Prevalence and factors associated with low functionality in elderly*

Prevalencia y factores asociados a baja funcionalidad en anciano

Prevalência e fatores associados à baixa funcionalidade em idosos

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Abstract

This cross-sectional, exploratory study aimed to estimate the prevalence of low functionality and identify associated factors in community-dwelling older adults aged $\geq$ 60 years in southwestern Bahia, Brazil, using a sample of 218 participants. Associations between low functionality and independent variables were examined through crude analyses; variables with $p \leq 0.20$ were retained for the adjusted model. Adjusted analyses were conducted using Poisson regression with robust variance to estimate prevalence ratios (PR) and 95 % confidence intervals (95 % CI). The prevalence of low functionality was 39 % (n = 85).

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Hospitalization (PR = 0.65; 95 % CI = 0.47 – 0.89; $p < 0.001$), basic activities of daily living (BADL) (PR = 0.55; 95 % CI = 0.41 – 0.74; $p < 0.001$) and cognitive status assessed through the Mini-Mental State Examination (MMSE) (PR = 0.49; 95 % CI = 0.30 – 0.82; $p < 0.001$) were positively associated with functionality.

Keywords
aging, functional decline, health of older adults, cognitive status, hospitalization.

Resumen

Este estudio exploratorio transversal tuvo como objetivo estimar la prevalencia de baja funcionalidad e identificar los factores asociados en adultos mayores ≥ 60 años habitantes de la comunidad, en el suroeste de Bahía, Brasil, con una muestra de 218 participantes. La asociación entre la baja funcionalidad y las variables independientes se verificó mediante análisis de datos crudos; aquellas variables con significancia estadística de al menos 20 % (≤ 0.20) se mantuvieron para el análisis ajustado mediante regresión de Poisson, con estimación robusta de las razones de prevalencia (RP) y sus intervalos de confianza del 95 % (IC95 %). La prevalencia de baja funcionalidad fue del 39 % (n = 85). La hospitalización (RP = 0.65; IC95 % = 0.47 – 0.89; $p < 0.001$), las actividades básicas de la vida diaria (ABVD) (RP = 0.55; IC95 % = 0.41 – 0.74; $p < 0.001$) y el estado cognitivo evaluado a través del Mini-Examen del Estado Mental (MMSE) (RP = 0.49; IC95 % = 0.30 – 0.82; $p < 0.001$) estuvieron asociados positivamente con la funcionalidad.

Palabras clave
envejecimiento, deterioro funcional, salud de los adultos mayores, estado cognitivo, hospitalización.

Resumo

Foi realizado um estudo transversal exploratório para estimar a prevalência e identificar fatores associados à baixa funcionalidade em peessoas idosas comunitários com idade ≥ 60 anos. Este estudo foi realizado no sudoeste da Bahia, com uma amostra de 218 participantes. A associação entre baixa funcionalidade e variáveis independentes foi verificada por análises brutas com significância estatística de pelo menos 20 % (≤ 0.20) para permanecer na análise ajustada por meio da regressão de Poisson, com cálculo robusto de razões de prevalência (RP) e intervalos de confiança de 95 % (IC 95 %). A prevalência de baixa funcionalidade foi de 39 % (n = 85). Hospitalização (RP = 0.65; IC95 % = 0.47 – 0.89; $p < 0.001$), atividades básicas da vida diária (ABVD) (RP = 0.55; IC95 % = 0.41 – 0.74; $p < 0.001$) e Mini-Exame do Estado Mental (MEEM) (RP = 0.49; IC95 % = 0.30 – 0.82; $p < 0.001$) foram positivamente associados à funcionalidade.

Palavras-chave
envelhecimento, declínio funcional, saúde da pessoa idosa, estado cognitivo, hospitalização.

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Introduction

The active, progressive, and intrinsic stage of aging involves several physical and psychophysiological changes that may negatively affect older adults' ability to adapt to their living environment. An individual's capacity to perform tasks, activities, or functions in daily life is referred to as functionality (Menezes et al., 2018; Reis et al., 2022; Souza Júnior et al., 2022; Teixeira & Guariento, 2010).

