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ORIGINAL ARTICLE

Interaction of depressive symptoms and activities of daily living with mild cognitive impairment: a structural equation model with results from the SABE Bogotá Study

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Objective: To analyze the interaction between depressive symptomatology, instrumental activities of daily living (IADLs), basic activities of daily living (BADLs), and cognitive impairment in a sample of Colombians over 60 years of age by binary logistic regression and structural equation modeling.
Methods: Secondary analysis of data from the 2012 Salud, Bienestar y Envejecimiento survey, which included 1,957 people from Bogotá, Colombia. The sampling was probabilistic, clustered, and stratified. The instruments used were the Mini-Mental State Examination (MMSE), the Lawton-Brody Scale, the Barthel Index, and the Geriatric Depression Scale. Bivariate and multivariate analyses were performed.
Results: Bivariate analyses revealed differences in performance between groups. The binary logistic regression model explained 42.3% of the variance. Based on these findings, a structural equation model (SEM) was developed, which yielded the following fit indices: chi-square minimum discrepancy (CMIN)/degrees of freedom (DF) = 4.81, goodness-of-fit index (GFI) = 0.98, comparative fit index (CFI) = 0.97, and root mean square error of approximation (RMSEA) = 0.04 (0.039; 0.049). The results show that IADL contribute most significantly to cognitive impairment, while depressive symptomatology and BADL contribute the least.
Conclusion: These findings suggest that depressive symptomatology and impaired performance in IADL/BADL are key factors to address in cognitive impairment, which highlights their importance in the context of mental and physical healthcare for the older Colombian population.

Keywords: Depressive symptoms; cognitive impairments; activities of daily living; elderly; functional status

Introduction

Population aging is a global phenomenon that has increased over the last few decades. The demographic transition towards an increasingly long-lived population entails secondary effects that include increased household expenses, pressure on public finances and health systems, and a possible stagnation of countries' economic progress.[1] The increase in health care costs associated with increased life expectancy depends on the health status of older adults.[2]

According to data from the World Health Organization (WHO),[3] the world population over 60 years of age is expected to increase significantly from 12 to 22% by 2050, with an estimated growth of up to 2.1 billion people, around 80% of whom will be residents of low- and middle-income countries. This increase in the population of older adults entails an increase in the demand for care and pensions, which will require reorganization and restructuring of the entities that make up the health and social protection systems, with the aim of promoting and developing adequate programs and infrastructure for the long-term care of this population.[4,5] The demand for medical care will also grow due to the chronic noncommunicable diseases associated with this stage of the life course, which include an increased risk of developing neurodegenerative conditions.[6,7]

Among the most common disorders in older adults is mild cognitive impairment (MCI). MCI represents a transitional stage between healthy aging and dementia and affects 10 to 15% of the population over 65 years of age. It is characterized by a decrease in cognitive abilities that is remarkably faster and deeper than the one observed in control patients that are also aging. Much effort has focused on slowing the progression of this condition, thus reducing its prevalence and the costs

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associated with treatment of dementia. Indeed, several researchers consider MCI an ideal "window" period to intervene and delay the progression to more severe stages of impairment. The goal is to protect and maintain independence in activities of daily living (ADL).[8,9] Likewise, cognitive impairment has been associated with cognitive frailty, which describes the simultaneous presence of a cognitive deficit and a biological vulnerability syndrome (physical frailty). The latter is defined by a series of operational criteria that include reduced physical activity (exhaustion, low energy expenditure), involuntary weight loss (reduced handgrip strength), and motor slowing (slow walking speed). These, in turn, are all known risk factors that increase the probability of developing some form of dementia.[10,11]

According to the Alzheimer's Disease Neuroimaging Initiative (ADNI), the progression from normal functioning to dementia comprises several stages: 1) cognitively normal; 2) significant memory concern; 3) early MCI; 4) MCI; 5) late MCI; and 6) Alzheimer's disease (AD).[12] Older adults with MCI are at significant risk of progressing to AD or developing other types of dementia.[13] In a study by McGirr et al.,[14] 33.6% of participants with MCI progressed to dementia within a period of 3 years. A systematic review with meta-analysis by Belleville et al.[15] found a progression rate of 38.7%, while Mitchell and Shiri-Feshk[16] reported that 39.2% of patients with MCI progressed to dementia in specialized clinical settings and 21.9% in population-based studies.

