Factors associated with above-average cognitive performance in long-lived older adults

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Abstract

Objective
To investigate the factors associated with performance equal to or higher than the 95th percentile in the Mini Mental State Examination of elderly people aged 80 years and over.

Method
This is a cross-sectional, descriptive, and quantitative research conducted with a convenience sample composed of 101 cognitively healthy older adults residing in Brazil's Federal District, assessed by scales that measure mood, social support, functional performance, and health.

Results
Bivariate statistical analyses indicated that older individuals with better cognitive performance in the Mini Mental State Examination, when compared to participants with performance below the 95th percentile, showed better self-perceived health, greater satisfaction with the ability to perform daily tasks, and a more positive evaluation of general social support and in the domain of having someone to talk to when feeling lonely.

Conclusion
High global cognitive performance in old age is associated with perceived health, satisfaction with functional performance, and social support.

Keywords: Aging; Cognition; Health of the elderly.

The increase in the elderly population, especially the number of individuals over the age of 80, is a growing reality in Brazil (Andrade et al., 2018; Knappe, 2016; Rocha et al., 2017). Due to this phenomenon, the successful aging of this population has been the focus of scholars, researchers, and policymakers, with the aim of ensuring that advanced old age is a stage lived with well-being and quality of life (Aita et al., 2021; Neri et al., 2019). In the literature, theoretical models of successful aging among long-lived elderly individuals focus on biomedical and/or psychosocial aspects, encompassing components such as better functional performance, engagement with life, having satisfactory living conditions, and utilizing compensatory mechanisms to regulate losses (Chen et al., 2020; Nosraty et al., 2019).

Cognition constitutes one of the measures associated with successful aging in long-lived older adults and is related to cognitive and brain reserve, a healthy lifestyle, and good physical and mental health. The term "above-average cognitive performance" encompasses the development and preservation of multiple cognitive abilities, as well as the absence of cognitive impairment in older individuals (Yu et al., 2019).

In this context, some studies document that certain groups of individuals above the age of 80 exhibit superior mnemonic and overall cognitive performance abilities when compared to cognitively healthy older individuals matched by age or level of education or to younger older adults (Bucci et al., 2016; Lin et al., 2017; Yu et al., 2019). Some of these older individuals achieve high mnemonic performance that surpasses normative values and those expected for adults who are at least two to three decades younger (Gefen et al., 2014).

Among the factors that moderate or explain the performance differences in this group, elevated social participation, strong social support, better physical health, and adoption of a healthy lifestyle are highlighted (Cho et al., 2015; Holstege et al., 2018; Tindale et al., 2019). Social participation refers to the level of engagement in activities involving social interactions, whether in formal or informal groups, or within the context of Advanced Activities of Daily Living (AADL). The AADL constitute a set of social, productive, and leisure activities performed by older adults that are influenced by personal motivation and sociocultural factors. In gerontological literature, engaging in these activities is related to personal development, integration, social skills, as well as factors such as living arrangements, sex, depressive symptoms, and better global cognitive performance (Dias et al., 2015).

Social support, in turn, encompasses elements of interpersonal relationships and has been used in the literature as a model to assess the level of social integration, isolation, or received assistance. The evaluation of social support encompasses assistance offered or received in emotional, material or financial, and instrumental dimensions. The protective nature of social support will vary depending on the context, relationships, and qualitative aspects in which they develop. In advanced old age, it has been highlighted as an important resource for managing day-to-day difficulties and coping with stressors.

In a systematic review of 22 studies, of which 19 involved elderly populations, positive associations between greater availability of social support and better cognitive performance were found in 17 of them. Among the components of social support, the emotional and instrumental domains were the ones most strongly associated with cognitive functions, which varied according to other components such as gender and functional status (Costa-Cordella et al., 2021).

In studies involving long-lived elderly individuals, such as that conducted by Cho et al. (2015), which analyzed data from 234 centenarians and 72 octogenarians from the United States, it was observed that higher levels of cognitive functioning were associated with more social

resources (engagement and social interaction) and fewer impairments in physical health (subjective perception of health and number of sensory limitations and chronic diseases). Conversely, lower levels of impairment in physical health and more social resources were linked to a higher prevalence of positive affect. Therefore, it is evident that proximal variables such as social resources play a crucial role in the well-being of long-lived elderly individuals, and maintaining healthy cognition is important for this group because this factor is related to physical health, social engagement, and consequently, positive affect.

