Motor performance of the elderly in northeast Brazil: differences with age and sex

DESEMPENHO MOTOR DE IDOSOS DO NORDESTE BRASILEIRO: DIFERENÇAS ENTRE IDADE E SEXO

DESEMPEÑO MOTRIZ DE ANCIANOS DEL NORESTE BRASILEÑO: DIFERENCIAS ENTRE EDAD Y SEXO

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ABSTRACT

The aim of the present study was to determine motor performance based on sex and age in community-dwelling elderly individuals of Northeast Brazil. This investigation was a cross-sectional study that analyzed data from 316 elderly individuals from a population-based household epidemiological survey held in January 2011. The study participants included 173 women (54.7%) and 143 men, with mean age of 74.2 ± 9.8 years. The women presented higher functional declines due to aging and more functional limitations in strength/endurance tests of their lower extremities and locomotion. In both sexes, the functional-limitation prevalence was higher in the 70- to 79-year and ≥ 80-year age groups, with women exhibiting more limitations after age 70 and men, after age 80. Data from this study can aid the planning of measures for prevention, maintenance or improvement of functional limitations in older people, providing these individuals with more integrated care.

DESCRIPTORS

Aged
Physical fitness
Psychomotor performance
Time and motion studies
Health of the elderly

RESUMO

O objetivo deste estudo foi identificar o desempenho motor, de acordo com o sexo e o grupo etário, em idosos residentes em comunidade do Nordeste brasileiro. Trata-se de estudo transversal que analisou dados de 316 idosos de uma pesquisa epidemiológica de base domiciliar e populacional realizada em janeiro de 2011. Participaram do estudo 173 mulheres (54,7%) e 143 homens com idade média de 74,2 (± 9,8 anos). As mulheres apresentaram maior declínio funcional com o avanço da idade e mais limitação funcional em testes de força/resistência de membros inferiores e locomoção. Em ambos os sexos, a prevalência de limitação funcional foi mais elevada nos grupos etários de 70-79 anos e ≥ 80 anos, com as mulheres apresentando mais limitação a partir dos 70 anos e os homens, a partir dos 80 anos. Os dados desta pesquisa podem subsidiar o planejamento de medidas para prevenção, manutenção ou melhora da limitação funcional em idosos, proporcionando maiores cuidados integrados.

DESCRITORES

Idoso
Aptidão física
Desempenho psicomotor
Estudos de tempo e movimento
Saúde do idoso

RESUMEN

Se apuntó a identificar el desempeño motriz de acuerdo a sexo y grupo etario en ancianos residentes en comunidad del Noreste brasileño. Estudio transversal analizando datos de 316 ancianos de una investigación epidemiológica de base domiciliaria y poblacional realizada en enero 2011. Participaron 173 mujeres (54,7%) y 143 hombres con media etaria de 74,2±9,8 años. Las mujeres presentaron mayor declinación funcional con el avance de la edad y más limitaciones funcionales en tests de fuerza/resistencia de miembros inferiores y locomoción. En ambos sexos, la prevalencia de limitación funcional fue mayor en los grupos etarios de 70-79 años y ≥80 años, presentando las mujeres mayores limitaciones desde los 70 años y los hombres a partir de los 80. Los datos de esta investigación pueden colaborar en la planificación de medidas de prevención, mantenimiento o mejora de la limitación funcional en ancianos, proporcionando mayores cuidados integrados.

DESCRIPTORES

Anciano
Acondicionamiento físico
Desempeño psicomotor
Estudios de tiempo y movimiento
Salud del anciano

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INTRODUCTION

Growth of the elderly population has been followed by an increased prevalence of chronic diseases and disabilities[1], resulting in serious challenges to health services[2-3].

Among the several indicators to be considered in assessing the health of elderly populations, motor performance has a peculiar significance, as it expresses the physical and mental skills necessary for independent and autonomous life[4], even in the presence of diseases[5].

In Brazil, there is little information regarding direct measurements of the functional health of elderly people living in communities. Only one household and population survey on the elderly population of São Paulo has been found in the literature. The motor performance tests conducted in that study have provided data on functional limitations[6]. Nonetheless, one should realize that no socioeconomic, environmental or cultural homogeneity exists between the regions of Brazil, which explains the various health-related behaviors and, consequently, affects motor performance. Studies addressing the motor performance of elderly people in different contexts allow for the expanded diagnosis of their health conditions.

