ANALYSIS OF THE PHYSICAL CAPACITY OF WOMEN WITH FIBROMYALGIA ACCORDING TO THE SEVERITY LEVEL OF THE DISEASE

EXERCISE AND SPORTS MEDICINE CLINIC

ORIGINAL ARTICLE

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ABSTRACT

Fibromyalgia (FM) is a chronic syndrome characterized by widespread musculoskeletal pain, which causes significant reduction in physical capacity of patients and affects their health and quality of life. Objective: To evaluate the physical capacity of FM patients correlated with the severity of the disease. Method: A transversal descriptive study on a sample of 66 women with FM (age: 51.79 ± 02.08 years) and a control group of healthy women (age 50.26 ± 8.75years). Physical amplitude was assessed by a battery of specific physical evidence and application of questionnaires: the Fibromyalgia Impact Questionnaire (FIQ) and the Short-Form Healthy Survey (SF-36) in the Spanish version. Results: healthy women have higher values of physical amplitude than sick women ($p < 0.05$), except for in hand dynamometry proof. Exclusively in the agility test the patients with FM could be identified according to their disease severity ($p = 0.021$).Quality of life in patients with FM is very deteriorated compared ($p = 0.021$) with healthy women and values that regulate the Spanish society. Conclusions: Analysis of the physical capacities is an additional assessment on the clinical relevance of fibromyalgia.

Keywords: physical exercise, fibromyalgia and quality of life.

INTRODUCTION

FM is a chronic disease characterized by generalized pain, muscular stiffness, reduced physical conditioning and fatigue[1], non-refreshing sleep, anxiety, cognitive difficulties[2], reduced physical work capacity[3] and the presence of at least 11 points sensitive to palpation and pressure in the musculoskeletal system, termed tender points[4], which lead the subject to important reduction of physical function and constant use of health centers. Therefore, it is associated with physical deficiency in basic tasks of daily living such as walking, lifting and carrying objects or working with the upper limbs in high, medium or low positions[5]. However, despite having had the physical capacities decreased, these patients present different initial levels of physical fitness; some of them can exercise at moderate to high intensity[6], while others experience onset of pain level with exercise[7]. In all cases, the patients with present low level of physical activity compared with healthy individuals and great part of them is sedentary[3,8], which means that over 80% of these subjects are not in good physical condition[9]. The population with FM has been associated with higher prevalence of overweight and obesity than the general population; therefore, obesity is the most frequent comorbidity of the FM syndrome, which may contribute to the severity of the condition[10]. However, the disease pathogenesis is still uncertain and there is great heterogeneity in their manifestations. Thus, the treatment is symptomatic and multidisciplinary, based on pharmacological treatments, psychological, physical and rehabilitation therapy.

Physical exercise is defined as an efficient resource in the non-pharmacological palliative treatment to promote health and quality of life in individuals affected by this disease[11,12]. It is important to understand the factors which determine the suitable prescription of physical activity in this population, a crucial fact for the physical and functional characterization of patients with FM. Some authors highlight that some tests of physical fitness (such as hand dynamometry and the six-minute walk test) could be a supporting instrument to the currently existing ones in the clinical diagnosis of fibromyalgia, as observed in a previous study, a way of discriminating the presence and severity of the disease[13,14].

The aim of this study is hence, to analyze the physical capacities of individuals with FM compared with healthy individuals and level of disease severity.

METHODS

Subjects

This is a descriptive and transversal study, in which the sample is non-probabilistic by convenience composed of a group of 66 women with FM (age: 51.79 ± 8.02 years) from the Association of Fibromyalgia of Jaén (AFIXA) – Spain, diagnosed with FM in medical appointments in rheumatology of the health system and under the criteria of the American College of Rheumatology[15] (ACR) and a group of 23 volunteers women without FM (age: 50.26 ± 8.75 years) from the same region.