Holstege et al. (2018), when investigating 300 cognitively healthy Dutch centenarians, observed that this population was characterized by independent elderly individuals with good sensory functioning, high levels of education, socioeconomic status, and a higher number of children. Mortality was associated with global cognitive functioning, such that centenarians scoring 26 or higher on the Mini Mental State Examination (MMSE) at baseline exhibited a mortality rate of 17% per year over a two-year period. Conversely, those scoring below 26 points showed a mortality rate of 42% per year. The MMSE is frequently employed due to its status as a globally recognized instrument for cognitive screening used in epidemiological studies to estimate changes in overall cognitive performance (Melo & Altemir, 2015).

After a two-year follow-up, Beker et al. (2020) reevaluated 79 surviving centenarians from the Holstege et al. (2018) study. The authors noted greater survival rates among centenarians scoring 26 to 30 points on the MMSE at the initial assessment. The estimated maximum survival rate in this group reached 82% per year (95% CI, 77% to 87%). Within this group, 73% of the participants did not exhibit substantial cognitive changes, indicating the maintenance of overall cognitive performance. It is estimated that this group represents less than 10% of Dutch centenarians, and documenting the profile of this population could provide insight for the design of cognitive health programs and the prevention of cognitive decline in advanced old age.

However, it is worth noting that sociodemographic factors can also play a role on the cognitive capacity of long-lived older adults. Variables such as age and education are predominant factors capable of influencing cognitive performance. It is considered that individuals with lower levels of education and advanced age tend to obtain lower scores in cognitive assessments (Scherrer Júnior et al., 2019).

Although a significant portion of the literature on this topic emphasizes the importance of components related to health, lifestyle, and social participation in the cognition of long-lived older adults, Brazilian studies focusing on this population are scarce and can contribute to understanding the role of objective and subjective components, as well as those associated with lifestyle and health. In this context, the present study investigated whether the high cognitive performance of long-lived older adults is associated with sociodemographic variables, mood, social support, functional performance, engagement in social and leisure activities, and perceived health.

Method

This is a cross-sectional, descriptive, and quantitative study. It was conducted in Brasília, which has 31 administrative regions, including the Administrative Region of Águas Claras, where the campus of the *Universidade Católica de Brasília* (Catholic University of Brasília) is located. Within the University, the research was carried out in two locations: at the university hospital for clinical, cognitive, and self-reported health assessment, and at the Physical Assessment and Training Laboratory for functional and physical evaluation.

Participants

The study sample was obtained by convenience and recruited at the Geriatrics and Internal Medicine Outpatient Clinic of the *Hospital Universitário da Universidade Católica de Brasília* (University Hospital) between the years 2016 and 2018.

The inclusion criteria were being aged 80 years or older, residing in the Federal District or its surroundings, consenting to participate in the study, and being available to undergo social, physical, and laboratory evaluations.

The exclusion criteria for this study were being bedridden, having severe hearing loss, having uncontrolled psychiatric morbidities, advanced stage of dementia syndrome, presence of cognitive decline in MMSE (Brucki et al., 2003): scores lower than 17 points for illiterate individuals, 22 points for individuals with 1 to 4 years of schooling, 24 points for those with 5 to 8 years of schooling, and 26 points for individuals with 9 years or more of schooling (criteria from the FIBRA Study, Neri & Vieira, 2013). Out of the 208 evaluated older adults, 107 were excluded for having performance below the cutoff scores on the MMSE and/or meeting other exclusion criteria. Thus, the final sample consisted of 101 long-lived older adults.

Instruments

The following instruments were used:

Sociodemographic questionnaire: with information on age - quantified in years; sex - male or female; marital status - single, widowed, married, or divorced; family income - quantified by the sum of the family's earnings per month.

Mini Mental State Examination (MMSE): a cognitive screening instrument composed of 30 questions that assess orientation in time and space, episodic memory, immediate repetition, praxis, visuospatial functions, and language (Brucki et al., 2003; Folstein et al., 1975). To classify the elderly with above-average scores on the MMSE, a score equal to or greater than the 95th percentile was chosen for each level of education (illiterate and 1 to 4 years of education, 28 points or more; 5 to 7 years of education, 29 points or more; 8 years or more of education, 30 points).