The purpose of the present study was to determine the motor performance of elderly people from a community in northeastern Brazil as a function of the sex and age group.

Studies addressing the motor performance of elderly people in different contexts allow for the expanded diagnosis of their health conditions.

METHODS

This cross-sectional study analyzed data from a household epidemiological survey conducted in January 2011, entitled "*Nutritional status, risk behaviors and health conditions of elderly people in Lafaiete Coutinho-BA*". The investigated city is located 356 km from the state capital (in the south-central mesoregion) and had 4,162 inhabitants during the period of data collection. The inhabitants were distributed between urban (52.9%) and rural (47.1%) areas, and all of them were enrolled in the Family Health Strategy (FHS) social assistance program. The city has low socio-demographic and educational indicators, as confirmed by the low socioeconomic status and educational level of the studied population, which is predominantly composed of rural workers and service suppliers.

The study protocol was approved by the Research Ethics Committee of Universidade Estadual do Sudoeste da Bahia (no 064/2010).

All the urban residents who were ≥ 60 years of age (n = 355) were contacted for interviews and tests (blood tests, blood pressure measurements, anthropometric measurements and motor tests). Residences were located using data from FHS. In total, 316 (89.0%) elderly subjects out of the 355 individuals that composed the studied population participated in the survey, whereas 17 declined to participate (4.8%), and 22 (6.2%) could not be located after three home visits on alternate days and were thus regarded as losses.

A form template based on the questionnaire used in the Survey on Health, Aging, and Well-Being - SABE (http://hygeia.fsp.usp.br/sabe/Extras/Questionário_2000.pdf) [7] was adopted, with the exception of the questionnaires focusing on physical activity and food intake, which were broader in this study.

Data were collected in two stages. The first stage consisted of a home interview covering various aspects such as personal information, cognitive assessment, health status, functional status, use of medicines, utilization of and access to health services, work history and income sources, housing characteristics, mobility and flexibility tests, feeding frequency and physical activity. The second stage was conducted at two family health units from the city and included blood pressure checks, blood tests, anthropometry and handgrip strength tests; this last stage was scheduled with an interval of one to three days after the home interview.

The following information was used in this study: age, sex, education, income, marital status, race/color and motor performance tests. The motor performance tests included balance, walk, chair stands, picking up a pen, and handgrip strength.

The motor performance tests were conducted by undergraduate and postgraduate students in the health field, who received special training for testing, refinement and calibration of the interviewers.

Subjects were excluded from analysis if they refused to take the tests or failed to understand the instructions due to cognitive problems. Individuals who were unable to perform the tasks due to physical limitations were categorized in the score analyses as disabled and included the following: 1) Subjects who were unable to walk or who needed help standing upright, subjects with palsy of any limb, subjects with leg prostheses, and subjects who could not maintain their balance were not submitted to tests involving the lower limbs. 2) Subjects who had undergone eye surgery during the previous six weeks were not tested for their ability to pick up a pen. 3) Subjects who had undergone arm or hand surgery during the three months prior to data collection were not subjected to the handgrip strength test.

Before each test, the interviewer explained and demonstrated the task, ensuring that the test could be conducted without posing any danger.

The handgrip strength test was performed using a hydraulic dynamometer (Saehan Corporation SH5001, Korea). The test was conducted using the arm that was considered by the subject to be stronger. During the test, the subject remained seated with the elbow on a table, the forearm pointing forward, and the palm of the hand facing upward. Each subject made two attempts, with 1-minute intervals, and the higher value (kg) was considered for this study. The participants were encouraged to apply their maximum strength. To evaluate performance, the values were distributed into the following percentiles (P_k) based on sex[6]: disabled = score 0 (disabled); ≤ P_{25} = score 1 (poor); > P_{25} to ≤ P_{75} = score 2 (medium); > P_{75} = score 3 (good).

The chair stand test was used to assess the strength/endurance of the lower limbs. Before the test, the individual was first instructed to sit down and then get up from the chair, for five times back-to-back, to ensure that the task was performed safely. The individual started the test in the seated position, with the arms crossed over the chest, and was instructed to stand up five times, as fast as possible, without pausing. The test was considered successfully completed if its duration was ≤ 60 seconds.

