Rev Bras Cineantropom Hum

original article

DOI: http://dx.doi.org/10.5007/1980-0037.2016v18n1p32

Normative values of functional fitness in non-active postmenopausal women

Valores normativos de aptidão funcional em mulheres não ativas na pós-menopausa

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Abstract – The aim of this study was to propose the normative table for the non-active postmenopausal Brazilian population composed of women aged 50-69 years through the AAHPERD functional fitness test battery. This is a cross-sectional study with 170 postmenopausal women (FSH dose> 26.72 mIU / L). The population was divided into two groups: 50-59 years (n = 97) and 60-69 years (n = 73). The inclusion criteria were not having participated of systematic motor intervention in the six months prior to the study period; not presenting motor or cognitive impairments that could impair the performance of evaluation protocols and absence of comorbidities that could prevent or limit evaluations. The group aged 50-59 years showed mean values of 55.6 ± 2.9 years for age, 54.0 ± 21.1 mIU / ml for FSH, 11.3 ± 1.8 seconds for coordination 20.2 ± 4.0 repetitions for strength, 51.9 ± 11.8 cm for flexibility, 23.0 ± 2.4 seconds for speed and 497 ± 39 seconds for aerobic resistance. The group aged 60-69 years showed mean values of 64.2 ± 2.8 years of age, 54.9 ± 16.1 mIU / ml for FSH, 11.5 ± 2.5 seconds for coordination, 20.2 ± 4.3 repetitions for strength, 54.4 ± 10.9 cm for flexibility, 24.5 ± 4.0 seconds for speed and 507 ± 47 seconds for aerobic resistance. The proposal of a normative table was made possible with the data analyzed, which is a new reference regarding functional fitness studies especially in physically inactive postmenopausal women.

Key words: Evaluation; Exercise; Health; Humans; Physical fitness.

Resumo – *Objetivou-se propor a tabela normativa para a população brasileira de mulheres não ativas na pós-menopausa entre 50 e 69 anos por meio da bateria de teste de aptidão funcional da AAHPERD. Estudo de característica transversal, com 170 mulheres na pós-menopausa (dosagem de FSH>26,72 mIU/L). A população foi dividida em dois grupos: 50 a 59 anos (n=97) e de 60 a 69 anos (n=73). Os critérios de inclusão foram não participar de intervenção motora sistematizada nos seis meses anteriores ao período do estudo; não apresentar comprometimentos motores ou cognitivos que inviabilizassem a realização dos protocolos de avaliação, não apresentar comorbidade que pudessem impedir ou limitar a realização das avaliações. O grupo 50 a 59 anos apresentou valores médios de 55,6 ± 2,9 anos de idade, 54,0 ± 21,1 mUI/ml para FSH, 11,3 ± 1,8 segundos para coordenação, 20,2 ± 4,0 repetições para força, 51,9 ± 11,8 centímetros para flexibilidade, 23,0 ± 2,4 segundos para agilidade e 497 ± 39 segundos para resistência aeróbia. O grupo de 60 a 69 anos apresentou média de 64,2 ± 2,8 anos de idade, 54,9 ± 16,1 mUI/ml para o FSH, 11,5 ± 2,5 segundos para coordenação, 20,2 ± 4,3 repetições para força, 54,4 ± 10,9 centímetros para flexibilidade, 24,5 ± 4,0 segundos para agilidade e 507 ± 47 segundos para resistência aeróbia. A proposta de apresentar uma tabela normativa foi possível com os dados analisados, sendo essa uma nova referência em relação a estudos de aptidão funcional especialmente em mulheres fisicamente inativas na pós-menopausa.*

Palavras-chave: *Aptidão física; Avaliação; Exercício; Humanos; Saúde.*

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Received: 09 Mai 2015
Accepted: 05 August 2015

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INTRODUCTION

The investigation of functional fitness in populations older than forty years is a theme quite explored in literature[1-4], since there is a decline in functional capacity from that age, represented by loss of muscle strength, levels of aerobic fitness, agility and balance[5,6]. Several studies involving test batteries to assess functional fitness are available[7-10], among them the American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD)[10] test battery stands out, which is widely used in research involving physical exercise[11-15].

Especially in postmenopausal women, in addition to the decline in functional fitness provided by aging, other changes accompany the end of the fertile phase (menopause), among them vasomotor symptoms (hot flashes, palpitations), psychological symptoms (mood changes, depression, irritability, anxiety, sleep disorders) and cognitive symptoms (memory problems, concentration)[16-19]. The determination of the fertile phase (post menopause) is made with the observation of the non-occurrence of menstruation for 1 year followed by plasma levels of follicle stimulating hormone (FSH) higher than 26.72 mIU/ml [20].

