Correlation between levels of physical activity, disease severity and pain intensity in women with fibromyalgia

Correlação entre níveis de atividade física, gravidade da doença e intensidade da dor em mulheres com fibromialgia

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ABSTRACT

BACKGROUND AND OBJECTIVES: Currently, there is conflicting evidence regarding both physical activity and exercise in relation to the impact of fibromyalgia (FM). The aim of this study was to correlate levels of physical activity, disease severity, and pain in women with FM.

METHODS: This is a cross-sectional study with 93 women diagnosed with FM, with an average age of 49.1±10.3 years. The Revised Fibromyalgia Impact Questionnaire (FIQR) was used to assess the impact of the disease on the women's health status. To evaluate the level of physical activity, the short version of the International Physical Activity Questionnaire (IPAQ) was used. The Numeric Pain Rating Scale (NPRS) was used to assess the intensity of the participants' pain.

RESULTS: Significant differences were found between the groups in terms of symptom severity (F = 9.471; p<0.001; n^2=0.174) and pain intensity (F = 5.074; p=0.008; n^2=0.101), which were unfavorable to the sedentary group (p<0.05). Significant inverse correlations were found in assessments of physical activity levels at light and moderate intensities, FIQR and pain (r_s = -0.20 to -0.30).

CONCLUSION: Sedentary women are severely impacted by the disease and may experience higher levels of pain. Weak to moderate correlations between physical activity levels, disease impact, and pain intensity suggest that engaging in physical activity at light and moderate intensities may be an important intervention in the management of FM.

Keywords: Fibromyalgia, Pain, Physical exercise.

RESUMO

JUSTIFICATIVA E OBJETIVOS: Atualmente existem evidências conflitantes tanto para a atividade física quanto para o exercício físico na relação com o impacto da fibromialgia (FM). O objetivo deste estudo foi correlacionar níveis de atividade física, gravidade da doença e dor em mulheres com FM.

MÉTODOS: Trata-se de um estudo transversal com 93 mulheres diagnosticadas com FM, com média de idade de 49,1±10,3 anos. O Questionário Revisado de Impacto da Fibromialgia (FIQR) foi utilizado para avaliar o impacto da doença no estado de saúde das mulheres. Para avaliar o nível de atividade física, utilizou-se a versão curta do Questionário Internacional de Atividade Física (IPAQ). A Escala Numérica de Avaliação da Dor (END) foi utilizada para avaliar a intensidade da dor das participantes.

RESULTADOS: Diferenças significativas foram encontradas entre os grupos, no tocante a gravidade dos sintomas (F = 9,471; p<0,001; n^2=0,174) e intensidade da dor (F = 5,074; p=0,008; n^2=0,101), desfavoráveis ao grupo sedentário (p<0,05). Correlações inversas significativas foram encontradas em avaliações de níveis de atividade física em intensidades leve e moderada, FIQR e dor (r_s = -0,20 a -0,30).

CONCLUSÃO: Mulheres sedentárias são impactadas de maneira muito severa pela doença e podem apresentar níveis mais elevados de dor. Correlações fracas e moderadas entre os níveis de atividade física, impacto da doença e intensidade da dor sugerem que a prática de atividade física em intensidades leve e moderada pode ser uma intervenção importante no tratamento da FM.

Descritores: Dor, Exercício Físico, Fibromialgia.

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HIGHLIGHTS

- Women with fibromyalgia had low levels of physical activity
- Sedentary women with fibromyalgia had greater pain intensity and symptom severity compared to women with higher levels of physical activity
- Greater frequency and duration of light and moderate intensity physical activity may help to improve fibromyalgia symptoms, including pain

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INTRODUCTION

Fibromyalgia (FM) is the third most common chronic musculoskeletal disease, after low back pain and osteoarthritis. The prevalence varies according to the country and the diagnostic criteria, ranging from 0.4% to 8.8%, with a world average of 2.7%[1]. In Brazil, FM affects 2% of the population, with 5.5 women for every man[2].