The pick-up-a-pen test was conducted to verify mobility/flexibility. In this test, the individual remained upright, with the feet together. Then, after the participant was informed that the test had begun, he/she would bend down to pick up a pen from the floor; the pen had been placed 30 centimeters in front of and in line with the tips of the toes. As the respondent reported being ready to begin the test, the timer was activated, and the time spent between bending down and returning to the former position—with pen in hand—was determined. The test was considered complete when the subject finished the activity (without leaning) within ≤ 30 seconds.

The walk test was employed to determine the locomotor ability of the elderly subject. The walking speed was tested using a path of 2.44 m, and the participant was requested to walk from one end to the other at his/her usual speed. When necessary, the participants could use assistive devices. The course was performed twice, and the shortest completion time (in seconds) was considered. The test was considered complete when the subject finished the activity in ≤ 60 seconds.

To evaluate performance in the chair stand, pick-up-a-pen and walk tests, criteria previously described by other authors were adopted[6,8-9]. From these criteria, a score was established as a function of the distribution of time in P_k: disabled or unable to complete = score 0 (disabled); > P_{75} = score 1 (poor); > P_{25} to ≤ P_{75} = score 2 (medium); ≤ P_{25} = score 3 (good).

Balance was determined in four stages wherein the subject was requested to perform each of the following tasks, for 10 seconds each: (1) maintain balance while standing with both feet together, (2) maintain balance while standing with the heel of one foot in front of the toes of the other foot, (3) maintain balance while standing on only the right leg, and (4) maintain balance while standing on only the left leg. To assess performance, the following score has been established[6]: unable to perform any of the tasks = score 0 (disabled); only able to perform task 1 = score 1 (poor); able to perform tasks 1 and 2 = score 2 (medium); able to perform tasks 1, 2, 3 and/or 4 = score 3 (good).

For the descriptive analysis of the variables, the means, standard deviation, median, interquartile range, percentiles and proportion of subjects as a function of sex and age were used (60-69, 70-79 and ≥ 80 years). The effect of age on motor performance was assessed by the Kruskal-Wallis test, whereas pairwise comparisons as a function of the age group and sex were performed using the U Mann-Whitney test. In line with the scores of motor performance, sex and age group, the proportion of subjects is shown in tables, which present chi-square calculations of the respective test; if any expected frequency was below five, then Fisher's exact test was applied. The relationship between the test scores of motor performance as a function of sex was verified using the Spearman correlation coefficient.

In all the analyses, the adopted significance level was 5% ($\alpha = 0.05$). Data were tabulated and analyzed using the Statistical Package for Social Sciences for Windows (SPSS 15.0, SPSS, Inc., Chicago, IL).

RESULTS

The study included 173 women (54.7%) and 143 men (45.3%). The ages ranged from 60 to 105 years, with an mean of 74.2 ± 9.8 years. The mean age was 74.9 ± 10 years (60 - 103) among the women and 73.4 ± 9.4 years among the men. Most of the population could not read or write messages (66.8%), had a family income below the minimum wage (88.1%), and declared themselves as non-white (78.9%); regarding marital status, 43.4% of the subjects reported not living with a partner.

Differences in the values of the handgrip strength and time spent on the chair stand, pick-up-a-pen and walk tests as a function of the sex and age group are shown in Table 1. The handgrip strength values for men were generally higher in all the age groups. In the older age groups, significantly lower handgrip strength values were determined in both sexes. The time allocated for women to undergo the motor performance tests was higher in all the tasks and in all the age groups, except for the pick-up-a-pen test, at the age groups of 60-69 years (P = 0.648) and 70-79 years (P = 0.135). The time spent by women in performing the tasks (chair stand,

Table 1 - Median and interquartile range for the values of handgrip strength and the times allocated for the tasks (chair stand, pick up a pen and walk), as a function of the sex and age group - Lafaiete Coutinho, BA, Brazil, 2011

