



Association between physical frailty and cognitive scores in older adults

Associação entre fragilidade física e escore cognitivo em idosos

Asociación entre fragilidad física y puntaje cognitivo en ancianos

Clóris Regina Blanski Grden¹, Maynara Fernanda Carvalho Barreto², Jacy Aurélia Vieira de Sousa¹, Juliana Andrade Chuertniek¹, Péricles Martim Reche¹, Pollyanna Kássia de Oliveira Borges¹

Objective: to investigate the association between physical frailty and cognitive scores in older adults at an Open University of the Third Age in Southern Brazil. **Methods:** descriptive cross-sectional study with convenience sample comprising 100 elderly, conducted from March to June 2013. For cognitive assessment, we applied the Mini Mental State Examination and the Edmonton Frail Scale. **Results:** there was a predominance of females (93%), with a mean age of 65.6 years. 81% of the participants were classified as non-frail, 16% as apparently vulnerable to frailty, and 3% as mild frailty. There was a significant association between cognitive performance and frailty ($p < 0.006$). **Conclusion:** the research on the association between physical frailty and cognitive scores in older people promotes the construction of gerontological care plans aimed at managing this syndrome.

Descriptors: Frail Elderly; Geriatric Nursing; Cognition.

Objetivo: investigar a associação entre a fragilidade física e o escore cognitivo de idosos de uma Universidade Aberta à Terceira Idade da região sul do país, Brasil. **Métodos:** estudo descritivo e transversal, amostra por conveniência constituído por 100 idosos, coleta de março a junho de 2013. Utilizou-se para avaliação da cognição o Mini Exame do Estado Mental e para a fragilidade a Escala de Edmonton. **Resultados:** houve predomínio do gênero feminino (93%), com média de idade de 65,6 anos. Foram classificados como não frágeis 81% dos participantes, aparentemente vulneráveis a fragilidade 16% dos idosos e fragilidade leve 3%. Houve associação significativa entre o desempenho cognitivo e fragilidade ($p < 0,006$). **Conclusão:** a investigação da associação entre fragilidade física e escore cognitivo em idosos subsidia a construção de planos de cuidados gerontológicos voltados a gestão da síndrome.

Descritores: Idoso Fragilizado; Enfermagem Geriátrica; Cognição.

Objetivo: investigar la asociación entre la fragilidad física y el puntaje cognitivo de ancianos de una Universidad Abierta a la Tercera Edad de la zona sur del país, Brasil. **Métodos:** estudio descriptivo y transversal, una muestra de conveniencia comprendían 100 ancianos, de marzo a junio de 2013. Fue utilizado para evaluación de la cognición el Mini Examen del Estado Mental y para la fragilidad, la Escala de Edmonton. **Resultados:** predominio del sexo femenino (93%), con edad media de 65,6 años. Fueron clasificados como no frágiles 81% de los participantes aparentemente vulnerables a la fragilidad 16% de los ancianos y fragilidad leve 3%. Hubo asociación significativa entre el rendimiento cognitivo y fragilidad ($p < 0,006$). **Conclusión:** la investigación de la asociación entre la fragilidad física y puntuaciones cognitivas en ancianos subvenciona la construcción de planes de cuidados gerontológicos destinados a la gestión del síndrome.

Descritores: Anciano Frágil; Enfermería Geriátrica; Cognición.

¹Universidade Estadual de Ponta Grossa. Ponta Grossa, PR, Brazil.

²Universidade Estadual de Londrina. Londrina, PR, Brazil.

Corresponding author: Clóris Regina Blanski Grden
Rua Teodoro Sampaio, 888. CEP: 84036-070. Ponta Grossa, PR, Brazil. E-mail: reginablanski@hotmail.com

Introduction

Population aging is a prominent worldwide phenomenon consisting of changes in the population age distribution, causing the relative increase of people over a certain age, setting the onset of old age⁽¹⁾. The Brazilian Institute of Geography and Statistics shows that, from 2001 to 2011, the absolute number of elderly aged 60 years or older went from 15.5 million to 24.85 million people in 2013⁽²⁾.

