

Functional disability of older adult's women and men with self-reported cataract: structural equation modeling

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FREE THEME ARTICLE

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Abstract Objective: to analyze the factors directly and indirectly associated with the functional disability of older women and men with cataracts. Methods: cross-sectional study carried out among 302 women and 142 elderly men with self-reported cataracts living in a health macro-region in Minas Gerais. Structural equation modeling was performed through path analysis ($p < 0.05$). Results: in the groups, the lowest cognitive ability ($p < 0.001$; $p = 0.001$) and the highest number of compromised components of the frailty phenotype ($p < 0.001$; $p < 0.001$) were directly associated with functional disability. In older women, there was a direct association with the outcome of worse physical performance ($p < 0.001$) and greater sedentary behavior ($p < 0.001$), and in men, the greater number of depressive symptoms ($p < 0.001$). As for the indirect ones, an association between lower education, mediated by lower cognitive capacity, and functional disability was identified in both groups ($p < 0.001$). Conclusion: regardless of gender, functional disability is associated with worse cognitive ability and the frailty syndrome; specifically, among older women, the outcome was associated with physical and behavioral conditions; among men, to the presence of depressive symptoms.

Keywords Aged, Activities of daily living, Cataract, Statistic, model

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Introduction

Cataract is the most common cause of decreased visual acuity and reversible blindness in the world, and one of the most prevalent chronic diseases in the older population¹.

Cataract is related to increased morbidity and mortality among the older people, due to the higher risk of falls, depression and functional disability²⁻³. Among the older people with cataract, the prevalence of functional disability is high (71.3%)³, affecting a higher percentage of women (58% to 77%) than men (23% to 42%)^{2,4-6}. Integrative review found that these aspects were associated with functional disability among older people with cataract: advanced age; presence of morbidities; worse physical performance; physical inactivity; number of impaired components of the frailty phenotype; factors related to eye health, such as worse visual acuity and sensitivity to contrast; as well as aspects linked to mental health, such as stress and anxiety levels, depressive symptoms and lower conscientiousness⁷.

However, there is a scarcity of studies that address the explanatory factors of the relationship of demographic, health and behavioural variables with the functional incapacity of older people with cataract, through models previously tested in moderation analyses⁷. In this scenario, structural equation modeling (SEM) allows simultaneous analysis of the dependence relationship and the interrelation of multiple variables. Besides this, it is estimated that there are direct effects and those mediated by other factors comprising the causal network of the outcomes of interest⁸.

Thus, the objective was to verify the factors associated, directly and indirectly, to the functional disability of older people with self-reported cataract, according to gender.

Methods

Study type

It was a cross-sectional study that used variables from the project database, "Active Ageing, Global Functionality and Quality of Life among the Older in an Uberaba Health Microregion in Minas Gerais State - MG", developed among those resident in the urban area of a health macroregion in this state, consisting of three health microregions, totalling 27 municipalities with

a population of 806,172, 15.6% of whom are 60 or older⁹.

Population and sample

For selection from the population, the technique of sampling by multiple-stage conglomerate was used. The first stage involved an arbitrary draw, through systematic sampling, of 50% of the census sectors of each municipality in the health macroregion. The sample interval (SI) was calculated by the formula: $SI = Ncs/ncs$; where Ncs is the total number of census sectors, and ncs, the number of census sectors drawn ($SI \approx 2$ in all the municipalities). In the second stage, to ensure the self-weighting sample, the number of older people per sector was fixed, for which there was calculation of the number of domiciles to be selected in proportion to the total number of older people resident in the 27 municipalities. Afterwards, the quantity of domiciles was divided by the number of census sectors, thus obtaining a similar number of older people to be interviewed in each sector. Finally, there was random selection of the first domicile in each census sector, and the others, from domicile to domicile, in a standardized manner, until saturation of the sector sample.

The sample size calculation, performed a posteriori, considered a determination coefficient of $R^2 = 0.1$ in a multilinear regression model with nine predictors, having as a significance level or Type I error, $\alpha = 0.05$ and Type II error, $\beta = 0.1$, thus resulting in an *a priori* statistical power of 90%. Through the Power Analysis and Sample Size (PASS[®]) application, version 13, introducing the values described above, a minimum sample size of $n = 370$ was obtained. Considering a 20% sampling loss, the final number of interview attempts was $n = 444$.

The study included the elderly aged 60 or older, resident in the urban area of the health macroregion, and had self-reported cataract. Those excluded had severe cognitive decline, as evaluated by the Mini Mental State Examination (MMSE)¹⁰, without an informant to respond to the Functional Activities Questionnaire (FAQ)¹¹, or with a final score greater than or equal to six points in this questionnaire; grave stroke sequels with plegia and aphasia; Parkinson's disease at a severe or unstable stage, self-reported by the older person and/or family.

