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The vicious cycle of physical inactivity, fatigue and kinesiophobia in patients with fibromyalgia syndrome

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SUMMARY

This study aims to determine the association between fatigue, kinesiophobia, disease severity, and physical inactivity by comparing fibromyalgia syndrome (FMS) patients with healthy controls. Pain and fatigue are significant barriers to the participation in functional activities. Inactivity is a result of fatigue, but exercise is the foundation of FMS treatment.

This case-control study included a total of 203 participants (107 patients with FMS and 96 healthy volunteers). The fibromyalgia impact questionnaire, the fatigue severity scale, the international physical activity questionnaire, and the Tampa scale for kinesiophobia were assessed. The FMS group scored significantly higher on the fatigue severity scale and kinesiophobia than the control group (p<0.001). Significantly lower metabolic task equivalent (MET) scale values were observed in the FMS group compared to the control group (p<0.001). The severity of fatigue and kinesiophobia correlated positively with the FMS impact questionnaire (p=0.001, r=0.621) and negatively with the MET scale (p=0.009, r= –0.287). Patients with FMS experience greater fatigue, kinesiophobia, and inactivity. As the severity of FMS worsens, so do disability, kinesiophobia, and fatigue. This study highlights the importance of breaking the cycle of fatigue and inactivity in the treatment of FMS.

Key words: *Fibromyalgia syndrome, fatigue, kinesiophobia, physical activity.*

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INTRODUCTION

Various symptoms are common in fibromyalgia syndrome (FMS), including widespread pain and cognitive dysfunction, psychological changes, irritable bowel syndrome, fatigue, decreased pain threshold, and morning stiffness (1).

Even though widespread pain is the main symptom of FMS, fatigue is one of the most common, affecting most patient with FMS (2, 3). Fatigue is a complex, multifactorial, annoying, and persistent symptom with a reported prevalence of 76% in patients with FMS (4). Therefore, new diagnostic criteria for FMS published in 2010 include fatigue (5).

Fatigue affects fibromyalgia patients both physically and mentally. Therefore, patients with FMS have cognitive limitations that affect concentration to perform particular jobs, to think clearly, or to remember information. Additionally, fatigue affects the functional capacity in daily activities and the performance of basic functions and activities in patients with FMS (6, 7).

It has been reported in recent meta-analyses that, in the treatment of FMS, exercise has a moderate effect on fatigue and minimal effect on sleep (8). The positive effect of exercise on the psychological state and quality of life in fibromyalgia is also mentioned (9). Recent meta-analyses have found that combined exercise programs and aerobic exercises are effective in the treatment of FMS (10). On the other hand, according to the results of some studies on exercise compliance of FMS patients, it has been reported that patients with FMS need help from health professionals for par-

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ticipation and adherence in exercise (11). People with FMS report that both pain and fatigue are major obstacles to their ability to participate in activities. İndeed, pain and fatigue during functional activities are barriers to participation in them (1). Increased pain levels are associated with decreased function, increased disease severity and symptoms (12-14). Physical disability associated with FMS is caused by fear of activity as well as pain (15).

Kinesiophobia is one of the most excessive forms of fear of pain due to motion or reinjury. In the literature, it has been reported that kinesiophobia may lead to avoidance of physical activity, functional impairment and depressive symptoms in the long term (16). Cognitive responses to pain form the fear-avoidance model. Here, the person experiencing pain perceives pain as a threat, which leads to kinesiophobia, and affects chronicity and disability (16).

Indeed, fatigue is a very common and important symptom of FMS and uncovering its relation with other determinants is important. This study examines the relationship between fatigue, kinesiophobia and physical inactivity in FMS and how they interact with each other. The primary outcome of this study was to identify increased fatigue levels and kinesophobia in participants with FMS compared to healthy controls. Additionally, the aim was to compare the physical activity limitation that occur due to kinesiophobia and fatigue in healthy volunteers. Our secondary outcome was to determine levels of fatigue and kinesophobia by disease activity.

PATIENTS AND METHODS

Study design and study population

This cross-sectional study was carried out with 203 female participants between the ages of 18 and 65 years between April 2021 and August 2021.

