

Differences in Physical Activity and Physical Fitness Level in Patients with Fibromyalgia Syndrome and Healthy Individuals

Fibromyalji Sendromlu Hastalar ile Sağlıklı Bireylerin Fiziksel Aktivite ve Fiziksel Uygunluk Düzeyi Farkları

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Abstract

Objective: The aim of this study was to investigate the physical activity and physical fitness levels in patients with fibromyalgia syndrome (FMS) and to compare the data with those in healthy individuals.

Methods: The study included 82 patients with FMS and 110 healthy individuals. In order to compare physical activity levels, all the subjects responded to the International Physical Activity Questionnaire, Long Form (IPAQ). The health-related physical fitness of the subjects was evaluated by body composition, muscle endurance, cardiorespiratory endurance, flexibility, and balance. Body mass index (BMI), sit-up test, 6-min walk test, sit and reach test, body lateral flexion, and Kinesthetic Ability Trainer 3000 (KAT 3000) were used to determine body composition, muscle endurance, cardiorespiratory endurance, flexibility, and balance, respectively.

Results: Of the patients with FMS, 36.6% were inactive, 45.1% were insufficiently active, and 18.3% were active. Of the healthy individuals, 40.9% were active, 36.4% were insufficiently active, and 22.7% were inactive. Significant differences were found ($p<0.05$) in IPAQ walking and total scores between the groups. The sit-up test scores ($p<0.001$) and right and left body lateral flexion scores ($p<0.001$) were significantly different between the FMS patient and control groups.

Conclusion: Our results showed that the physical activity and physical fitness levels of patients with FMS were lower than those of healthy individuals.

Keywords: Fibromyalgia syndrome, physical fitness, physical activity levels

Öz

Amaç: Çalışmanın amacı fibromyalji sendromlu (FMS) hastalarda fiziksel aktivite ve fiziksel uygunluk düzeyini belirlemek ve sağlıklı bireylerin verileri ile karşılaştırmaktır.

Yöntemler: Çalışmaya 82 fibromyalji hastası ve 110 sağlıklı olgu dahil edildi. Fiziksel aktivite düzeyini karşılaştırmak için tüm olgular Uluslararası Fiziksel Aktivite Anketi'nin (UFAA) uzun formatını cevaplandırdılar. Olguların sağlıklıla ilişkili fiziksel uygunluk düzeyini belirlemek için vücut kompozisyonu, kassal endürans, kardiorespiratuar endürans esneklik ve denge ölçümleri değerlendirildi. Vücut kitle indeksi, mekik testi, 6 dakika yürüme testi, otur-uzan test, gövde lateral fleksiyon, KAT 3000 testleri sırasıyla vücut kompozisyonu, kassal endürans, kardiorespiratuar endürans, esneklik ve dengeyi belirlemek için kullanıldı.

Bulgular: FMS'li hastaların %36,6'sı aktif, %45,1'i minimal aktif, %18,3'ü inaktifti. Sağlıklı olguların %40,9'u aktif, %36,4'ü minimal aktif, %22,7'si inaktifti. Gruplar arasında UFAA yürüme ve toplam skoru arasında istatistiksel olarak anlamlı fark bulundu ($p<0,05$). Sağlıkla ilişkili fiziksel uygunluk düzeyinde mekik testi ($p<0,001$) ve her iki gövde lateral fleksiyonu ($p<0,001$) skorunda fibromyalji ve kontrol grubu arasında istatistiksel olarak anlamlı fark gözlemlendi.

Sonuç: Sonuçlarımız FMS'li hastaların fiziksel aktivite ve fiziksel uygunluk düzeyinin sağlıklı bireylere göre daha düşük olduğunu gösterdi.

Anahtar Kelimeler: Fibromyalji sendromu, fiziksel aktivite, fiziksel uygunluk düzeyi

INTRODUCTION

Fibromyalgia syndrome (FMS) is a clinical syndrome with unknown etiology and is characterized by tenderness with palpation of the points defined by the American College of Rheumatology (ACR), lower pain threshold, sleep disorders, sexual dysfunction, fatigue, and frequently observed affective disorder and chronic spread musculoskeletal pain (1-3). The prevalence is about 1%-2% and is higher in older age. According to the data of ACR, the mean presentation age is 49 years and 89% patients are women (4, 5).

