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original article

Functional fitness in older women from southern brazil: normative scores and comparison with different countries

Aptidão funcional em idosas do sul do brasil: valores normativos e comparação com idosas de diferentes países

Gislaine Cristina Vagetti[1]
Valter Cordeiro Barbosa Filho[2]
Valdomiro de Oliveira[3]
Oldemar Mazzardo[3]
Natália Boneti Moreira[4]
Antonio Carlos Gomes[5]
Wagner de Campos[3]

Abstract – Functional fitness loss during aging may compromise the quality of life and independence of older subjects. It is important to evaluate and diagnose the functional fitness of the elderly population. This study proposed normative functional fitness scores for a sample of elderly women from southern Brazil and compared values to their counterparts in the US, Extremadura (Spain), Taiwan (China) and Spain. The study sample consisted of 1,783 older women aged 60.0 to 84.9 years (mean 68.7 years; standard deviation 6.3 years) who performed the proposed motor tests of the "Senior Fitness Test" for functional fitness in older women. The percentile values specific to each age group were calculated based on the seven functional fitness components: body mass index, 6-minute walk, arm curl, 30-s chair stand, chair sit-and-reach, backscratch, and 8-feet up-and-go. The non-parametric binomial test compared the 50th percentile value of Brazilian older women with those from other countries. Older women´s performance in the functional capacity tests decreased across age groups. The mean BMI varied among age groups from 29.11 to 26.76 kg/m^2, 6-minute walk from 572.94 to 486.95 m, arm curl from 17.51 to 15.11 repetitions, 30-schair stand from 15.62 to 14.30 repetitions, chair sit-and-reach from 1.01 to – 0.47 cm, back scratch from -4.92 to -10.52 cm and 8-feet up-and-go from 5.96 to 6.83 sec. Functional fitness scores among older women in different countries differed significantly. However, the direction and magnitude of differences were specific to the functional fitness component. Significant differences were observed in the normative scores, suggesting that the use of international normative scores in Brazilian older women may underestimate or overestimate potential functional limitations.

Key words: Aging; Aptitude Tests; Health in the Elderly.

Resumo – *A perda da aptidão funcional durante o envelhecimento pode comprometer a independência e qualidade de vida dos idosos. Sua avaliação é uma importante etapa do diagnóstico do estado de saúde dessa população. Objetivou-se propor valores normativos da aptidão funcional em idosas do sul do Brasil e comparar seus valores com idosas dos Estados Unidos, Estremadura (Espanha), Taiwan (China) e Espanha. A amostra do estudo foi composta por 1.783 idosas com idades entre 60,0 e 84,9 anos (média de 68,7 anos; desvio padrão de 6,3 anos), as quais efetuaram os testes motores propostos na "Senior Fitness Test" para a aptidão funcional em idosos. Os valores percentílicos, específicos para cada grupo etário, foram calculados para os sete componentes da aptidão funcional. O teste não paramétrico binomial foi utilizado para comparar o percentil 50 das idosas brasileiras com o das idosas de outras localidades. Foi possível observar que o rendimento das idosas nos testes de capacidade funcional reduziu com o avanço da idade. A média do IMC variou entre os grupos etários de 29,11 a 26,76kg/m^2; Andar 6 minutos de 572,94 a 486,95 m, Flexão de antebraço de 17,51 a 15,11repetições, Sentar e levantar de 15,62 a 14,30 repetições, Sentar e Alcançar de 1,01 a -0,47 cm, Alcançar atrás das costas -4,92 a -10,52 cm e Sentado e caminhar de 5,96 a 6,83 seg. Os escores de aptidão funcional apresentaram clara diferença entre os países. Contudo, a direção e a magnitude das diferenças entre idosas de diferentes países variaram de acordo com o indicador de aptidão funcional. Houve importantes distinções entre os valores percentílicos de idosas brasileiras e os de outras localidades, sugerindo que a utilização de valores normativos internacionais pode subestimar ou superestimar limitações funcionais em idosas brasileiras.*