Low functionality has been reported in epidemiological studies as an important outcome associated with impairments in motor domains and other health problems in older adults. In contrast, good functional capacity supports active, independent and autonomous aging, and has been described as a contributor to the maintenance and revitalization of physiological and mental functions in this population (Aguiar et al., 2019; Atalaia-Silva et al., 2018).

In this context, human ageing involves multiple organic changes that may lead to significant and disabling functional and cognitive decline. Across the life course, activities of daily living—such as shopping, using the telephone, driving, and using public transport—can become limited due to various events, and the impact of these restrictions on older adults can be highly detrimental. Adverse clinical outcomes in older adults, including functional dependence, falls, and hospitalizations, may increase the need for health care (Grden et al., 2020; Sá et al., 2019).

According to the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística, 2023), Brazil's total population was estimated at 203 062 512 in 2022, representing a 6.5 % increase compared to 2010. Over the same period, the population aged 60 years reached 32 113 490 (15.6 %), an increase of 56.0 % compared to 2010, when it totaled 20 590 597 (10.8 %). Therefore, it is important to identify strategies to mitigate the onset of disabilities through practices and actions implemented within health networks, understanding the importance of preventive measures and ongoing assessments aligned with professional training. The findings from these evaluations can guide the selection of methods and interventions aimed at improving quality of life and monitoring the clinical status of older adults (Instituto Brasileiro de Geografia e Estatística, 2023; B. P. Santos et al., 2018; P. H. S. Santos et al., 2015).

From this perspective, studies have focused on functional decline in older adults with the aim of maintaining and improving functionality and promoting overall well-being, independence, and quality of life. However, further research is still needed to investigate the association between low functionality and related factors in older adults, which will provide useful and up-to-date scientific evidence to better assess this association in this population (Gama et al., 2021; Sá et al., 2019; B. P. Santos et al., 2018).

Research on techniques or practices that benefit sensory and functional responses in older adults are also needed to minimize aging-related complications and improve quality of life. In this context, estimating the prevalence of low functionality and identifying its associated

factors are essential for developing preventive measures and more effective care alternatives, helping to reduce accident-related events, prevent the development of dependence, and potentially avoid premature mortality due to subsequent complications.

Methods

This is a descriptive, exploratory study with a cross-sectional, analytical, and quantitative design and constitutes a sub-project of *Vulnerability and social and health conditions of older adults in primary care and long-term care institutions: a comparative study in Brazil, Portugal and Spain*. The research was carried out in two Family Health Units (USF) in the municipality of Jequié, Bahia, Brazil, from July 2022 to March 2023.

The sample comprised 218 older adults of both sexes. Eligible participants were aged ≥ 60 years, male or female, who agreed to participate in the study. Individuals with neurological comorbidities that prevented comprehension of the questionnaire were excluded. Cognitive status was assessed using the Mini-Mental State Examination (MMSE), which evaluates 11 domains (spatial and temporal orientation, immediate and delayed recall memory, calculation, language/naming, repetition, comprehension, writing, and copying a drawing) (Folstein et al., 1975). Participants scoring < 17 on the MMSE were excluded from the study.

The multicenter project was submitted to the Research Ethics Committee (CEP) of FAINOR — Faculdade Independente do Nordeste (Annex III), under CAAE number 36278120.0.2002.5578, and was approved under Opinion Number 4.351.219.

All participants received detailed information about the study. Participation was voluntary, and no harm of any kind was expected for those involved. After the study procedures were explained and participants were informed that the collected information would remain anonymous, they signed the Informed Consent Form (ICF), in accordance with the applicable resolution.

The biosociodemographic and health conditions survey collected information on age, sex, level of education, family income, marital status, presence of pain, chronic diseases, and medication use. Low functionality was assessed using the Vulnerable Elders Survey-13 (VES-13) (Saliba et al., 2001), which comprise 13 items across four indicators: age, self-perception of health, physical limitations, and disabilities. Based on the total score, older adults were classified into three frailty risk categories: robust (≤ 2 points), pre-frail (3 – 6); and frail (7 – 10).

The Timed Up and Go Test (TUGT), proposed by Podsiadlo & Richardson (1991), is a sensitive and specific measure for identifying older adults at risk of falling and is widely used to assess functional mobility in this population. The test measures, in seconds, the time required for participants to rise from a chair (45 cm high), walk a distance of three meters, turn around, walk back to the chair, and sit down again safely.