Tests	Age groups			
	60-69	70-79	≥ 80	All
Handgrip strength (kg)				
Women*	20.0 ± 6.0[a†]	18.0 ± 4.0[b†]	16.0 ± 7.0[c†]	18.0 ± 6.0[†]
Men*	30.5 ± 13.0[a†]	29.0 ± 10.0[a†]	24.0 ± 9.0[b†]	28.0 ± 12.0[†]
All*	23.0 ± 11.0[a]	21.0 ± 11.0[b]	19.0 ± 10.0[c]	21.0 ± 11.0
Chair stand				
Women***	13.0 ± 6.0[a†]	14.0 ± 8.0[ab†]	18.5 ± 8.0[b†]	14.0 ± 8.0[†]
Men*	11.0 ± 6.0[†]	12.0 ± 5.0[†]	14.5 ± 5.0[†]	12.0 ± 5.0[†]
All**	12.0 ± 5.0[a]	13.0 ± 6.0[a]	15.0 ± 8.0[b]	13.0 ± 7.0
Pick up a pen				
Women*	2.0 ± 2.0[a]	2.0 ± 2.0[a]	3.0 ± 3.0[b†]	2.0 ± 2.0[†]
Men*	2.0 ± 1.0	1.0 ± 1.0	2.0 ± 1.0[†]	2.0 ± 1.0[†]
All*	2.0 ± 1.0[a]	2.0 ± 1.0[a]	2.0 ± 2.0[b]	2.0 ± 2.0
Walk				
Women*	3.0 ± 1.0[a†]	4.0 ± 1.0[a†]	4.0 ± 2.0[b†]	4.0 ± 1.0[†]
Men*	3.0 ± 2.0[†]	3.0 ± 1.0[†]	3.0 ± 2.0[†]	3.0 ± 2.0[†]
All*	3.0 ± 2.0[a]	3.0 ± 1.0[b]	4.0 ± 2.0[c]	3.0 ± 1.0

* P < 0.001; ** P = 0.001; *** P = 0.012, significant difference in the values between age groups (Kruskal-Wallis test).
[a,b,c] Medians with different superscript letters denote statistically significant differences (Mann-Whitney test).
[†] P ≤ 0.05, significant difference in values as a function of sex (Mann-Whitney test).

Table 2 - Percentiles* of the handgrip strength values (kg) and times spent in the chair stand (s), pick up a pen (s) and walk (s) tests as a function of the age group and sex - Lafaiete Coutinho, BA, Brazil, 2011

Age group	Women				Men				All
	60-69	70-79	≥ 80	All	60-69	70-79	≥ 80	All	≥ 60
Handgrip strength (n)	58	57	52	167	54	47	35	136	303
5	10.9	12.7	8.0	9.4	16.5	17.2	7.6	14.8	10.2
10	12.9	14.0	8.3	11.0	19.5	20.0	10.6	18.7	12.4
25	17.5	16.0	12.0	15.0**	23.0	25.0	19.0	22.0**	17.0
50	20.0	18.0	16.0	18.0	30.5	29.0	24.0	28.0	21.0
75	23.2	20.0	19.0	21.0**	36.0	35.0	28.0	34.0**	28.0
90	29.0	23.2	22.0	24.0	40.0	39.0	32.8	38.3	34.0
95	30.0	24.3	22.3	28.6	42.5	39.6	34.8	40.1	38.0
Chair stand (n)	56	49	38	144	53	44	28	125	269
5	6.0	9.0	9.9	8.0	7.7	8.0	8.4	8.0	8.0
10	8.0	9.0	10.0	10.0	8.0	8.0	9.0	8.0	9.0
25	11.0	11.0	13.7	11.0	9.0	10.0	11.0	10.0	10.0**
50	13.0	14.0	16.5	14.0	11.0	12.0	14.5	12.0	13.0
75	16.7	19.0	21.2	19.0	14.5	14.7	15.7	15.0	17.0**
90	21.3	23.0	29.4	24.0	21.6	20.0	22.1	20.0	22.0
95	24.3	32.5	40.8	28.5	27.2	23.7	24.1	24.4	26.0
Pick up a pen (n)	55	47	37	140	51	43	26	120	260
5	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
10	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
25	1.0	1.0	2.0	1.0	1.0	1.0	1.0	1.0	1.0**
50	2.0	2.0	3.0	2.0	2.0	1.0	2.0	2.0	2.0
75	3.0	3.0	5.0	3.0	2.0	2.0	2.2	2.0	3.0**
90	4.0	4.0	9.2	5.0	4.0	4.0	4.3	4.0	4.9
95	5.4	6.6	13.1	7.9	5.0	4.8	5.0	5.0	5.95
Walk (n)	58	50	39	148	54	47	28	129	277
5	2.0	2.0	3.0	2.0	1.7	2.0	2.0	2.0	2.0
10	2.0	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0
25	3.0	3.0	4.0	3.0	2.0	3.0	3.0	2.0	3.0**
50	3.0	4.0	4.0	4.0	3.0	3.0	3.0	3.0	3.0
75	4.0	4.0	6.0	4.0	4.0	4.0	4.7	4.0	4.0**
90	5.2	5.9	7.0	6.1	5.0	5.2	6.0	5.0	6.0
95	9.0	7.4	13.0	9.0	5.2	8.2	6.5	6.0	7.0