Index of Independence in Activities of Daily Living (ADL): measured using the self-care scale proposed by Katz et al. (1963). The absence or presence of difficulties in ADLs was investigated, such as: toileting, feeding, moving, transferring, bathing, and personal hygiene. Participants with limitations in any activity were classified as "with limitations in ADLs", and those without limitations were classified as "independent in ADL".

Instrumental Activities of Daily Living (IADL) Inventory: measured using the scale proposed by Lawton and Brody (1969). The instrument assesses the presence or absence of difficulties in tasks that involve maintaining an independent life, such as: cooking, transportation, administrating finances, housekeeping, taking medications, using the telephone, and shopping. Participants with limitations in any activity were classified as "with limitations in IADL", and those without limitations were classified as "independent in IADL".

Advanced Activities of Daily Living (AADL) Inventory: proposed by Reuben et al. (1990), includes the frequency of performing the following activities: caring for or assisting others, performing household tasks, managing one's own business and finances, staying in touch with others through letters, phone calls, and/or emails, visiting friends and family at their homes or inviting

others to one's own home for meals or recreational activities, and participating in social gatherings or senior groups. Based on the responses provided, participants were classified as "performs" or "does not perform".

Questionnaire on self-reported chronic diseases: including heart diseases, hypertension, stroke, cancer, rheumatoid arthritis, lung diseases, depression, and osteoporosis. Participants were divided into three categories: no diseases; one or two diseases, and three or more diseases.

Self-perceived health questionnaire, using three of the five items proposed by Neri et al. (2019) regarding the elderly person's assessment of: (1) their overall health; (2) their health compared to the previous year; (3) their level of activity compared to the previous year. For each item, the elderly participants responded using a Likert scale. In the first question, five response options were provided, namely: "1 = Very poor"; "2 = Poor"; "3 = Regular"; "4 = Good"; and "5 = Very good". Participants were categorized into two groups: "Very poor, poor, and regular" and "Good and very good". For the remaining questions, three response possibilities were presented: "1 = Worse", "2 = Same", and "3 = Better".

Geriatric Depression Scale (GDS): 15-item version, with scores ranging from 0 to 15 points. It was adapted for the Brazilian population by Almeida and Almeida (1999), basing it on the original scale created by Yesavage et al. (1982), consisting of 30 items. The objective of the GDS is to detect the presence of symptoms suggestive of depression in the elderly, with a cutoff point above 6 points. In the present study, participants were classified with scores > 6 points and < 6 points.

Interpersonal Support Evaluation List (ISEL): designed to assess perceived social support through five scalar questions that measure the availability of socioemotional, instrumental, informative, and affective support (Cohen et al., 1985; Neri & Vieira, 2013). Response options were encoded on a 1-4 Likert scale, respectively indicating "definitely false", "probably false", "probably true", and "definitely true". For this study, the score of each item was analyzed.

Satisfaction With Life Scale: proposed by Neri (2002), with questions on overall satisfaction with life, satisfaction compared to others of the same age, and six items pertaing to satisfaction related to the domains of memory, functional capacity and problem-solving, friendships and family relationships, environment, access to health services, and means of transportation. Each question had response options of "A Little" (value of 1), "Somewhat" (value of 2), or "Very Much" (value of 3). In this study, each item was investigated separately, and responses were categorized as "A Little and Somewhat" and "Very Much".

Procedures

Data collection occurred in three stages. In the first stage, the elderly person along with their companion were informed about the research objectives during their medical appointment at the outpatient clinic. Both the elderly person and the companion were informed about the voluntary nature of participation, their ability to withdraw from the study at any time and without any cost, the safety and complete confidentiality of the provided data, and the need to sign the Informed Consent Form (ICF). In the second stage, the elderly person who agreed to participate in the research, after signing the ICF, was directed to a room where, alongside the interviewer (a healthcare professional trained for instrument application), underwent the first stage of data collection, involving cognitive screening and the administration of the sociodemographic questionnaire. In the third and final stage, the elderly person was referred to a medical consultation with the geriatrician for clinical

and health assessment, and then underwent functional, mood, social support, and life satisfaction assessments with the study researchers. All responses were electronically recorded in a Google form and later submitted to the study's database spreadsheet.