Participants were divided into two groups: the FMS group and the healthy volunteer group. Patients who applied to the physical therapy and rehabilitation outpatient clinic with complaints such as chronic widespread pain, fatigue, and sleep disturbance between the specified dates were examined by a phisiatrist (BCK) with 8 years of experience with FMS and chronic pain. The FMS group of this study consisted of 107 female patients who were newly diagnosed according to the ACR 2010 diagnostic criteria or who were followed up with a diagnosis of FMS (5).

Ninty six female participants, who applied to the outpatient clinic for general health screening, had no symptoms including chronic pain, were not diagnosed with FMS, and agreed to participate in the study. They constituted the healthy volunteer group of this study.

This study was conducted according to the Declaration of Helsinki and all participants gave written voluntary consent before enrolling in the study.

Fibromyalgia ımpact questionnaire (FIQ), Tampa kinesophobia scale (TKS), fatigue severity scale (FSS) and the short form of the ınternational physical activity questionnaire (IPAQ-SF) were completed. All scales were filled in face to face sessions from the participants. Additionally, demographic data (age, gender, height, weight, marital status, education level) and the duration of FMS diagnosis were recorded.

Exclusion criteria for both groups were the presence of health problems that affect the level of physical activity (cardiac or pulmonary insufficiency, limb amputation, recent surgery history).

Functional status

FIQ is used to assess the patient’s functionality and determine the severity of the disease. The scale consists of 10 items and each item is 10 points. Therefore, the total maximum score is 100 points. Increasing scores indicate higher disease activity and lower functional status (17).

The kinesiophobia level was assessed using the TSK which includes 17 items and assesses the subjective rating of kinesiophobia. Each item is scored using a 4-point Likert-type scale, (1 point is reporting complete disagreement and 4 points are reporting complete agreement). The total points range between 17 and 68. Higher scores refer a higher severity of kinesiophobia. Scores higher than 37 points mean high levels of kinesiophobia and scores less than or equal to 37 mean low levels of kinesiophobia (16, 18).

FSS is a nine-item scale that assesses the level and severity of fatigue and is rated on a 7-point Likert scale (1 point means "absolutely disagree" and 7 points means "strongly agree"). The total score of this scale varies between 0-7 point, thus the maximum score is seven. FSS evaluates the extent to which fatigue affects physical function, motivation, exercise, and whether fatigue affects the work, family or social life of patients (19). Turkish validation study of the scale has been conducted in patients with FMS (20).

Table I - Baseline parameters of participants.

	FMS	Controls	p value
Age (mean±SD)	41.86±9.16	39.47±9.82	0.059
BMI (mean±SD)	25.90±3.45	24.98±3.16	0.086
Marital status n (%)			0.264
Single	13 (12.1)	19 (19.8)	
Married	88 (82.2)	70 (72.9)	
Divorced	6 (5.6)	7 (7.3)	
Education n (%)			0.127
Literate	8 (7.5)	4 (4.2)	
Elementary	34 (31.8)	19 (19.8)	
Secondary	47 (43.9)	50 (52.1)	
University	18 (16.8)	23 (24.0)	
Occupation n (%)			0.579
Housewife	23 (21.5)	15 (15.6)	
Desk worker	38 (35.5)	42 (43.8)	
Physically demanding	39 (36.4)	34 (35.4)	
Retired	7 (6.5)	5 (5.2)	
Habits n (%)			0.189
None	73 (68.2)	65 (67.7)	
Cigarette	31 (29.0)	23 (24.0)	
Alcohol	3 (2.8)	8 (8.3)	
FSS score (mean±SD)	4.97±1.60	3.20±1.42	<0.001
MET scale n (%)			<0.001
1	82 (76.6)	33 (34.4)	
2	18 (16.8)	48 (50.0)	
3	7 (6.5)	15 (15.6)	
TSK scale n (%)			<0.001
1	14 (13.1)	49 (51.0)	
2	93 (86.9)	47 (49.0)	
TSK score (mean±SD)	43.69±7.51	36.56±5.54	<0.001

SD, standard deviation; BMI, body mass ındex; TSK, tampa scale for kinesiophobia; FSS, fatigue severity scale; MET, metabolic task equivalent.

