






Article

Functional Differences Found in the Elderly Living in the Community

Estela Calatayud ^{1,2}, Beatriz Rodríguez-Roca ¹, Javier Aresté ³, Yolanda Marcén-Román ^{1,2,*}, Carlos Salavera ^{4,*} and Isabel Gómez-Soria ^{1,2}

¹ Faculty of Health Sciences, University of Zaragoza, 50009 Zaragoza, Spain; estelacs@unizar.es (E.C.); brodriguez@posta.unizar.es (B.R.-R.); isabelgs@unizar.es (I.G.-S.)

² Institute of Health Research of Aragón (IIS Aragón), 50009 Zaragoza, Spain

³ Independent Scholar, 50004 Zaragoza, Spain; javieraresté@hotmail.es

⁴ Faculty of Education, University of Zaragoza, 50009 Zaragoza, Spain

* Correspondence: yomarcen@unizar.es (Y.M.-R.); salavera@unizar.es (I.C.S.)

Abstract: **Introduction:** Successful aging lies in cognitive and functional maintenance, and in the optimal performance of daily tasks that keep the elderly free of disability and dependence. However, there is little evidence for functional differences for gender and age, and how cognitive and physical demands in past working lives can affect them, to design more personalized occupational therapy interventions to prevent functional and cognitive impairment. **Method:** This observational descriptive study evaluated 367 older adults living in a community with subjective memory complaints and scored between 24 and 35 with the Spanish version of the “Mini-Mental State Examination (MEC-35)”. Basic activities of daily living (BADL) were studied with the Barthel Index, while instrumental ADL (IADL) were examined with the Lawton–Brody scale. Functional differences for gender, age, and physico-mental occupation were examined. **Results:** The significant differences found for gender indicated that men did better in BADL ($p = 0.026$) and women better performed IADL ($p < 0.001$). Differences between age groups suggest that the younger group (aged 64–75) obtained better results for BADL ($p = 0.001$) and IADL ($p < 0.001$). For physico-mental occupation, statistically significant differences were found only in IADL for mental ($p = 0.034$) and physical occupation ($p = 0.005$). **Conclusions:** Gender, age, and the cognitive and physical demands of occupational stages, can be important predictors of cognitive and functional impairment. These results can be generalized to other health centers in the province and to other Spanish Autonomous Communities because their socio-demographic variables are similar. It would be interesting to carry out multimodal personalized interventions that consider the factors that might affect functional impairment to preserve personal autonomy.

Keywords: activities of daily living; aging; cardiovascular risk factors; occupations; age-related memory disorders; risk factors



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1. Introduction

Population aging is a global phenomenon. In 2019, the prevalence of people aged 65 or older was 703 million worldwide, and this number is predicted to double by 2050 and reach 1500 million [1].

Successful aging relies on the preservation of cognitive and functional capabilities [2]. On the cognitive side, it has been verified that a quarter of older adults show subjective memory complaints (SMC), which could represent the earliest stage of mild cognitive impairment (MCI) and later turn into dementia [3,4]. In parallel, SMC could be a risk factor for diminished functional performance in activities daily living (ADL) [5]. For this reason, evaluating self-informed SMC could help to predict and diagnose cognitive and functional impairment [5–7].

Diagnosing MCI criteria usually excludes functional deficits despite recent studies showing deterioration in ADL with high cognitive demand [8]. This is considered to be a potentially important indicator to be used to measure how cognitive impairment develops [9].

We define “functional capability” as “the capability of autonomously executing those actions, complex or not, that make up our day-to-day tasks in a seared manner both at the individual and social levels” [10]. The evaluation of this capability allows us to analyze the repercussions of its alteration to quality of life, use of sanitary services by the elderly, and also institutionalization and mortality [11]. This evaluation is an effective method that reflects patients’ perspectives on their personal health status [12].

ABDL are self-management abilities like dressing and bathing, and instrumental ADL (IADL) involve more complex daily tasks like preparing food or managing finances [13]. Slight changes in IADL, such as cooking and cleaning, can be detected in the elderly, which can be associated with sensory disability [14,15].