* Data from subjects who managed to complete the tests.
** Used to define the performance categories.

pick up a pen and walk) significantly increased at the age of 80 years or above. By contrast, the time spent by men from the various age groups did not differ in the tests (chair stand, P = 0.076; pick up a pen, P = 0.146; walk, p = 0.091).

The percentile distribution of the values from the motor performance tests is shown in Table 2, in which the values employed to define the motor performance categories are marked.

Table 3 shows the distribution of the elderly into the four categories of performance on each task, for both women and men. In the handgrip strength, pick up a pen and balance tests, no significant differences were observed in the proportions of motor performance between the sexes. Nevertheless, significant differences were determined in the chair stand and walk tests, wherein women presented a higher prevalence of disabilities and poor performance. The highest prevalence of functional limitation (disability and poor performance) in women was observed for strength/endurance of the lower limbs (chair stand test) and balance, whereas in men, the highest prevalence was verified in the strength of the upper limbs (handgrip strength) and balance.

Table 4 shows the distribution of the elderly in each task, regarding the four performance categories based on the age group and sex. In general, the older age groups in both sexes exhibited a significantly higher prevalence of disability and poor performance in all tests, while the most significant differences were measured between the oldest group (≥ 80 years) and the two younger groups (60-69 years and 70-79 years).

The correlations between the motor performance tests are shown in Table 5. The scores of all the tests were positively and significantly correlated, while the strongest relationships were observed in both sexes in the following tests: 1) chair stand with pick up a pen and 2) pick up a pen with walk.

Table 3 - Distribution of the elderly as a function of sex and categories of test performance - Lafaiete Coutinho, BA, Brazil, 2011

Tests	Disabled		Poor		Medium		Good		P-value
	n	%	N	%	N	%	N	%	
Handgrip strength									
Women	2	1.2	45	26.6	82	48.5	40	23.7	0.701*
Men	4	2.9	36	25.7	71	50.7	29	20.7	
Total	6	1.9	81	26.2	153	49.5	69	22.3	
Chair stand									
Women	29	16.8	46	26.6	72	41.6	26	15.0	0.001**
Men	16	11.3	18	12.8	64	45.4	43	30.5	
Total	45	14.3	64	20.4	136	43.3	69	22.0	
Pick up a pen									
Women	16	10.3	28	17.9	63	40.4	49	31.4	0.249**
Men	10	7.7	17	13.1	48	36.9	55	42.3	
Total	26	9.1	45	15.7	111	38.8	104	36.4	
Walk									
Women	16	9.8	32	19.5	55	33.5	61	37.2	< 0.001**
Men	10	7.2	20	14.4	21	15.1	88	63.3	
Total	26	8.6	52	17.2	76	25.1	149	48.2	
Balance									
Women	16	9.3	43	25.0	45	26.2	68	39.5	0.245**
Men	12	8.5	24	16.9	36	25.4	70	49.3	
Total	28	8.9	67	21.3	81	25.8	138	43.9	

* Fisher's exact test.
** Chi-square test.