The aging process results in progressive decrease of the functional reserve of individuals, which associated with lifestyle indicates the occurrence of chronic diseases⁽³⁾ and other conditions that can lead someone to frailty.

There are two international research groups conceptualizing frailty and developing instruments for their implementation: one in the United States and another in Canada. For the first group, frailty can be defined biologically as a vulnerability clinical status to stress factors that reduces physiologic reserves, hence decreasing homeostasis efficiency⁽⁴⁾. Researchers from the Canadian Initiative on Frailty and Aging accept the American frailty phenotype model, however understand that in order to assess frailty, we must consider important elements such as cognition, mood, and social support⁽⁵⁾.

Researchers in this field unanimously describe the term physical frailty as the most appropriate to name the syndrome, which has multiple causes and associated factors, consisting of a decrease in strength, endurance, and physiological function, thus contributing to expand the individuals' vulnerability to dependence and/or death⁽⁶⁾.

Literature mentions several risk factors for frailty, such as female⁽⁷⁻⁸⁾, advanced age⁽⁹⁾, and changes in cognitive functions⁽¹⁰⁻¹¹⁾. As for the cognitive changes, a longitudinal study with 942 elderly in Mexico found that participants with low cognitive function, that is, with scores lower than 21 on the Mini Mental State Examination (MMSE) presented greater risk of becoming frail than the elderly with

high cognitive function (scores greater than or equal to 21)⁽¹²⁾.

It is worth mentioning that both the physical frailty and the cognitive changes may compromise the health of the elderly, predisposing to fall with consequent loss of functional capacity and autonomy, resulting in poorer quality of life. For this reason, early detection of the syndrome in this population is imperative, as well as the assessment of cognitive functions by the health team.

From this perspective, this study aimed to investigate the association between physical frailty and cognitive scores in older adults at an Open University of the Third Age in Southern Brazil.

Method

This is a descriptive epidemiological study of cross-sectional approach conducted at an Open University of the Third Age in Southern Brazil, from March to June 2013. The target population comprised 120 elderly. After applying the inclusion and exclusion criteria, the convenience sample consisted of 100 participants who were interviewed individually in a restricted area of the institution.

Participants selection occurred based on the following criteria: a) aged 60 years or older; b) literate and enrolled in the study institution; c) with scores above the cutoff line on the Mini Mental State Examination⁽¹³⁻¹⁴⁾.

As for the exclusion criteria: elderly with speech impairment that could compromise the participation and the quality of interviews, and those who after three attempts of contact did not agree to participate.

As an initial stage for data collection, we applied the Mini Mental State Examination⁽¹⁴⁾ for cognitive assessment, aimed at identifying the ability of the elderly to correctly answer a structured questionnaire. The instrument comprises seven categories, represented by groups of specific cognitive functions: temporal orientation, spatial orientation, registration, attention and calculation, recall, language, and visual

constructive capacity. The total score ranges from zero to thirty, using the following cutoff points for evaluation: for illiterate elderly, 13 points; for those with basic and average education, 18 points; and 26 points for high education⁽¹⁴⁾. Elderly who did not reach the abovementioned cutoff points did not participate in the study, however, it is worth highlighting that for this sample all the elderly obtained satisfactory score on the Mini Mental State Examination.

To evaluate frailty in older adults, we used the Edmonton Frail Scale (EFS)⁽⁵⁾. Considered a comprehensive scale, it contemplates and evaluates nine domains: cognition, general health status, functional independence, social support, medication use, nutrition, mood, continence, and functional performance, investigated through 11 items⁽¹⁵⁾. The instrument allows characterize the elderly in no frailty, apparently vulnerable to frailty, mild frailty, moderate frailty, and severe frailty. The maximum score is 17, representing the highest level of frailty. Frailty analysis scores are: 0-4, no frailty; 5-6, apparently vulnerable to frailty; 7-8, mild frailty; 9-10, moderate frailty; 11 or more, severe frailty⁽¹⁵⁾.