A significant deterioration in tasks related to executive functions (EEFF) and memory, such as buying groceries, taking medications, managing finances, or using a phone, can be observed in MCI [9,14,15]. It has been verified that improvements in memory and EEFF are associated with fewer probabilities of dependence in performing IADL [16].

What is currently known about maintaining the optimum cognitive-functional function in elderly adults is that individual differences exist. Some elderly adults continue maintaining most of these capacities all their lives, but they diminish in others from very mild forms to neurodegenerative diseases developing. Even in relatively healthy “successful elders” certain cognitive functions reduce compared to previous levels [2]. Evaluating functional aspects is believed important to avoid institutionalizing the elderly [17].

IADL functioning is affected by not only cognitive factors, but also by physical, environmental [18], personal [19], and occupational factors [20]. Such factors could be older age, feminine gender, diabetes, arterial hypertension (AHT), cerebrovascular accidents (CVA) [21], and high physical work demand during working lives [22].

Age is considered the main risk factor for cognitive and functional impairment, and differences have been established between younger (aged 65–74) and older (aged 75 and older) elderly adults [15,21]. As people live longer, age-related diseases ensue, many of which directly and indirectly impact the brain’s health [15]. Normal cognitive aging is characterized by an almost linear reduction from early adulthood, which affects the speed at which information is processed, memory and reasoning [23]; turn, these cognitive deficits are related to greater functional impairment [2].

Age is the highest risk factor for MCI [24] and dementia [25]. The dementia incidence exponentially increases between the ages of 60 and 80 years, from which point this rate slows down [25]. With increasing age, not only does the incidence risk of neurodegenerative diseases rise, but so do cerebrovascular diseases [26,27], and, consequently, functional capacity diminishes [2]. Nevertheless, although a certain degree of decline in the brain’s functioning is predictable with aging, significant cognitive decline is not inevitable and can perhaps be prevented [15].

However, the following are considered to be protective factors: high physical activity levels, being married [21,28], and mentally demanding occupations during one’s working life [29].

The literature shows that identifying risk and protective factors for the elderly’s functional impairment can be useful when adopting preventive interventions in the future [21,28,30,31]. However, a knowledge gap is acknowledged as to which factors generate these individual cognitive and functional differences [2] and very little evidence for functional differences in older adults with SMC exists when socio-demographic, clinical, and occupational factors are considered together.

In view of all this, the aim of this study was to acknowledge the functional level differences across age, gender, and physical and mental occupation, in older adults with

SMC to ultimately be able to design and implement preventive personalized programs in the future from the occupational therapy field.

2. Methods

Participants and Methods

This descriptive observational study was conducted in a primary care center in the Zaragoza province (NE Spain). Our initial sample size was 416 participants, but 49 did not meet the inclusion criteria. Therefore, our final sample was made up of 367 participants with SMC who were attended to during primary healthcare consultations, and received the usual medicine and nursing healthcare.

The participants received information about the project from informative posters placed on the doors of all the medical consultation rooms where their family doctors worked. The sample size calculation was performed with the 95% confidence level and a 5% sampling error. The final evaluated sample was representative of the Zaragoza province. The inclusion criteria were: ≥ 65 years with a Spanish version of Mini-Mental State Examination (MEC-35) [32] score between 24 and 35 points with SMC. The exclusion criteria were: institutionalization and having received cognitive stimulation in the past 12 months.

In all, 49 participants did not meet the inclusion criteria (35 were excluded for scoring < 24 MEC-35 points and 14 for not presenting SMC). The remaining 367 met the inclusion criteria and were evaluated.