This variability in progression rates may be due to several reasons: differences in both the conceptual and operational definitions of MCI; heterogeneity in methodological rigor across studies; use of different instruments for assessment of cognitive impairment; and the wide diversity of sociodemographic characteristics among the analyzed samples.

Cognitive decline and dementia in old age are frequently associated with depression.[17,18] The decline in cognitive, functional, social, and physical abilities significantly influences the occurrence of depression in older adults.[19] Depression has also been associated with high mortality and comorbidity rates in the geriatric population.[20,21] There is evidence that depression in older adults has a series of negative repercussions, including a decrease in quality of life, difficulties in performing ADL, reduced level of physical activity, and onset of adverse medical conditions.[19,22]

The overall prevalence of depression in individuals with cognitive impairment has been estimated as 32%, with a marked difference between the general population and clinical samples.[23] Additionally, during a follow-up period of 27 months, 39.7% of older adults with depression and MCI progressed to AD. It is important to note that the prevalence of AD was markedly higher for those who had experienced depressive episodes during a recent 2-year period compared to those who had a more remote history of episodes of depression.[24]

Regarding physical performance, functionality is described in terms of daily living skills and can be understood as the ability to perform both the essential and the most complex tasks of daily life. This is related to the concept of basic activities of daily living (BADL) and instrumental activities of daily living (IADL). BADL are tasks focused on personal care and are essential for interaction in a social environment, while IADL are actions that support everyday life in broader contexts than the personal one. Both are largely dependent on motor functionality.[25]

BADL encompass such fundamental tasks as eating, bathing, dressing, bowel and bladder control, walking, and grooming, whereas IADL are associated with organizational activities and include such tasks as managing finances and medications, shopping, preparing food, using the telephone, or performing basic household chores.[26] Studies of participants with an MCI diagnosis have found that the ability to perform both basic and instrumental activities deteriorates gradually; this decrease accelerates in the transition to AD, becoming increasingly disabling in the most advanced stages of the disease.[27]

Autonomy in carrying out ADL is a fundamental aspect in the lives of individuals. This independence is directly influenced by the relationship between motor functioning (muscle strength, endurance, and balance) and cognitive or executive functions.[28] Thus, the decline in functional capacity can be the result of a variety of factors, including health problems, mood variations, and a decline in mental faculties.[29]

Some studies have analyzed how MCI and depressive symptomatology affect the autonomy and ability of older adults to perform IADL, BADL, or both,[30-34] while others have only analyzed the relationship between MCI and functional alterations in IADL, BADL, or both, not including depressive symptoms.[26,35-37] In studies that included depressive symptomatology, both MCI and depressive symptoms were found to negatively influence older adults' functional ability to carry out ADLs.

In Colombia, Borda et al. conducted a pioneering study in this field.[38] Their research team analyzed the relationship between cognitive impairment and IADL based on the results of the Bogotá arm of the Salud, Bienestar y Envejecimiento (SABE) survey, finding that the IADL with the greatest association with cognitive impairment were those that require greater capacity for abstraction and planning.[38]

Park et al.[33] found that, compared with depressive symptoms, cognitive decline had a stronger association with impaired ability to carry out IADL. Similarly, Chen & Liu[31] point out that disability or functional alterations could mediate the relationship between depressive symptoms and MCI, highlighting the importance of early evaluation for individuals who present with altered functionality or depressive symptomatology to reduce the risk of developing dementia. Zhang & Yang[34] also conclude that, when functional limitations co-occur with MCI, there is a significant risk for the development of depression.

Camacho-Conde & Galán-López[30] found that depressive symptomatology was prevalent in older adults institutionalized in nursing homes and that such symptomatology was correlated with MCI, being more frequent in dependent older adults than in non-dependent ones. Heser et al.[32] found that depressive symptoms were not significantly associated with cognitive function during a

12-month follow-up period. However, the study highlights two key aspects: first, depressive participants showed greater functional and cognitive impairments than non-depressive participants; and second, the increase in depressive symptomatology over time predicted a greater loss of functionality and autonomy.