After having received detailed information about the study's aims and procedures, each participant signed an informed consent form before the participation in the study, which follows the ethical norms of the World Medical Association in the Declaration of Helsinki from 1964. Inclusion criteria for the FM group were: to be a member of the AFIXA and, in both groups, do not present any kind of pathology which could interfere in the results of the study (further rheumatic diseases and/or severe somatic disorders such as cancer, coronary disease or schizophrenia). No individual

participated in exercise programs longer than 20 minutes per day and more than three days per week. The study was approved by the Bioethics Committee of the University of Jaén.

Procedure

In order to avoid fatigue and symptoms aggravation, the subjects were evaluated during a complete week. On the first day, they answered a Spanish version of the FIQ and the Short- Form Health Survey questionnaires (SF-36). Weight, height, BMI, flexibility and hand dynamometry were recorded. After 48 hours, the agility, leg strength and aerobic resistance events were performed. All patients were evaluated by the same investigation group to reduce possible measurement errors.

MATERIALS

Physical aptitude test: the senior test battery Fitness Test, Rikli and Jones was used (1999)[16], to assess functional capacity, specifically for leg strength (30 Second Chair Stand Test), aerobic capacity walk for six minutes (six minute- walk test) and agility and dynamic balance test (8 feet up and go test) were used. These tests are of easy application and present simple punctuation and healthy exercises, which require simple equipment and small space. Moreover, the Sit and Reach Flexibility test was used (Wells and Dillon, 1952)[17], for the balance test, the choice was the Stpork Balance Stand Test by Johnson and Nelson (1979)[18] and the handgrip strength dynamometry. This last test is widely used in patients with FM.

Lower limbs strength: it was assessed through the 30 Second Chair Test. This test measures leg strength and consists in performing during 30 seconds the highest number of leg flexions and extensions, sitting and standing from a chair, starting from sitting position, with erect back and feet rested on the ground with no use of arms, which remained crossed at chest level. The patients had a familiarization period.

Arm strength: handgrip strength was measured with a manual dynamometer (hydraulic dynamometer). The patients performed the tests twice, alternating hands, with one minute-rest between each measurement and with arm at complete extension, making a 30º angle with the trunk. The best score of each hand was chosen and the mean recorded.

Leg flexibility: it was evaluated with the Sit and Reach test which consists of a front trunk flexion starting from the sitting position. The Wells and Dillon bench was used for the test to measure flexibility of the posterior part of the trunk and legs. The bench is 35cm high and wide and 40cm long, with a standard ruler on the upper part which surpasses 15cm from the feet support surface. The individual sat in front of the bench, placing feet on the support and with knees extended. She raises arms with hands overlapped, taking them forward and pushing the marker as far as possible on the ruler.

Agility and dynamic balance: the 8 Feet up and go test was used for this measurement. It consists in standing from a chair and walking eight feet (2.44m) forward, spinning around a cone returning to the chair and sitting again in the shortest time possible, having the shortest time of the assays recorded[16].

Static balance: it was evaluated through the Stork Balance Test[18,] in which the individual is barefoot, hands on hips and eyes open. She places the foot which is not rested on the ground, on the knee and interior to the leg of support. The best time of two assays without losing balance is recorded (or this position); maximum time is of 60 seconds per leg.

Aerobic resistance: it was measured with the Six Minuit Walk Test (6MWT). It consists in determining the maximal distance competed during six minutes around a rectangular circuit of 45.7 meters[16].

Tender points: sensitivity to pain was measured with a standard pressure algometer (EFFEGI, FPK 20, Italy) applying pressure on the 18 pressure points according to the criteria by the ACR[15]. The painful point is noted as positive when the patient notices pain to pressure of up to 4kg/cm$^{2.}$ The total number of positive points of each participant was taken note of.

Anthropometric measurements: a stadiometer was used (Seca 22, Hamburg, Germany) to measure height (cm), weight (kg) and abdomen/hip ratio with a bioimpedanciometer (imbbody 720, biopasce, Korea). The BMI was calculated dividing the weight (kg) by the height to the square in meters.