2.1. Instruments

The following socio-demographic variables were studied: gender, age, level of education, marital status, and mental occupational, physical occupational, and clinical statuses such as AHT, diabetes, hypercholesterolemia, obesity, and CVA. An analysis of the subgroups was considered according to both the physical occupational and mental occupational statuses based on three levels for each one: low, medium, high [33]. The presence of SMC was evaluated by the question: Do you have complaints about your memory? Dichotomous response (yes/no) [34,35]. The Barthel Index and the Lawton–Brody scale were used as the outcome variables. The Barthel Index (BI) assesses the level of independence of 10 basic ADL (BADL) [11]. The maximum score for the BI is 100, where scores higher than 60 denote low dependence with ADL and scores below 20 demonstrate high dependence with ADL. Internal consistency was 0.90, with interobserver reliability Kappa Index between 0.47 and 1.00, and the interobserver reliability Kappa Index between 0.84 and 0.97. Cronbach's alpha was 0.90–0.9228 for the internal consistency evaluation [36]. The SF-BI was confirmed to be a useful evaluation instrument because its test–retest agreement rate, absolute reliability, item internal consistency, and validity were high. Therefore, the short-form BI can be easily used in clinical practice, and both clinicians and researchers can utilize patients' selective ADL functions with stroke and employ them as useful information [37]. The structural validity, reliability, and interpretability of the BI were considered sufficient for measuring and interpreting changes in geriatric rehabilitation patients' physical functions [38]. It is a useful tool for measuring disability in health and social care settings in the care continuum [39].

The Lawton and Brody scale assesses the degree of autonomy in eight IADL necessary for living independently in the community [10]. Scores lie between 0–8 points. Its sensitivity is 0.57 and its specificity is 0.92 [40]. The minimal important change of the Lawton IADL scale is around half a point. The certainty of this conclusion is reduced by variation across calculation methods [41].

The evaluation process was performed by occupational therapists blinded after receiving the corresponding training to guarantee the homogeneous application of the evaluation instruments.

2.2. Statistical Analysis

The statistical analysis was performed with the IBM SPSS Statistics Package, v.22 (SPSS Inc., Chicago, IL, USA). The descriptive statistics are shown according to the nature of each variable: mean (m) and standard deviation (SD), or by the number of participants in each category (n) and the proportion of patients over the total (%). The normality of the variables was verified by the Kolmogorov–Smirnov test. The non parametric Mann–Whitney U test was used to analyze the cognitive characteristics for each gender. To measure the cognitive characteristics according to the mental occupation state, the Kruskal–Wallis H test was applied. The level of significance was set at 5%. Finally, stepwise multiple regression was used to estimate the predictive value of age, gender, marital status, obesity, and hypercholesterolemia on BADL and IADL.

2.3. Ethical Considerations

This study was approved by the Ethical Committee of Clinical Studies of Aragón in Act No. 18/2011, with registration number PI11/90. Personal data protection regulations were respected. All the participants were informed about the study objectives and signed informed consent. The deontological norms recognized by the Declaration of Helsinki (52nd WMA General Assembly, Edinburgh, Scotland, October 2000) [42], good clinical practice norms were followed and current legislation was complied with.

3. Results

First, 367 elderly adults were measured with a score between 24 and 35 for the Spanish version of MMSE (MEC-35). The study participants' socio-demographic and clinic characteristics are shown in Table 1.

Table 1. The patients' socio-demographic and clinical characteristics per gender and age group.