IPAQ-SF contains 7 questions that provide information about sitting, walking, and moderate to vigorous-intensity activities. The total score includes the duration (minutes) and frequency (days) of intense activity. The sitting score (sedentary behavior level) is calculated separately. Each activity needs to be done for at least 10 min at a time. The metabolic task equivalent (MET) - minute/week score is provided by multiplying the minutes, days, and MET values. According to standard MET values, 1.5 MET sitting, walking time (minutes) multiplied by 3.3 MET. In the calculation, 4 METs are considered medium activity and 8 METs are considered an intense activity. As a result of the IPAQ score, PA levels are classified as low (<600 MET-min/week), medium (600-3000 MET-min/week) and high (>3000 MET-min/week) physical activity level (21, 22). The reliability and validity of the Turkish version of the questionnaire were conducted (23).

Statistical analysis

Statistical analysis of the study data was performed using IBM SPSS (Statistical package for the social sciences) Statistics for Windows version 25.0. Descriptive data were expressed as mean±standard deviation or number and frequency. The distribution of variables was checked with the Kolmogorov-Smirnov test to compare two groups. Variables were compared with the independent sample t-test, the Mann-Whitney U test, and the chi-squared tests. Associations between variables were evaluated by the Pearson's or Spearman's correlation coefficients. The significance level was set at p≤0.05.

Sample size calculation

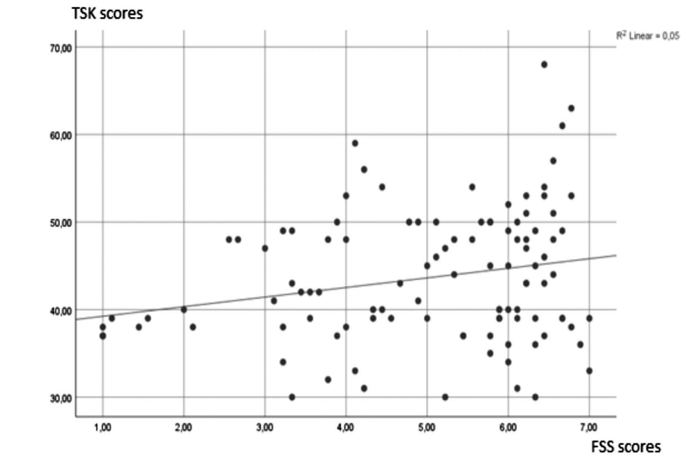
The sample size calculations were performed using the G*Power 3 program (Heinrich-Heine-Universität Düsseldorf, Düsseldorf, Germany) t-test with a power of 95%, a significance level of 0.05, and medium effect size (d=0.5), obtaining a sample size of 176 participants. To allow for potential data loss of 15%, the required sample size was 203 participants.

RESULTS

A total of 203 people, of whom 107 diagnosed with FMS and 96 healthy volunteers, were included in our study. While the average age of the participants was 40.73±9.53, BMI values were 25.46±3.34. There was no statistical difference between the demographic values such as age, BMI, marital status, education level, occupation and habits between the two groups (p>0.05) (Table 1).

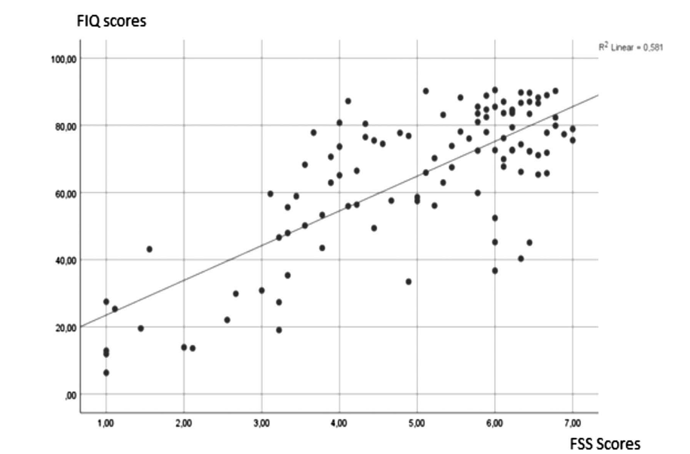
Fatigue severity scale and kinesiophobia values were found to be significantly higher in the group with FMS compared to healthy volunteers (p<0.001). When the MET levels of FMS patients were examined, it was observed that 76% of them were low, 16.8% were medium, and 6.5% were high physical activity levels. MET levels were found to be statistically significantly lower when compared with the control group (p<0.001). While the TSK score was 43.69±7.51 in FMS patients, it was 36.56±5.54 in the control group. Considering the low and high risk groups according to these scores, the severity of kinesiophobia was high in 86.9% of FMS patients, while this rate was 49.0% of in healthy volunteers. This means that kinesiophobia was statistically significantly higher in patients with FMS (p<0.001) (Table 1).