The FM impact questionnaire was used (FIQ) to evaluate the symptoms related with FM. It consists of a self-applied questionnaire designed to evaluate the components of the health status, which are believed to be the most affected by FM. This questionnaire was validated for the Spanish population with FM by Rivera ad Gonzalez (2004)[19]. It I composed of 10 dimensions: physical deterioration; general wellness; job loss and seven other items in a visual analog scale (VAS), which indicate: hard work; pain; fatigue; morning tiredness; stiffness; anxiety and depression. The total FIQ punctuation ranges from 0 to 100 and a higher value indicates greater impact of the disease[19]. The patients were classified according to the points obtained in: moderate FM, if FIQ was < 70; and severe FM, if the punctuation in the FIQ was ≥ 70[20].

The Health Survey Short Form-36 (SF-36) questionnaire is a general instrument for health and quality of life evaluation. It contains 36 items grouped in eight scales, namely: physical function; physical role; physical pain; general health; vitality; social functioning; emotional role and mental health. Punctuation is recorded from 0 to 100 in each scale; in which higher scores indicate better health. In this study the Spanish version of the SF-36 was used[21].

Data were analyzed using the SPSS statistical program, version 18.0 for Windows (SPSS Inc, Chicago, USA) and the significance level was set in $p < 0.05$. Descriptive statistics was applied in mean and standard deviation. The chi-square by Kruskal-Wallis and by Mann-Whitney tests were used to compare the sociodemographic variables between groups.

The Shapiro-Wilk test was applied to verify the data normal distribution. The data comparison between the women with FM and the healthy women occurred by covariance analysis (ANCOVA) using age as covariable.

Additionally, non-parametric contrast test by Kruskal-Wallis for data which did not present normal distribution after many transformations (square root and logarithmic transformation). The pair comparisons were performed with the Bonferroni and U by Mann-Whitney tests. The Spearman correlation was performed between physical tests and pain dimension of the SF-36 and total FIQ scales in women with FM.

RESULTS

The characteristics of the participants are presented in table 1.

Table 2 presents the results of all anthropometric tests and physical status. The three groups of women present similar BMI values. Significant differences are obtained between the women wih FM and the healthy women in all physical status parameters, except for in the hand dynamometry.

Concerning the pair comparison with the adjustment by multiple comparison by Bonferroni and U test by Mann-Whitney, except for in the hand dynamometry, in which there are no differences between groups, there are significant differences ($p < 0.05$) in the rest of the aptitude tests between the health group and both groups with FM: moderate FM and severe FM, with significant differences between severe FM and moderate FM in the agility test ($p = 0.021$).

Table 3 demonstrates the Spearman correlation between the physical aptitude tests, the total FIQ scale and the physical pain dimension of the SF-36 scale in the sample composed of women with FM. It is observed that the Sit and Reach and Stork Balance Stand tests do not present any significant correlation with pain or the total FIQ scale, and only the 8-feet up and go tests correlate with both parameters.

Table 4 evidences the results obtained with the SF-36, in which significant differences were found ($p = 0.000$) in all dimension of the scale comparing the healthy and with FM women. The pair comparison with the U by Mann-Whitney test revealed that only in vitality and mental health important differences were found ($p < 0.05$) concerning the severity of the disease. When compared with the normative values of the Spanish population for similar ages, significant deterioration is found in health and quality of life in patients with FM; however, the healthy women from the control group also presented lower values.

Table 1. Sociodemographic characteristics between the healthy and with FM women.