In order to classify and characterize the sample, we investigated the variables age, gender, marital status, education, income, financial situation, and health problems. Data were tabulated and stored in Excel® 2007 software, through double-check. To analyze the results, we used the Stata software version 12 and the statistical tests of Fisher and Bonfferoni for the association of dependent (frailty) and independent variables (socio-demographic data and cognition). Descriptive analyzes of the variables took place and the results were considered valid with a confidence interval of 95% ($p < 0.05$).

The Human Research Ethics Committee of Universidade Estadual de Ponta Grossa approved the study under protocol No. 208,338. The ethical principles of voluntary participation and informed consent of each subject were respected, in accordance with Resolution 466/2012 in force at the time of the research.

Results

One-hundred elderly participated in the study, including females (93%) and males (7%). The average age of participants was 65.63 years, with special reference for married (48%) and widowed (32%). As for education, most elderly had 11-15 years of study (43%). Regarding family income, (80%) seniors considered their income satisfactory and most received 1-4 minimum wages. Among the interviewees, (75%) reported having health problems (Table 1).

Table 1 - Frequency distribution of socio-demographic and clinical variables of elderly students at an Open University of the Third Age

| Variables | n(%) | p-value |
|--------------------------------------|-----------|---------|
| Age | | 0.069 |
| 60 - 65 | 59 (59.0) | |
| 66 - 70 | 26 (26.0) | |
| 71 - 75 | 10 (10.0) | |
| 76 - 80 | 3 (3.0) | |
| > 81 | 2 (2.0) | |
| Gender | | 0.527 |
| Female | 93 (93.0) | |
| Male | 7 (7.0) | |
| Marital status | | 0.004* |
| Married | 48 (48.0) | |
| Widowed | 32 (32.0) | |
| Single | 20 (20.0) | |
| Education (years) | | 0.083 |
| 0 - 5 | 14 (14.0) | |
| 6 - 10 | 26 (26.0) | |
| 11 - 15 | 43(43.0) | |
| 16 - 20 | 15 (15.0) | |
| 21 - 25 | 2 (2.0) | |
| Income | | 0.001* |
| Satisfactory | 80 (80.0) | |
| Average | 7 (7.0) | |
| Unsatisfactory | 13 (13.0) | |
| Financial situation (Minimum wage**) | | 0.385 |
| 1 - 2 | 39 (39.0) | |
| 2 - 4 | 39 (39.0) | |
| >4 | 21 (21.0) | |
| Did not answer | 1 (1.0) | |
| Health problems | | 0.004* |
| Yes | 75 (75.0) | |
| No | 25 (25.0) | |

*Significant result, Fisher's exact test ($p < 0.05$); **Minimum wage at the time of data collection approximately US\$295.00.

With regard to the frailty syndrome, it was observed that older adults were considered not frail (81%); were apparently vulnerable to frailty (16%); had mild frailty (3%); no elderly presented moderate or severe frailty (Table 2). As for the average score in the Mini Mental State Examination, non-frail elderly obtained 27.4 points, the apparently vulnerable to the syndrome presented 26.8 points, and those with mild frailty 22.3 points.

Table 2 - Distribution of individuals according to the score on the Edmonton Frail Scale

| Level of frailty measured with the EFS | n (%) | Average MMSE (\pm SD) |
|--|-----------|--------------------------|
| No frailty (0-4 points) | 81 (81.0) | 27.4 (\pm 2.1) |
| Apparently vulnerable (5-6 points) | 16 (16.0) | 26.8 (\pm 1.93) |
| Mild frailty (7-8) | 3 (3.0) | 22.3 (\pm 3.5) |

Caption: EFS=Edmonton Frail Scale; MMSE=Mini Mental State Examination; SD=Standard Deviation

There was a statistically significant association between cognitive scores and the frailty syndrome ($p < 0.006$), observed by the negative linear trend (R -squared=0.0754). Thus, the better the cognitive score the lower the frailty score, in other words, high score on the Mini Mental State Examination meant good cognitive performance, and low score in Edmonton Frail Scale represented less vulnerability to frailty.