Palavras-chave: *Idoso; Saúde do Idoso; Teste de aptidão.*

1 State University of Parana. Department of Music therapy. Curitiba, PR. Brrazil

2 Federal University of Santa Catarina. Department of Physical Education. Florianópolis, SC. Brazil

3 Federal University of Parana. Department of Physical Education. Curitiba, PR. Brazil

4 Dom Bosco College. Department of Physiotherapy. Curitiba, PR. Brazil

5 Brazilian Confederation of Athletics

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INTRODUCTION

The aging process is a complex and multifaceted set of morphological changes in the cardiopulmonary, nervous, and immune systems, including decreases in ventilatory peak flow, mineral bone density, and others[1]. Physiological declines on the musculoskeletal system result in muscle mass, power and strength loss (*sarcopenia*), decreases in bone mineral density, and cartilage and joint changes[2]. These musculoskeletal alterations tend to cause decreases in functional fitness, in other words, the ability to perform daily activities safely and independently (e.g. difficulties in balance and mobility and limitations in muscle skeletal strength)[3].

Functional fitness loss as a consequence of the aging process is associated with different health factors, including chronic diseases (e.g., hypertension and orthopedic impairments), sedentary lifestyle, disabilities, and low quality of life[4]. Therefore, assessing the functional fitness is important in the health status diagnosis of older adults.

Different methods and motor tests have been developed to evaluate the functional fitness of older adults[5,6]. Rikli and Jones[3] proposed a battery of functional fitness tests with normative scores for older adults based on a study that included 7,143 participants (4,058 women) aged 60-94 years from 20 different states of the United States (US). Tests included lower and upper body strength, aerobic endurance, lower and upper body flexibility, motor agility/dynamic balance, and body composition (body mass index or BMI)[3]. Similar tests have been applied to develop normative scores for older adults in the US, Extremadura (Spain), Taiwan (China) and Spain7-9.

Sociocultural, behavioral and even biological differences make it unfeasible to use the same normative functional fitness scores to populations of different countries. Moreover, contrasts among different individuals living in high-income (e.g. USA and Spain) and low-and-middle-income (e.g., Brazil and Taiwan) countries are still poorly understood. For older Brazilians, some studies have proposed normative scores, but they were limited to certain age groups[10-12], nonrandomized and small sample sizes[13-19]. A study conducted in 2005 with older women from Curitiba compared normative scores with older American women20. The study concluded that the functional fitness of Brazilian women was lower than their American counterparts due to the lack of public health initiatives targeting functional fitness in Brazilians. However, since then, government-based physical activity programs have been developed to increase the physical fitness and function of older adults. To our knowledge, no study conducted in Brazil has compared different components of normative scores in different countries.

Therefore, a study comparing functional fitness normative scores with populations of other countries is necessary. The aim of this study was to develop functional fitness normative scores in a representative sample of Brazilian older women participating in a government-based physical activity program and compare these normative scores with their peers in the US, Extremadura (Spain), Taiwan and Spain. This study will contribute

to the assessment and promotion of health and functional fitness in the older population and allow the identification of specific actions to improve functionality and independence in this population.

METHODOLOGICAL PROCEDURES

Sampling procedures

A cross-sectional study was performed in Curitiba, southern Brazil (Human Development Index = 0.856). This city had a population of 1,751,907 inhabitants in 2010, with 10.3% of the population aged 60 years or older (approximately 181,000 individuals). The municipal government developed a program specifically aimed at the elderly population of Curitiba: the *Idoso em Movimento* (active older adults) program. This program provided information to this population on healthy lifestyles and promoted weekly physical activities (2–3 times per week, 45-minute sessions). In 2010, this program attended 4,346 women and 110 men distributed across 32 Public Health Care Centers in all city microregions. We evaluated only women because of the few men who participated in this program. Therefore, women aged 60 years or over participating in this program composed the study population.

To calculate the sample required for this study, the following statistical parameters were considered: (i) population of 4,346 individuals; (ii) prevalence of insufficient functional fitness of 50%, which considers maximum variance; (iii) confidence level of 95%; (iv) sampling error of three percentage points; (v) design effect of 2.0 to correct the error related to the conglomerate sampling process; and (vi) addition of 30% for possible losses and refusals. Therefore, the sample was estimated to have 1,859 individuals.