Patients' Socio-Demographic and Clinical Characteristics								
	Per Gender			p-Value	Per Age Group			p-Value
	Total (n = 367) n (%)	Men (n = 123) n (%)	Women (n = 244) n (%)		Total (n = 367) n (%)	65–74 Years (n = 197) n (%)	>75 Years (n = 170) n (%)	
Level of education								
Primary	282 (76.8%)	82 (66.7%)	200 (82%)	<0.001 **	282 (76.8%)	144 (73.1%)	138 (81.2%)	0.067
Higher	85 (23.2%)	41 (33.3%)	44 (18%)		85 (23.2%)	53 (26.9%)	32 (18.8%)	
Marital status								
Single	19 (5.2%)	2 (1.6%)	17 (7.0%)	<0.001 **	19 (5.2%)	10 (5.1%)	9 (5.3%)	0.001 *
Married	246 (67%)	104 (84.6%)	142 (58.2%)		246 (67%)	145 (73.6%)	101 (59.4%)	
Widowed	90 (24.5%)	13 (10.6%)	77 (31.6%)		90 (24.5%)	33 (16.8%)	57 (33.5%)	
Separated	12 (3.3%)	4 (3.3%)	8 (3.3%)		12 (3.3%)	9 (4.6%)	3 (1.8%)	
Physical occupational								
Low	74 (20.2%)	26 (21.1%)	48 (19.7%)	<0.001 **	74 (20.2%)	43 (21.8%)	31 (18.2%)	0.455
Medium	160 (43.6%)	40 (32.5%)	120 (49.2%)		160 (43.6%)	88 (44.7%)	72 (42.4%)	
High	133 (36.2%)	57 (46.3%)	76 (31.1%)		133 (36.2%)	66 (33.5%)	67 (39.4%)	
Mental occupational								
Low	217 (59.1%)	48 (39%)	169 (69.3%)	<0.001 **	217 (59.1%)	112 (56.9%)	105 (61.8%)	0.424
Medium	129 (35.1%)	59 (48%)	70 (28.7%)		129 (35.1%)	75 (38.1%)	54 (31.8%)	
High	21 (5.7%)	16 (13.2%)	5 (2%)		21 (5.7%)	10 (5.1%)	11 (6.5%)	
AHT								
Yes	179 (48.8%)	63 (51.2%)	116 (47.5%)	0.639	179 (48.8%)	88 (44.7%)	91 (53.5%)	0.090
No	188 (51.2%)	60 (48.8%)	128 (52.5%)		188 (51.2%)	109 (55.3%)	79 (46.5%)	
Diabetes								
Yes	52 (14.2%)	22 (17.9%)	30 (12.3%)	<0.001 **	52 (14.2%)	30 (15.2%)	22 (12.9%)	0.531
No	315 (85.8%)	101 (82.1%)	214 (87.7%)		315 (85.8%)	167 (84.8%)	148 (87.1%)	
Hypercholesterolemia								
Yes	139 (37.9%)	41 (33.3%)	98 (40.2%)	<0.001 **	139 (37.9%)	87 (44.2%)	52 (30.6%)	0.008 *
No	228 (62.1%)	82 (66.7%)	146 (59.8%)		228 (62.1%)	110 (55.8%)	118 (69.4%)	
Obesity								
Yes	50 (13.6%)	16 (13%)	34 (13.9%)	<0.001 **	50 (13.6%)	37 (18.8%)	13 (7.6%)	0.002 *
No	317 (86.4%)	107 (87%)	210 (86.1%)		317 (86.4%)	160 (81.2%)	157 (92.4%)	
CVA								
Yes	24 (6.5%)	10 (8.1%)	14 (5.7%)	<0.001 **	24 (6.5%)	13 (6.6%)	11 (6.5%)	0.960
No	343 (93.5%)	113 (91.9%)	230 (94.3%)		343 (93.5%)	184 (93.4%)	159 (93.5%)	

p: p-value of Pearson's Chi square. CVA: cerebrovascular accident. AHT: arterial hypertension. * $p < 0.05$ ** $p < 0.001$.

Our sample comprised 66.48% (244) women and 53.67% (197) belonged to the younger group (65–74 years old). Their average age was 73.85 years, with a SD of 5.99 (74.40 ± 5.93 in men and 73.57 ± 6.00 in women), 76.8% had completed Primary Education and 67% were married. Their physical occupation was low in 20.2% of cases with an average of 43.6% and was high for 36.2%. Mental occupation was lower in 59.1% of cases with an average of 35.1% and was high for 5.7%. Statistically significant differences for gender were found, skewing toward men ($p = 0.000$), across all the socio-demographic and occupational variables. However, these differences in age group were found only in the younger age group (65–74 years) who were married ($p = 0.001$). The cardiovascular pathologies for which statistically significant differences were found were for men with diabetes and ACV, and for hypercholesterolemia and obesity for women ($p = 0.000$). The age study indicated statistically significant differences in both hypercholesterolemia ($p = 0.008$) and obesity ($p = 0.002$) in the younger group (65–74 years).

Table 2 shows the differential functional characteristics for gender. Men did better in BADL ($p = 0.026$), while women did better in IADL ($p < 0.001$). Differences in age groups indicated that the younger one (65–75 years) did significantly better in both BADL ($p = 0.001$) and IADL ($p < 0.001$).

Table 2. Differential functional characteristics for gender and age (average and standard deviation).