Table 4 - Distribution (%) of the elderly according to the age group, sex and categories of test performance - Lafaiete Coutinho, BA, Brazil, 2011

Tests	Women			P-value	Men			P-value
	60-69	70-79	≥ 80		60-69	70-79	≥ 80	
Handgrip strength (n)	58	57	54		54	49	37	
Disabled	0.0	0.0	3.7		0.0	4.1	5.4	
Poor	15.5	22.8	42.6	< 0.001*	22.2	16.3	43.2	0.002*
Medium	43.1	59.6	42.6		51.9	51.0	48.6	
Good	41.4	17.5	11.1		25.9	28.6	2.7	
Chair stand (n)	60	57	55		55	49	37	
Disabled	6.7	14.0	30.9		3.6	10.2	24.3	
Poor	21.7	28.1	29.1	0.009**	12.7	12.2	13.5	0.002*
Medium	50.0	42.1	32.7		36.4	51.0	51.4	
Good	21.7	15.8	7.3		47.3	26.5	10.8	
Pick up a pen (n)	56	52	47		52	45	33	
Disabled	1.8	9.6	21.3		1.9	4.4	21.2	
Poor	14.3	11.5	29.8	0.001*	13.5	11.1	15.2	0.020*
Medium	41.1	42.3	36.2		36.5	33.3	42.2	
Good	42.9	36.5	12.8		48.1	51.1	21.2	
Walk (n)	59	55	49		55	49	35	
Disabled	1.7	9.1	20.4		1.8	4.1	20.0	
Poor	10.2	14.5	36.7	< 0.001*	14.5	10.2	20.0	0.020*
Medium	35.6	38.2	26.5		10.9	22.4	11.4	
Good	52.5	38.2	16.3		72.7	63.3	48.6	
Balance (n)	59	57	55		56	49	37	
Disabled	1.7	7.0	20.0		3.6	6.1	18.9	
Poor	18.6	15.8	41.8	< 0.001**	14.3	10.2	29.7	< 0.001*
Medium	11.9	40.4	25.5		17.9	24.5	37.8	
Good	67.8	36.8	12.7		64.3	59.2	13.5	

* Fisher's exact test.
** Chi-square test.

Table 5 - Spearman correlation coefficient for testing motor performance in the elderly subjects - Lafaiete Coutinho, BA, Brazil, 2011

Motor performance tests	Women			
	$r_{spearman}$	$r_{spearman}$	$r_{spearman}$	$r_{spearman}$
	Chair stand	Pick up a pen	Walk	Balance
Handgrip strength	0.33*	0.21*	0.28*	0.41*
Chair stand		0.61*	0.55*	0.51*
Pick up a pen			0.60*	0.47*
Walk				0.44*
	Masculino			
	Chair stand	Pick up a pen	Walk	Balance
Handgrip strength	0.36*	0.47*	0.42*	0.40*
Chair stand		0.60*	0.58*	0.46*
Pick up a pen			0.64*	0.48*
Walk				0.54*

P < 0,01 (2-tailed).

DISCUSSION

In Brazil, studies providing objective information on the functional health of elderly people living in communities are still scarce. The present report is the second household and population survey to provide data on functional limitations among the elderly by testing motor performance; the first investigation[6] did not apply the locomotor ability test and was performed in a region with socioeconomic and cultural characteristics that differed from those of the present study.

Because the present study is a population survey, the results of this research can be used in the absence of normative data as a reference for evaluating other elderly populations with similar characteristics. Furthermore, because this study employed motor performance tests that have been widely used in the literature[6,8,10], the present data may be used to compare different populations, particularly, elderly groups from Latin America and the Caribbean who participated in the SABE survey[6-7,10].

Results of this study revealed a functional decline with age among older women in the tests of strength (upper and lower limbs), mobility/flexibility and locomotion. By contrast, the men exhibited decreased strength only in their upper limbs. In most of the tasks, it was noted that the women's functional decline occurred from the age of 80 onwards, except for the manual handgrip strength test, for which the difference was perceived within the age range of 70-79 years. In contrast with the women, the handgrip strength in the men was only lower in the group that was ≥ 80 years of age. These findings differ from those regarding elderly people in southeastern Brazil[6], wherein a functional decline was observed in both sexes, in all the mentioned tests except for the walk task, which was not considered in the study.

Unlike the results determined by São Paulo[6], the findings of Lafaiete Coutinho suggest that the impact of aging on the functional health of elders from the northeastern region is higher among women than among men. The reduction in walking speed and the increase in the time required by women to conduct the chair stand test are consistent with the results from longitudinal studies[11].