Patients with FMS tend to avoid activities because of the reduced pain threshold and the loss of motivation for work. The inactivity and limitation of participation adversely affect the physical fitness and functional capacity in patients with FMS, eventually affecting their work, family, and daily lives (6, 7). The problems such as fatigue sleep disorders, stiffness, depression, anxiety, and cognitive disorders

seen in FMS patients, in addition to extensive pain, negatively affect the quality of life and reduce the capability of individuals to cope their routine lives. Consequently, the performance of activities of daily life is reduced in patients with FMS, and it is seen that they have a more sedentary lifestyle than healthy individuals. It can be said that the most important outcome of the sedentary lifestyle is the reduction in physical activity and fitness level (8, 9).

Healthcare professionals advocate that increasing leisure time physical activities is the most important strategy in therapy programs for patients with FMS. A multidirectional evaluation is essential to cover physical activity and physical fitness parameters in order to determine the rehabilitation program that is appropriate for patients with FMS (10).

There are few studies in the literature that have assessed physical fitness and physical activity in patients with FMS and compared them with those in healthy individuals (9, 11). Therefore, the aim of our study was to determine physical activity and fitness levels in patients with FMS and to compare them with those in healthy individuals.

METHODS

Design

This was a randomized controlled clinical study conducted at the department of physical medicine and rehabilitation outpatient clinics. The study was approved by the ethics committee (reference number KA11\227).

Participants

Eighty-two patients with FMS and 110 healthy individuals (controls) aged between 40 and 60 years were consecutively enrolled in the study.

Inclusion criteria included a referral for the study by a medical doctor, willingness to participate, and an established diagnosis of FMS according to the ACR 1990 diagnostic criteria. These criteria included widespread pain lasting for more than 3 months and pain on palpation at 11 of 18 specified tender points at least. Other inclusion criteria included disease duration of at least 1 year.

The exclusion criteria established were the following: neurological impairment, significant osteoporosis, severe mental and physical disorders, malignancy, severe cardiorespiratory diseases, any new passing operation for any condition, any other rheumatic condition, and the use of assistive devices in daily activities. The control group did not have any FMS diagnosis. The selection of the control group followed the same inclusion and exclusion criteria as that of the FMS patient group. All the participants gave their informed consents.

Assessments

1. Socio-demographic characteristics

Socio-demographic characteristics included age and sex. Body mass index (BMI) was calculated from the body weight and height (kg/m^2). Disease duration, exercise habits, and smoking habits were also noted.

2. Pain

Musculoskeletal pain was assessed using the Turkish version of the McGill Pain Index Short Form (MPI) (12). MPI consists of 15 descriptive adjectives (11 sensory and 4 affective) self-rated by the subjects on the basis of their intensity level on a Likert-type scale (0=none,

1=mild, 2=moderate, 3=severe) for pain sensation. Three pain scores were identified as the sum of the intensity rank values of the words chosen for the sensory and affective descriptors. The total score was taken as the sum of the intensity values. MPI also consisted of a pain intensity measurement shown by the visual analog scale (VAS) and the evaluative total pain intensity index of the standard MPI.

3. Physical activity

The International Physical Activity Questionnaire Turkish Version, Long Form (IPAQ) was used to assess physical activity levels (13). It consists of 27 questions. IPAQ is a scale that records different levels of physical activity in the previous week and considers 5 sub-parameters of physical activity. These sub-parameters are housework, work/occupation related, transportation, leisure time activities, and the number of hours spent sitting per day. In each of the 4 parameters (housework, work/occupation related, transportation, leisure time activities), the number of days per week and the time per day spent on both moderate and vigorous activities are recorded. In this study, the moderate and vigorous intensities were 3-6 metabolic equivalent task (MET) and >6 MET, respectively. One MET is equal to 3.5 mL of oxygen per kilogram of body mass per minute, which is the energy expenditure at rest. The MET-h in moderate- and vigorous-intensity activity per week were used for outcome measures. The PA data of the questionnaire were converted into energy expenditure estimates as MET using specific values. In order to determine the weekly physical activity (MET-h/week), the number of hours dedicated to each activity class was multiplied by the specific MET score for that activity. The scores of <600 MET, 600-1500 MET, and >3000 MET were defined as inactive, minimal active, and highly active, respectively (14).