Chronic widespread pain, physical and mental fatigue and sleep disorders are the most common symptoms, while cognitive and autonomic dysfunctions, depression and anxiety are also reported in FM patients[3-5]. Due to the multiple symptoms and the low evidence of specific biomarkers[6], the diagnosis is clinical, using criteria established by the American College of Rheumatology (ACR), which include the generalized pain index, the symptom severity scale persisting for a minimum of three months and the absence of another health condition explaining the pain[7].

Despite advances in the identification and prevalence of symptoms of FM, the etiology remains uncertain. Genetic factors, trauma and stress, neuroendocrine abnormalities, disturbances in pain regulation and central sensitization are seen as possible influencing factors[8]. Treatment is characterized by integrated and multidisciplinary interventions, using drugs such as antidepressants and anticonvulsants, and non-pharmacological methods[9].

Among the non-pharmacological forms, patient education and physical activity are highly recommended[10]. However, when compared to healthy adults, women with FM, due to multiple symptoms including generalized pain, have shown lower levels of physical activity[11]. Most studies have investigated structured exercise programs and indicate that modalities such as aerobic training and strength training can be effective in reducing symptoms, including pain, and improving quality of life (QoL)[12].

One study[13] reported that the choice of a particular type of exercise should be based on evidence, and that barriers to involvement and accessibility should also be considered in FM. Furthermore, it seems that more studies are needed to determine the most appropriate physical activity and exercise variables, such as frequency and duration, to achieve the best results in terms of QoL, functional capacity and pain reduction.

Few studies have investigated the relationship between FM and the total component of physical activity, represented by structured exercises and day-to-day activities such as housework, going up and down stairs, habitual commuting, etc., which can influence physical activity levels. From this perspective, the outcomes of the studies are conflicting. For example, improvements in symptoms and pain reduction in physically active individuals have been reported[14]. On the other hand, physical activity levels may be associated with physical function, but not with pain[15].

However, studies evaluating this relationship between physical activity and FM are important in order to provide adequate information for managing the disease and establishing assertive guidelines and incentives for practicing physical activity. Therefore, the aim of this study was to correlate physical activity levels, disease severity and pain in women with FM. The initial hypothesis is that the less active individuals are, the more severe their FM symptoms and pain will be.

METHODS

This study is characterized as cross-sectional and observational. Women with FM were recruited from the Extension Project to Support People with Fibromyalgia (*Projeto de Extensão para Apoio às Pessoas com Fibromialgia* - PAPEF) at Cesumar University (*Universidade Cesumar* - UNICESUMAR), or from among those who had scheduled a specialized Rheumatology appointment in the Brazilian Public Health System (*Sistema Único de Saúde* - SUS), at the Aclimação Basic Health Unit and at the Municipal Hospital in the city of Maringá, from July 1 to 30, 2022. Subsequently, for data collection, a face-to-face meeting was scheduled at UNICESUMAR's Interdisciplinary Health Promotion Intervention Laboratory (*Laboratório Interdisciplinar de Intervenção em Promoção da Saúde* - LIIPS), between August 1 and 30, 2022.

The sample was recruited by convenience and only women took part due to the higher FM prevalence compared to men. The following inclusion criteria were used: women aged between 20 and 70 years and diagnosed with FM by a specialist doctor, according to the 2010 ACR criteria[7]; generalized pain index ≥ 7 and symptom severity scale ≥ 5, or generalized pain index ≥ 3 - 6 and symptom severity scale ≥ 9; presence of symptoms for at least 3 months; and the absence of another health condition explaining the pain. Exclusion criteria were: having an acute or terminal illness, such as cancer, stroke, recent heart disease, or having schizophrenia. A total of 93 women were eligible to constitute the sample.