Data Analysis

The data were quantitatively analyzed using the IBM®SPSS® software, version 20.0. Mean comparisons between groups were performed using non-parametric tests such as the Mann-Whitney test for discrete and continuous quantitative variables, and Chi-square or Fisher's exact test for categorical quantitative variables. Non-parametric tests were chosen due to the lack of normal distribution in discrete and continuous variables. Additionally, the effect size value was calculated for statistically significant associations in group comparison tests. The Rank Biserial Correlation (r_{rb}) was used as a measure of effect size. The significance level for analyses was set at $p < 0.05$.

The project was approved by the Research Ethics Committee of the *Universidade Católica de Brasília*, under opinion number 1.290.368, and Certificate of Presentation for Ethical Appreciation, CAAE: 50075215.2.0000.0029, complying with the requirements of Resolution nº 466/2012 of the Brazilian National Health Council, which establishes the norms and regulatory guidelines for research involving human subjects.

Results

The investigated sample had a mean age of 84.2 years (SD = + 4.61 years), a mean of 4.3 years of education (SD = + 4.77), and most participants were widowed (47.7%) or single (34.7%). Most participants reported a mean monthly family income equal to or higher than three minimum wages (49.1%) or between two to three monthly minimum wages (39.6%). Among the 101 long-lived elderly participants, 90 (M = 83.2 years of age; SD = + 3.93) scored below the 95th percentile on the MMSE, while 11 (M = 81.4 years of age; SD = + 3.96) scored equal to or above.

As presented in Table 1, participants scoring equal to or above the 95th percentile achieved 28 points in the "illiterate" education level category (n = 2) and "1 to 4 years of education" category (n = 3); 29 points or more in the "5 to 7 years of education" category (n = 3); and 30 points in the "8 years or more of education" category (n = 3). Stratification of the groups according to education level was chosen to reduce the bias of education on overall cognitive performance.

Analyses indicated that participants with cognitive performance equal to or above the 95th percentile provided similar responses to those of other long-lived participants regarding sociodemographic conditions (Table 1), functional performance, mood, and chronic diseases (Table 2), as well as the profile of participation in AADL (Table 3).

Table 1
Characterization of the cognitive performance profile of the long-lived elderly according to educational level

Level of Education	N	M	Mdn	SD	25th Percentile	50th Percentile	75th Percentile	95th Percentile
Illiterate	26	21.27	21.00	3.29	19.0	21.0	23.25	28
1 to 4	18	24.89	24.50	1.93	23.0	24.0	26.00	28
5 to 7	34	25.59	25.00	2.01	24.0	25.0	27.00	29
8 or more	23	26.96	27.00	1.89	26.0	27.0	29.00	30

Note: Mdn: Median; N: Number.

Table 2
Sociodemographic characterization of the long-lived elderly according to cognitive performance below or above the 95th percentile in the Mini Mental State Examination

Sociodemographic variables	Performance below the 95th percentile on the MMSE = 90	Performance equal to or above the 95th percentile on the MMSE = 11	*p*-value
	%		
Age range			*p* = 0.485
80 to 84 years	66.7	81.8	
85 or more	33.3	18.2	
Sex			*p* = 1.000
Male	40.0	36.4	
Female	60.0	63.6	
Marital status			*p* = 0.725
Single	40.0	54.5	
Married	10.0	0.0	
Divorced	7.8	0.0	
Widowed	42.2	45.5	
Income range			*p* = 0.067
1 MW	11.1	36.4	
2 MW	41.1	18.2	
3 MW or more	47.8	45.5	

Note: PROCAD Study of Long-Lived Elderly in the Federal District in 2018. Fisher's Exact test, *p* < 0.05; MW: Minimum Wage Salary.

Table 3
Health Conditions of Long-Lived Elderly According to Cognitive Performance Below or Above the 95th Percentile in the Mini Mental State Examination