Data collection

This occurred in the domiciles through direct interview, from May 2017 to June 2018. Ten interviewers with knowledge of the health area were selected, having undergone training and capacitation about ethical research issues.

Demographic and economic data, self-reported morbidities and health self-assessment were obtained by applying the structured questionnaire devised by members of the Collective Health Research Group. The cognitive capacity was evaluated by applying the MMSE, translated and validated in Brazil¹⁰. The score ranges from 0, which indicates the higher degree of cognitive impairment, up to 30 points, corresponding to the best cognitive capacity¹⁰.

For analysis of depressive symptoms, the Abbreviated Geriatric Depression Scale (GDS-15) was used, validated in Brazil, the total score ranging from 0 to 15 points, 5 or more being considered indicative of depressive symptoms¹². For the SEM, the number of depressive symptoms responses to the GDS-15 questions were considered, each "Yes" answer receiving a point. In the measurement of physical performance, the Brazilian version of the Short Physical Performance Battery (SPPB) was used, composed of the total score obtained in the balance tests, march speed and the rapidity of getting up from a chair five consecutive times. The score range was 0 (disability) to 12 (best performance)¹³.

Sedentary behaviour was determined according to the total time sitting in minutes per day, by means of the weighted mean of time sitting on a weekday and on one day at the weekend, in accordance with the International Physical Activity Questionnaire (IPAQ), adapted and validated in Brazil¹⁴: [(time sitting on a weekday x 5 + time sitting on a weekend day x 2)/7]. The longer the time sitting, the greater the sedentary behaviour level¹⁵.

Fragility syndrome was identified via the five components of the frailty phenotype: (1) unintentional weight loss; (2) self-reported exhaustion and/or fatigue; (3) decreased muscle strength; (4) slow march speed; (5) low level of physical activity¹⁶.

The first component was evaluated by the question, "Last year, did you intentionally lose more than 4.5kg or 5% of your body weight?" The second was measured by two questions from the Brazilian version of the Center for Epidemiological Studies depression scale: item 7 ("Did you feel that you had to make an effort to

perform your usual tasks?"), and item 20 ("Was there something you couldn't go ahead with?")¹⁷. For the third, manual grip force was measured by the Jamar Manual Hydraulic Dynamometer, Saehan model SH5001-973. Three measurements were obtained with a one-minute interval between them, and presented in terms of kilogram/force (kgf), the average value being considered, and the cut-off points adjusted by gender and the body mass index¹⁶.

In the fourth component, march time (seconds) was considered. The older people covered a total distance of 8.6m, the two initial and two final metres being disregarded for calculation purposes. Three measurements were performed, considering the average value and the cut-off points adjusted by gender and height¹⁶.

The fifth was measured by the long version of the IPAQ for the older people¹⁴. Those who practiced weekly physical activity for 150 minutes or more were considered active; and inactive between 0 and 149 minutes¹⁸. The older person with three or more items were classified as fragile; with one or two, pre-fragile; and those with all negative test, not fragile¹⁶.

Regarding functional capacity, the basic activities of daily living (BADL) were measured by the Katz Index, adapted to the Brazilian reality and composed of six items that measure individual performance in self-care activities¹⁹. For the instrumental activities of daily living (IADL), the Lawton & Brody Scale was used, adapted for Brazil, the older people were categorised with scores of 7 points (totally dependent), 8 to 20 (partial), to 21 (completely independent)²⁰. The advanced activities of daily living (AADL) were verified, consisting of 13 questions of a social nature, with the options: never done it; stopped doing it; and still do²¹. Performance in activities on each of the scales was considered, the higher scores being for the BADL, and the lower for IADL and AADL, thus indicating greater functional disability.

Study variables

The independent variables were demographic: age group, in years (60-70; 70-80; 80 or more; average of complete years of life), schooling in complete years of study (none; 1-5; 5 or more; average of complete years of study); health: self-reported morbidities (none; 1-5; 5 or more; average number of morbidities), physical performance (average SPPB score), depressive symptoms or indications of them

(Yes and No; average number of depressive symptoms), cognitive capacity (average MMSE score); health self-assessment (poor, bad, regular, good, great), frailty condition (non-frail; pre-frail; frail; average number of impaired components of the frailty phenotype); and the behavioural: sedentary behaviour (average time spent in sedentary behaviour). The dependent variable was the functional capacity (average of the BADL, IADL and AADL scores).