The sample was selected using a two-stage conglomerate sampling process. In the first stage, two Public Health Care Centers were selected (primary sampling unit) in each of the nine microregions. In the second stage, group classes (Idoso em Movimento Program) were randomly selected (secondary sampling unit) proportionally to the number of older women in the respective city microregion. All individuals included in the group classes were invited to participate in this study. Thus, the sampling selection included 18 Public Health Care Centers and 52 group classes (about 35 older women per class).

Individuals with severe musculoskeletal, neurological, and cardiovascular disorders that could compromise motor test performances were not included in this study. Of the 1,895 older women who participated in data collection, 112 were excluded because they did not complete all motor tests. No refusals or losses were recorded during data collection. Therefore, the final sample consisted of 1,783 older women, or 94.1% of individuals initially evaluated.

Instruments and procedures

Data were collected between February and July 2011. The interview (descrip-

tive variables), motor tests, and anthropometric measurements (weight, height) were performed by trained professionals with the Research Center for Sports and Exercise, from the Federal University of Parana, Brazil.

Functional fitness evaluation

The motor tests proposed in the Senior Fitness Test (SFT) were used to evaluate the functional fitness of older women[3]. The detailed description of the motor tests is shown in Table 1. All tests were performed on a circuit in order to minimize localized fatigue effects. The performance of participants in the motor tests was individually recorded. Before starting the tests, all participants performed 10-minute warm-up exercises. The recovery period between tests was approximately two minutes. In order to become familiarized with the battery of tests, participants had a moment for explanation and practicing the tests[3].

Table 1. Description of "Senior Fitness Test" (SFT; Rikli and Jones3).

Test item	Assessment category	Description
Body mass index (BMI)	BMI	Ratio of body weight to squared height (kg/m^2)
6-min walk	Aerobic endurance	Distance walked in 6 minutes around a 50-meter course
Arm curl	Upper body strength	Number of biceps curls in 30 seconds holding hand weight (5 lb)
30-s chair stand	Lower body strength	Number of full stands in 30 seconds with arms folded across chest
Chair sit-and-reach	Lower body flexibility	From sitting position at front of chair, with leg extended and hands reaching toward toes, number of cm (+ or -) from extended fingers to tip of toe
Back scratch	Upper body flexibility	With one hand reaching over shoulder and one up middle of back, number of in (between) extended middle fingers (+ or -)
8-ft up-and-go	Agility/Dynamic balance	Number of seconds required to rise from seated position, walk 8 ft, turn around, and return to the sitting position

Descriptive variables

Information regarding age group (60.0–64.9, 65.0–69.9, 70.0–74.9, 75.0–79.9, and 80.0–84.9), Ethnicity (white, black, other), marital status (single, married, divorced, widowed), occupational status (retired, pensioner, housewife), and education level (incomplete elementary, complete elementary, complete high-school, complete higher education) was obtained during the interview. Socioeconomic class was assessed using questionnaire proposed by the Brazilian Association of Research Companies[21]. This instrument groups subjects into economic classes (A1 [richest], A2, B1, B2, C1, C2, D, and E [poorest]), based on a score combining asset ownership, household head's education, and number of employees per household. Socioeconomic classes were grouped into high (A + B), middle (C), and low (D + E) categories. Other variables were obtained through interview using the following questions: "Do you have any health problems?" (no or yes); and "Do you take any medicine regularly?" (none, one, two, or three or more medications). Finally, the weekly time spent in physical activities (minutes per week) was assessed using the International Physical Activity

Questionnaire (IPAQ) short version[22]. The weekly time of each individual spent in moderate-to-vigorous physical activities was classified according to the current guidelines[23] of the World Health Organization (WHO) for older people (up to 149.9 min/wk; 150–299.9 min/wk; and 300 or more min/wk).

Data Analysis

Descriptive statistics was based on mean, standard deviation, minimum and/or maximum value for continuous data, and absolute and relative frequency for categorical data. The percentile values (P5, P10, P25, P50, P75, P90, and P95) for each age group were calculated for the seven functional fitness components. The non-parametric binomial test compared the 50th percentile (P50) of Brazilian elderly women to the same percentile of older women from other locations[3,7-9]. The 50th percentile was selected for comparison because it represents a main tendency value for sample functional fitness in each study.