Discussion

This research presented predominance of females and the age group 60-65 years. Similarly to the survey on frailty, cognition, and socio-demographic data conducted in seven Brazilian cities, in which 67.7% of the elderly population ($n=3478$) studied was female⁽⁷⁾.

It is worth mentioning that Open Universities of

the Third Age consist of 80% of women⁽¹⁶⁾, which can be understood by their greater participation in programs and social and leisure activities. Usually when young, women leave school in order to take care of children and home, or even due to financial difficulties. In this context, they can resume educational activities when the children leave home and have more time to devote to study.

There was no significant association between age and frailty, though it is possible to identify in national literature that age is a determining factor for the frailty syndrome in older adults^(10,17-18), especially those aged 80 years or older. From this perspective, presented findings can be explained by the age characteristic of the participants, in which the average age was 65.63 years, representing a population of young elderly that can be more active.

We observed significant association between widowhood and frailty. Results confirm the research developed in Spain with 640 elderly, aimed at assessing the prevalence of frailty and identify its associated factors in elderly living in the community⁽¹¹⁾ with special reference to widowhood associated with frailty.

In this study, the association between education and frailty was not statistically significant, a different result from the Brazilian study with 3,478 seniors aged 60 or older in the community⁽⁷⁾, reflecting the profile of elderly participants, members of an Open University of the Third Age, where the minimum criteria to be enrolled is being literate, and most individuals had 11-15 years of study. Results of several studies have shown the prevalence of basic and average education in older people vulnerable to frailty or frail, in which the majority of elderly Brazilians never attended school⁽¹⁸⁻²⁰⁾.

As regards the financial condition, the great majority of the elderly (80%) reported being satisfied with their family income and 39% of participants received 3-4 minimum wages. It is noteworthy that

deemed unsatisfactory family income may be a factor for frailty⁽⁴⁾ and is significantly associated with worse scores of global cognitive performance, temporal orientation, and registration⁽¹⁰⁾.

We verified the association between frailty and the variable health problems, a similar result to the study developed in Santa Cruz, Rio Grande do Norte, Brazil, which attempted to investigate the characteristics, prevalence, and associated factors related to frailty. The presence of comorbidities was observed as a factor associated with frailty ($p=0.035$)⁽²¹⁾. It is important noting that the presence of two or more comorbidities are relevant conditions for the occurrence of the syndrome in the elderly and may also increase the risk of negative health outcomes^(4,22).

As for the frailty levels, data that emerged from this research were different from a cross-sectional study with elderly in Ribeirão Preto, São Paulo, Brazil, which used the Edmonton Frail Scale and found 12% no frailty, 24% apparently vulnerable, and 64% frailty (mild, moderate, or severe)⁽²³⁾. The differences found in this study might be due to the characteristics of the group investigated, which shows high education level and a small sample size.

With relation to frailty and cognitive performance, the results revealed a significant association, as in the population-based cross-sectional research conducted in São Paulo with 384 elderly aged 65 or older living in the community⁽¹⁰⁾. Similarly, the longitudinal study conducted in Mexico with 1,994 participants aged 65 or older showed that non-frail elderly with cognitive impairment had higher chances of becoming frail compared to those without cognitive impairment⁽¹²⁾.

In the Brazilian context, cognitive impairment as negative impact factor in the health of older adults and its role in accelerating the frailty process^(7,24) is reported, thus demonstrating the relevance of early identification of cognitive decline and frailty syndrome

in elderly, so that health professionals can implement prevention and/or treatment strategies.