Data processing and analysis

The Excel® program was used to build an electronic database, and performed the double digitalization. Inconsistencies were verified between the two databases, and corrections were performed whenever necessary. The analyses were carried out on the programs, Statistical Package for the Social Sciences (SPSS®), version 24 and Analysis of Moment Structures (Amos®), version 24.

The data were submitted to descriptive analysis through frequencies, absolute and relative, and average and standard deviation. The structural model was devised based on an integrative review⁷. Thus, the hypothetical model (Figure 1), composed of variables observed, represented by rectangles, and classified as endogenous and exogenous, was tested by path analysis⁸. It is noteworthy that endogenous variables receive directional arrows, and measurement errors are attributed letter “e” in the models⁸.

From the hypothetical model (Figure 1), the steps were performed for the SEM⁸. The parameters were estimated by the Maximum-Likelihood method and the qualities of adjustments of the models were evaluated according to the chi-square ratio (χ^2) and the degree of freedom (DF) between 1 and 2; Goodness of Fit Index (GFI) ≥ 0.95 ; Comparative Fit Index (CFI) ≥ 0.95 ; Tucker-Lewis Index (TLI) ≥ 0.90 and Root Mean Error of Approximation (RMSEA) ≤ 0.058 . Initially, the hypothetical model was tested; afterwards, the respecifications were performed. For this, the non-significant pathways ($p > 0.05$) were eliminated, and the calculations of the modification indexes (≥ 11)⁸ were performed.

In path analysis, independent variables: age (complete years of life); schooling (complete years of study); self-reported morbidities (number); physical performance (total score); cognitive capacity (total MMSE score); depressive symptoms (number); frailty (number of

impaired phenotype components); sedentary behaviour (time, in min/day, employed in such behaviour) were used in quantitative form. The latent variable, functional capacity, was composed of the BADL, IADL and AADL scores.

Direct associations were presented by estimates of standard coefficients in the paths between demographic, health and behavioural variables, and functional disability for BADL, IADL and AADL. The indirect associations were determined from intermediate paths among the aforementioned variables. Indirect standard coefficients were obtained by multiplying the coefficients of direct paths among the variables, the significance being evaluated with the Goodman Test. In all the tests, the Type I error was fixed at 5% (value $p < 0.05$).

Ethical aspects

The project was approved by the Ethics and Research with Humans Committee, CAAE No. 65885617.8.0000.5154. The interviews were conducted with the free, informed consent of the older person and their signed declarations to this effect.

Results

460 older people with self-reported cataract were interviewed, 16 of whom presented cognitive decline. Thus, the final sample consisted of 444, divided into two groups, females ($n = 302$) and males ($n = 142$).

The demographic, economic and health characteristics are presented in Table 1.

The averages and standard deviation of the quantitative variables included in the model, according to the gender of the older people residents in the urban area of the Minas Gerais health macroregion, are described in Table 2.

It was observed in both older people gender groups that the lower cognitive capacity ($p < 0.001$; $p = 0.001$, respectively) and the larger number of impaired components of the frailty phenotype ($p < 0.001$; $p < 0.001$) were directly associated with functional disability (Table 3).

It was also found, among older men, that the larger number of depressive symptoms ($p < 0.001$), and among older women, that the worse physical performance ($p < 0.001$), and the higher sedentary behaviour ($p < 0.001$), were directly associated with functional disability (Table 3).

