion of health and disease prevention, in a proximity context, leading to the preservation or improvement of the mental health of the elderly population with mild cognitive impairment.

Problem statement

Older persons, particularly after 65 years of age, which is coincident with the retirement age, are very likely to reduce their cognitive work and thus being more at risk of experiencing a cognitive decline. Hence, it is crucial to identify factors that can potentially cause greater vulnerability/protection of cognition, in order that the health services contribute with effective interventions so that the risk of cognitive decline in older persons is reduced.

Research methods

Purpose of the study

This is a descriptive, exploratory and transversal study, conducted in a community population of the north of Portugal, performed between January 2014 and June 2015.

Research questions

- Which are the protection factors for cognitive preservation in older persons?
- Which are the vulnerability factors for cognitive decline in older persons?

Population/sample

This study was performed in a health unit of the north region of Portugal,

with a population of 11.200 people, aged between 65 and 75 years. A random sample was selected with 280 older persons, and for every 40 persons, one person was selected.

From this sample, a total of 129 persons did not meet the inclusion criteria: 66 patients did not meet the inclusion criteria; 32 persons did not attend the consultation; and 31 persons refused to participate in the study.

All persons were invited to attend a consultation in the health services and were evaluated as for the communication skills in order to be able to participate in this study.

The older persons that did not attend the consultation were visited at home to assess the inclusion criteria and a total sample of 151 persons were selected (53.9% of the initially selected persons).

Data collection

Data collection was performed by the project's researchers, between January 2014 and June 2015.

The elderly involved in this study were previously informed of the objectives of the study and asked to sign an informed consent.

All ethical recommendations of the Declaration of Helsinki were considered.

The project was granted approval by the administration board and the ethics committee with no. 130/13 OP dated 11.07.2013.

The older persons that met the criteria for cognitive impairment were directed to their health teams (physician/nurse), for the reassessment of the clinical condition (10 persons/6.6%).

This study aims to identify the vulnerability and protection cognitive factors in older persons.

An assessment questionnaire was used for data collection, including questions related to sociodemographic, clinical and lifestyles variables and using different scales/assessment instruments:

- The Mini-Mental Status Examination (MMSE), by Folstein et al.¹⁵ With 30 items, using 5 subscales: guidance (10 items); attention (3 items); calculation (5 items); language (3 items); memory (8 items) and constructive ability;
- The Cognitive Reserve Questionnaire (CRQ) developed by Rami et al.¹⁶ With 8 items – 1. School level; 2. Parents school level; 3. Training courses; 4. Professional occupation; 5. Musical training; 6. Languages knowledge (able to keep a conversation); 7. Reading activities; 8. Intellectual games (chess, puzzles, crosswords);
- Subjective Memory Complaints Scale (SMC) de Schmand et al., 1996, adapted to the Portuguese population by Ginó et al., 2008¹⁷.

With 10 items, in a 4-point Likert Scale (0, nothing, to 3, very), in which marks > 4 points – subjective memory complaints of some relevance and potentially indicative of deficit.

- Clinical Dementia Rating (CDR), Hughes et al., 1982¹⁸.

With six items (memory; orientation; judgement and problem-solving; community affairs; home and hobbies and personal care), rated between 0 and 3 points: 0 = no cognitive impairment; 0.5 = very mild dementia; 1 = mild dementia; 2 = moderate dementia; 3 = severe dementia.

In terms of rating, the memory is a primary dimension and its rating prevails over the other dimensions, except when there are three dimensions with higher ratings.

- Geriatric Depression Scale (GDS) short version by Yesavage¹⁹.

With 15 items, where values > 5 – depression and > 11 – severe depression To assess functionality, the Lawton Index was used (values ≤ 8 points –

total independence, > 9 ≤ 20 points – moderate dependence, > 20 points – high dependence.

The scales were used to assess items such as perform domestic tasks, wash the clothes, prepare meals, go shopping, use the telephone, use public transport, manage money and medication. The Barthel Index was also applied to assess items such as eating; personal hygiene, use the toilet, bathing, dress and undress, bladder and bowel control, walking, transfer from chair to bed and go up and down stairs. The total score was 100 points: < 20 points - total independence; > 20 ≤ 35 points – severe dependence; 40 to 55 – moderate dependence; 60 to 90 - mild dependence; > 90 points – presence of dependence.

The questionnaire was evaluated by a group of eight experts (one psychiatrist, two psychologists, two professors from the mental health area, three specialist nurses in mental health). A pre-test was applied to ten users of a different health unit in order to assess comprehension and time needed to complete the questionnaire.

Data were inputted through an optical reading software and validated by researchers. These data were computed into SPSS version 2.0 and a statistical analysis was performed (t-test and Pearson correlation).

The internal consistency of the instruments ensured the results trustworthiness with a significant Cronbach alpha.

Findings

The study sample comprised 151 older persons aged between 65 and 75 years, with an average age of 70.8 (± 5.4) and mode of 67 years. The majority of participants were female: 78 (51.7%), with primary school level (68.9%), and 86.5% were cohabiting with spouse/children and 77.5% were married/living in marital status.