Data sources/measurements

Sociodemographic information was collected using a self-administered structured questionnaire, covering the following data: name, age, diagnosis of FM, use of drugs and associated comorbidities. All participants were instructed to fill in the information correctly, and any questions were answered.

The height of the participants was measured using a Sanny® stadiometer with an accuracy of 0.1 cm (standard model, ES 2030, São Bernardo do Campo, São Paulo, Brazil). Body weight was measured on a mechanical scale (Welmy® model with a capacity of 300 kg and precision of 100 g, Model 104A, Santa Bárbara do Oeste, São Paulo, Brazil), according to the protocol established by a reference study[16]. Body mass index (BMI) was calculated as body mass (kg) divided by height squared (m^2) and classified according to the World Health Organization (WHO)[17]: <18.5 = underweight; 18.5 - 24.9 = normal; 25.0 - 29.9 = overweight; and > 30 = obese.

The Revised Fibromyalgia Impact Questionnaire (FIQR), translated and validated for the Brazilian population, was used to assess the impact of FM on women's health[18]. It is a self-administered questionnaire made up of 21 individual questions, with response options on a scale of 0 to 10 points. The total score ranges from 0 to 100, divided into 3 domains: function (0 to 30), general impact (0 to 20) and symptoms (0 to 50). A higher score indicates a greater impact of the disease. The following cut-off points were used to indicate the degree of severity of the

disease: very mild/mild 0-40, moderate 41-63, severe 64-82 and very severe >83[19].

To assess the level of physical activity, the short version of the International Physical Activity Questionnaire (IPAQ) was used, validated for the Brazilian population[20]. The short version has seven questions to estimate the time spent per week on different dimensions of physical activity, such as walking and physical exertion, at light, moderate and vigorous intensities; as well as the time dedicated to passive activities carried out in a sitting position. Participants were classified according to the following recommendations: 1 - Very Active: those who met the recommendations of: a) vigorous: ≥ 5 days/week and ≥ 30 minutes per session; b) vigorous: ≥ 3 days/week and ≥ 20 minutes per session, plus (+) moderate and/or walking: ≥ 5 days/week and ≥ 30 minutes per session; 2 - Active: those who have met the recommendations of: a) vigorous: ≥ 3 days/week and ≥ 20 minutes per session; or b) moderate or walking: ≥ 5 days/week and ≥ 30 minutes per session; or c) any additional activity: ≥ 5 days/week and ≥ 150 minutes/week (walking + moderate + vigorous); 3 - Irregularly Active A: those who meet at least one of the recommendation criteria regarding the frequency or duration of activity: a) frequency: 5 days/week or b) duration: 150 minutes/week; 4 - Irregularly Active B: those who do not meet any of the recommendation criteria in terms of frequency or duration. 5 - Sedentary: those who did not perform any physical activity for at least 10 continuous minutes during a week. For the analyses, the participants were divided into 3 groups: active (very active and active); irregularly active (irregularly active A and B); and sedentary.

The Numerical Pain Rating Scale (NPRS) was used to assess the pain intensity of women with FM. It consists of a numerical scale from 0 to 10, in which a score of 0 indicates no pain, while a score of 10 represents more intense pain. The scale shows good reliability when used in chronic pain disorders, including FM[21].

All the procedures were previously informed to the participants, who signed the Free and Informed Consent Term (FICT) to be included in this study. This study was approved by UNICESUMAR's Research Ethics Committee. CAAE: 58445822.0.0000.5539.

Statistical analysis

The results were presented as mean ± standard deviation (SD). The Shapiro-Wilk test was used to assess the normality of the data. ANOVA with Tukey's post-test was used to compare anthropometric parameters, symptom severity and pain intensity in the groups of women according to their level of physical activity on the IPAQ (sedentary, irregularly active and active). The effect size was estimated using Eta squared (n^2) and the following cut-off points were used[22]: small (n^2<0.01), medium (n^2 between 0.02 and 0.06) and large (n^2>0.14). Spearman's correlation (r_s) was used for the correlations, since the variables related to the level of physical activity (frequency and duration) had a non-normal distribution. The magnitude of the correlations was classified as: weak (0.10 to 0.29), moderate (0.30 to 0.49) and strong (above 0.49)[22]. The software used was SPSS version 29.0 (Somers, NY, USA), with an accepted significance level of p≤0.05.