For the lower cognitive capacity mediated,

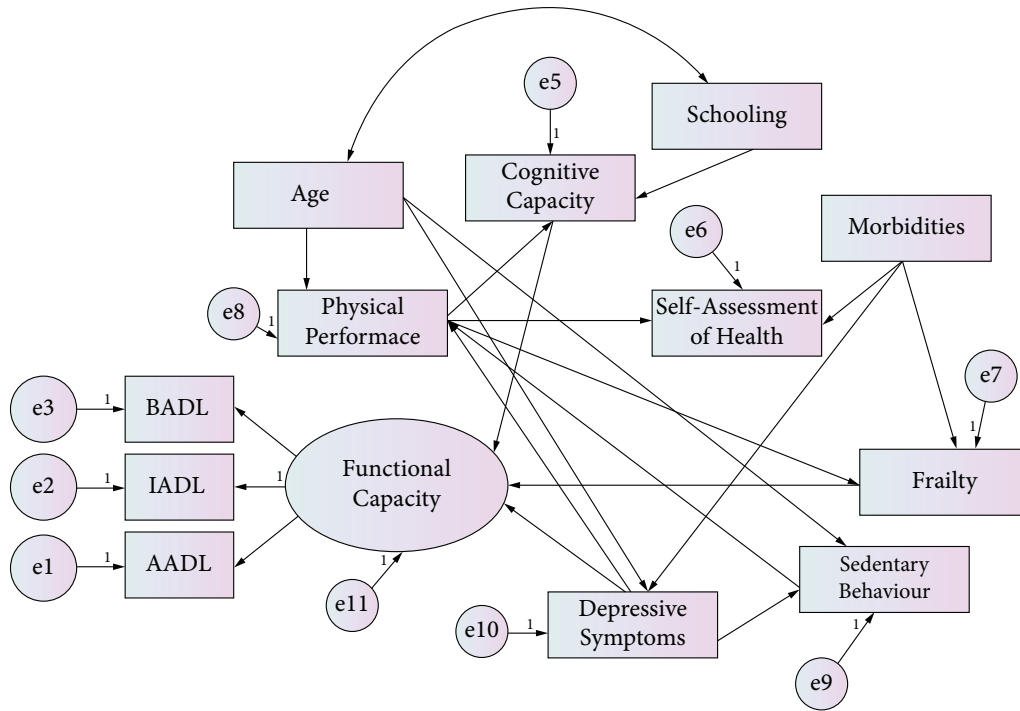


Figure 1. Hypothetical model for analysis of the paths among the socio-demographic, health and behavioural variables and the functional disability of the older people with cataract, according to gender.

among both older women and men, the indirect association between a lower schooling level and functional disability ($\beta = 0.18$; $\beta = 0.13$, respectively) (Table 3).

Among older women, higher age and the greater number of depressive symptoms were indirectly associated with functional disability mediated by the worse physical performance ($\beta = -0.08$; $\beta = -0.12$, respectively), by the larger number of impaired components of the frailty phenotype ($\beta = -0.03$; $\beta = -0.03$, respectively), and by the higher level of sedentary behaviour ($\beta = -0.02$; $\beta = -0.05$, respectively) (Table 3).

Among the older men, there were indirect association with functional disability: the worse physical performance, mediated as much by the lower cognitive capacity ($\beta = 0.07$) as the larger number of impaired components of the frailty phenotype ($\beta = 0.26$); this and the larger number of depressive symptoms acted as mediators of the association of the outcome with the larger number of self-reported morbidities ($\beta = -0.09$; $\beta = -0.06$, respectively). The larger number of

depressive symptoms also measured the association of older age with functional disability ($\beta = -0.08$) (Table 3).

Figure 2 presents the models with the direct and indirect effects of demographic, health and behavioural variables on functional disability according to the gender of older people with self-reported cataract, resident in a Minas Gerais State health macroregion.

Discussion

It was evidenced that, regardless of gender, the larger number of impaired components of the frailty phenotype and the lower cognitive capacity were directly associated with the outcome. In turn, the larger number of depressive symptoms was directly associated with functional disability among older men with cataract; while the greater sedentary behaviour and the worse physical performance were among the older women with the referred condition.

Table 1. Socio-demographic, economic, health and behavioural characteristics of older people with self-reported cataract, resident in a health macroregion, Minas Gerais, Brazil, 2017-2018.

Variables	Gender						p*
	Females (n=302)		Males (n=142)		Total (n=444)		
	n	%	n	%	n	%	
Age range (complete years)							0.069
60 70	103	34.1	35	24.6	138	31.1	
70 80	139	46.0	68	47.9	207	46.6	
80 or over	60	19.9	39	27.5	99	22.3	
Schooling (complete years of study)							0.545
None	67	22.2	31	21.8	98	22.1	
1 5	169	56.0	86	60.6	255	57.4	
5 or over	66	21.9	25	17.6	91	20.5	
No. of self-reported morbidities							0.001
1 5	25	8.3	41	28.9	66	14.9	
5 or over	277	91.7	101	71.1	378	85.1	
Physical performance							0.004
Very bad	36	11.9	14	9.9	50	11.2	
Low	55	18.2	11	7.7	66	14.9	
Moderate	120	39.7	54	38.0	174	39.2	
Good	91	30.1	63	44.4	154	34.7	
Symptomatology depressive / indicative of depressive symptoms							0.001
Yes	96	31.8	22	15.5	118	26.6	
No	206	68.2	120	84.5	326	73.4	
Self-assessment of health							0.001
Very bad	39	12.9	5	3.5	44	9.9	
Bad	32	10.6	10	7.0	42	9.5	
Regular	135	44.7	56	39.4	191	43.0	
Good	79	26.2	61	43.0	140	31.5	
Excellent	17	5.6	10	7.0	27	6.1	
Frailty condition							0.022
Not fragile	62	20.5	34	23.9	96	21.6	
Pre-fragile	135	44.7	77	54.2	212	47.8	
Fragile	105	34.8	31	21.8	136	30.6	

Note: *Pearson chi-square (p<0,05).