	Total (n = 367)	Men (n = 123)	Women (n = 244)	p-Value
Barthel (BADL)	96.76 (6.51)	97.54(5.80)	96.37 (6,85)	0.026 *
Lawton (IADL)	7.09 (1.45)	6.25 (1.60)	7.52(1,15)	<0.001 **
	Total (n = 367)	65–74 Years (n = 197)	>75 Years (n = 170)	p-Value
Barthel (BADL)	96.76 (6.51)	97.61 (5.81)	95.78 (7.17)	0.001 *
Lawton (IADL)	7.09 (1.45)	7.38(1.22)	6.76 (1.62)	<0.001 **

p: *p*-value of the Mann–Whitney U; * $p < 0.05$; ** $p < 0.001$.

Table 3 offers the statistically significant differences found in IADL for both mental occupation ($p = 0.034$) (in favor of the low level) and physical occupation ($p = 0.005$) (in favor of the average level) statuses.

Table 3. Differential functional characteristics for mental and physical occupational statuses (m and SD).

	Total (n = 367)	Mental Occupation Study			p-Value
		Low (n = 197)	Average (n = 170)	High (n = 170)	
Barthel (BADL)	96.76 (6.51)	96.59 (6.62)	97.15 (6.45)	96.19 (6.30)	0.371
Lawton (IADL)	7.09 (1.45)	7.20 (1.44)	7.05 (1.36)	6.28 (1.87)	0.034 *
	Total (n = 367)	Physical Occupation Study			p-Value
		Low (n = 74)	Average (n = 160)	High (n = 133)	
Barthel (BADL)	96.76 (3.41)	97.06 (6.65)	96.78(5.43)	96.58 (5.70)	0.970
Lawton (IADL)	7.09 (0.75)	7.19 (1.88)	7.26 (1.06)	6.84 (1.26)	0.005 *

p: *p*-value of the Kruskal–Wallis h; * $p < 0.05$.

In order to evaluate the predictive value of gender, age, marital status, obesity, and hypercholesterolemia in the study of the BADL and IADL, multiple hierarchical regressions were undertaken. Age was used as the predictor of BADL, while gender, age, and marital status were employed as predictors of IADL. Table 4 shows the steps followed by the models to predict the likelihood of BADL and IADL.

Table 4. Gender, age, marital status, obesity, and hypercholesterolemia as predictors of BADL and IADL.

		Barthel (BADL)					Lawton (IADL)					
		B	e.t.	R ²	t	Sig.	Gender	B	e.t.	R ²	t	Sig.
Step 1	Age	−0.169	0.056	0.024	−2.99	0.000	Sex	1.271	0.253	0.414	8678	0.000
Step 2							Gender	1.223	0.142	0.477	8.621	0.000
							Age	−0.058	0.011		−5.165	0.000
Step 3							Gender	1.182	0.142	0.487	8.303	0.000
							Age	−0.061	0.011		−5.420	0.000
							Marital status	0.241	0.112		2.148	0.032

The Barthel Index excluded the variables gender, marital status, obesity, and hypercholesterolemia; Lawton excluded the variables obesity and hypercholesterolemia.

4. Discussion

This study explored the functional profile of the elderly, and the socio-demographic and cardiovascular factors, and the mental and physical occupational statuses, were analyzed in a primary care health center in Spain.

On the socio-demographic characteristics, for gender we observed that married men with a higher level of education predominated. People in the younger age group (64–75 years) who were married and had a higher level of education predominated. These results coincide with other authors, who have identified advanced age and being a woman as risk factors for functional impairment. Besides, being married and having a high level of education has been considered a protective factor [17,21,28]. Thus, one of the factors that more strongly impacted ADL was being separated or divorced marital status, and living with other people [29]. Lázaro Alquézar et al. [17], found that 9.6% of the subjects presented severe/absolute dependence, and this percentage rose to 15.5% and 18.7% for people over the age of 75 and 80 years, respectively, while mild/moderate dependence was related to being a woman having a lower level of education.