RESULTS

Table 1 shows the sample's demographic and anthropometric characteristics, pain intensity and the impact of fibromyalgia. Ninety-three women with FM were assessed. The women were classified as overweight according to the BMI found and had a high level of pain. The impact of FM assessed by FIQR was severe.

Table 1. Anthropometric characteristics, pain and FIQR of the women in the sample (n=93)

	Mean ± SD
Age (years)	49.1 ± 10.3
Height (cm)	160.0 ± 6.5
Body mass (kg)	75.6 ± 14.4
BMI (kg/m²)	29.5 ± 5.2
Pain (NPRS)	8.0 ± 1.9
FIQR – total score	72.2 ± 18.7
FIQR – function	19.1 ± 6.9
FIQR – overall impact	14.3 ± 5.5
FIQR – symptoms	38.8 ± 8.7

FIQR = Fibromyalgia Impact Questionnaire Revised; BMI = Body Mass Index; NPRS = Numerical Pain Rating Scale.

Table 2 shows the classification of women according to their level of physical activity. Only 29% of the women were considered active. The majority of the sample was classified as irregularly active (44.1%), and 26.9% of the women were classified as sedentary.

Table 2. Classification of groups according to physical activity levels

	n (%)
Sedentary	25 (26.9 %)
Irregularly active	41 (44.1 %)
Active	27 (29.0 %)

Table 3 shows the comparison between women classified according to physical activity levels, for anthropometric data, FIQR and pain intensity. Significant differences were found between the group means for symptom severity (FIQR and domains), with effect size estimates (n^2) ranging from 0.134 to 0.174, and pain intensity (NPRS) of n^2=0.101. There were significant differences (p<0.05) between the active *versus* sedentary groups for the following variables: pain (-1.2 points), FIQR total score (-15.8 points), FIQR function (-5.1 points), FIQR overall impact (-4.5 points) and FIQR symptoms (-6.2 points). For the same variables, there were significant differences between the irregularly active *versus* sedentary groups: pain (-1.4 points), FIQR total score (-18.4 points), FIQR function (-6.1 points), FIQR overall impact (-4.6 points) and FIQR symptoms (-7.7 points). There were no differences between the groups for age and body composition data.

The following significant (p<0.05) but weak to moderate correlations were found between levels of physical activity (frequency and duration), pain and FIQR (table 4): for light activities, pain and FIQR with frequency (days) and duration (minutes

Table 3. Analysis of variance of anthropometric data, pain and FIQR of the groups, according to levels of physical activity

	Sedentary (n = 25)	Irregularly active (n = 41)	Active (n = 27)	F	p-value	n^2
Age (years)	51.9 ± 10.0	48.8 ± 10.9	46.9 ± 9.5	1.593	0.209	0.034
Height (cm)	159.0 ± 6.1	160.2 ± 6.5	160.6 ± 6.9	0.415	0.661	0.009
Body mass (kg)	76.9 ± 14.4	72.4 ± 11.6	79.4 ± 17.3	2.141	0.123	0.045
BMI (kg/m²)	30.4 ± 5.4	28.1 ± 3.8	30.7 ± 6.2	2.578	0.082	0.054
Pain (NPRS)	9.0 ± 1.0	7.6 ± 2.2*	7.8 ± 1.7*	5.074	0.008	0.101
FIQR - total score	84.9 ± 11.3	66.5 ± 17.2*	69.1 ± 21.2*	9.471	<0.001	0.174
FIQR - function	23.3 ± 6.1	17.2 ± 6.0*	18.2 ± 7.3*	7.333	0.001	0.140
FIQR - overall impact	17.6 ± 2.6	13.0 ± 5.8*	13.1 ± 6.0*	7.045	0.001	0.135

Data are presented as Mean ± SD. *p < 0.05 compared to the sedentary group.
FIQR = Fibromyalgia Impact Questionnaire Revised; BMI = Body Mass Index; NPRS = Numerical Pain Rating Scale.