The direct association between the lower cognitive capacity and functional disability, in older people of both genders with cataract, corroborates previous study⁴. There is evidence of a predisposition, in the older people, regarding the emergence of cataract and other morbidities, and functional and cognitive decline⁴. Sensory impairment, such as eyesight, may mediate adverse effects of ageing on cognitive capacity, possibly due to sensory deprivation, which generates a greater impact on brain function via diaschisis. Such a concept suggests that focal brain damage (as in sensory areas) is capable of

affecting distinct, more distant cerebral regions than initially affected²².

Worse visual function also hinders social interaction and performance in activities in daily living (ADL)²³, a fact that can worsen cognitive performance by being conducive to social isolation²³. Besides this, the positive effects of cataract surgery on the improvement of cognitive and functional capacities²⁴ are known. Therefore, health professionals should consider this aspect for cognition improvement among older people.

Table 2. Distribution of averages and standard deviations of socio-demographic, health and behavioural variables included in the model of older people, according to gender, with self-reported cataract, resident in a health macroregion, Minas Gerais, Brazil, 2017-2018.

Variables	Gender						p*
	Females		Males		Total		
	Average	Std. Deviation	Average	Std. Deviation	Average	Std. Deviation	
Age (complete years)	73.14	7.17	74.68	8.11	73.63	7.51	0.043
Schooling	3.72	3.76	3.25	2.74	3.57	3.47	0.139
Cognitive capacity (0 - 30)	24.57	3.78	24.57	3.25	24.57	3.62	0.998
No. of self-reported morbidities	8.65	3.11	6.53	2.89	7.97	3.19	0.001
Depressive symptoms (0 - 15)	4.33	3.54	3.06	2.66	3.92	3.34	0.001
Physical performance (0 - 12)	7.54	3.22	8.48	3.03	7.84	3.19	0.004
Sedentary behaviour	312.66	178.00	322.84	165.17	315.92	173.88	0.566
No. of impaired components of frailty phenotype (0 - 5)	1.89	1.38	1.51	1.23	1.77	1.34	0.050

Note: *Student t test (p<0.05).

Table 3. Direct and indirect standard coefficients for the variables associated with functional disability of older people, according to gender, with self-reported cataract, resident in a health macroregion, Minas Gerais, Brazil, 2017-2018.

Associations	Gender			
	Female		Male	
	Estimator	p*	Estimator	p*
Direct				
Worse physical performance	0.47	<0.001	-	-
Lower cognitive capacity	0.37	<0.001	0.38	0.001
Greater sedentary behaviour	-0.24	<0.001	-	-
Higher no. of impaired components of the frailty phenotype	-0.33	<0.001	-0.63	<0.001
Higher no. of depressive symptoms	-	-	-0.42	<0.001
Indirect				
Greater age → Worse physical performance → Functional disability	-0.08	<0.001	-	-
Greater no. of depressive symptoms → Worse physical performance → Functional disability	-0.12	<0.001	-	-
Less schooling → Less cognitive capacity → Functional disability	0.18	<0.001	0.13	0.001
Worse physical performance → Less cognitive capacity → Functional disability	-	-	0.07	0.001
Greater age → Higher no. of impaired components of the frailty phenotype → Functional disability	-0.03	<0.001	-	-
Worse physical performance → Higher no. of impaired components of the frailty phenotype → Functional disability	-	-	0.26	<0.001
Greater no. of depressive symptoms → Higher no. of impaired components of the frailty phenotype → Functional disability	-0.03	<0.001	-	-
Greater age → Greater sedentary behaviour → Functional disability	-0.02	<0.001	-	-
Greater no. of depressive symptoms → Greater sedentary behaviour → Functional disability	-0.05	<0.001	-	-
Greater no. of self-reported morbidities → Higher no. of impaired components of the frailty phenotype → Functional disability	-	-	-0.09	<0.001
Greater age → Higher no. of impaired components of the frailty phenotype → Functional disability	-	-	-0.08	<0.001
Greater no. of self-reported morbidities → Greater no. of depressive symptoms → Functional disability	-	-	-0.06	<0.001

Note: *p<0.05.