Mansbach & Mace[36] point out that impairments in executive functions and memory are differential predictors of dependency for individuals with MCI, especially impacting finances, cooking, and remembering events. Makino et al.[37] found that limitations in taking public transport or difficulty using maps to get around in unfamiliar places were strongly associated with risk of developing MCI. A meta-analysis conducted by Altieri et al.[26] suggests that individuals with MCI had significant difficulties in performing IADL and BADL compared to cognitively healthy people. Similarly, a meta-analysis conducted by Jekel et al.[35] identified that alterations in IADL, especially in those that require high neuropsychological functioning, are key indicators of an increased risk of dementia.

Considering the evidence presented above, the present study aimed to analyze the interaction of depressive symptoms and alterations in IADL and BADL performance with cognitive impairment in a Colombian sample over 60 years of age.

Methods

Study design

The present study proposes a secondary analysis of the SABE – Bogotá D.C. population-based survey, conducted in 2012 by Pontificia Universidad Javeriana. SABE – Bogotá D.C. was a cross-sectional study designed according to a probabilistic, multistage, clustered, and stratified sampling strategy, based on the national census carried out in 2005. The generated sample had a level of reliability of 95%, implying it was representative of the total population of the city.[38]

Participants

SABE – Bogotá D.C. has 2,000 people over 60 years of age, both from rural and from urban areas of the city, registered on the survey database. For statistical analyses, data from 1,957 people were used; 43 records were excluded due to lost data. Of the included records, 37.8% (n=739) and 62.2% (n=1,218) were female. Ages ranged from 60-69 (n=953, 48.7%), 70-79 (n=689, 35.2%), and $\geqslant$ 80 years (n=315, 16.1%), with a mean age of 71.18 years. According to the results of Mini-Mental State Examination (MMSE) assessment, 10.8% (n=211) experienced abnormal cognitive function, defined by an MMSE score $\leqslant$ 12, while the remaining 89.2% (n=1,746) exhibited cognitive functioning within normal parameters.

Instruments

The instrument used to collect information was the same questionnaire used in the SABE – Bogotá D.C. survey, modified and adapted for the Colombian context, including 11 sections related to personal identification, family structure, health status, disability conditions, functional status, cognitive function, mobility trajectories, and work history. The SABE – Bogotá D.C. survey was the first survey that aimed to analyze data exclusively from older adults in Colombia, considering a wide age range (from 60 to 100 years old). The sample is representative to determine particular conditions of aging in Bogotá, a city that houses people from all over the country. In addition, the sampling strategy used and the support of both the Pan American Health Organization and a major university in Colombia ensured its reliability and validity.

Variables

The definitions presented are based on the theoretical model used by the authors cited above.[38,39,40]

Cognitive impairment (DV) – The criterion used to define MCI was obtaining a score $\leqslant$ 12 on the modified version of the MMSE. This instrument was chosen based on its use in many previous studies by several authors[38-41] in Colombia and Chile. This cutoff point is also that most commonly used across the different studies, conducted in different Latin American countries, which have used the SABE survey.

Depressive symptomatology (IV-1) – Assessed with the abbreviated Geriatric Depression Scale (GDS-15) by Yesavage et al.[42] A cutoff point for significant depressive symptomatology was established by Borda et al.[38,39] and Cano et al.[40] as a score $\geqslant$ 6.