	Healhty (n = 23)	Moderate FM (n = 42)	Severe FM (n = 24)	p
Works n (%)				
Yes	7 (30.4)	14 (33.3)	2 (8.3)	0.070
No	16 (69.6)	28 (66.7)	22 (91.7)	
Education n (%)				
No education	2 (8.7)	2 (4.8)	6 (25.0)	
Elementary school	9 (39.1)	22 (52.4)	11 (45.8)	0.334
High School	9 (39.1)	16 (38.1)	7 (29.2)	
University	3 (13)	2 (4.8)	0 (0)	
Marital status n (%)				
Married	16 (69.6)	35 (83.3)	24 (100)	
Single	3 (13.0)	4 (9.5)	0 (0)	0.028
Widowed	0 (0)	2 (4.8)	0 (0)	
Separated	4 (17.4)	1 (2.4)	0 (0)	
Age – mean (SD)	50.26 (8.75)	50.57 (7.59)	53.00 (8.23)	0.420
Diagnosis time – mean (SD)	-	8.08 (4.93)	8.68 (4.74)	0.586
Number of tender points– mean (SD)	-	17.70 (0.76)	16.86 (2.42)	0.401

Table 2. Physical aptitude and anthropometric parameters of healthy women compared with patients with FM according to the severity level.

	Healthy Mean (SD) n = 23	FM moderate Mean (SD) n = 42	Severe FM □ Mean (SD) n = 24	p
Height (m)	159.91 (6.02)	157.40 (4.63)	156.21 (4.52)	0.038
Weight (kg)	69.38 (14.01)	67.73 (17.84)	70.12 (17.08)	0.717**
BMI (kg/m^2)	28.07 (5.97)	28.70 (5.35)	29.50 (5.61)	0.859
Abdomen/hip ratio	0.96 (0.08)	0.97 (0.69)	0.99 (0.07)	0.679
Rest heart rate (bpm)	76.08 (12.73)	76.78 (20.84)	81.54 (13.02)	0.204**
Sit and Reach (cm)	-1.39 (7.51)	-6.76 (7.29)	-8.35 (5.49)	0.003
30-s Chair Stand Test (rep.)	14.43 (3.57)	11.12 (2.47)	10.82 (2.77)	0.000
Handgrip Strength Test (kg)$_{\dagger}$	26.78 (4.97)	25.80 (6.44)	22.41 (7.81)	0.077
8-feet up and go test (s)$_{\#}$	4.71 (0.75)	5.19 (0.86)	5.90 (1.34)	0.001
Stork Balance Stand Test (s)*	33.85 (23.16)	17.27 (2.66)	15.98 (3.26)	0.008**
6-MWT (m)^	566.39 (72.91)	482.10 (52.92)	462.66 (73.12)	0.001

In the mean and standard deviation values expressed # lower scores indicate better performance . † Mean of points in the right hand and left hand. * Mean punctuation in the right and left leg. P ** value is calculated by the Kruskal-Wallis test proeba. Severe □ FM was FIQ FIQ≥70. ^ N = 15 in healthy. 29 moderate FM and 19 severe FM.

Table 3. Spearman correlation between the physical aptitude and physical pain dimension tests (SF-36) and the total FIQ scale in entire group of women with FM.

	Physical pain #	Total FIQ scale
Sit and Reach	0.082	-0.093
30-s Chair Stand Test	0.387(**)	-0.106
Handgrip Strength Test	0.071	-0.253(*)
8-feet up and go test	-0.332(**)	0.322(*)
Stork Balance Stand Test	0.126	-0.139
6-MWT	0.384(**)	-0.111

* $p < 0.05$. **$p < 0.01$. # High values indicate lower pain.

Table 4. SF-36 scale of healthy women compared with the ones with FM according to the severity level.