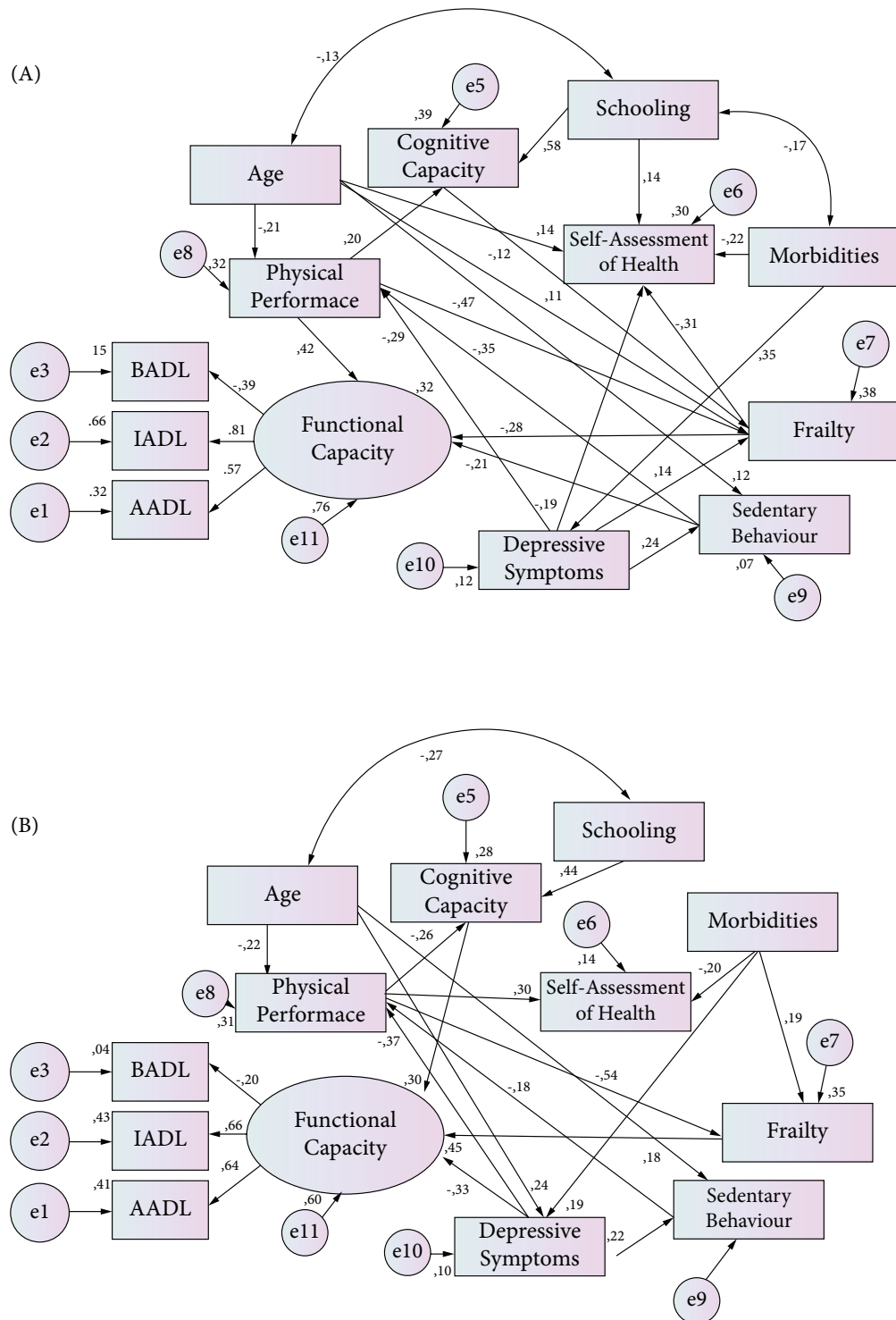


Figure 2. Models with direct and indirect effects of demographic, health and behavioural variables on functional disability of older people, according to gender, with self-reported cataract, resident in a health macroregion, Minas Gerais, Brazil.

Note: (A) Indicators of model adjustment quality for female gender (χ^2 (GL = 40) = 70.4; p = 0.002; CFI = 0.97; GFI = 0.96; TLI = 0.95; RMSEA = 0.050); BADL: basic activities of daily living; IADL: instrumental activities of daily living; AADL: advanced activities of daily living. (B) Indicators of model adjustment quality for male gender (χ^2 (GL = 46) = 64.4; p = 0.037; CFI = 0.95; GFI = 0.93; TLI = 0.92; RMSEA = 0.050); BADL: basic activities of daily living; IADL: instrumental activities of daily living; AADL: advanced activities of daily living.