Performance in IADL and BADL (IV-2) – Assessed with the Barthel[43] and Lawton-Brody[44] scales for BADL and IADL respectively. Both scales are dichotomous. The IADL scale consisted of 14 items where 0 = independence for all activities and 1 = partial or total dependency for some activities.[39,40] The BADL scale consisted of 10 items, with scores ranging from 90-100 denoting independence and scores of 0-89 denoting some degree of dependency.[39,40]

Data analysis

The Kolmogorov-Smirnov test determined that none of the variables exhibited a normal distribution. Bivariate analyses were performed to establish the association of cognitive functioning (normal vs. altered) with depressive symptoms (non-depressive vs. depressive) with each of the IADL and BADL using the chi-square test. Subsequently, a binary logistic regression (BLR) was conducted using a backwards Wald model that included the variables whose associations were statistically significant. Odds ratios (OR) were estimated to compare the influence of the independent variables (depressive symptoms, IADL, and BADL) on the dependent variable (cognitive impairment), with 95%CIs; p-values $<$ 0.05 were considered statistically significant. Finally, a structural equation model was proposed based on the results of BLR.

Ethics statement

The SABE study complied with the ethical principles outlined in the Declaration of Helsinki and was approved

by the institutional review board of Pontificia Universidad Javeriana.[38-40] All participants provided written informed consent prior to participation.[38-40] Additionally, the research project from which this study derives was reviewed and approved by the ethics committee of Universidad Católica de Colombia under Act No. 51 (October 26, 2023) and Act No. 52 (November 16, 2023), approval code CON0000617. Patient anonymity and confidentiality were strictly maintained throughout the study.[38-40]

Results

Data were analyzed in SPSS version 29 and IBM Amos. Table 1 shows the percent distribution of participants with and without depressive symptomatology and stratified by cognitive functioning (normal vs. altered), along with four of the 10 BADL items and four of the 14 IADL items. Due to the size of the table, data from only eight of the 24 associations are presented and analyzed. However, all were statistically significant ($p < 0.01$). In general, individuals with no depressive symptomatology and normal MMSE scores showed greater independence in all IADL and BADL, while individuals with depressive symptoms and altered MMSE showed greater dependency for these activities (the remaining data are presented in Supplementary Table S1). Bivariate analyses: associations of dependency with MMSE categories, depressive symptomatology, IADL, and BADL.

In the case of IADL, as seen in Table 1, people with cognitive impairment tend to be more independent if they do not experience depressive symptomatology. Consequently, among participants who present some degree of dependency and cognitive impairment, those with depressive symptomatology are more dependent for IADL than those without symptoms. Regarding BADL, similar patterns are observed. People with cognitive impairment but without depressive symptomatology are more independent compared to those with cognitive impairment and depressive symptoms.

BLR

The BLR included the 39 indicators associated with cognitive impairment: 14 items from the IADL scale, 10 items from the BADL scale, and 15 items from the GDS scale. These indicators were selected considering the statistical significance of the associations of dependency with MMSE, depressive symptomatology, IADL, and BADL that showed $p < 0.05$. Thus, the BLR was performed using a backwards Wald model, which excludes variables that do not contribute significantly to the model. The significance of the chi-square statistic for the BLR model in the omnibus test was < 0.05; the model selected seven IADL, three BADL, and four GDS items which contribute the most to cognitive impairment. Nagelkerke's R^2 indicates that the variance of the dependent variable explained by the model is 42.3%.

Table 2 shows that, among all the variables that contribute to the model, those most relevant to cognitive impairment are IADL-related: activities such as telephone use, handling money, taking medications, and preparing meals. In the case of BADL, the one that contributes the most is dependence to move from armchair to bed. Finally, for depressive symptoms, the items that contributed the most were ''feeling worthless the way you are now,'' followed by ''having problems with memory.'' All the variables had a two-tailed significance < 0.05, except for the item ''being able to perform heavy work at home'' (IADL) and ''use stairs'' (BADL). However, despite elimination of these variables from the model, the other indices did not improve; the software kept these variables in the equation, and in the bivariate analyses, they were found to be significant.

Structural equations model

Based on the results presented above, a structural equations model was proposed using the maximum likelihood model. Figure 1 presents the graphic representation of said model. The model fit indices obtained were as follows: ratio of chi-square (χ^2) to the number of degrees of freedom (χ^2/ndf) = 4.81; values less than five are acceptable. The goodness-of-fit index (GFI) was 0.98, and the comparative fit index (CFI), 0.97; 0 indicates absence of fit, and 1, optimal fit. Values of 0.95 or higher are considered excellent.[45] The root mean square error of approximation (RMSEA) was 0.04; this statistic is considered optimal when its values are 0.05 or lower.[46] The RMSEA confidence interval ranged from 0.039 to 0.049.