SF36 scale	Healthy (n = 23) Mean (SD)	Moderate FM (n = 42) Mean (SD)	Severe FM (n = 24) Mean (SD)	p	Healthy Spanish women (45- 54 years) Mean (SD)*
Physical	80.24 (25.90)	35.73 (18.89)	27.28 (17.42)	0.000	84.7 (20.2)
Physical role	66.67 (46.17)	4.38 (11.16)	4.25 (14.09)	0.000	80.0 (37.5)
Physical pain $_{\#}$	74.14 (29.99)	25.49 (16.41)	18.60 (14.12)	0.000	73.5 (30.5)
General health	59.58 (16.48)	25.24 (13.17)	19.60 (11.71)	0.000	66.0 (22.3)
Vitality	56.43 (24.70)	25.24 (14.09)	16.13 (12.49)	0.000	64.9 (22.4)
Social function	73.21 (24.13)	47.56 (22.04)	36.06 (20.40)	0.000	88.9 (21.7)
Role emocional	55.56 (43.88)	17.89 (32.57)	8.46 (20.22)	0.000	85.8 (32.2)
Mental health	53.71 (16.99)	45.27 (13.86)	37.63 (12.70)	0.000	70.1 (21.4)

High values indicate lower pain.* Data of Spanish women between 45-54 years[22].

DISCUSSION

The assessed women from both groups present overweight values according to the BMI reference of the WHO (2003) (overweight, BMI: 25.0–29.99kg). The BMI obtained in patients with FM in this study is similar to previous studies[3,24,25]. According to references by Aranceta et al.[25], the BMI is above the normative values for the Spanish population, placing the sample in overweight level II or pre-

obesity level. Concerning the body fat distribution, no significant difference was found between healthy and with FM individuals in the waist/hip ratio, presenting values above the healthy parameter compared with the Spanish population (android obesity), placing these women at high cardiovascular risk[25].

No differences in the three groups of the study were found in the rest HR values, and the ones obtained in women with FM are similar to the ones in the study by Carbonell[12]. However, Thieme et al.[26] found higher values in the rest heart rate in women with FM compared with healthy women with the same age.

Concerning physical aptitude, the results of this study show that it is reduced in women with FM compared with the healthy group with the same age and BMI. Our results also suggest that all physical aptitude tests, except for in the hand dynamometry, were able to discriminate between the presence and absence of FM. Similar results were obtained by Aparicio[27] who, suggests the Handgrip Strength Test as a discrimination factor for the disease.

In the present study, none of the physical aptitude tests, except for the agility test, was able to discriminate between moderate and severe FM, although worsening of all parameters of physical and anthropometric aptitude has been observed in women with severe FM.

The values obtained in the physical aptitude tests are higher in women with FM than the ones found in similar studies with populations from the same southern Spanish region. Especially in this study, women with FM presented higher scores in the manual test in dynamometer, 6-MWT and 8-feet up go test than in the study by Aparício[27]. Comparing the results of the physical aptitude with the normative values [16], we proved that the 30s-Chair Stand Test and 6-MWT revealed that women with FM present values similar to the healthy women aged between 80 and 89 years (percentile 50).

In the 8-feet up and go test, the values are similar to the ones from the healthy women aged between 60 and 69 years (percentile 50). Thus, Panton et al.[28] suggest that the leg strength and functionality are similar in women with FM and healthy women of advanced age, suggesting that FM increases the risk of early incapacity associated with age.

In the hand dynamometry there were no differences between groups with results similar to the ones obtained by Panton et al.[28], with higher values in women with FM compared with other studies[12,27] and similar to the healthy women from the study by Aparicio[27]. Conversely, Aparício et al.[24] and Heredia[29] indicate that handgrip strength is reduced in patients with FM.

In the test for leg strength (30-s Chair Stand Test) significant differences were found between healthy and sick individuals, but not between the severity levels of FM, contrary to the study by Aparicio[27], in which significant differences were found between severity levels. The results obtained in women with FM are higher than the ones mentioned in the previously mentioned studies[12,27] for women in the same geographical area.