In alignment with another study⁵, this research found, in both sexes, a direct association between the larger number of impaired components of the frailty phenotype and functional disability. This association may be due to reduction of the homeostatic organic reserve and tendency to sarcopenia, with increased vulnerability of the individual to environmental stressors¹⁶. There is also a tendency toward development of pre-frailty and frailty among the older people with visual problems²⁵, which suggests that senility-related eye diseases, such as cataract, are possibly associated with the fragility syndrome⁵.

Specifically among older men with cataract, a prior study²⁶ and this one identified a direct association between the larger number of depressive symptoms and functional disability. It is worth noting that cataract is an important cause of blindness, and that low visual acuity has the potential to cause psychic suffering and depression²⁷. Cataract surgery can reduce the number of manifestations of depression among the older people, especially men²⁸. The depressive symptoms potentially impair the ability to perform ADL⁵, as the execution of these activities depends on proper functioning of mood and other functional systems.

This research showed a direct association between worse physical performance and functional disability in older women with cataract, which is in line with previous investigations^{5,29} that also showed improvement in the physical performance of older women after facetectomy²⁹. Low visual acuity generates worsening body balance, postural stability and mobility, predisposing the older woman to functional disability²⁹.

In the direct association of sedentary behaviour with functional disability among older women with cataract, preceding studies observed that those with visual impairment, especially aged over 50, showed higher levels of sedentary behaviour than those with normal vision³⁰, and that the chances of functional decline were higher among those over 85 with greater sedentary behaviour compared to those without³¹. Therefore, considering that ageing is impacted by the relationship between functional disability and sedentary behaviour, changes in habits should be fostered, as less sedentary behaviour and encouragement to practice physical activity, with lower levels are associated with higher risk, and higher levels with lower

the risk of cataract development³², aside from the fact physical activities are practiced more after facetectomy surgery³².

This study also found an indirect association, mediated by the worse cognitive capacity, of the lower schooling level with functional disability, among older people with cataract. Investigation observed that illiterate elderly are more likely to develop cataract than the literate³³. In the older people, it was also found that there was a direct association between the lower schooling and greater prevalence of cognitive impairment³⁴. Thus, schooling presents an essential modifiable factor in the care of older people, with impacts on the prevalence of cataract, access to and success of treatment, and the maintenance of functional capacity.

Regarding the indirect association between older age and functional disability in the older women, mediated by the worse physical performance, it is observed that the oldest old present less physical performance than the less old³⁵. The harm among females matches a study⁵ in which women presented worse scores in physical performance tests, especially those who were much older³⁵. In addition, the reduction of visual acuity, imposed by cataract, can impair balance and mobility, predisposing functional decline⁶.

Like physical performance, the larger number of impaired components of the frailty phenotype also mediated the indirect association above. Older people are more prone to the development of sarcopenia, intrinsic risk factors for the emergence of the fragility syndrome⁵. The integrative review revealed that the larger number of impaired components of the frailty phenotype may have a harmful effect on the functional capacity of the older people with cataract⁷. However, it should be noted that physical activity, by providing improved mobility and muscle strength, can reverse this tendency toward frailty and mitigate functional decline³².

Sedentary behaviour also measured the association between older age of elderly women and functional disability. Investigation observed greater chance of functional decline in women, aged 85 or over, who remained seated for 10 hours per day when compared to those who spend less than five³¹. Ageing is related to decline in sensory functions, especially visual²⁹, which can be detrimental in participation of the older women in social and physical activities,

and is conducive to sedentary behaviour^{6,29}. The relationship between sedentary behaviour and functional disability affects the ageing process itself, and, therefore, changes in this habit and the promotion of regular physical activity play an essential role in maintaining the independence and autonomy of the older people, as well as contribute to a better quality of life²⁹.

Cataract does not only impair physical conditions, but also the mental aspect of the older people, conducive to psychological disorders³⁶. In this study, among the older women with cataract, the larger number of depressive symptoms, mediated by the physical and behavioural conditions mentioned above, was indirectly associated with functional disability. Performance in ADL depends on the integrity of functional systems, such as mood, and their disorders, such as depressive symptomatology, are more frequent in the older women³⁷, and are associated with functional disability³⁸. Similarly, this condition also affects older women with impaired eyesight^{27,37}, which is a component related to physical performance, mobility, independence and autonomy⁷.

As for the indirect association between the larger number of depressive symptoms and functional disability in the older women, mediated by the worse physical performance, it is noteworthy that this²⁹ and a depressive symptomatology³⁷ are more frequent among older women with cataract, the development of which is linked to biological ageing^{4,6-7}, and may affect independence and autonomy⁷.