Health condition variables	Performance below the 95th percentile on the MMSE = 90	Performance equal to or above the 95th percentile on the MMSE = 11	*p*-value
	%		
Activities of Daily Living			*p* = 0.206
Independent	79.8	100	
Difficulty in 1 or more	20.2	0.0	
Instrumental Activities of Daily Living			*p* = 0.196
Independent	40.0	63.9	
Difficulty in 1 or more	60.0	36.4	
Non-communicable chronic diseases			
Heart diseases (% Yes)	13.4	14.3	*p* = 0.989
Hypertension	87.8	87.8	*p* = 0.975
Stroke/ischemia	7.9	0.0	*p* = 0.963
Diabetes	29.6	37.5	*p* = 0.693
Cancer	18.8	0.0	*p* = 0.593
Arthritis/rheumatism	32.2	0.0	*p* = 0.098
Lung diseases	12.5	14.3	*p* = 0.989
Depression	17.5	25.0	*p* = 0.633
Osteoporosis	38.1	42.9	*p* = 0.925
Number of diseases			*p* = 0.990
None	0.0	3.7	
One or two	62.5	54.9	
Three or more	37.5	41.5	
Self-rated health			*p* = 0.009
Very poor, poor, or regular	61.1	18.2	
Good and very good	38.9	81.8	
Health compared to the previous year			*p* = 0.923
Worse	37.8	36.4	
Same	37.8	45.5	
Better	24.4	18.2	
Activity compared to the previous year			*p* = 0.081
Worse	47.8	18.2	
Same	43.3	81.8	
Better	8.9	0.0	
Geriatric depression scale			*p* = 0.989
≥ 6 points	21.3	14.3	
< 6 points	78.7	85.7	

Note: PROCAD Study of Long-Lived Elderly in the Federal District in 2018. Fisher's Exact test, *p* < 0.05.

Regarding functional performance and chronic diseases, the prevalence of depressive symptoms above the GDS cutoff point was 21.3% in the group below the 95th percentile on the MMSE and 14.3% in the group with performance equal to or above the 95th percentile. In the group with better performance, there was a lower prevalence of limitations in ADL and IADL, a lower prevalence of worsening of the level of activity compared to the previous year, and a lower prevalence of worsening health compared to the previous year. However, none of these differences were statistically significant. Associations were observed between better cognitive performance and positive self-rated health, indicating that the group with better cognitive performance in advanced old age had a more positive self-rated health (Table 2).

Regarding the AADL, the group with better cognitive performance showed higher engagement in most activities. However, the differences between groups were not statistically significant (Table 4). Regarding perceived social support (Table 5), the group with performance equal to or above the 95th percentile in the MMSE had higher means compared to the group with performance below the 95th percentile. However, statistically significant associations were only observed between cognitive performance, total ISEL score (p = 0.031; Rank Biserial Correlation (rrb) – rrb = 0.416), and the domain "Having someone to talk to when feeling lonely" (p = 0.037; rrb = 0.468), indicating that the group with better overall cognitive performance had a more positive assessment of the availability of their social network. In both associations, the effect size (rrb) ranged from 0.41 to 0.46, which is considered modest.

Regarding satisfaction with life, according to the descriptive analysis, it was observed that long-lived older adults with better cognitive performance had a higher prevalence of "very satisfied" responses for most domains of the scale, except for satisfaction regarding health services and available transportation. By employing inferential statistical analysis, it was noted that only satisfaction with the ability to perform daily tasks differed between the groups (p = 0.045; rrb = 0.395), indicating that the group with better performance had a higher prevalence of participants who reported being "very satisfied" in this domain (Table 5). The effect size for this association was also modest, approaching 0.4.

Table 4
Prevalence of engagement in Advanced Activities of Daily Living among long-lived elderly individuals according to cognitive performance below or above the 95th percentile in the Mini Mental State Examination

Variables	Performance below the 95th percentile on the MMSE = 90	Performance equal to or above the 95th percentile on the MMSE = 11	*p*-value
	%		
Visiting other people's homes	70.8	90.9	*p* = 0.183
Receiving guests	89.9	100	*p* = 0.592
Going to church or religious temple	70.8	90.9	*p* = 0.280
Participating in social gatherings	57.3	81.8	*p* = 0.192
Driving a car	19.1	18.2	*p* = 1.000
Taking day trips away	62.9	81.9	*p* = 0.320
Taking long trips	59.6	72.7	*p* = 0.521
Volunteer work	21.3	18.2	*p* = 0.989
Paid work	11.2	9.1	*p* = 0.997
Participating in boards and councils	3.4	0.0	*p* = 0.985
Universities Open to Older Adults and continuing education	3.4	0.0	*p* = 0.998
Community centers and groups for the elderly	3.4	0.0	*p* = 0.978

Note: PROCAD Study of Long-Lived Elderly in the Federal District in 2018. Fisher's Exact test, *p* < 0.05.