The indicators in Figure 1 show that the items that remained in each of the independent variables (IADL, BADL, and depressive symptoms) adequately measure each construct. IADL values ranged from 0.45 to 0.79, BADL values ranged from 0.51 to 0.85, and GDS items ranged from 0.37 to 0.82.

The relationships of IADL and BADL with cognitive impairment were inverse. The estimated values of -0.65 and -0.17 indicate that, the greater the independence, the lower the cognitive impairment. On the other hand, the association between depressive symptoms and MMSE scores indicates a direct relationship between these specific symptoms and cognitive impairment, with an estimated value of 0.27. Results suggest that the variables that contribute the most to cognitive impairment are those related to IADL, while those that contribute the least are depressive symptoms, followed by BADL.

Discussion

Although meta-analyses, systematic reviews, and longitudinal and cross-sectional studies have analyzed the relationship between the different variables included in this study, the existing research has focused on descriptive, correlational, mediation, and moderation studies. Those studies provided relevant information to propose the structural equation model presented above, which allowed the identification of relevant factors and estimated how much they contributed to cognitive impairment.

Thus, the results obtained in both the bivariate analyses and the BLR reveal important data on the

Table 1 Association between MMSE categories (normal vs. impaired) with IADL, BADL, and depressive symptoms (non-depressive vs. depressive)

Depressive symptoms/MMSE category†	Independent	Dependent	χ^2	p-value
IADL item				
Does he/she manage his/her own money?				
Non-depressive				
Normal	95.7	4.3	332.56	0.00*
Impaired	63.8	36.2		
Depressive				
Normal	91.2	8.8		
Impaired	47.2	52.8		
Can he/she go shopping independently?				
Non-depressive				
Normal	89.1	10.9	280.09	0.00*
Impaired	42.9	57.1		
Depressive				
Normal	74.8	25.2		
Impaired	32.1	67.9		
Can he/she prepare his/her own meals?				
Non-depressive				
Normal	89.5	10.5	272.15	0.00*
Impaired	47.6	52.4		
Depressive				
Normal	81.4	18.6		
Impaired	36.8	63.2		
Does he/she take his/her own medications?				
Non-depressive				
Normal	95.4	4.6	335.12	0.00*
Impaired	61.9	38.1		
Depressive				
Normal	92.2	7.8		
Impaired	49.1	50.9		
BADL item				
Feeding/Eating				
Non-depressive				
Normal	99.4	0.6	153.24	0.00*
Impaired	85.7	14.3		
Depressive				
Normal	96.8	3.2		
Impaired	82.1	17.9		
Bathing				
Non-depressive				
Normal	98.8	1.2	233.85	0.00*
Impaired	78.1	21.9		
Depressive				
Normal	94.4	5.6		
Impaired	69.8	30.2		
Dressing				
Non-depressive				
Normal	98.1	1.9	225.47	0.00*
Impaired	74.3	25.7		
Depressive				
Normal	93.9	6.1		
Impaired	69.8	30.2		
Walking				
Non-depressive				
Normal	98.0	2.0	216.83	0.00*
Impaired	75.2	24.8		
Depressive				
Normal	91.9	8.1		
Impaired	66.0	34.0		

Data on independent and dependent variables presented as percentage.
BADL = basic activities of daily living; IADL = instrumental activities of daily living; MMSE = Mini-Mental State Examination (normal $\geqslant$ 13/19, impaired $\leqslant$ 12/19).
† Non-depressive $\leqslant$ 5/15, depressive $\geqslant$ 6/15 (Geriatric Depression Scale [GDS]).
* $p < 0.01$.