Frailty was assessed using the Edmonton Frailty Scale (EFS), which evaluates domains such as cognition, general health status, functional independence, social support, medication use,

nutrition, mood, continence, and functional performance. Scores of 0 – 4 indicate not frail; 5 – 6, apparently vulnerable; 7 – 8, mildly frail; 9 – 10, moderately frail; and ≥ 11, severely frail (Rolfson et al., 2006).

Basic activities of daily living were assessed using the Barthel Index (eating, bathing, dressing, personal hygiene, urination, defecation, toilet use, bed/chair transfer, walking, and stair climbing), with scores ranging from 0 to 100. Participants were classified as independent (100 points), mildly dependent (60 – 95), moderately dependent (40 – 55), severely dependent (20 – 35), or totally dependent (< 20) (Mahoney & Barthel, 1965).

The Lawton and Body scale was used to assess instrumental activities of daily living (telephone use, transportation, shopping, meal preparation, housework, medication use, and financial management). Scores range from 0 to 21 and were categorized as total dependence (≤ 5)., partial dependence (> 5 and < 21), and independent (21) (Lawton & Brody, 1969).

Depressive symptoms were assessed using the short version of the Geriatric Depression Scale (GDS-15; Yesavage). This widely used and validated instrument facilitates the diagnosis of depression in older adults and consists of 15 negative/affirmative questions. Scores of 5 – 10 indicate mild depressive symptoms, whereas scores 11 indicate severe depressive symptoms (Almeida & Almeida, 1999).

Body Mass Index (BMI) was calculated as body weight (kg) divided by the height squared, and classified as underweight (BMI ≤ 22), normal (BMI < 27), and overweight/obese (BMI ≥ 27) (World Health Organization, 1995; Cervi et al., 2005). Body weight was measured using a portable digital platform scale with a maximum capacity of 150 kg and accuracy of 100 g. Height was measured with a portable stadiometer, with participants positioned with head in the Frankfurt plane (Tôrres et al., 2006).

Data tabulation and analysis

Data were consolidated in Microsoft Excel 2007 spreadsheets, and statistical processing and analysis were performed using SPSS® (Statistical Package for the Social Sciences), version 21.0 for Windows. Low functionality was defined as the study's dependent variable. Categorical variables were expressed as relative and absolute frequencies, and continuous variables as measures of central tendency and dispersion. The variable 'hospitalization' was dichotomized (none and yes) based on item 2 of the general health status domain: "In the last 12 months, how many times have you been admitted to a hospital?", from the EFS scale, considering 0 points for none and ≥ 1 for yes. Functional vulnerability was dichotomized (without/with low functionality), considering scores ≤ 3 as not vulnerable and ≥ 4 as vulnerable. The instrument domains were also analyzed.

Descriptive analyses included calculations of absolute and relative frequencies for categorical variables and means and standard deviation for continuous variables. Associations between low functionality and independent variables were examined using crude and adjusted

Poisson regression models with robust variance, estimating prevalence ratios (PR) and 95 % confidence intervals (95 % CI). Variables that showed statistical significance of at least 20 % ($p \leq 20$) in crude analyses were retained in the adjusted model.

Results

The highest proportions of older adults were aged 60 – 68 years (52.8 %), female (66.1 %), and reported an income of two or more minimum wages (51.4 %); 91.7 % reported being able to read and write. The prevalence of a negative perception of functionality was 68.3 %, and 99.1 % presented dependence on instrumental activities of daily living. Depressive symptoms were observed in 79.4 % of participants (Table 1).

Table 1
Descriptive sociodemographic and health characteristics of the general sample of older adults in Jequié, Bahia (Brazil), 2023

Variables	No.	%
Sex		
Female	144	66.1
Male	74	33.9
Marital status		
Without partner	107	49.1
With partner	111	50.9
Level of education		
Cannot read and write	18	8.3
Can read and write	200	91.7
Age group		
60 – 68 years old	115	52.8
> 68 years	103	47.2
Income		
Up to one minimum wage	106	48.6
Two or more minimum wages	112	51.4
Work status		
Retired	143	65.6
Working	75	34.4
Chronic illnesses		
1 illness	105	48.2
> 1 illness	113	51.8
Use of medication		
Not using	32	14.7
Using	186	85.3
Presence of pain		
No	68	31.2
Yes	150	68.8
Hospitalization		