Table 4. Correlations between frequency and duration of physical activity with pain intensity and total FIQR

	Pain		FIQR - total score	
	r_s	p-value	r_s	p-value
Light activity				
Frequency (days)	-0.22*	0.034	-0.24*	0.017
Duration (minutes/day)	-0.21*	0.035	-0.22*	0.028
Moderate activity				
Frequency (days)	-0.13	0.184	-0.23*	0.022
Duration (minutes/day)	-0.22*	0.029	-0.25*	0.016
Vigorous activities				
Frequency (days)	0.00	0.950	-0.03	0.735
Duration (minutes/day)	0.06	0.957	-0.03	0.723
Total frequency (week)	-0.20*	0.047	-0.30*	0.003
Total duration (minutes/week)	-0.22*	0.033	-0.29*	0.005

*Significant correlations (p<0,05).
FIQR = Fibromyalgia Impact Questionnaire Revised.

per day); for moderate activities, pain with duration and FIQR with frequency and duration; pain and FIQR with frequency and total duration of physical activity per week. For both pain and FIQR, no significant correlations were found with vigorous activity.

DISCUSSION

Considering that most of the women did not meet the criteria, such as frequency and/or duration, to be classified as active, the present study showed that women with FM have low levels of physical activity, and sedentary women are severely impacted by the disease, with higher levels of pain. Higher frequency and duration of light and moderate intensity physical activity were inversely correlated with symptom severity and pain intensity. The current findings confirm this hypothesis.

Studies have emphasized the importance of physical activity and that individuals with FM have lower levels compared to healthy people[11,23]. In addition, higher levels of physical activity and exercise may be associated with improved symptoms, reduced depression, improved physical function and QoL[12].

A study[24] of 408 women with FM reported inverse correlations between FIQR and level of physical activity, and showed that sedentary and insufficiently active women are severely impacted by the disease. In the present study, sedentary women, compared to active and irregularly active women, showed a greater impact of FM, while no significant differences were observed between active and irregularly active women.

Similarly to the FIQR, in the pain score, sedentary women had significantly higher levels, but no differences were found between active and irregularly active women, demonstrating that when it comes to physical activity, according to international recommendations, any energy expenditure beyond rest can have a positive impact on health and QoL[25].

As an example, one study[26] showed that just 20 minutes of a moderate-intensity physical activity session (65%-70% of VO2 peak) resulted in a 5% reduction in immune cells producing the pro-inflammatory cytokine TNF. The acute reduction in inflammatory responses during physical activity could be an important factor in the treatment of individuals with chronic pain conditions such as FM. Some of the mechanisms shown to benefit individuals with FM through physical activity include: secretion of endogenous opioids and the antinociceptive effect on chronic pain; modulation of the immune system in local and systemic pain, as well as in the central nervous system (CNS), releasing anti-inflammatory cytokines. In the CNS,

regular physical activity reduces the activation of glia and inflammatory cytokines[27,28].

Despite the findings on pain, previous studies are conflicting on this issue. Generalized pain is an important limiting factor when related to physical activity, which can contribute to a sedentary lifestyle, worsening health status and QoL[29]. Individuals with FM characterized as active seem to modulate pain more adequately, and physical activity was positively associated with the brain responses shown during pain distraction[11,30].