Functional fitness at different stages of menopause is differentiated[21,22] as shown in population-based study in which it was found that women at premenopausal, perimenopausal and postmenopausal periods show significant differences in functional indicators such as strength and balance[21,22]. Whereas postmenopausal women exhibit alterations in functional fitness, a distinct functional classification parameter in relation to women who have not reached this stage is necessary. Even with several publications involving the AAHPERD test battery[23-27], none of them considers this specificity (post menopause) in the characterization of the sample investigated.

The aim of this study was the development of specific normative tables of functional fitness for physically inactive postmenopausal women of two age groups: 50-59 years and 60-69 years.

METHODOLOGICAL PROCEDURES

The Center for Studies and Laboratory of Evaluation and Prescription of Motor Activities - CELAPAM - Department of Physical Education, Faculty of Science and Technology - FCT UNESP, Campus of Presidente Prudente, Brazil, develops interventions with physical exercises for menopausal women, offering several forms of therapy with aerobic exercise, concurrent, functional and multimodal programs. This project, called Action and Health, has been conducted since 2010, and the data from this study were collected between 2012 and 2014. Participants were recruited through newspapers, radio and television in the form of invitation to participate in the project, being screened in an interview, which consisted of collecting information through anamnesis. The interview included questions such as how long the participant did not practice physical exercises (prerequisite

to participate in the survey was not taking part in any physical exercise program six months prior to data collection). In addition, participants answered questions about schooling, presence of degenerative disease, existence of joint or musculoskeletal injuries, or any comorbidity that could prevent or limit evaluations. The presence of one of the above would impair participation in the functional fitness assessments. When all the inclusion criteria were met, the participant scheduled functional fitness assessments and blood analysis described below.

This study was approved by the Ethics Research Committee of FCT-UNESP, Presidente Prudente, Brazil (Presentation Certificate for Ethics Appreciation - CAAE No. 11547013.2.0000.5402). All participants who agreed to participate in the research signed the Informed Consent Form and the research was conducted according to the Helsinki Declaration revised in 2008.

Sample and study design

The study included 170 postmenopausal women divided into two groups: Group aged 50-59 years (n = 97) and group aged 60-69 years (n = 73). All subjects were evaluated by researchers previously trained with expertise in the AAHPERD functional fitness test battery. Blood evaluation was performed in a clinical laboratory.

Instruments

The test battery used to assess functional fitness was proposed by AAHPERD and consists of five motor tests that evaluated coordination, strength resistance, flexibility, agility and dynamic balance and general aerobic resistance. The complete and illustrated description of assessments can be verified in the findings of Zago and Gobbi[27]. A brief description of the five battery tests is shown below.

1) Agility and Dynamic Equilibrium Evaluation: the participant begins the test sitting on a chair with heels on the floor. The evaluator indicates the start of the test and the participant should move to the right, skirting the cone. After skirting the cone, the participant must return to the chair, sit down and take the foot off the floor (this is repeated in all situations after skirting the cone), repeating movement to the left side. The test consists in not consecutively skirting the left and right cones twice, with a total of four movements.
2) Coordination Evaluation: the participant sits in front of a table and uses her dominant hand to perform the test. With three cans placed on the table (right-handed participant must put cans from the right to the left and left-handed otherwise) the participant must exchange the cans position. The test consists in four cycles (12 changes) as a complete circuit. The shortest performance time was considered as the final result.
3) Flexibility Evaluation: the participant sits on the floor with legs extended positioned on a tape measure fixed to the floor. The participant was asked

to perform trunk flexion and arm extension (with hands overlapping each other) at the farthest point on the tape. The participant remained in the final position for at least two seconds, as the distance reached was measured. Two attempts were allowed, considering the highest value.

4) Strength Resistance Evaluation: sitting in a chair, the participant must hold as many elbow push-ups in 30 seconds. The test is performed only once with the dominant arm.
5) Aerobic Resistance Evaluation: The participant is instructed to walk as quickly as possible (without running) for 804.67 meters, and the test was held on a 400-meter running track. Time was recorded in minutes and seconds and reduced to seconds.

For blood analysis, the chemiluminescent immunoassay technique for microparticles - CMIA commonly used for FSH dosage was used. In addition to the FSH dosage, other analyses that are not objective of this research were also held, where participants were instructed not to perform physical activity the day before blood collection, keep fasting for 12 hours and show up between 7:00 am and 7:30 am at the unit of the respective laboratory.

Data analysis

For the construction of the normative table, descriptive analysis was used, with mean and standard deviation of data, plus percentile values (P20, P40, P60 and P80). Outliers were identified and excluded using the Z Score, having as reference for inclusion of up to 3 standard deviations. All analyses were performed using SPSS software version 17.0.