Table 2 Associations of MMSE (normal vs. impaired) with IADL, BADL, and depressive symptoms in binary logistic regression

Items	B	SE	Wald	OR	95%CI	p-value
IADL						
Does he/she manage his/her own money?	0.910	0.262	12.059	2.485	1.487-4.153	0.00**
Can he/she prepare his/her own meals?	0.660	0.243	7.373	1.935	1.202-3.116	0.01*
Does he/she take his/her own medications?	0.711	0.279	6.481	2.035	1.178-3.517	0.01*
Is he/she capable of walking around the neighborhood and returning home without assistance?	0.582	0.267	4.737	1.789	1.060-3.020	0.03*
Can he/she use the telephone?	1.575	0.270	34.035	4.833	2.847-8.205	0.00**
Can he/she turn the radio and TV on and off?	-0.868	0.414	4.390	0.420	0.186-0.945	0.04*
Can he/she do light household chores like washing the floor or walls?	0.403	0.231	3.044	1.497	0.951-2.354	0.08
BADL						
Transfer from chair to bed	0.113	0.047	5.775	1.120	1.021-1.228	0.02*
Stairs	-0.075	0.044	2.904	0.928	0.852-1.011	0.09
Bladder	-0.113	0.033	11.475	0.893	0.837-0.953	0.00**
Depressive symptoms[†]						
Do you feel happy most of the time?	-0.516	0.266	3.756	0.597	0.354-1.006	0.05*
Do you feel that you have more problems with memory than most people?	0.683	0.194	12.366	1.981	1.353-2.899	0.00**
Do you feel worthless the way you are now?	0.704	0.231	9.290	2.021	1.286-3.177	0.00**
Do you feel that your situation is hopeless?	0.488	0.221	4.889	1.628	1.057-2.509	0.03*
Constant	-3.611	0.642	31.655	0.027		0.00**

BADL = basic activities of daily living; IADL = instrumental activities of daily living; MMSE = Mini-Mental State Examination (normal $\geqslant$ 13/19; altered $\leqslant$12/19); OR = odds ratio; SE = standard error.
[†] Four items from the Geriatric Depression Scale (GDS).
* $p < 0.05$; ** $p < 0.01$.

interaction of depressive symptoms and IADL and BADL performance for cognitively impaired older adults. There is evidence that the presence of depressive symptoms in older people with cognitive impairment is associated with a significant decrease in independence to perform IADL (such as handling money, using the telephone, shopping, preparing meals, and taking one's medications) when compared to people without depressive symptomatology who also experience cognitive impairment. These results align with those of studies conducted in Spain, Taiwan, Germany, the United States, South Korea, and Colombia.[30-33,38] IADL require a high level of cognitive and executive skills,[36] and depressive symptoms seem to exacerbate existing difficulties in that regard, which could translate into increased dependency for this age group.[29] In Japan, Makino et al.[37] found that the IADL that contributed the most to the development of cognitive impairment were difficulties in using public transport and using maps to get around in unfamiliar places, activities that were not included in the SABE – Bogotá D.C. study.

Although BADL were affected by depressive symptoms, the degree of deterioration was lower when contrasted with IADL. However, the presence of depressive symptoms continues to be a considerable and significant factor for increase in dependency, even in routine tasks of daily life, as proposed by Camacho-Conde & Galán-López[30] and Heser et al.[32] This indicates that depressive symptoms not only affect the higher cognitive functions necessary for IADL but also seems to affect the motivation and energy to perform IADL. Thus, the combination of a loss of physical and functional capacities essential for independence and presence of depressive symptoms may significantly reduce cognitive abilities, thereby accelerating functional and cognitive decline in older adults. This is consistent with the findings of Chen & Liu,[31] Park et al.,[33] and Zhang & Yang.[34]

Some IADL, BADL, and specific items of depressive symptomatology from the GDS were found to be significant predictors of cognitive impairment, suggesting that deficits in these areas can be considered potential indicators of poor cognition in the older population. Among BADL, the ability to move from an armchair to bed was identified as a critical indicator of cognitive impairment, followed by difficulty using stairs,[31] an aspect that reflects that physical mobility and motor coordination are essential for independence in daily life. On the other hand, feeling useless or worthless and having memory problems were the depressive symptomatology items that contributed the most to the model, consistent with previous findings from Chen & Liu[31] and Heser et al.[32] This points to the need to address emotional states during the course of cognitive impairment in older adults.