4. Physical fitness

The health-related physical fitness domains, namely flexibility, motor control (balance), muscular endurance, and cardiorespiratory fitness, were measured by a physical therapist (15). The instructions about the test were given to the patients and controls during the fitness tests.

Cardiorespiratory fitness

The cardiorespiratory fitness of the study subjects was evaluated using the 6-min walk test (6MWT), which was conducted in a 30-m-long flat hallway, as per the American Thoracic Society guidelines. Blood pressure, heart rate, and oxygen saturation were measured before and after the test. After the test, fatigue severity was recorded by the modified Borg scale. The 6MWT distance was measured in meters (16).

Motor control (balance)

In order to assess the balancing ability, Kinesthetic Ability Trainer 3000 (KAT 3000) (Med-Fit Systems Inc., Fallbrook, C.A., USA) was used (17). There are protocols for static and dynamic balance. During the evaluation, the subjects stood barefoot with opened eyes and arms crossed over the chest on a platform for both static and dynamic balance. The subjects also stood in front of a computer screen for bio-feedback and tilt on a movable system platform. At the static balance evaluation, a colorful mark on the computer screen was required to be fixed at the center. At the dynamic balance evaluation, the subject was asked to follow the colourful mark on the moving cursor which is making a 360° circle. The subjects were given an opportunity of 3 trials for each test, and the best score acquired from the test was accepted. Each test was completed in 30 s. The subjects were allowed to rest after each test.

Flexibility measures

Flexibility was assessed using a sit and reach test, which was performed by sit and reach box with a measuring scale. The test involved sitting on the floor with legs stretched out straight ahead. The soles of the feet were placed flat against the box. Both knees were locked and pressed flat to the floor. With the palms facing downward and the hands on top of each other, the subjects reached forward along the measuring line as far as possible. The subjects performed the test 3 times and reached the most distant point on the scale with fingertips. The subjects were asked to reach laterally while standing for the body lateral flexion test. The longest distance of the 3-time reach was noted (15).

Muscular endurance

The sit-up test was used to assess the endurance of abdominal muscles. The subjects were lying in the supine position with their knees flexed at 90°. The subjects performed trunk flexion at this position for 30 s. The number of trunk flexion repetitions was recorded (15).

Statistical Analysis

For discrete and continuous variables, descriptive statistics (mean, standard deviation, median, minimum value, maximum value, and percentile) were given. In addition, the homogeneity of the variances, which is one of the prerequisites of parametric tests, was checked through Levene's test. The assumption of normality was tested via the Shapiro-Wilk test. In order to compare the differences between the 2 groups, Student's t-test was used when the parametric test prerequisites were fulfilled and the Mann-Whitney U test was used when such prerequisites were not fulfilled. The differences between 3 and more groups were compared by 1-way analysis of variance when the parametric test prerequisites were fulfilled, and the Kruskal-Wallis test was used when such prerequisites were not fulfilled. The Bonferroni correction method, which is a multiple comparison test, was used to evaluate the significance of results among 3 and more groups. The chi-square test was used to determine the relationships between 2 discrete variables. When the expected sources were less than 25%, the values were determined through the Monte Carlo Simulation in order to include such sources in analysis. The data were evaluated via Statistical Package for the Social Sciences version 17.0 (SPSS Inc.; Chicago IL, USA). $p < 0.05$ and $p < 0.01$ were taken as significance levels.