In relation to cardiovascular risk factors, men more frequently presented diabetes and CVA, and more women more frequently had hypercholesterolemia and obesity. The younger age group presented more hypercholesterolemia and obesity. In general, diabetes, AHT, and stroke are considered risk factors for functional impairment [21], in relation to the elderly's lifestyle [43]. It has been suggested that diabetes and stroke are modifiable factors associated with cognitive decline [44]. Obesity was not associated with self-informed health and this optimistically perceived health poses a challenge for prevention and educational interventions in the harm caused by unhealthy conducts [45]. In addition, the cardiovascular profile alters before cognitive symptoms appear [46].

Regarding functional differences for gender, the present study revealed that men and women better performed BADL and IADL, respectively. Functional impairment evolution appears to be different in men and women [31]. Unlike other studies, a lower performance has been found in BADL in women in relation to older age and greater cognitive impairment [47]. In IADL, similarly to our study, women display more autonomy, which could be explained by gender inequalities in the distribution of household chores that can create more environmental dependence in men [47,48]. However, other studies have reported no statistically significant differences between gender and functional dependence, but found a significant association between the Barthel Index and living with other people, and stressed the very important role of families in determining protection of highly dependent elderly adults [30].

Functional differences according to age group indicated that the younger group (aged 64–75 years) better performed both BADL and IADL. Other studies have reported that age is considered the most important functional risk factor [17,21,47,49].

Indeed, performing ADL became worse with age. However, the population aged 75 years and older found it harder to perform all IADL. With BADL, the oldest subjects found it more difficult to get up/lie down, walk, take a shower, and use the toilet. The

elderly aged 80 or older presented significantly more deterioration for all activities, except eating [17].

When analyzing occupational factors, the participants who had high cognitive demands during their work lives performed IADL worse. Other studies indicate that workplace-related mental demands are considered protective factors of cognitive and functional health [29]. This can be explained by not exercising EEFF at the occupational level [16], and also by the fact that the mental occupation in our participants was low. The performance of IADL for those participants with high levels of occupational physical demands was lower. Other studies have similarly indicated that high physical work demands during working lives might be associated with more marked mobility limitations and functional impairment [22].

The regression analysis found that age acted as a predictor of worse functional performance in ADL, which falls in line with that reported by van der Vorst et al., 2017 [21]; Yuan et al., 2018 [50]; Lázaro Alquézar et al., 2007 [17]; Tomás et al., 2003 [48]. Gender, age, and marital status intervened in functional performance with IADL, exactly as previous studies have pointed out [17,21,28,32,47–49] and no evidence was found for the relation between obesity/hypercholesterolemia and performing IADL.

5. Conclusions and Future Actions

Gender, age, and cognitive and physical demands of working lives can be important predictors of cognitive and functional impairment. These results can be generalized to other health centers in our province and to other Spanish Autonomous Communities because their socio-demographic variables are similar. In view of the data analysis, it would be advisable to develop interventions from the occupational therapy field that comprehensively contemplate all the biopsychosocial aspects that could influence functional deterioration and occupational performance in aging.

Future research lines could be established to carry out randomized clinical trials with multimodal intervention whose components integrate some ADL, such as memory, executive function, and physical exercise [50].

6. Limitations

First of all, as the participants herein included had a medium-low mental occupation status and a medium-high physical occupation status, our results cannot be extrapolated to the general population. Second, other factors that may influence the incidence of functional impairment, such as physical exercise, self-perceived health, physical, motor and sensory characteristics, psychological state (anxiety and depression), pain, comorbidities, or hospital admissions, were not contemplated. Third, the participants were recruited from a primary healthcare center in a specific neighborhood and were not randomly drawn from the community. However, the fact that occupational therapists do not form part of Spanish public health services in health centers acts as a limitation for the participants to understand the study objectives. Finally, another main limitation of this study is that, although its sample size is large, more lateral approaches are needed for BADL and IADL to be assessed in conjunction with socio-demographic and clinical variables in other populations (age, race, nationality, etc.).

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Institutional Review Board Statement: The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Research Ethics Committee of the Spanish Autonomous Community of Aragón, protocol number CEICA PI11/90.

Informed Consent Statement: All respondents were volunteers and signed an informed consent form.

Data Availability Statement: The data presented in this study are available upon request from the corresponding author.

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Conflicts of Interest: The authors declare that they have no conflict of interest.

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