The indicators identified by this study are essential for the development of comprehensive intervention models that consider depressive symptomatology, IADL, and BADL to improve the quality of life of the older population.

These findings suggest that IADL is the factor that contributes the most to cognitive impairment, as found in the meta-analyses carried out by Altieri et al.[26] and Jekel et al.[35] and in a study by Zhang & Yang.[34] In contrast with the findings of Chen & Liu,[31] Heser et al.,[32] Park et al.,[33] and Zhang & Yang,[34] the present study found that depressive symptomatology was more likely to contribute to cognitive impairment than BADL, which supports the hypothesis that depression plays a significant role in disrupting BADL and IADL as well as in the decline of cognitive abilities for older adults, as postulated by Chen & Liu.[31]

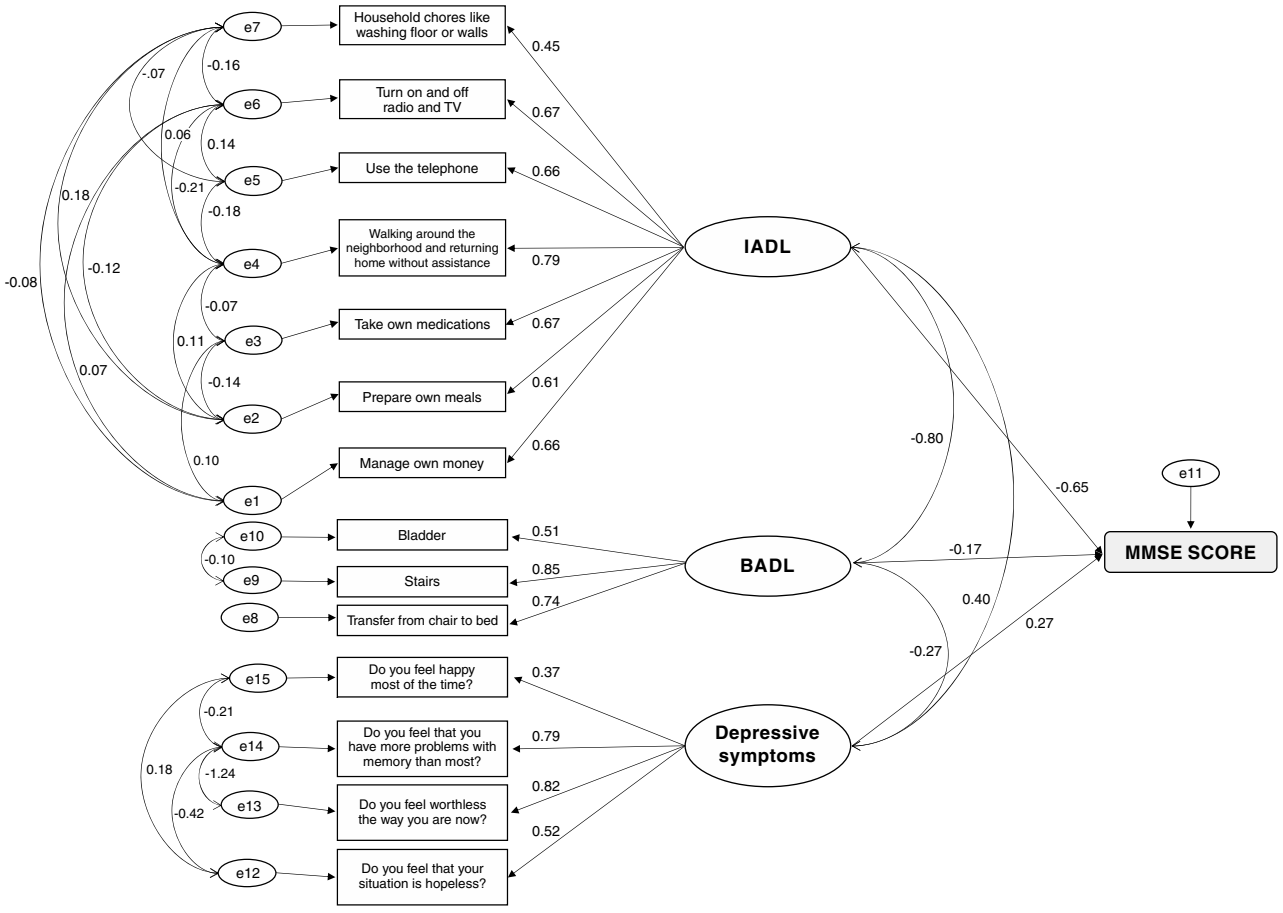


Figure 1 Model schematic. BADL = basic activities of daily living; IADL = instrumental activities of daily living; MMSE = Mini-Mental State Examination.

The strong relationship between IADL and cognitive impairment highlights the importance of preserving independence in these activities to reduce the risk or severe impairment. In addition, the relationship between depressive symptomatology and cognitive impairment highlights the importance of addressing emotional and affective aspects in the context of interventions aimed at improving the cognitive and functional health of older adults.

The main limitation of this study is its cross-sectional design, which prevents causal inferences and precludes determination of the direction of the effects of the observed relationships between the included variables. However, determining that IADL are the activities of daily living that contribute the most to cognitive decline is important, especially considering the findings of Borda et al.,[38] where all IADL had a significant correlation with cognitive impairment. This might be useful for early diagnosis, optimization of appointment times, early warning regarding potential onset of cognitive impairment, and ordering of diagnostic studies for timely management. However, the design chosen for the present study does not allow us to infer if IADL disruption precedes cognitive impairment or is rather an effect of cognitive impairment. Future studies are needed to clarify this.

Among other limitations, the data was obtained through self-reports, which introduces the possibility of recall biases that affect the accuracy of the responses and are especially relevant in this population. Likewise, the study used screening instruments such as the MMSE and the GDS to determine the presence or absence of cognitive impairment and depressive symptoms. The sensitivity and specificity of the MMSE are limited when respondents have low educational attainment,[47] and the GDS has shown low levels of reliability.