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Table 1 (continued)

Variables	No.	%
None	191	87.6
Yes	27	12.4
Risk of falling		
No risk	69	31.7
At risk	149	68.3
BADL		
Independent	169	77.5
With dependence	49	22.5
IADL		
Independent	2	0.9
With dependence	216	99.1
BMI		
Low weight	35	16.4
Normal	82	38.3
Overweight	97	45.3
Functionality		
Not low	133	61.0
Low	85	39.0
Frailty		
Not frail	126	57.8
Frail	92	42.2
Depressive symptoms		
Without depressive symptoms	45	20.6
With depressive symptoms	173	79.4
MMSE		
Without impairment	78	35.8
With impairment	140	64.2

Note. BADL: basic activities of daily living, IADL: Instrumental Activities of Daily Living, BMI: Body Mass Index (kg/m²), MMSE: Mini-Mental State Examination.

Regarding BMI, regardless of sex, 45.3 % of participants were overweight. Overall, 68.3 % were at risk of falls and 64.2 % were at risk of frailty. In addition, 51.8 % reported having more than one chronic disease, 85.3 % reported continuous use of medication, and 64.2 % showed cognitive impairment. Due to missing data for weight/height, BMI was calculated using the valid percentage (98.2 % of the total sample), excluding four older adults who were bedridden, had amputations, or had immobilized limbs and were therefore unable to undergo anthropometric measurements (Table 1).

In the crude analysis (Table 2), low functionality was significantly associated with sex (PR = 1.67; 95 % CI = 1.10 – 2.53; p = 0.01), level of education (PR = 0.60; 95 % CI = 0.40 – 0.91; $p = 0.01$), age group (PR = 0.56; 95 % CI = 0.40 – 0.80; $p = < 0.01$), work status (PR = 1.33; 95 % CI = 0.91 – 1.95; $p = 0.13$), chronic diseases (PR = 0.65; 95 % CI = 0.45 – 0.92; p = 0.01), use of medication (PR = 2.26; 95 % CI = 1.08 – 4.75; p = 0.03), presence of

pain (PR = 0.67; 95 % CI = 0.45 – 1.02; $p = 0.06$), hospitalization (PR = 0.66; 95 % CI = 0.44 – 0.97; p = 0.03), risk of falling (PR = 0.54; 95 % CI = 0.34 – 0.84; $p = < 0.01$), basic activities of daily living (BADL) (PR = 0.39; 95 % CI = 0.29 – 0.52; p = < 0.001), frailty (PR = 0.41; 95 % CI = 0.29 – 0.59; $p = < 0.001$), depressive symptoms (PR = 0.62; 95 % CI = 0.44 – 0.87; $p = < 0.01$), and MMSE (PR = 0.35; 95 % CI = 0.21 – 0.58; $p = < 0.001$).

Table 2
Association between low functionality and independent variables (n = 218) in older adults in Jequié, Bahia (Brazil), 2023

	PR Gross		**PR Adjusted**	
Variables	**95 % CI**	**p**	**95 % CI**	**p**
Gender				
Female	1.67 (1.10 – 2.53)	0.01	1.35 (0.89 – 2.06)	0.15
Male	1	—	1	—
Marital status				
Without partner	0.81 (0.58 – 1.14)	0.23	—	—
With partner	1	—	—	—
Level of education				
Can read and write	0.60 (0.40 – 0.91)	0.01	0.91 (0.62 – 1.33)	0.65
Cannot read and write	1	—	1	—
Age group				
60 – 68 years old	0.56 (0.40 – 0.80)	< 0.01	0.84 (0.60 – 1.18)	0.32
> 68 years	1	—	1	—
Income				
Two or more minimum wages	1.01 (0.72 – 1.41)	0.92	—	—
Up to one minimum wage	1	—	—	—
Work status				
Retired	1.33 (0.91 – 1.95)	0.13	1.13 (0.80 – 1.60)	0.45
Working	1	—	1	—
Chronic illnesses				
1 illness	0.65 (0.45 – 0.92)	0.01	0.98 (0.70 – 1.38)	0.92
> 1 illness	1	—	1	—
Use of medication				
Using	2.26 (1.08 – 4.75)	0.03	1.30 (0.62 – 2.70)	0.47
No using	1	—	1	—
Presence of pain				
No	0.67 (0.45 – 1.02)	0.06	0.77 (0.53 – 1.12)	0.17
Yes	1	—	1	—
Hospitalization				
None	0.66 (0.44 – 0.97)	0.03	0.65 (0.47 – 0.89)	< 0.001
Yes	1	—	1	—
Risk of falling				