RESULTS

Table 1 presents the results of descriptive statistics with mean and standard deviation for functional fitness variables and other sample characteristics.

The group aged 50-59 years had mean age of 55.6 ± 2.9 years with FSH 54 ± 21.1 mIU / ml and the group aged 60-69 years had mean age of 64.2 ± 2.8 years with FSH 54.9 ± 16.1.

Table 1. Sample characteristics with values expressed as mean and standard deviation.

Variables	50-59 years (n=97)	60-69 years (n=73)
Age (years)	55.6 ± 2.9	64.2 ±2.8
FSH (mUI/ml)	54.0 ± 21.1	54.9 ± 16.1
Weight (kg)	69.2 ±16.6	68.4 ±14.3
Height (cm)	163 ± 23	162 ± 19
BMI (kg/m^2)	26.1 ± 3.2	26.1 ± 3.0
Schooling (years)	10.4 ± 4.1	10.5 ± 4.3
Coordination (seconds)	11.3 ± 1.8	11.5 ± 2.5
Strength (repetitions)	20.2 ± 4.0	20.2 ± 4.3
Flexibility (cm)	51.9 ± 11.8	54.4 ± 10.9
Agility (seconds)	23.0 ±2.4	24.5 ± 4.0
Aerobic resistance (seconds)	497 ± 39	507 ± 47

Table 2 shows the values corresponding to the intervals of percentiles of the five tests that make up the AAHPERD test battery for the group aged 50-59 years. Percentiles 20, 40, 60 and 80 were used as cutoffs and their data ranges were classified as very poor, poor, fair, good or very good. Table 3 presents the same information related to the group aged 60-69 years.

Table 2. Percentile score and classification for women aged 50-59 years.

Percentile score	Classification	Coordination (seconds)	Strength (repetitions)	Flexibility (centimeters)	Agility (seconds)	Aerobic resistance (seconds)
< 20	Very poor	> 12.73	< 17	< 42	> 24.73	> 527
21 to 40	Poor	12.73 to 11.47	17 to 19	42 a 47	24.73 to 23.28	527 to 507
41 to 60	Fair	11.46 to 10.61	20 to 21	48 a 55	23.27 to 22.45	506 to 488
61 to 80	Good	10.6 to 9.91	22 to 23	56 a 60	22.44 to 21.11	487 to 464
> 80	Very good	< 9.91	>23	> 60	< 21.11	< 464

Table 3. Percentile score and classification for women aged 60-69 years.

Percentile score	Classification	Coordination (seconds)	Strength (repetitions)	Flexibility (centimeters)	Agility (seconds)	Aerobic resistance (seconds)
< 20	Very poor	> 13.88	<17	<44	> 27.92	> 547
21 to 40	Poor	13.88 to 11.34	17 to 19	44 to 50	27.92 to 25.50	547 to 514
41 to 60	Fair	11.33 to 10.39	20 to 21	51 to 58	25.49 to 22.61	513 to 492
61 to 80	Good	10.38 to 9.49	22 to 24	59 to 64	22.60 to 21.23	491 to 466
> 80	Very good	< 9.49	> 24	> 64	< 21.23	< 466

The Table 4 presents the comparison of means for group aged 60-69 years, considering data reported here and those of Zago and Gobbi[27], showing that the values between non-active and active women are significantly different.

Table 4 - Comparison of the mean values of non-active women (this study) and active women in the study by Zago and Gobbi[27] aged 60-70 years

Variable	Non-active women Present study (N=97)		Active women Zago and Gobbi[27] (N=94)		
	Mean	SD	Mean	SD	p-value
Coordination (seconds)	11.5	2.5	11	2.7	0.9
Strength (repetitions)	20.2	4.3	29	6	<0.0001
Flexibility (centimeters)	54.4	10.9	57.9	10.4	<0.02
Agility (seconds)	24.5	4	20.4	2.5	<0.0001
Aerobic resistance (seconds)	507	47	494	51	0.1

Student t test for average of two samples with different sizes and equal variances.Significance p <0.05.

Table 5 presents a compilation of data from this study and other studies with active and sedentary elderly female Brazilians aged 70-79 years.