Four studies were considered for normative score comparison: i) the study by Rikli and Jones[3], which included 7,183 participants (5,048 women) aged 60 to 94 years from 20 different states of the United States; ii) the study by Gusiy[7], which included 6,449 participants (5,610 women aged 60 to 99 years) who lived in the region of Extremadura (Spain); iii) the study by Chen[8], which included 1,014 participants (501 women aged 60 to 92 years), from Taiwan (China); and iv) the study by Pedrero-Chamizo[9], which included 3,136 older adults (2,412 women), aged ≥65 years, from six regions in Spain.

These studies were selected based on four criteria: 1) having used the same motor tests, 2) separate data for the same age groups as the present study, 3) having used probabilistic samples (i.e., random and comprehensive selection of the sample in the study region), and 4) having presented normative 50th percentile scores for the specific age groups of each country or region. All analyses were performed using SPSS 16.0 software; significance level of 5% was considered.

Ethical aspects

This study was approved by the Research Ethics Committee of the Federal University of Parana (protocol no.: 1040.165.10.11). All individuals provided written informed consent for study participation.

RESULTS

The final sample comprised older women aged 60.0-84.9 years (mean 68.7 years; standard deviation 6.3 years), mostly older women aged 60–64 years (35%), white (80.7%), C socioeconomic class (57.5%), complete elementary school (44.6%), retired (58.8%), and widowed (40.4%).In relation to physical activity levels, 43.1% of older women performed 150–299 minutes per week of moderate to vigorous physical activity, while 6.9% of them reported 300 or more minutes per week of physical activity at this intensity (Table 1).

Table 2. Characteristics of the study sample. Curitiba, Brazil (n=1,783).

Continuous Variables	Mean (SD)	(min – max)
Age (years)	68.7 (6.3)	60.0 – 84.0
Weight (kg)	68.4 (11.9)	37.0 – 128.0
Height (meters)	1.55 (0.06)	1.37 – 1.86
Categorical Variables	n	%
Age group (years)		
60-64	624	35.0
65-69	432	24.2
70-74	409	22.9
75-79	196	11.0
80-84	122	6.8
Ethnicity		
White	1,438	80.7
Black	214	12.0
Other	131	7.3
Socioeconomic level		
A+B (best condition)	588	33.0
C	1026	57.5
D+E (worst condition)	169	9.5
Educational level		
Incomplete elementary	573	32.1
Complete elementary	796	44.6
Complete high school	267	15.0
Complete higher education	147	8.2
OcupationalStatus		
Retired	1,047	58.8
Pensioner	358	20.1
Housewife	378	21.2
Marital Status		
Single	141	7.9
Married	726	40.7
Divorced	196	11.0
Widow	720	40.4
Health Problems		
No	389	21.8
Yes	1,394	78.2
Number of medicines		
None	400	22.4
1 medicine	786	44.1
2 medicines	444	24.9
3 or more medicines	153	8.6
MVPA		
0-149 min/wk	892	50.0
150-299 min/wk	768	43.1
300+ min/wk	123	6.9

MVPA = moderate to vigorous physical activity.

Table 2 shows means and standard deviations of each functional fitness test for the Brazilian older women. There was a decline in performance throughout age groups in all tests. When comparing the scores of youngest and oldest groups, the mean BMI varied from 29.11 to 26.76 kg/m^2, 6-minute walk from 572.94 to 486.95 m, arm curl from 17.51 to 15.11repetitions, 30-s chair stand from 15.62 to 14.30 repetitions, chair sit-and-reach from 1.01 to -0.47 cm, back scratch from -4.92 to -10.52 cm and 8-ft up-and-go from 5.96 to 6.83 sec. This tendency was also confirmed by the analysis of percentile values (Table 3).

Table 3 - Mean and standard deviation of functional fitness tests in older women by age group. Curitiba, Brazil (n=1,783).