Table 5
Perceived social support and satisfaction with life among long-lived elderly individuals according to cognitive performance below or above the 95th percentile on the Mini Mental State Examination

Social support variables	Performance below the 95th percentile on the MMSE = 90		Performance equal to or above the 95th percentile on the MMSE = 11		p-value
	M	SD	M	SD	
Perceived social support					
Having someone to talk to when feeling lonely	3.25	+ 0.99	4.00	+ 0.00	p = 0.037
Meets with and talks to friends and family	3.65	+ 0.91	4.00	+ 0.00	p = 0.145
Finds people that can help with daily activities when sick	3.42	+ 0.91	4.00	+ 0.00	p = 0.071
Has someone to rely on when in need of suggestions on how to handle a problem	3.41	+ 1.10	4.00	+ 0.00	p = 0.138
Has someone who's opinion they completely trust	3.45	+ 1.02	3.86	+ 0.38	p = 0.424
Total Perceived social support	13.43	+ 3.41	15.86	+ 0.38	p = 0.030
Satisfaction with life Variables	Performance below the 95th percentile on the MMSE = 90		Performance equal to or above the 95th percentile on the MMSE = 11		p-value
	%				
Satisfaction with life					
Satisfaction with life today	59.2		85.2		p = 0.240
Satisfaction with life compared to other people of the same age	73.3		100		p = 0.187
Satisfaction with memory	53.9		71.4		p = 0.453
Satisfaction with abilities to carry out daily activities	60.5		100		p = 0.045
Satisfaction with friendships and family relationships	78.7		100		p = 0.336
Satisfaction with the environment you live in	51.3		71.4		p = 0.439
Satisfaction with access to healthcare services	60.5		28.6		p = 0.126
Satisfaction with transportation at your disposal	68.0		28.6		p = 0.091

Note: PROCAD Study of Long-Lived Elderly in the Federal District in 2018. Fisher's Exact test, $p < 0.05$.

Discussion

Crossing the 80-year marker with high cognitive performance can be one of the goals for achieving successful old age (Ribeiro et al., 2022). In Brazil, the 80+ group (80 years and older) is the fastest-growing population, and data about this group are still scarce and demands the development of more research (Neri et al., 2019). The results of the present study indicated that participants with performance equal to or above the 95th percentile in the MMSE showed better self-rated health, higher satisfaction with the ability to solve daily tasks, and greater overall social support, particularly in the domain of "Having someone to talk to when feeling lonely".

Regarding self-rated health, studies in Gerontology emphasize this variable as an important predictor of objective health conditions, measured through indicators of physical and cognitive health, as well as functional performance (Belém et al., 2016; Figueiredo et al., 2019; Torquato et al., 2014).

In the context of advanced old age, self-perception is part of the discussions about the paradox of well-being, where, despite functional decline in activities of daily living, long-lived older adults would increase their subjective well-being and satisfaction with their own functioning pattern as a strategy to compensate for and cope with losses suffered throughout their life (Hansen & Blekesaune, 2022; Santana & Lima, 2015).

It is believed that positive findings regarding self-rated health can be supported by the capacity for cognitive-emotional self-regulation, which consequently facilitates adherence to health treatments and lifestyle changes, including physical exercise and healthy eating (Santana & Lima, 2015). Moreover, self-rated health can be influenced by processes of social comparison based on the performance standard of older adults in the same age group (Belém et al., 2016).

Together, these processes may partially explain why older adults with better cognitive performance better evaluate their health status and individual functioning patterns in daily tasks, even in the absence of statistically significant differences in the number of chronic diseases and in the performance of activities of daily living (ADL, IADL, and AADL) between the two groups of older people. However, as discussed by Hansen and Blekesaune (2022), the limits of the well-being paradox in advanced old age are marked by increased social threats, health-related challenges, and restrictions imposed on physical functioning, factors that should be further investigated in long-lived older individuals.

Previous studies have observed associations between better performance in IADLs in older adults with above-average cognitive function (Silva et al., 2014), while others found associations between AADLs and a lower prevalence of cognitive decline in a cohort of older adults from the SABE study in São Paulo (Dias et al., 2015). As these are long-lived older adults without cognitive decline, it is possible that the presence of functional limitations may be influenced by components of motor performance or factors related to instrumental support for carrying out these activities. In this study, the prevalence of difficulty in one or more IADLs was 36.4% in the group with performance equal to or above the 95th percentile in the MMSE and 60.0% in the group with performance below the 95th percentile, indicating that this population has more limitations in maintaining an independent life compared to younger elderly individuals or the 50+ population (Oliveira et al., 2020). However, more in-depth analyses are necessary, as the pattern of engagement in social activities in advanced old age seems to be associated with motivational variables and those more oriented towards face-to-face interactions (Batistoni et al., 2015).