[48] Nonetheless, since this is a secondary analysis, all statistical calculations were run based on an existing database that contained the available evidence, as is common practice in such studies. Future longitudinal research would be necessary to clarify the temporal relationship between cognitive impairment, depressive symptoms, and alterations in IADL and BADL, while exploring the influence of other relevant variables. Considering that 52% of the participants were classified on the low tier of the socioeconomic stratification and 45% were classified on the medium tier, restricted access to health care due to living conditions is a relevant variable that might impact physical and mental health. Other potential confounding variables were not taken into account for the statistical analyses.

The key contribution of this study lies in the statistical analysis of the relationship between depressive symptomatology, IADL performance, and BADL performance among individuals over 60 years of age with cognitive impairment in the Colombian population. The proposed model provides a holistic view of the relationship between emotional and functional conditions in cognitive impairment. For this sample, higher levels of dependency were found for IADL than for BADL in participants with depressive symptoms. Furthermore, functional impairment for IADL had a greater impact on cognitive impairment than depressive symptomatology and impairment for BADL.

We conclude this study with a call to interdisciplinary research by all fields that are interested in improving the quality of life of older adults, and suggest the implementation of prevention or intervention programs designed to optimize functioning for activities of daily living and to improve the general well-being of older adults. It is essential that interventions not only focus on their care, health, and nutrition, but also consider depressive symptomatology and other emotional aspects that can affect daily functionality, such as physical therapy or behavioral interventions, oriented not only toward the patient but also to professional caregivers as well as non-professional caregivers and family members.

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Disclosure

The authors report no conflicts of interest.

Data availability statement

The data that support this study are not publicly available.

Author contributions

AFAM: Formal analysis, Methodology, Project administration, Visualization, Writing – original draft, Writing – review & editing.
MPSO: Conceptualization, Data curation, Formal analysis, Funding acquisition, Project administration, Resources, Supervision, Writing – review & editing.
BLAP: Data curation, Formal analysis, Methodology, Project administration, Visualization, Writing – review & editing.
All authors have read and approved of the final version to be published.

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