The relationship between disability levels evaluated with the fatigue severity scale and kinesiophobia, fibromyalgia impact questionnaire and MET values in FMS patients was measured. The FIQ total score of the FMS patients included in our study was 64.64±21.71. A positive correlation was found between the severity of fatigue and kinesiophobia (p=0.037, r=0.202) (Figure 1) and the fibromyalgia impact questionnaire (p<0.001, r=0.621), while a negative correlation was found with the MET scale (p=0.009, r=-0.287) (Figure 2).



TSK, Tampa scale for kinesiophobia; FSS, fatigue severity scale.

Figure 1 - Correlation between the fatigue severity scale and and the Tampa scale for kinesiophobia scores.

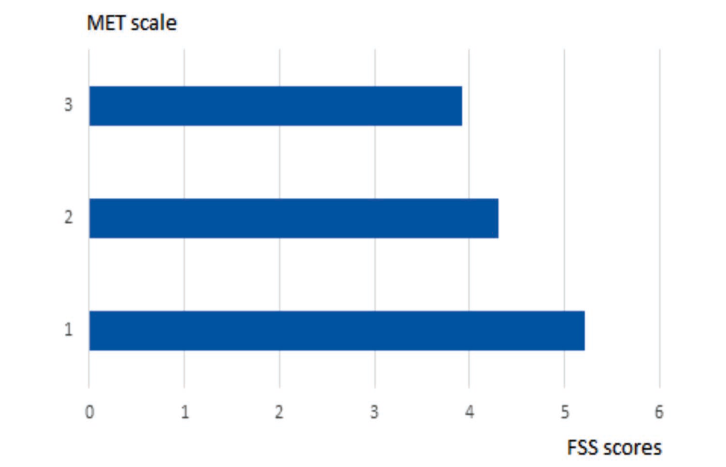


FSS, fatigue severity scale; FIQ, fibromiyalgia ımpact questionnaire.

Figure 2 - Correlation between the fatigue severity scale and the fibromiyalgia ımpact questionnaire scores.

DISCUSSION

This study's results show that patients with FMS have higher levels of fatigue and kinesiophobia compared to healthy controls, and that patients with FMS are more inactive. Koçyiğit *et al.* reported that patients with FMS, who have chronic widespread pain, consider pain as a threat, and as a result, they enter a negative cycle of kinesiophobia, pain-related fear, fear of movement, hypervigilance, and avoidance acts. Therefore, they reported that patients with FMS have higher kinesiophobia scores (24). In this study, 86.9% of patients with FMS were in the high-level kinesiophobia



FSS, fatigue severity scale; MET, metabolic task equivalent.

Figure 3 - Distribution of fatigue severity scale scores (FSS) and the metabolic task (MET) equivalent scale.

group. In the literature, the frequency of kinesiophobia in fibromyalgia patients varies between 38.6 and 75.1%, and it was thought that sample sizes, ethnicity and cultural differences may contribute to the differences in these results (24). In this study's outcomes, 65.4% of fibromyalgia patients had a high disease-related disability. In our view, this finding might explain the somewhat higher level of our kinesiophobia results compared to the literature.

When planning this study, we thought that fatigue might be another factor causing physical inactivity in FMS patients. While fatigue is an important part of the FMS clinic, it was not included in the 1990 ACR diagnostic criteria for FMS, but the 2010 ACR diagnostic criteria include fatigue (5, 25). People with FMS typically describe fatigue as an overall feeling of tiredness or exhaustion while completing functional tasks, decreased attention, sleepiness, or feeling of heaviness (1). There are different types of fatigue, including objective physical-mental, subjective physical-mental and objective-subjective realistic (26). In this study, subjective fatigue was evaluated with a self-rating scale. This study's results show that fatigue severity is significantly higher in FMS patients compared to healthy volunteers. The results of our study also show that fatigue is weakly correlated with kinesiophobia and physical inactivity. Additionally, there is a moderate correlation between the severity of FMS and the level of fatigue. Similarly, Correa-Rodriguez *et al*. stated that women with FMS reported more fatigue compared to healthy ones (27). Dailey *et al*. showed that pain and fatigue are significantly associated with physical performance in women with FMS (1). The results of the studies in the literature correlate the severity of the disease with the quality of life in patients with FMS (28, 29). Quality of life is considered an important outcome measure in recent studies on FMS management (30-33). The results of this study show the relationship between FMS severity and fatigue. Management of FMS severity is valuable in improving symptoms and quality of life.