The main household income was from the retirement pension

(96.7%), and 45.7% of the older persons received less than 500 Euros per month and 72.2 % reported major concerns about daily expenses.

The domestic affairs were performed by 62.3% of the sample.

As to the lifestyles that may act as protective or vulnerability factors to these persons, 60.9% reported daily consumption of alcoholic beverages, considered as adequate, and 86.6% had no smoking habits.

As for physical exercise, 45% reported some physical activity, with hiking being the most prevalent (45.7%), followed by gymnastics (7.3%), hydrogymnastics (4.6%) and swimming (3.3%). People who referred physical exercise, 29.1% reported doing it on a daily basis, and 24.5% at least 2 to 3 times a week.

In what concerns the eating habits, 67.5% reported having a good diet, with 89.4% considering to have a balanced diet. The majority of food consumption was related to fruit (76.2%), dairies (56.3%) and vegetables (53%). Despite these indicators, 25.2% of people only ate three daily meals.

As for the sleep and rest patterns, 74.8% considers as sufficient the sleeping hours according to their personal needs, with 52.3% sleeping 6 to 8 hours a day and 27.2% usually taking a nap.

In relation to leisure activities, 55% of the older persons did not usually engage in these activities, however, the most commonly mentioned was watching TV (82.1%), followed by reading (41.1%), listening to music (32.5%) and sewing (32.5%).

Despite not being considered as a leisure activity, 29.1% of participants referred taking care of their grandchildren.

For 84.8% of participants reported having a stable and satisfactory emotional life.

The use of health services is mentioned by 79.5% of the persons and for some it usually occurs every six months (49.7%). The general physician was the most cited as the reference health professional (89.4%) followed by the nursing professional (5.3%).

In relation to health care, 72.2% referred specific needs, with a major incidence of cardiovascular diseases (57.6%).

As to medication consumption, 89.4% of participants reported a daily

consumption, with only 27.8% taking one or two daily medication. The most reported medications were related to cardiovascular diseases (66.2%), sleeping pills (26.5%) and antidiabetic (24.5%). A special emphasis was for medication for depressive symptoms (13.2%) and mental disorders (3.3%), even in cases with no diagnosis.

The associations between the dimensions integrating the different instruments (intercorrelations) were analysed, and it was decided not to exclude results even if they were not statistically significant.

A positive correlation was found between values of CRQ and the MMSE, with $p \leq 0.001$ and for the GDS, with $p \leq 0.05$, total values of the scales.

The correlation between the values of the MMSE and the GDS is statistically significant, with $p \leq 0.01$.

The dimensions of the MMSE show an association between items, with an emphasis on MMSE orientation and MMSE attention and calculation, showing a correlation of $r = .75$; $p = 0.001$ and $r = .89$; $p = 0.001$ respectively.