The distance completed in the 6-MWT for women with FM is similar to the one found by Pankoff et al.[30], and slightly higher than the one in the study by Ayan et al.[31] and Carbonell[12]. Given the differences of the FM group due to the severity of the disease, the results of the 6-MWT are similar to the ones by Aparicio[27] in a sample from the same geographical area. The data found in healthy women are higher than the ones in the study by Aparicio[27] and similar to the ones by Hulens et al.[32]. Concerning the gait velocity, in previous studies reduction in velocity was detected in patients with FM[29], in agreement with Pankoff et al.[30] and Auvinet et al.[33]. Although the velocity variation may have been caused by any number of mechanisms, Auvinet et al.[33] and Heredia[29] attribute decrease of velocity and deterioration of gait to the characteristic pain of the disease, which causes alterations in muscular recruiting and bradykinesia. All these aspects joined with obesity and lack of strength, causes reduction in the tasks of daily living, which makes them significantly reduce their daily activities and create a vicious cycle with higher levels of overweight, which affects and compromises their quality of life [29]. Additionally, there is an association between velocity of slow gait and risk for cognitive incapacity or deterioration, falls onset and or mortality[35].

In the agility test (8-feet up and go test), the values reached by the FM group are better than the ones reported in previous studies[12,27], reaching values similar to the ones in the study with healthy women by Aparicio[27]. This test is able to discriminate the existing relation between the levels of higher or lower severity of FM, a circumstance which does not occur in the study by Aparicio[27].

Regarding the balance criterion, FM is associated with lack of balance and increase of falls, suggesting that FM may affect peripheral or central mechanisms of postural control [36]. In this study, significant differences have been found between the healthy group and the group with FM, not being it a test which discriminates the severity of the disease, according to Aparicio[27].

The flexibility test in women with FM outlines results which are according with Aparicio[27]. Differences have been found with healthy women, although it is not a test capable of discriminating the severity of the disease, a circumstance which occurs in the study by Aparicio.

Perceived health and quality of life in the women with FM when compared with the healthy women of this study is usually worse, and similar to the studies by (Aparicio et al.[14] and Besteiro et al.[37]. The results obtained in the SF-36 dimensions are lower than in the study by Besteiro et al. (2008). Except for the dimensions of physical and emotional role in the other dimensions of the SF-36, similar results were obtained in patients with FM with the same severity level of the disease[20] of the study by Aparicio et al[4]. Concerning the disease severity, only the mental health and vitality dimensions are sensitive to the severity; however, in the study by Aparicio et al.[14], except for the physical role, the other dimensions of the SF-36 are significantly worse compared with the disease severity. Finally, the correlation analysis points out significant correlations between the different physical tests and the pain dimension of the SF-36 and FIQ scale, indicating that deterioration of physical capacity may be related to higher impact of the disease and hence higher level of pain. Thus, the FM will seriously deteriorate quality of life of women who suffer this condition, especially on the physical and pain sensitivity levels. These results are related with the ones found in previous studies, such as the one by Santos e al.[38] and Bergman[39], in which individuals who present general pain syndrome significantly punctuates in each of the eight dimensions of the SF-36 questionnaire compared with healthy individuals in the general population, observing

that health deterioration is particularly remarkable in patients with FM. The results obtained in this study, when compared with the reference values in Spain, indicate lower scores in all dimensions of the SF-36 and the three analyzed groups than in the Spanish population at the same age.

Limitations: the administration of medication may affect performance in physical tests. Moreover, an important limitation was that the sample was not randomly selected, since it belonged to the urban population of the FM Provincial Association, which may appear as a bias of belonging. However, the use of a broad test battery of this study enables an accurate evaluation of the physical capacity of women with FM.

Clinical implications: the inclusion of the physical aptitude evaluation as a complement to the diagnosis, prognostic and monitoring of FM is clinically relevant. Especially the agility test, (8-feet up and go test) could be used as a supporting instrument in the evaluation and monitoring of FM in women, since it has been evidenced great capacity of discrimination between presence/ absence of FM, and moderate FM/severe FM.

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