Conclusion

This research enabled to identify a significant association between frailty and cognitive scores in elderly participants of an Open University of the Third Age, with a predominance of non-frail and apparently vulnerable older adults. The results presented highlight the importance of cognitive and frailty assessment in elderly through validated instruments such as the Mini Mental State Examination and Edmonton Frail Scale. These instruments allow the early identification of factors that can trigger the syndrome, providing opportunities for nurses and health professionals to plan care and gerontological actions aimed at improving the quality of life and maintaining the functional capacity of the elderly.

As limitation for this research, we highlight the population size and the characteristics of the study group, who were literate, with eleven to fifteen years of study, and actively participated in various activities proposed by the institution. Likewise, the cross-sectional study design does not identify causal relationships. Nevertheless, conducting investigations that explore the frailty syndrome and its evaluation components are imperative for identifying the clinical conditions of older adults.

Studies that incorporate elderly participants assisted in different contexts, such as in an Open University of the Third Age, enable a broader assessment of this age group, also addressing the most healthy and educated individuals. We believe that constructing effective actions to maintain or restore the health of older adults is based, among other things, on the comprehensive investigation of these subjects inserted in various health care models.

Collaborations

Grden CRB and Barreto MFC contributed to the design, analysis, data interpretation, drafting of the article, and final approval of the version to be published. Sousa JAV, Chuertniek JA and Borges PKO contributed to the data collection, analysis, and interpretation, and drafting of the article.

References

1. Camarano AA, Kanso S. Texto para discussão nº 1426. Perspectivas de crescimento para a população brasileira: velhos e novos resultados. Rio de Janeiro: IPEA; 2009.
2. Instituto Brasileiro de Geografia e Estatística (IBGE). Síntese de indicadores sociais: uma análise das condições de vida da população brasileira. Rio de Janeiro: IBGE; [internet] 2013 [citado 2015 fev 13]. Disponível em: http://www.ibge.gov.br/home/estatistica/populacao/projecao_da_populacao/2013/default.shtm.
3. Tier CG, Santos SSC, Poll MA, Hilger RM. Health and social conditions of elderly accompanied by primary attention in Sobral - CE. *Rev Rene*. 2014; 15(4):668-75.
4. Fried LP, Tangen CM, Walston J, Newman AB, Hirsch C, Gottdiener J, et al. Frailty in older adults: evidence for a phenotype. *J Gerontol Med Sci*. 2001; 56(3):146-56.
5. Rolfson DB, Majumdar SR, Tsuyuki RT, Tahir A, Rockwood K. Validity and reliability of the Edmonton Frail Scale. *Age Ageing*. 2006; 35(5):526-9.
6. Morley JE, Vellas B, Kan GAV, Anker SD, Bauer JM, Bernabei R, et al. Frailty consensus: a call to action. *J Am Med Dir Assoc*. 2013; 14(6):392-7.
7. Neri AL, Yassuda MA, Araújo LF, Eulálio MC, Cabral BE, Siqueira MEC, et al. Methodology and social, demographic, cognitive, and frailty profiles of community-dwelling elderly from seven Brazilian cities: the FIBRA Study. *Cad Saúde Pública*. 2013; 29(4):778-92.
8. Castell MV, Sánchez M, Julián R, Queipo R, Martín S, Otero A. Frailty prevalence and slow walking speed in persons age 65 and older: implications for primary care. *BMC Fam Pract*. 2013; 14(86):1-9.
9. Carstensen LL, Fried LP. The meaning of old age. In: Beard J, Biggs S, Bloom DE, Fried LP, Hogan P, Kalache A, et al. *Global population ageing: peril or promise?* Geneva: World Economic Forum; 2012. p.15-7.
10. Macuco CRM, Batistoni SST, Lopes A, Cachioni M, Falcão DVS, Neri AL, et al. Mini-Mental State examination performance in frail, pre-frail and non-frail community dwelling older adults in Ermelino Matarazzo, São Paulo, Brazil. *Int Psychogeriatr*. 2012; 24(11):1725-31.
11. Jürschik P, Nunin C, Botigué T, Escobar MA, Lavedán A, Viladrosa M. Prevalence of frailty and factors associated with frailty in the elderly population of Lleida, Spain: the FRALLE survey. *Arch Geront Geriatr*. 2012; 55(3):625-31.
12. Raji MA, Snih SA, Ostir GV, Markides KS, Ottenbacher KJ. Cognitive status and future risk of frailty in older mexican americans. *J Gerontol A Biol Sci Med Sci*. 2010; 65(11):1228-34.
13. Folstein MF, Folstein SE, McHugh PR. "Mini-mental state": a practical method for grading the cognitive state of patients for the clinician. *J Psychiatr Res*. 1975; 12(3):189-98.
14. Bertolucci PH, Brucki SM, Campacci SR, Juliano Y. The Mini-mental state examination in a general population: impact of educational status. *Arq Neuropsiquiatr*. 1994; 52(1):1-7.
15. Fabrício-Wehbe SCC, Schiaveto FV, Vendrusculo TRP, Haas VJ, Dantas RAS, Rodrigues RAP. Cross-cultural adaptation and validity of the "edmonton frail scale - EFS" in a brazilian elderly sample. *Rev Latino-Am Enfermagem*. 2009; 17(6):1043-9.
16. Oliveira PH, Mattos IE. Prevalência e fatores associados à incapacidade funcional em idosos institucionalizados no Município de Cuiabá, Estado de Mato Grosso, Brasil, 2009-2010. *Epidemiol Serv Saúde*. 2012; 21(3):395-406.