Loss of mass, strength and muscle quality are key factors identified as responsible for deterioration of the functional capacity of aging individuals[12]. Evidence indicates that the maximum muscle strength of the lower limbs in the group of elderly individuals who are 80 years of age is up to 27% lower compared with those who are 60 years of age[13]. In addition, increasing age is correlated with a decrease in the quality and quantity of nerve information required for effective motor and cognitive control[14].

Due to limitations of this study, we could not identify the factors that explain the different functional decline pattern based on sex. However, some information should be highlighted: in poor countries, women comprise the majority of the elderly population and report a higher number of chronic diseases[15]. The living conditions (past and present) of men and women in northeastern Brazil are possibly distinct and more pronounced than the conditions observed in the southeastern region, which is more similar to developed countries. This factor may be related to the higher functional decline among women in this study, compared with the findings of the SABE survey in São Paulo[6].

When the median time to complete the chair stand was compared between elderly subjects from Lafaiete Coutinho and participants in the SABE survey (São Paulo, Barbados and Cuba)[6,10] and the Third National Health and Nutritional Survey - NHANES III - (U.S.)[16], it was found that men in the present study (12.0 s) had a performance generally equal to those from São Paulo (12.0 s) and Cuba (12.0 s), higher than those from the U.S. (12.3 s) and inferior to those from Barbados (10.0 s). By contrast, women from Lafaiete Coutinho (14.0 s) had a performance equivalent to that of elderly women from Cuba (14.0 s) and inferior to that determined in São Paulo (13.0 s), the U.S. (13.1 s) and Barbados (12.0 s). In addition, the elderly participants from Lafaiete Coutinho displayed inferior performance on the walk test compared with subjects from the U.S., of both sexes: 3.0 s *vs*. 2.8 s and 4.0 s *vs*. 3.1 s, for men and women, respectively.

Analyses of prevalence in the motor performance categories have revealed that the proportions of disabled individuals (of both sexes) with poor performance on the tests were higher in the older age groups. Among women, there is a gradual increase in the prevalence of disability and poor performance in every age group. Among men, there is much similarity between the two younger age groups, whereas the increase was more pronounced in the group of individuals aged 80 or above, except for the chair stand test, in which the distribution was much similar to that seen in women. These findings suggest that the impact of aging on the functional ability of the elderly is more accentuated in women.

The chair stand and walk tests have demonstrated that women have more functional limitations than do men. The verification that women have a lower walking speed and more difficulty with tasks involving strength/endurance of the lower limbs may be associated with the fact that they are more affected by co-morbidities related to painful episodes (such as arthritis[17]), which generally limit the mobility and stability of the joints, especially in the lower limbs.

Because the cut-off points for classification of the walk test were not specific to the sex of the individual, the men might have had some advantage over the women due to the dependence of the locomotion speed on the step length, which is related to the stature and the muscle power in the lower extremities[18]. It is established that, regardless of age, men have greater muscle power than women have[19]; in this study, men likewise exhibited a significantly higher mean height ($P < 0.001$) (data not shown).

The results revealed that the prevalence of inabilities to perform balance tests was significantly higher in the group aged ≥ 80 years, as has been observed in other populations[6,16], thus suggesting greater motor deficits with advancing age. Aging affects the visual, vestibular and somatosensory systems and may suppress various stages of postural control, thereby reducing the compensatory capacity of the system and increase instability[20-21].

Correlations between the motor performance scores were significant in all the tests, for both sexes. These findings suggest that elderly individuals who perform well in one task tend to exhibit a similar efficiency in the other tests, corroborating the results of the SABE survey[6].

The limitations inherent to cross-sectional studies were present in this study. The results presented a brief moment in the life of the elderly individuals; information relating to past behavioral and environmental factors, which could influence the process and trajectory of functional limitations, were not obtained.

It is concluded that assessing motor performance, as part of the evaluation of elderly individuals, may improve the quality of health diagnoses. Data from this study might support the planning of measures for prevention or improvement of functional limitations in elderly people and thus might enable more integrated care.

CONCLUSION

In brief, the results of the present study revealed that: (i) compared with the men, the older women exhibited a greater functional decline at more advanced ages; (ii) compared with the men, the women presented more functional impairments during strength/endurance tests involving the lower limbs and locomotion; (iii) in both sexes, the prevalence of functional limitations was higher in the older age groups, with women exhibiting more limitations from 70 years of age upwards and men, from 80 years of age upwards.

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