RESULTS

Participants' Characteristics

The mean values of gender, age, body mass index, duration of disease, educational status, and marital and employment status for patients with FMS and healthy individuals are shown in Table 1. There were no baseline differences in the characteristics and clinical profiles between the 2 groups (Table 1). The smoking status and exercise habits of the 2 groups are shown in Table 1. The McGill Pain sub-parameter scores are also shown in Table 1.

Physical Activity Level

In total, 36.6% patients with FMS and 22.7% healthy individuals were found to be inactive. We observed 45.1% of the patients with FMS and 36.4% of the healthy individuals to be insufficiently active (Table 2). The walking and total physical activity scores in IPAQ of the patients with FMS were significantly lower than those of the healthy individuals ($p < 0.05$). Table 3 shows the mean values of IPAQ scores and comparisons of physical activity levels between the FMS patient and control groups.

Table 1. Baseline characteristics of FMS patient and control (CO) groups

	FMS	CO	p
Case Number n	82	110	
Gender, n (%)			
Female	59 (72)	71 (64.5)	0.279
Male	23 (28)	39 (34.5)	
Age (X±SD)	53.62±7.12	51.7±8.37	0.626
BMI (X±SD)	27.26±4.13	26.22±3.95	0.439
Smoking status, n (%)			
Smoking	53 (64.6)	54 (49.1)	0.045
Not smoking	25 (30.5)	48 (43.6)	
Quit smoking	4 (4.9)	8 (7.3)	
Exercise habit, n (%)			
Yes	18 (22.0)	39 (35.5)	0.168
No	64 (78.0)	71 (64.5)	
McGill Pain Scale (X±SD)			
Sensory pain	8.47±7.65	0.12±0.67	0.000
Affective pain	1.75±2.49	0.22±0.77	0.000
Total pain	10.23±9.87	0.30±0.95	0.000
McGill VAS	5.05±2.58	0.42±1.36	0.000
The evaluative total pain intensity	2.31±1.08	0.25±0.75	0.000

$p < 0.05$ was considered statistically significant. Values are reported as mean (X)±standard deviation (SD) or the number of participants (%), unless otherwise specified.
BMI: body mass index; FMS: fibromyalgia syndrome; CO: control; VAS: visual analog scale

Table 2. Percentage of physical activity levels in patients with FMS and controls

	FMS	CO
Inactivity, n (%)	30 (36.6)	25 (22.7)
Moderate activity, n (%)	37 (45.1)	40 (36.4)
Vigorous, n (%)	15 (18.3)	45 (40.9)

FMS: fibromyalgia syndrome; CO: control; Number of participants (%)

Table 3. Comparison of physical activity levels in patients with FMS and controls

IPAQ MET-min/week (X±SD)	FMS	CO	p
Walking PA	1010.53±1589.57	2175.22±3191.71	0.005
Moderate PA	993.87±1618.01	1110.73±1997.24	0.999
Vigorous PA	308.76±935.02	1114.76±3643.97	0.119
Total PA	2257.15±3081.29	4137.30±6595.91	0.029

$p < 0.05$ was considered statistically significant. FMS: fibromyalgia syndrome; CO: control; Values are reported as mean±standard deviation (SD).
IPAQ: International Physical Activity Questionnaire; MET-min/week: metabolic equivalent-(min/week); PA: physical activity

Table 4. Comparison of physical fitness sub-parameters score between FMS and controls

Physical Fitness	FMS	CO	p
Cardiorespiratory fitness			
6MWT distance (m)	389.39±69.97	408.91±78.83	0.435
Borg Rating of Perceived Exertion Scale	3.56±2.17	2.75±2.43	0.108
Motor control (Balance)			
Static balance score	509.71±280.76	543.75±426.34	1.000
Dynamic balance score	2935.54±942.86	2723.37±757.99	0.550
Flexibility measures			
Sit and reach test (cm)	2.63±9.36	1.08±9.93	0.999
Left lateral flexion test (cm)	15.99±3.45	17.67±3.56	0.008
Right lateral flexion test (cm)	16.25±3.55	17.44±3.73	0.147
Muscular endurance			
Sit-up test (repetition number)	14.20±3.28	18.18±5.58	0.000
p<0.05 was considered statistically significant. FMS: fibromyalgia syndrome; CO: control; 6 MWT: 6-min walk test; M: meter; cm: centimeter			