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Table 2 (continued)

	PR Gross		PR Adjusted	
Variables	**95 % CI**	**p**	**95 % CI**	**p**
No risk	0.54 (0.34 – 0.84)	< 0.01	0.86 (0.55 – 1.33)	0.50
At risk	1	—	1	—
BADL				
Independent	0.39 (0.29 – 0.52)	< 0.001	0.55 (0.41 – 0.74)	< 0.001
With dependence	1	—	1	—
IADL				
Independent	1.28 (0.31 – 5.19)	0.72	—	—
With dependence	1	—	—	—
BMI				
Low weight	0.87 (0.53 – 1.43)	0.60	—	—
Normal	0.89 (0.62 – 1.25)	0.54	—	—
Overweight	1	—	—	—
Frailty				
Not frail	0.41 (0.29 – 0.59)	< 0.001	0.70 (0.49 – 1.00)	0.053
Frail	1	—	1	—
Depressive symptoms				
Withoug depressive symptoms	0.62 (0.44 – 0.87)	< 0.01	0.86 (0.65 – 1.15)	0.32
With depressive symptoms	1	—	1	—
MMSE				
Without impairment	0.35 (0.21 – 0.58)	< 0.001	0.49 (0.30 – 0.82)	< 0.01
With impairment	1	—	1	—

Note. PR: prevalence ratio, CI: confidence interval, BADL: basic activities of daily living, IADL: Instrumental Activities of Daily Living, BMI: Body Mass Index (kg/m²), MMSE: Mini-Mental State Examination.

In the adjusted model, low functionality with hospitalization (PR = 0.65; 95 % CI = 0.47 – 0.89; $p = < 0.001$), BADL (PR = 0.55; 95 % CI = 0.41 – 0.74; $p = < 0.001$), and cognitive status assessed by the MMSE (PR = 0.49; 95 % CI = 0.30 – 0.82; $p = < 0.01$) remained statistically significant ($p = < 0.05$). These findings suggest that hospitalization, BADL, and cognitive status remained protective factors for low functional capacity after adjustment for sex, level of education, age group, work status, chronic diseases, medication use, frailty, presence of pain, and risk of falling (Table 2).

Discussion

This study investigated the prevalence of and factors associated with low functionality among older adults. Hospitalization, BADL, and cognitive status assessed by the MMSE were associated with the outcome, acting as protective factors against low functionality. In

addition, participants who lived without a partner, had an income of two or more minimum wages, reported more than one chronic disease, took medication, were overweight, and were aged between 60 and 68 years were more likely to present low functional capacity. Unlike other national studies, 91.7 % of participants in the present study reported being able to read and write, and just over 79 % presented symptoms of depression (Abrantes et al., 2019; Lenardt et al., 2021; Remígio Cavalcante et al., 2021).

According to the projections for 2000–2030 of the Brazilian Institute of Geography and Statistics (IBGE), life expectancy at birth is, on average, 6.9 years higher for women (80.5 years) than for men (73.6 years). Women tend to have healthier habits and greater engagement in self-care, whereas men have higher mortality related to external causes (e.g. traffic accidents and violence) as well as higher alcohol and tobacco consumption (Cepellos, 2021; Instituto Brasileiro de Geografia e Estatística, 2024).

According to this study, 39 % of older adults were classified as having low functionality using the VES-13, and 68.3 % were at risk of falling according to the TUGT. Similar findings have been reported in other studies with Brazilian older adults, showing an association between functional decline, risk of falls, and functional dependence (Aguiar et al., 2019; Atalaia-Silva et al., 2018; Rodrigues & Alvarenga, 2020). Considering the health status of the sample, most participants presented health problems, which is consistent with ageing as the life stage with the highest incidence and prevalence of chronic diseases (Rodrigues & Alvarenga, 2020; P. H. S. Santos et al., 2015).