The role of physical activity in the pathophysiology of FMS is contradictory. It has been reported in the literature that the avoidance of physical activity and excessive activity are associated with an increase in the severity of symptoms, such as pain and fatigue in patients with FMS, and that both high and low levels of physical activity increase the severity of symptoms (2). On the other hand, Sieczkowska *et al*. showed that physically active patients with FMS had better quality of life and less depressive symptoms (28). In a recent meta-analysis, it has been reported that the intervention of physical exercises was effective on the symptoms and physical well-being of FMS patients (10). The results of another recent meta-analysis show that especially resistance exercises are effective on pain and fatigue in patients with FMS (34). In addition, in terms of physical exercise intensity, it has been reported that the exercise intensity should be light at the beginning and increased over time to not aggravate the symptoms of FMS patients (10). The results of this study showed that the kinesiophobia levels of FMS patients were high. In this patient population with a high level of kinesiophobia, careful adjustment of exercise intensity is important in order to break the cycle of physical inactivity. The results of a recent meta-analysis suggest individualized exercise prescription, in which exercise intensity, frequency, and duration are appropriately determined for the best outcomes in terms of quality of life (35).

Joustra *et al*. reported that patients with FMS were remarkably less physically active than healthy controls (26). According to the findings of our study, 76.6% of the FMS patient group had a MET level of one. This outcome is related to the high disease level of 65.4% of the patients in the FMS patient group who constituted the sample. However, the results of this study are important in terms of revealing the physical inactivity of FMS patients. Joustra *et al*. evaluated physical activity levels in patients with FMS and chronic fatigue syndrome and reported that patients with FMS were less physically active than controls, and this inactivity was associated with higher symptom severity (26). At this point, it is important to identify the causes and encourage patient education, social support and multidisciplinary treatments to prevent physical inactivity.

Limitations

Although the diagnosis of FMS was made by the physiatrist in our study, the use of self-report questionnaires in the evaluation of fatigue, symptom severity, kinesiophobia and physical activity represents a limitation. This study's sample consisted entirely of women, so our data should not be generalized to other populations. Another potential limitation of our study is that a selection bias may exist, due to the control group being recruited from a convenience sample.

Psychiatric diseases, distress level, anxiety and depression were not questioned while forming the sample of this study. Psychiatric diseases, anxiety and depression may have affected the level of fatigue, so it can be considered as a limitation as well. Despite its limitations, this study may be valuable as it demonstrates reduced levels of physical inactivity, increased fear of movement, and fatigue in FMS patients compared to healthy controls. Future studies should analyze the relationship between physical inactivity, fatigue, kinesiophobia and FMS longitudinally.

CONCLUSIONS

According to the results of our study, as disability due to FMS increases, kinesiophobia and fatigue also increase in patients. In our opinion, reducing the level of disability through effective treatment of FMS can reduce fatigue and kinesiophobia, thus avoiding physical activity restrictions. As a consequence, with increased physical activity, the symptoms of the disease could be reduced and the vicious circle could be broken. These findings highlight an important difference in fear of movement or reinjury in FMS patients.

The effectiveness of exercise in patients with FMS is well documented in high-quality reviews and meta-analyses. It is also well known that exercise is effective on widespread pain, depressive symptoms, and general health and physical function. Clinicians and therapists should consider the propensity for inactivity in patients with FMS and take precautions to prevent complications caused by inactivity.

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Conflict of interest

The authors declare no competing financial interests. The authors declare no potential conflict of interest.

Ethical approval

The local ethics committee of the Yozgat Bozok University approved the study (approval number: 2017KAEK-189_2021.03.10_18), which is registered in ClinicalTrials.gov (NCT04827550).

This study was conducted according to the Declaration of Helsinki.

İnformed consent

All participants gave written voluntary consent before enrolling in the study.

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