Physical Fitness

In health-related physical fitness tests, the 6MWT and balance test scores were not statistically different between the FMS patient and control groups (Table 4). The left lateral flexion test scores of the flexibility measurement showed significant differences between the FMS patient and control groups (p<0.05) (Table 4). In the FMS patient group, the sit-up test scores were significantly lower than those in the control group (p<0.05) (Table 4).

DISCUSSION

This study was planned to determine the levels of physical fitness and activity change in patients with FMS in comparison with those in healthy individuals of the same age group. It was observed that physical fitness sub-parameters and activity levels are reduced in patients with FMS.

While most studies in the literature have focused on the relation between physical activity and health, very few have focused on the investigation of the validity, reliability, and accuracy of the methods used to assess the physical activity levels in patients with FMS. There is also a lack of information about physical inactivity in this population, the effectiveness of recommendations related to physical activity, and the factors affecting physical activity. Previous studies, investigating physical activity levels in patients with FMS, mostly considered the cases of patients older than 30 years, and most of them were females (11, 18, 19).

In a study by Ruiz et al. (11), in which physical activity was assessed using an accelerometer, it was reported that 60% of females with FMS

had a physical activity of moderate level for 40 min per day for 5 or more days a week, and 70% of these displayed sedentary behaviors for about 10 h of the day. It was seen that they were more sedentary during the weekends.

Mannerkorpi et al. (20) investigated the development and reliability of specific activity questionnaires for 37 patients with FMS. The mean free-time activities of the cases were found to be for 5.9 h/week, the mean housework activities were found to be for 15 h/week, and the mean activities at the job were found to be for 11.4 h/week. They also reported that 66% of cases had low-intensity activities, 29% had moderate-intensity activities, and 5% had high-intensity activities. They recorded the 6MWT average as 518 m and found a low correlation with physical activity (20).

When we assessed the physical activity levels of patients with FMS using the IPAQ questionnaire, similar to other studies, it was found that 37% of the cases were inactive, 45% were minimally active, and 18% were active. In our study, a comparison of patients with FMS and healthy individuals showed significant differences in the IPAQ walking physical activity scores, while no differences were found between moderate-intensity, vigorous-intensity, and total physical activity levels.

The walking physical activity score in the IPAQ questionnaire for patients with FMS was 1010.53±1589.57 MET-min/week. The value for moderate-intensity activity was 308.76±935.02 MET-min/week, and the total physical activity score was 2257.15±3081.29 MET-min/week. The walking score in the IPAQ questionnaire for healthy individuals, however, was 2175.22±3191.71 met-min/week.

The patients with FMS informed that they always had chronic pain, which became more severe with any physical activity or stress. Chronic pain in FMS adversely affects the daily life of patients and limits their daily and free-time activities. In our study, the patients with FMS had either a sedentary life or a very low level of activities. The patients with FMS who participated in our study stated that they had difficulties, particularly in their home and business lives. They also expressed that they were unable to perform physical activities because of pain and the limitations of activity, and they also felt depressed. In general, pain and muscle strength are the main focus in physiotherapy when evaluating patients with FMS. However, the evaluations of physical activity and physical fitness, which are the main problems for the patients, are neglected as in case of other rheumatoid diseases (20).

Physical functionality, cardio-respiratory endurance, and quality of life are adversely affected in patients with FMS due to pain and fatigue. In this disease, without a known effective and radical treatment, the enhancement of functionality, cardio-respiratory endurance, and quality of life and reduction of depression and anxiety are also aimed, together with the reduction of pain. It has been stated that poor physical fitness increases muscular fatigue, which is an important problem in FMS. On the other hand, it is also known that FMS adversely affects the physical fitness level in patients and this form a vicious circle (18, 21).