Functional fitness components	Age Group (years)				
	60-64	65-69	70-74	75-79	80-84
BMI (kg/m^2)	29.11 ±4.80	28.38 ±4.59	28.39 ±4.20	27.67 ±4.57	26.76 ±4.04
6-min walk (m)	572.94 ±48.93	560.21 ±51.63	531.72 ±47.20	514.02 ±58.91	486.95 ±4.46
Arm curl (rep)	17.51 ±3.57	17.38 ±3.75	16.28 ±3.53	15.89 ±3.06	15.11 ±3.26
30-s chair stand (rep)	15.62 ±2.99	15.78 ±2.94	15.15 ±2.80	14.51 ±2.64	14.30 ±3.15
Chair sit-and-reach (cm)	1.01 ±6.41	1.16 ±6.69	-0.50 ±6.72	-1.12 ±6.79	-0.47 ±6.21
Back scratch (cm)	-4.92 ±8.84	-7.00 ±9.70	-8.68 ±9.43	-8.98 ±10.26	-10.52 ±10.81
8-ft up-and-go (sec)	5.96 ±0.78	6.00 ±0.81	6.36 ±0.85	6.63 ±0.92	6.83 ±1.01

BMI: Body Mass Index;

Older women from southern Brazil showed significantly higher 50th percentile values for BMI compared to American (all p<0.001) and Taiwanese women (all p<0.001). In contrast, 50th percentile BMI values were significantly lower compared to Extremaduran women (all p<0.001) (Figure 1A).

On the 6-minute walk test (Figure1B), older Brazilian women had significantly higher 50th percentilen than Extremaduran women regardless of age group (all p<0.001). Brazilians had significantly lower scores than American women in the three younger age groups (p<0.01), but had similar score in age group 75–79 and (p=0.62) higher score in age group 80-84 years (p<0.001). When compared to Spanish women, higher scores were observed for age groups 65-69 (p=0.02), 75-79 (p=0.01), and 80-84 (p<0.001) (Figure 1B).

In the analysis of upper limb strength (Figure 1C), Brazilian older women had significantly higher 50th percentile values than American women (all p<0.001). Similar scores were observed for upper limb strength between Brazilians and their Spanish age matched counterparts with the exception of age group 80–84 years (p=0.04), in which Spanish women showed better performance.

In the analysis of lower limb strength (Figure 1D), Brazilian women had significantly higher 50th percentile values in almost all age groups compared to Taiwanese and American women (p<0.05), except for age group 60–64 years among American women (p=0.09). The only statistically significant difference between the Brazilians and Spanish lower limb strength scores was in the 70–74 year-old-group (p=0.01), favoring older Brazilian women.

Table 4. Functional fitness test percentiles in older women by age group. Curitiba, Brazil (n=1,783).

	n	P_5	P_{10}	P_{25}	P_{50}	P_{75}	P_{90}	P_{95}
BMI (kg/m^2)								
60-64	624	21.99	23.36	25.77	28.64	32.00	35.59	37.85
65-69	432	21.52	22.77	25.11	28.07	31.12	34.46	36.32
70-74	409	21.98	23.27	25.37	27.97	30.93	33.85	35.88
75-79	196	21.06	22.04	24.20	27.32	30.24	34.48	36.44
80-84	122	20.28	22.02	23.58	26.27	29.52	32.25	34.28
6-min walk (m)								
60-64	624	480.00	505.00	540.00	575.00	612.00	640.00	643.70
65-69	432	468.65	495.00	526.50	560.00	597.75	630.00	640.00
70-74	409	452.50	475.00	505.00	530.00	562.00	597.00	605.00
75-79	196	410.95	435.60	485.00	519.00	560.00	596.30	605.00
80-84	122	391.50	417.90	458.25	487.50	514.75	559.70	569.85
Arm curl (rep)								
60-64	624	12	13	15	18	20	22	24
65-69	432	11	12	14	17	20	23	24
70-74	409	10	12	13	16	19	21	22
75-79	196	11	12	13	16	18	20	21
80-84	122	11	11	13	14	17	19.70	21.70
30-s chair stand (rep)								
60-64	624	12	12	13	15	17	19	21
65-69	432	11	12	14	15	18	20	21
70-74	409	11	12	13	15	17	19	20
75-79	196	10	11	13	14	16	18	20
80-84	122	10	11	12	14	16	19	20
Chair sit-and-reach (cm)								
60-64	624	-12.00	-7.00	0.00	2.00	4.00	8.00	10.00
65-69	432	-12.35	-6.70	0.00	2.00	5.00	8.00	11.00
70-74	409	-15.00	-10.00	-3.00	1.00	3.00	5.00	8.00
75-79	196	-15.00	-10.30	-3.00	0.50	3.00	5.00	7.00
80-84	122	-12.85	-9.70	-4.00	0.00	4.00	6.70	8.00
Back scratch (cm)								
60-64	624	-20.00	-18.00	-11.00	-3.00	2.00	4.50	7.00
65-69	432	-25.00	-21.00	-14.00	-6.00	1.00	4.00	6.35
70-74	409	-26.00	-21.00	-14.00	-8.00	-2.00	2.00	4.50
75-79	196	-27.00	-23.00	-16.75	-9.50	1.00	3.00	5.15
80-84	122	-27.85	-23.70	-18.25	-10.00	0.00	2.70	4.85
8-ft up-and-go (sec)								
60-64	624	4.76	4.99	5.40	5.93	6.44	7.08	7.34
65-69	432	4.87	5.01	5.43	5.93	6.50	7.06	7.46
70-74	409	5.12	5.29	5.71	6.26	7.00	7.51	7.93
75-79	196	5.19	5.46	6.00	6.60	7.19	8.01	8.35
80-84	122	5.20	5.43	6.10	6.65	7.45	8.34	8.68