Like the worse physical performance and depressive symptomatology, frailty syndrome, which also measured the aforementioned indirect association, is more frequent among older women⁵. Literary findings revealed that the older people with depressive symptoms had a higher risk of developing frailty³⁹. The presence of depressive symptoms compromises social involvement, worsening the condition of frailty³⁹, and, consequently, the functional decline^{7,39}, a more evident scenario among older people with cataract⁷. Thus, clinical practice should identify depressive symptomatology and the frailty syndrome among older women with cataract, due to negative impacts on the quality of life and functional capacity^{7,39}. Moreover, in understanding the depressive symptomatology among older women with cataract, it is essential to consider behavioural health issues, as these aggravate susceptibility to functional decline^{7,40}.

Ageing brings physiological changes, often accentuated by the presence of chronic diseases, some preventable and treatable⁵, such as depressive symptomatology. In this paper, among the older men, this condition mediated the indirect association between older age and functional disability. Senile cataract^{4,6-7}, functional decline^{5,7} and depressive symptoms are conditions related to the advancement of age, the latter markedly among men⁴¹. Specifically among those with cataract, low visual acuity can give rise to psychic suffering^{24,27-28}, and, consequently, functional disability^{5,7,26}. Thus, it is necessary to identify in men of advanced age, more vulnerable to these conditions, functional, social and emotional aspects related to the preservation of autonomy and independence, in order to reduce the risk of negative outcomes caused by depressive symptomatology and cataract.

In addition to old age, in the older men group, depressed symptoms mediated the association between the larger number of self-reported morbidities and functional disability. Multimorbidity may imply functional limitations that affect the performance of activities related to personal, social or work life, contributing to the emergence of mood disorders, such as a depressive symptomatology⁴². Investigation carried out among older people awaiting cataract surgery verified a prevalence of depressive symptoms in 28.6%, and low visual acuity, and more morbidities were associated with depressive symptoms⁴³. Also, both depressed symptomatology and eyesight problems, such as cataract, were associated with functional decline⁷.

Among older men, there was an indirect association, mediated by the larger number of impaired components of the frailty phenotype, between the larger number of self-reported morbidities and functional disability. The reduction in visual acuity, present in patients with cataract, and the presence of multimorbidity are risk factors for diminished autonomy and independence⁴⁴.

The study identified an association between the severity of crystalline lens opacification and the worse frailty condition⁴⁵, since, possibly, senile cataract and frailty share a common risk factor: structural qualitative changes related to ageing, proteins as much in the lens as in the skeletal musculature⁴⁵. Therefore, visual difficulty²⁶, multimorbidity and frailty syndrome are associated with functional disability^{7,26}, and should be observed in the care for the older man with cataract.

Furthermore, cognitive capacity in the group of older men also mediated the association between the worse physical performance and functional disability. Impairment to surface, distance and contrast perception caused by cataract, affect mobility, balance and physical performance²⁹. Such conditions contribute to changes in physical performance, and, consequently, are conducive to functional disability²⁹. Therefore, understanding the relationship of physical performance and the cognitive capacity of older men with cataract may help to identify preclinical markers in diagnostic evaluations for interventions directed to functional capacity promotion.

In this research, the larger number of impaired components of the frailty phenotype mediated, in the male group, the association between the worse physical performance and functional disability. Systematic review showed that frailty can be associated in older men with sarcopenia, which generates decreased strength and quality of muscular contraction, and co-ordination of movement⁴⁰, and, if coexisting with cataract⁸, may predispose them to frailty syndrome and to worse physical performance⁷, generating functional disability and increased risk of mortality⁴⁰.

As limitations, the research presents self-reported conditions of the cataract diagnosis, morbidity and time spent in sedentary behaviour. Moreover, there is absence of variables linked to social participation and environmental elements, as they potentially act as barriers or facilitators in the execution of ADL; and the inclusion of older people with cognitive decline would also expand understanding among this population segment.

Moreover, new longitudinal and multicentre research, and representative samples of the older people in various Brazilian states, can identify the presence of other causalities, and associations beyond those verified in this study.

Conclusion

It is concluded that, regardless of gender, functional disability is associated with worse cognitive capacity and fragility syndrome; specifically in older women, the outcome was associated with physical and behavioural conditions; in older men, with the presence of depressive symptoms.

This study extends the knowledge frontier concerning the factors associated with functional disability in older people with cataract, presents the gender differences, and allows for the creation of more effective care policies, attentive to relevant elements of major importance for each of these population segments.

Collaborators

NN Oliveira, NGN Oliveira: conception, research design, interpretation, analysis and manuscript draft. DMS Tavares: conception, research design, analysis, manuscript draft and research coordinator. All authors contributed in the critical review of the manuscript and approved its submitted version.

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