While there are studies comparing different physical fitness variables between patients with FMS and healthy individuals, there is no study investigating all the parameters of physical fitness related to health.

Although there are many studies in the literature related to the treatment of FMS that have investigated the efficacy of various exercise programs, studies examining how physical fitness levels are affected by the disease are limited (11, 21).

Fontaine et al. (19) in their study on the effects of physical activity on lifestyle in patients with FMS, used the physical fitness parameters BMI and 6MWT. The cases were divided into 2 groups to receive either moderate-intensity physical activity of 60 min for 12 weeks or a short-term social training for 3 months. In the end, while the mean number of steps increased in the physical activity group, no differences were found in 6MWT scores (19).

Aparicio et al. (22) evaluated the differences in physical fitness in patients with FMS and healthy individuals based on the FMS level. For the evaluation of physical fitness, the sit to stand test for 30 min was used to evaluate the lower extremity strength; grip strength was used to evaluate the upper extremity strength; the sit and reach test was used to evaluate the lower body flexibility; the back scratch test was used to evaluate the upper extremity flexibility; the flamingo test with eyes closed was used to evaluate the static balance; the 8-step test was used to evaluate the dynamic balance; and 6MWT was used to evaluate the cardiopulmonary endurance. Significant differences were found between the groups in the sit and reach test, balance test, and 6MWT scores. The patients with FMS showed lower values for these parameters (22).

One of the most comprehensive studies that can be compared with our study is that of Sener et al. (23) In that study, physical fitness parameters related to health in 39 patients with FMS were compared with those of 40 healthy individuals. The physical activity level was assessed using a metabolic holter, resting energy consumption was assessed using an indirect calorimeter, aerobic capacity was assessed with the bike ergometer test, strength was evaluated using a hand and leg dynamometer, and trunk flexibility was assessed using a digital flexibility device. No significant differences were observed in the maximal aerobic capacity, daily number of steps, and total energy consumption. Hand grip strength and trunk flexibility scores were significantly lower than those in healthy individuals, and the reported results are similar to those of our study (23).

In our study, similar results were obtained for 6MWT parameters for patients with FMS and healthy individuals when evaluating the cardio-respiratory endurance of patients with FMS. The similarity between the results could be attributed to the lack of exercising habits in healthy individuals and being inactive. The lower level of 6MWT is an evidence for the diagnosis of cardio-respiratory disease.

In this study, we evaluated the abdominal muscle strength and endurance with the sit-up test. Patients with FMS showed poorer results than healthy individuals. The possibility that the extensive pain in FMS can affect the endurance of abdominal muscles to a greater extent and getting tired more quickly can be listed among the causes of these poorer results.

With regard to flexibility, the comparison of patients with FMS with healthy individuals in lateral flexion tests for the trunk showed that there was a significant reduction. The mobility of muscle, joint, and surrounding structures decreased in relation to the pain in patients. Similar results were obtained when the scores for patients with FMS in static and dynamic balance were compared with those for healthy individuals. The differences were found in a study comparing the

balance between patients with FMS and healthy individuals with the flamingo and 8 feet up and go tests; however, no differences were found in our study in the balance results between the patients with FMS and healthy individuals. This difference can be attributed to the difficulties in concentration because silence in the testing environment could not be ensured during the tests and there may be differences in the implication of the testing methods (22).

Despite the useful results, our study had some limitations such as the lack of comprehensive evaluations including the lower and upper extremity muscle groups in the scope of muscle strength, endurance, and flexibility evaluations. More objective methods could have been used in place of the physical activity questionnaire to reach a large sample group.

CONCLUSION

This study revealed that physical activity and fitness levels are impaired in patients with FMS in comparison with healthy individuals. These data can be used to evaluate the efficacy of different treatment programs aimed at promoting physical activity in this population. It is important to encourage not only patients with FMS but also individuals without FMS to engage in daily physical activity.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Medicine and Health Sciences Research Council of Başkent University (Reference number KA11\227).

Informed Consent: Written informed consent was obtained from all participants who participated in this study.

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