In the chair sit-and-reach test (Figure 1E), older Brazilian women had significantly lower values than Taiwanese women in almost all age groups (all with $p<0.001$), except in the oldest age group, where no differences were observed ($p=0.51$). When comparing with older women from the US, Brazilians were outperformed in age groups 70-74 ($p=0.01$) and 75-79 ($p=0.02$) years. Older Brazilian women only demonstrated consistently su-

perior scores against Spanish women (all p<0.05). No statistical significant differences were observed in the 50th percentile scores between Brazilian and Extremaduran women.

In the analysis of the upper limb flexibility test (Figure 1F), Brazilian women had better scores than women from Extremadura in age groups 60-64 (p<0.001), 65-69 (p<0.001), and 80-84 (p<0.01) years. American women overcame their age matched Brazilian counterparts in all age groups (all p<0.001). On the other hand, higher results of Spanish women were only true for age groups 65-69 (p=0.02) and 70–74 years (p<0.001).

Finally, in the 8-ft up-and-go test (Figure1G), older Brazilian women were significantly faster than Extremaduran women regardless of age group (all p<0.001). When compared to Taiwan and the US, only the oldest age group of

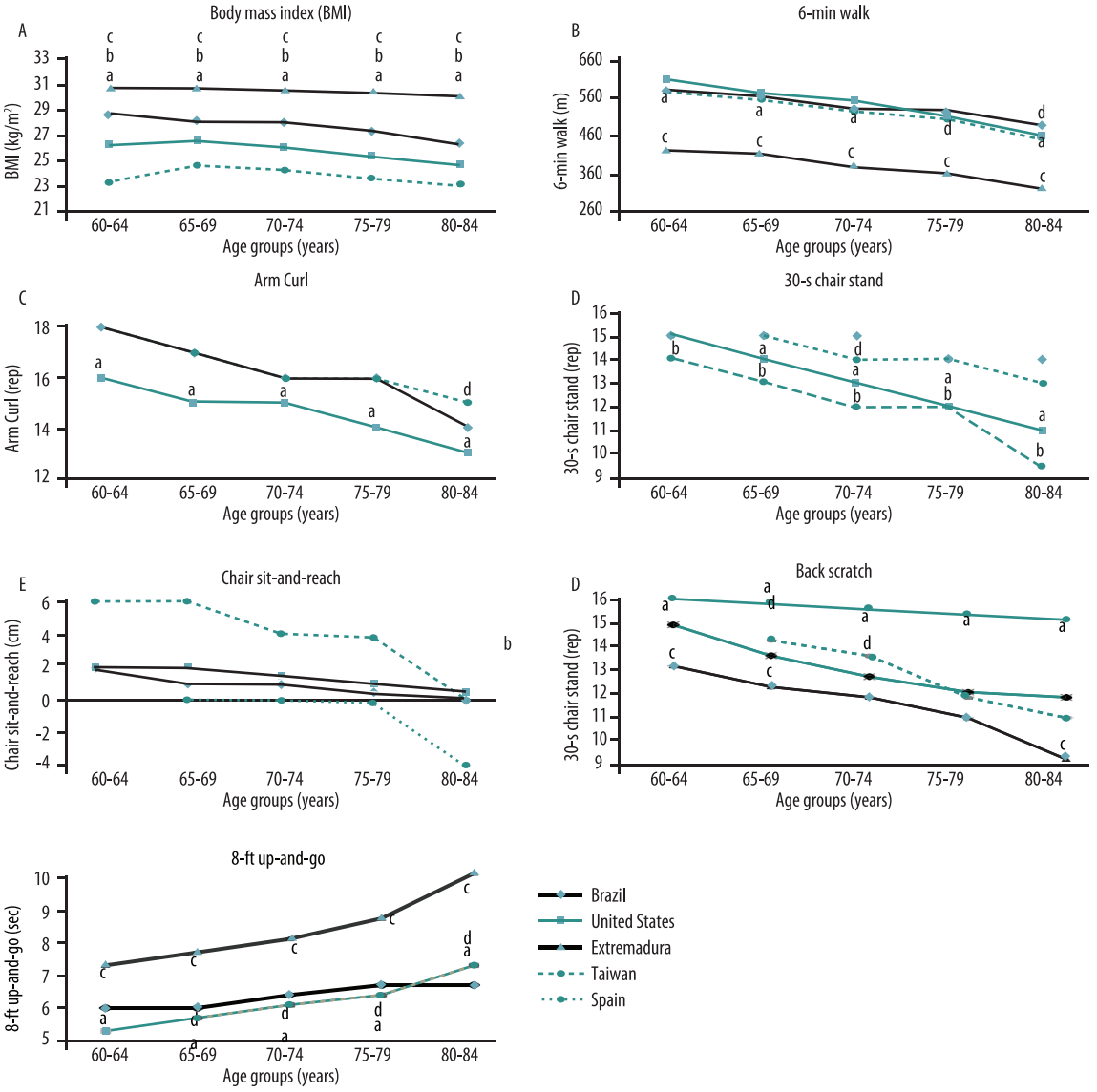

Figure 1 – Comparison of the 50th percentile values of the functional fitness test scores among elderly women in southern Brazil and elsewhere by age group. **a)** p<0.05 = Comparison of the 50th percentile value between Brazil and the United States; **b)** p<0.05 = Comparison of the 50th percentile value between Brazil and Taiwan; **c)** p<0.05 = Comparison of the 50th percentile value between Brazil and Extremadura; **d)** p<0.05 = Comparison of the 50th percentile value between Brazil and Spain. Note: The direction and magnitude of this difference were represented in the vertical measurement range. Additionally, figures that are missing population lines indicate that the study did not include the specific test.