However, the proportion of participants classified as having functional decline was significant, as approximately one third of the sample presented low functionality. These findings are consistent with a longitudinal study carried out in Mato Grosso, Brazil, from March to June 2016 and from July to October 2018 with 304 older adults (predominantly women), registered at Family Health Units, which also used the VES-13 and reported a slightly lower prevalence of decline in functional capacity (35.2 %) (Cabral et al., 2021).

The causes of low functionality in older adults are multifactorial and often interrelated. Among the main conditions associated with this adverse outcome are frailty, hospitalization, and limitations in BADL. Another finding of this study was that better cognitive function was associated with a lower risk of functional loss. In non-community-dwelling older adults, however, a large proportion presents cognitive deficits or are at risk of cognitive impairment, as reported in previous studies (Aguiar et al., 2019; Carvalho et al., 2018; B. P. Santos et al., 2018).

Regarding BMI and IADLs, a higher degree of functional decline might be expected. However, in the present study, low functionality was associated with other factors, but not with BMI and IADL. These differences may be related to variability within the same population depending on the screening instrument used to assess functionality. In this sample, a higher proportion of participants were classified as non-dependent in IADL, unlike other studies

such as Cabral et al. (2021) and Carvalho et al. (2018). Similarly, no significant association with BMI was observed, consistent with findings from other studies on functional conditions in older adults (Ferreira et al., 2022; Vieira et al., 2019).

In a municipality in southern Minas Gerais, a cross-sectional study of 406 community-dwelling older adults found that older age, a higher number of medications, and the presence of depressive symptoms were associated with worse functional capacity (Ferreira et al., 2022). Regarding sex, being a woman was associated with lower functional scores in that study. These associations may vary within the same population depending on the screening instrument used to identify the likelihood of low functionality. Although the increasing prevalence of chronic diseases in older adults is not an unexpected event, the growing proportion of individuals who become dependent in basic activities of daily living poses new challenges for care management in this population, particularly in relation to functional decline (Licoviski et al., 2021; Moreira et al., 2020).

A cohort study of 99 older adults that described functional trajectories at four time points—15 days before hospitalization, during hospitalization, at discharge, and 30 days after discharge—found that approximately 28.2 % of the older women experienced a significant loss of function between 15 days before hospitalization and 30 days after discharge. One possible explanation for this finding is the higher likelihood of functional deterioration among individuals with frailty syndrome (Carvalho et al., 2018). Hospitalization itself increases the likelihood of functional decline and may contribute to a negative perception of functional status among older adults (Caldas et al., 2013; B. P. Santos et al., 2018).

The prevalence of frailty was high (approximately 42.2 %), although no statistically significant association was observed, which supports the need to expand epidemiological research on prevalence and factors associated with community-dwelling older adults. Measures obtained from the scales used in this study were relevant for estimating participants' functional decline. These findings are informative for planning preventive strategies and targeted care for the older adult population (Atalaia-Silva et al., 2018; Dias et al., 2023; Taguchi et al., 2022).

Limitations of the study

Non-probabilistic convenience sampling was one of the limitations of this study, despite the BMI and TUGT. Several instruments were used to assess the study variables, which may limit comparability with findings from other studies. Finally, information on the variables under analysis was obtained through self-reported questionnaires, which may be subject to recall bias.

Conclusion

This study concludes that the prevalence of low functionality among older adults is associated with hospitalization, basic activities of daily living, and cognitive status, while age and sex

appear to be important predictors of the outcome. It was also concluded that the prevalence of a negative perception of functionality, dependence on instrumental activities of daily living, and depressive symptoms was high, ranging from 68.3 % to 99.1 %.

Regular practice of supervised physical activity, mental-health focused actions, and operative health education groups aimed at promoting healthy lifestyle habits may help strengthen protective behaviors and reduce factors that impair functional capacity within Family Health Unit routines. Finally, estimating the prevalence of and identifying the factors associated with low functional capacity in community-dwelling older adults is crucial to developing more effective preventive measures and alternative care strategies, as well as for testing the ability of these variables to discriminate low functional capacity in this population.

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