On the other hand, one study[15] found an association with function and fatigue, but not with pain, related sensitivity and psychological factors. Another study[27] carried out a systematic review of research investigating the relationship between physical activity and exercise with chronic pain in adults, including FM, and demonstrated that physical activity is potentially beneficial, although the evidence of benefit is of low quality and inconsistent. However, physical interventions do not appear to cause injury to participants. The reasons for these discrepancies in study results are unclear, but may be related to methodological differences in the assessment of physical activity levels (e.g. self-report questionnaires *versus* accelerometry), the levels of FM severity in the samples and pain assessment methods (e.g. NPRS and Visual Analog Scale *versus* subscales of QoL assessment questionnaires such as SF36 and WHOQOL).

Frequency and duration of activity are important components used as criteria for establishing physical activity levels[20]. Both frequency and total duration per week were weakly to moderately inversely correlated with FIQR score and pain perception in this study, meaning that it is possible that higher levels of physical activity may represent lower disease severity and pain.

When categorizing by intensity, higher frequency and duration (minutes/day) in light activities (e.g. walking) and moderate activities (e.g. housework, carrying light weights) were inversely correlated with FIQR and pain, except for frequency and pain in moderate activities. Although significant, the magnitude of the correlations was weak to moderate, so greater engagement in light and moderate activities possibly contributes to fewer symptoms in women with FM. Regarding the lack of correlation between frequency and pain in moderate activities, it is possible that with greater energy expenditure per minute, compared to light activities, regardless of frequency but relative to duration, satisfactory results can be achieved in the impact of pain[27].

One study[24] showed that higher levels of light activities are associated with lower levels of pain, fatigue and overall impact in women with FM, however, in contrast to the present study, it also demonstrated correlations with vigorous activities. Despite the possible benefits of vigorous activities, the practice of activities at light and moderate intensities is widely recommended[31] and may promote greater adherence when compared to vigorous activities, due to the fear of exacerbation of symptoms, especially pain[32]. Low-intensity activities can improve psychological variables, pain perception and QoL in women with FM[33].

It is important to emphasize that the present study did not differentiate exercise modalities, such as aerobic training, strength training, etc., but rather used examples of self-reports of frequency and duration in the categories of physical activities, such as light, moderate, and vigorous, potentially increasing their values. Given the significant relevance of the specific practice of exercise modalities, such as aerobic and strength training, evidence points to a reduction in the perception of pain and improvement in QoL[12], while the size of the effect may vary according to the types of exercises. In general, frequencies of 2 to 3 days per week and duration of more than 20 minutes per day are recommended for the best management of FM, depending on the intensity and types of physical activities[10]. Interventions aimed at promoting and encouraging the practice of physical activities in women with FM are important, potentially contributing to the improvement of symptoms, including pain and QoL.

This study has several limitations. It is a cross-sectional study, so causality cannot be determined. A self-report questionnaire was used to assess physical activity levels, which may result in overestimation of the data. Furthermore, only activities performed in the last 7 days were reported, which may not represent the participants' usual physical activity. Only women with FM were evaluated, so the data cannot be extrapolated to men or women with FM who have other medical conditions, such as cancer, stroke, recent heart disease, and schizophrenia, according to the exclusion criteria of this study. Finally, a control group was not created and the data were compared with the literature.

As for future perspectives, this research, in addition to evaluating the levels of physical activity resulting from the energy demand of all activities, suggests a specification by exercise modalities, such as strength training and aerobic training. This allows correlating these modalities with the severity of symptoms, including pain. In addition, the time spent in sedentary activities, such as time in sitting and lying positions, can be evaluated and correlated with the impact on women's health. Finally, the inclusion and comparison with a control group is strongly recommended.

CONCLUSION

The present study demonstrated that women with FM have low levels of physical activity, while sedentary women are severely impacted by the disease and may have higher levels of pain. Significant, weak and moderate inverse correlations between physical activity levels, disease impact and pain suggest that physical activity at light and moderate intensities may be an important intervention in the treatment of FM. Future studies are needed to confirm or contrast the present findings.

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AUTHORS' CONTRIBUTIONS

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