Brazilian women was faster (p=0.01). All other American and Taiwanese age groups outperformed the Brazilian counterparts in the agility test (all p<0.05).

DISCUSSION

Functional fitness results from the interaction among physical health, mental health, and social integration[17]. Functional fitness is susceptible to the aging process, therefore it is expected that the performance in the functional fitness tests decline overtime[3]. According to previous studies[10,13,20], a reduction in performance was observed as the age increased. The decline in performance for each functional fitness test occurred at different rates, corroborating previous data from Brazilian[20], American[3], and Spanish[7] studies. This decline can be explained by the presence of major changes in biological systems [24-27], even when physical activity behavior is present.

The main object of this study was to generate and compare normative functional fitness scores. Significant differences among normative functional fitness scores from Brazil, Spain, Extremadura, Taiwan and the US are present in all components of the functional fitness test[3,7-9]. These findings emphasize the importance of considering data from Brazilian older women to classify functional fitness in the country, since choosing normative scores from other countries can lead to underestimation or overestimation bias of functional fitness. Collectively, comparisons between functional fitness of Brazilian older women and older women from the US, Spain, Taiwan and Extremadura revealed that the BMI of women from Southern Brazilian was higher than in most countries. In addition, Brazilians generally perform better in aerobic endurance and strength tests and worse in flexibility and agility tests than their age matched counterparts from those countries.