Table 5. Compilation of percentile results of this study and the study by Zago and Gobbi[23] and Benedetti et al.[27]

			Percentiles				
Variables	Studies	Sample of women	< 20	21-40	41-60	61-80	> 80
COO (s)	Present study	PM 50-59 years	>12.73	12.73 to 11.47	11.46 to 10.61	10.60 to 9.91	<9.91
	Present study	PM 60-69 years	>13.88	13.88 to 11.34	11.33 to 10.39	10.38 to 9.49	<9.49
	Zago and Gobbi[27]	Active 60-69 years	>14.6	14.5 to 12.8	12.7 to 11.7	11.6 to 10.1	<10.1
	Benedetti et al.[23]	Sedentary 70-79 years	>14.5	14.4 to 12.1	12.0 to 11.1	11.0 to 10.2	<10.2
STRENGTH (repetitions)	Present study	PM 50-59 years	<17	17 to 19	20 to 21	22 to 23	>23
	Present study	PM 60-69 years	<17	17 to 19	20 to 21	22 to 24	>24
	Zago and Gobbi[27]	Active 60-69 years	<17	18 to 21	22 to 24	25 to 28	>29
	Benedetti et al.[23]	Sedentary 70-79 years	<17	18 to 19	20 to 21	22 to 24	>25
FLEX (s)	Present study	PM 50-59 years	<42	42 to 47	48 to 55	56 to 60	>60
	Present study	PM 60-69 years	<44	44 to 50	51 to 58	59 to 64	>64
	Zago and Gobbi[27]	Active 60-69 years	<25	25 to 44	45 to 53	54 to 61	>61
	Benedetti et al.[23]	Sedentary 70-79 years	<49	49 to 56	57 to 62	63 to 70	>70
AGIL (s)	Present study	PM 50-59 years	>24.73	24.73 to 23.28	23.27 to 22.45	22.44 to 21.11	<21.11
	Present study	PM 60-69 years	>27.92	27.92 to 25.50	25.49 to 22.61	22.60 to 21.23	<21.23
	Zago and Gobbi[27]	Active 60-69 years	>26.4	23.7 to 26.4	21.5 to 23.6	19.6 to 21.4	<19.6
	Benedetti et al.[23]	Sedentary 70-79 years	>28.8	26.3 to 28.8	24.4 to 26.2	22.8 to 24.3	<22.8
AR (s)	Present study	PM 50-59 years	>527	527 to 507	506 to 488	487 to 464	<464
	Present study	PM 60-69 years	>547	547 to 514	513 to 492	491 to 466	<466
	Zago and Gobbi[27]	Active 60-69 years	>547	547 to 509	508 to 491	490 to 463	<463
	Benedetti et al.[23]	Sedentary 70-79 years	>601	601 to 546	545 to 525	524 to 505	<505

NOTE: COO - coordination; FLEX - flexibility; AGIL - agility and dynamic balance; AR - aerobic resistance; PM – Post menopause.

DISCUSSION

The elaboration of normative tables of functional fitness in non-active postmenopausal women was possible, as shown. Other studies have also analyzed the functional capacity performance in women through the AAHPERD test battery[23,27], however, previous studies have not discriminated participants as for the postmenopausal stage. It is noteworthy that previously published studies have been widely used as normative reference for functional fitness by Brazilian researchers, which were developed with active women aged 60-69 years[27], non-active women aged 70-79 years[23] and the study with young women[28] (20-30 years) also evaluated by the AAHPERD test battery.

The evaluation of physically active women does not reflect the reality of the Brazilian population, which presents a high level of physical inactivity (near 60%) in the age group of interest[29-30]. Disregarding the regular practice of physical exercise is an important bias in research related to functional fitness, since physical activity mitigates functional decline[11,25].

Some researchers have explored the importance of maintaining functional fitness through exercise[11,25] and the effect of body

composition on functional fitness[2,4]. Physical exercise programs can influence agility / balance and coordination of physically active elderly women[11] and regular participation in physical activity programs tends to improve or maintain all functional fitness components, even during the long period of 12 years compared to those who perform only physical efforts required in daily living tasks[25].

Physical activity can influence body composition, which negatively contributes to functional fitness, as reported by Mazo et al.[2], who found an inverse relationship between BMI and functional fitness in elderly women, a fact also highlighted in the findings of Rech et al.[4], who found that older overweight women are five times more likely of having weak functional fitness. In such cases, regular exercise can positively influence functional fitness while serving to control body composition.

Some important features deserve to be discussed in future investigations such as the time in which volunteers have been postmenopausal and if hormone replacement therapy is associated with functional performance. Specifically regarding the latter, there seems to be no consensus about the influence of hormone replacement on functional fitness[21].

Studies comparing active and sedentary groups as well as postmenopausal women and women at the fertile phase have dealt with key issues for further investigation based on current gaps in literature.

CONCLUSION

Based on the results obtained, the proposal of normative tables with physically inactive postmenopausal women aged 50-69 years is relevant, as there is a gap in literature regarding this characteristic in particular. These data may be useful for researchers and health professionals to classify functional fitness levels and thus help in the adequate prescription of exercises in order to improve performance in daily activities and the quality of life of this population.

It was concluded that the normative tables proposed here are an important reference for the population of physically inactive postmenopausal women, defining normative values regarding functional fitness.

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