As demonstrated in the figure 1, there is a strong correlation between

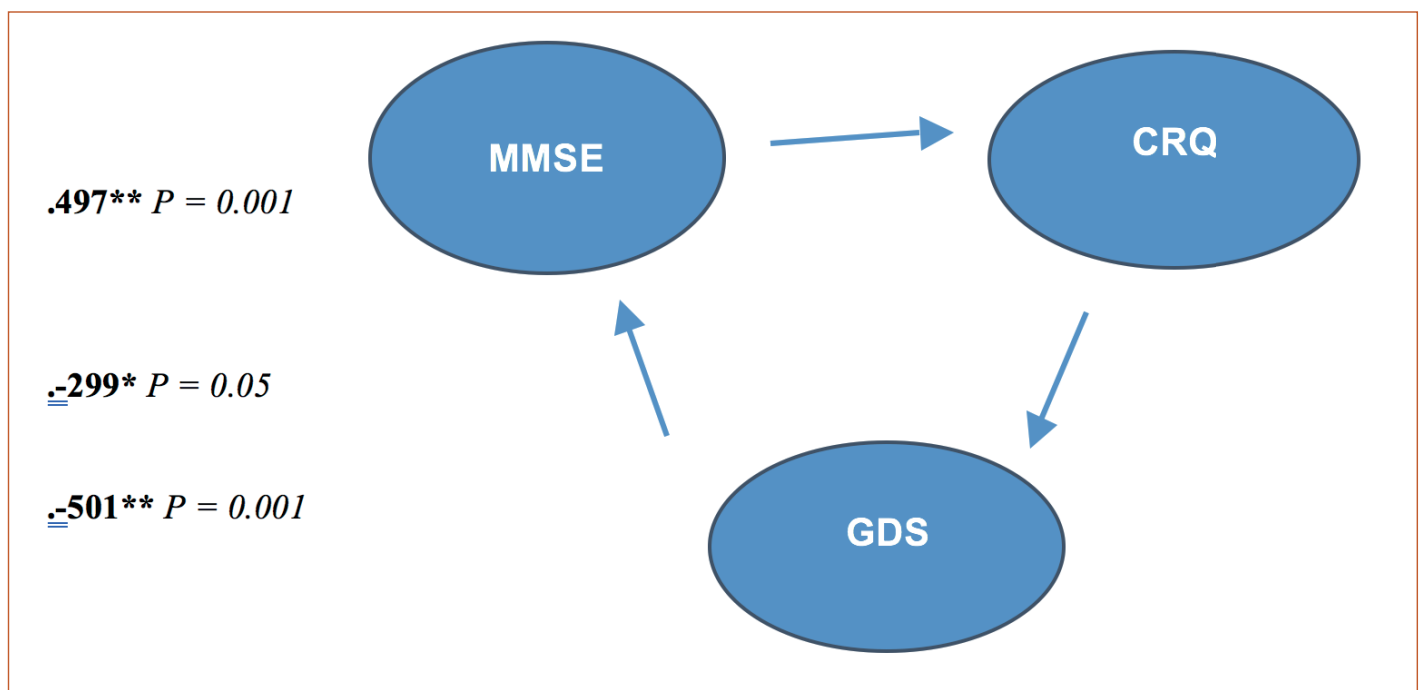


Figure 1. Correlation between the MMSE, the GDS and the CRQ

the cognition values, assessed through the MMSE with the cognitive reserve questionnaire (positive correlation) and with the geriatric depression scale (negative correlation), with statistically significant correlations. These results show a strong association between these variables, which is relevant in a clinical approach, and suggests that working to preserve cognition, positively impacts the cognitive potential and the prevention of depressive symptoms. In addition, there is a negative and statistically significant relation ($-.0.299$), between the cognitive reserve questionnaire and the geriatric depression scale, suggesting that the higher the cognitive potential, the lower the likelihood of depressive symptoms.

Discussion

The results of this study show that the sociodemographic factors: gender, age, family situation, age, and school level, influence the older person's capacities, also corroborated by several studies^{20, 21}.

Importantly, and despite literature refers that older persons experiencing pain often have reduced levels of functionality²², this study demonstrates that these people do not report pain, practice daily physical exercise (29.1%) and some (24.5%) engage in this activity at least two to three times a week, particularly doing hiking (45.7%).

The functional capacity characterized by the necessary abilities to maintain an independent and autonomous life, is divided into two categories: activities of daily living (ADL's) and the instrumental activities of daily living (IADL's), since the participants did not need assistance to perform the activities of daily living (62.3%).

In relation to the impact of the physical and psychological resources to the functional autonomy in older age, it is interesting to note that the conclusions of a study²³ indicate that the physical resources are the most useful for the maintenance of the performance in the activities of daily living ADL, and memory is an important psychological resource for the instrumental autonomy.

This study identified vulnerability factors in older persons: the lifestyles (physical activity – 45%); the cardiovascular risk (daily alcohol consumption and smoking habits, 13.4% and 60.9%, respectively); 24.5% of the participants take antidiabetic medication; 26.5% take sleeping pills and 13.2% use antidepressive medication. As an essential biological human function, sleeping highly improves the cognitive ability, specifically in what memory and creativity are concerned. Several studies corroborate that sleeping a short nap is sufficient to improve the memory performance and in some cases the benefits are comparable to a night sleep²⁴.

Also importantly, the physical activity, the regular cognitive stimulation and social interaction contribute to the improvement of the cognitive function, namely attention, memory and consciousness, the ability to perform the activities of daily living and emotional and social well-being. All these factors are extremely useful for the reduction of the risk of developing the Alzheimer Disease and controlling its progression⁹. The regular engagement in leisure activities, such as reading, crosswords and games, at least six hours per week will reduce the risk of dementia incidence, which also corroborate the findings of this study²⁵.

From the overall sample, 84.8% of the participants refer having a stable and satisfactory emotional relationship⁸, who state that regular positive emotions ease the ability of retention and complex decision making and problem-solving.

These results corroborate that the vulnerability factors aforementioned are the focus of health care in 79.5% of the older persons, although 5.3%

have mentioned the nursing professional.

The present results indicate that the balance between the vulnerability and cognitive protection factors in older persons increase the likelihood of maintaining the abilities to perform the activities of daily living.

Conclusion

This study confirms that lifestyles involving physical exercise, feeding habits, sleep and rest patterns, leisure activities, a satisfactory emotional life and the use of health services can function as vulnerability factors.

Thus, small improvements or even the balancing of cognitive functions may be considered important health gains. As such, it is recommended that the Cognitive Stimulation Technique is included in care programmes targeted at older persons and performed by technicians specialized in Mental Health and Psychiatric Nursing, in order to contribute to the preservation of the cognitive and functional capacity of the patients, which will very likely enable greater independence and improvement of quality of life.

Relevance for clinical practice

An important implication for future practice relates to the assessment of vulnerability and cognitive protection factors in older persons, in health professionals' decision-making and in the evaluation in clinical, scientific, administrative and social contexts.

The assessment of the functional status of older persons is crucial to the preservation of the autonomy of life⁸.

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