Regarding chronic diseases, there was a high prevalence of diseases in the participants, and subsequent analyses may need to adjust based on medications and time of diagnosis. According to the findings of Ioakeim-Skoufa et al. (2022), there is a possible selectivity effect concerning chronic diseases in the very old elderly group, especially in comparisons between centenarians and elderly people aged 80 to 99, indicating that the oldest group seemed to have fewer diseases. Furthermore, the authors observed profiles of morbidity, including cardiovascular and metabolic diseases, obstructive pulmonary conditions, and neoplasms. It was observed that one-third of octogenarian women had a metabolic pattern (diabetes, dyslipidemia, and other endocrine-metabolic disorders), with a higher number of diseases (up to seven concurrent diseases) and a prevalence of polypharmacy (half of the group). Therefore, the authors draw attention to the need to investigate, beyond the selectivity effect present in advanced old age, different disease profiles, drug intake, and health. In this study, it was not possible to examine these components.

Another issue concerns the activity profile, frequency of exposure, and which domains impact global cognition and different cognitive domains. There might be a connection between the type of activity and its relationship with one or more cognitive domains (Wang et al., 2013). In this study, although older adults with better performance had a higher prevalence of engagement in AADL, no statistical differences were observed between groups, which could be related to the reduced statistical power of the analyses. However, participants expressed greater satisfaction regarding engagement profile in activities.

The associations between social support and better cognitive performance have been extensively documented in the literature (Coelho & Michel, 2018; Kuiper et al., 2016; Wang et al., 2013). Social support would act as a moderator of well-being and cognitive vitality, involving components such as social interactions and emotional support and the complexities surrounding the relationships between giving and receiving social support. The data from this study, while

showing modest effect sizes, are consistent with the studies of Litwin and Stoeckel (2016), Kelly et al. (2017), and Holstege et al. (2018). In Cho et al.'s study (2015), social support and social interaction were considered proximal variables to cognitive functioning and physical health. Although it was not possible to conduct multiple models and path analysis due to statistical reasons and lack of conceptual models based on the Brazilian long-lived population, it is suggested that the associations between perceived social support and better global cognitive performance are controlled by depressive symptoms, health, and functionality.

In summary, the group of elderly individuals investigated in this research consists of cognitively healthy older adults, whose profile, living conditions, and health deserve further investigation. However, the presented analyses need to be approached with caution. This study is cross-sectional and based on a small sample size of participants. Therefore, the findings do not allow for establishing cause-and-effect relationships between variables. Additionally, there was a modest effect size of the associations found, along with a potential bias of underestimating differences between groups, associated with the use of non-parametric tests and reduced statistical power. For these reasons, the presented data are exploratory, restricted to a sample evaluated in an outpatient context, and cannot be generalized to the context of the Brazilian long-lived population.

Furthermore, the MMSE was used as a parameter for classifying cognitive performance. Although it is a globally recognized instrument, it might not have accurately captured the cognitive domains that would more precisely classify elderly individuals with better cognitive performance (Melo & Altemir, 2015). Nevertheless, despite these limitations, the presented results indicate some variables that warrant further study among octogenarians and nonagenarians with better cognitive performance when examining components such as mood, social support, functional performance, and health.

This becomes particularly important when designing policies for the promotion and prevention of cognitive health, as well as for the planning of actions that can enhance satisfactory living conditions in advanced old age. In this context, the development of more studies with Brazilian long-lived individuals is necessary to verify whether the same variables observed are associated with better cognitive performance in this age group.

Conclusion

In the present study, high global cognitive performance in advanced old age was associated with perceived health, satisfaction with functional performance, and subjective assessment of social support.

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Contributors

C. A. PEREIRA and H. S. SILVA participated in all stages of the study: conception and design, data analysis and interpretation, and review and approval of the final version of the article. E. R. FREITAS, I. P. F. S. CHARIGLIONE, L. GOMES, C. F. MORAES, and V. P. ALVES participated in the review and final approval of the article.