17. Fabrício-Wehbe SCC, Cruz IR, Haas VJ, Diniz MA, Dantas RAS, Rodrigues RAP. Reproducibility of the Brazilian version of the Edmonton Frail Scale for elderly living in the community. *Rev Latino-Am Enfermagem*. 2013; 21(6):1330-6.
18. Storti LB, Fabrício-Wehbe SCC, Kusumota L, Rodrigues RAP, Marques S. Fragilidade de idosos internados na clínica médica da unidade de emergência de um hospital geral terciário. *Texto Contexto Enferm*. 2013; 22(2):452-9.
19. Vieira RA, Guerra RO, Giacomini KC, Vasconcelos KSS, Andrade ACS, Pereira LSM. Prevalence of frailty and associated factors in community-dwelling elderly in Belo Horizonte, Minas Gerais State, Brazil: data from the FIBRA study. *Cad Saúde Pública*. 2013; 29(8):1631-43.
20. Fhon JRS, Rosset I, Freitas CP, Silva AO, Santos JLF, Rodrigues RAP. Prevalence of falls among frail elderly adults. *Rev Saúde Pública*. 2013; 47(2):266-73.
21. Sousa AC, Dias RC, Maciel AC, Guerra RO. Frailty syndrome and associated factors in community-dwelling elderly in Northeast Brazil. *Arch Gerontol Geriatr*. 2012; 54(2):95-101.
22. Mello AC, Engstrom EM, Alves LC. Health-related and socio-demographic factors associated with frailty in the elderly: a systematic literature review. *Cad Saúde Pública*. 2014; 30(6):1-25.
23. Leonardo KC, Talmelli LFS, Diniz MA, Fhon JRS, Fabrício-Wehbe SCC, Rodrigues RAP. Avaliação do estado cognitivo e fragilidade em idosos mais velhos, residentes no domicílio. *Cienc Cuid Saude*. 2014; 13(1):120-7.
24. Alencar MA, Dias JMD, Figueiredo LC, Dias RC. Frailty and cognitive impairment among community-dwelling elderly. *Arq Neuropsiquiatr*. 2013; 71(6):362-7.