The direction and magnitude of differences among countries varied according to functional fitness tests. The comparison of BMI demonstrated higher values among older women in Brazil than Americans and Taiwanese women and lower BMI values than Extremaduran women. This was the only variable that demonstrated relatively similar pattern of decline among age groups in different countries (see figure 1A), which could lead us to infer that BMI values are highly culturally specific in the elderly population and follow a somewhat pre-determined development pattern. Nevertheless, high BMI values lead to public health concerns about the increase in the incidence of functional limitation[26-28] and lower quality of life in older adults[29]. Overweight and obesity have been linked to negative effects on physical[13,26] and mental health[29] in the elderly. There is also evidence of negative relationship between BMI and performance in other functional fitness components26,27 ; therefore, health promotion programs aiming to control and reduce nutritional status should be aimed at women from southern Brazil.

In the aerobic endurance evaluation (6-min walk), Brazilian women, in general, had higher scores compared to Extremaduran and Spanish women. On the other hand, the opposite is true when compared to women from the US. Our results partially support those observed in a previous com-

parison between Brazilian and American women20, in which Americans outperformed Brazilians in all age groups. In this research study, however, Brazilian women outperformed their North American counterparts in the oldest age group. An accentuated pattern of decline in performance was observed for American, Taiwanese and Extremaduran women, especially after the age of 70 (see figure 1B), but not for Brazilians in our sample. Our findings suggest that the participation in physical activity governmental programs may have helped reducing differences in aerobic endurance over age groups, favoring even more the two oldest groups by preventing the loss of aerobic capacity, commonly observed at this age[1-2].

The upper limb strength (arm curl) and lower limb strength tests were consistently higher for older Brazilian women than their American and Taiwanese counterparts. These results contradict previous studies comparing Brazil and the US20, even though both studies extracted the population from the same region in Brazil. The differences observed between these studies may be related to the fact that our sample was composed of older women who participated in a physical activity community program. The participation in structured physical activities, which included light strength training, may have accounted for the older Brazilian women superiority on strength tests.

In both flexibility tests, Brazilians had lower performance and more pronounced declines in flexibility scores if compared to top performers in the Chair-Sit-and-Reach (figure 1 E), and the Back Scratch tests (figure 1 F). Maintaining optimal flexibility levels is important for preserving physical function and performing everyday activities. Flexibility is a fundamental capacity and its decrease is associated with the frequency of falls in the elderly[30].

The 8-feet up-and-go test, which is a power, speed, agility and dynamic balance test, mirrored the results of aerobic endurance test, in which the tendency of decline in performance was less accentuated in the oldest group, overcoming older Spanish[9] and American[3] women. These results partially support previous studies with women from southern Brazil[20], demonstrating superior results of American women, but also suggesting that declines in performance in the oldest age groups may be attenuated with physical activity interventions.

The relatively large sample size and the rigorous sample selection method can be highlighted as strengths of this study. This analysis emphasized important differences in several functional fitness components of Brazilian and non-Brazilian older women.

The study also presented limitations. The first was the inability to generalize normative scores for elderly patients with severe diseases, with cognitive limitations, or for males, because no elderly patients with such features were included. Similarly, the values found in this study cannot be generalized to older women throughout Brazil or in any other particular region of the country. Finally, the cross sectional model used in this study did not allow evaluating individual and natural changes due to aging.

CONCLUSION

The normative scores for Brazilian older women presented differences among age groups, enhancing the use of specific cut-off points for each age group in order to evaluate and diagnose potential functional limitations, either in clinical or epidemiologic studies. In addition, differences in functional fitness between older women from southern Brazil and those from other countries suggest that the use of international normative scores may underestimate or overestimate potential functional limitations in Brazilian older women. Therefore, these normative scores may be used for evaluating and diagnosing functional fitness in southern Brazilian elderly populations.

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Corresponding author

Gislaine Cristina Vagetti
Universidade Federal do Paraná
Centro de Pesquisa em Exercício e Esporte
Rua Coração de Maria, 92, BR 116, km 95 Jardim Botânico, CEP 80215-370, Curitiba, PR, Brasil.
E-mail: gislainevagetti@hotmail.com