

# Effects of muscle stretching and physical conditioning as physical therapy treatment for patients with fibromyalgia

## Efeitos do alongamento muscular e condicionamento físico no tratamento fisioterápico de pacientes com fibromialgia

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### Abstract

**Objective:** To investigate the effects of muscle stretching exercises and physical conditioning as physical therapy treatment for fibromyalgia. **Methods:** Fifteen women with a diagnosis of fibromyalgia in accordance with the criteria of the American College of Rheumatology were evaluated and divided into two groups: Group 1 (G1, eight patients) underwent treatment consisting of muscle stretching and Group 2 (G2, seven patients), participated in a physical conditioning program. Sleep quality, pain-modulating factors, associated symptoms and medications used were evaluated. Furthermore, the Fibromyalgia Impact Questionnaire (FIQ) was applied to evaluate the impact of fibromyalgia. The treatment lasted for eight weeks, with one session per week of 40 to 45 minutes in duration. The FIQ data obtained before and after treatment were analyzed by means of Student's *t* test for dependent samples ( $\alpha < 0.05$ ) and other variables were analyzed descriptively. **Results:** Most of the patients presented poor quality of sleep (86.67%). Many presented worsening of their pain when doing domestic tasks (40%) and there were no factors that relieved their pain (28.57%). All presented sleep disorders with associated symptoms (100%) and most used antidepressives (69.23%). For the FIQ data, statistically significant differences were observed in morning tiredness ( $p = 0.0428$ ) and stiffness ( $p = 0.0130$ ) among the G1 patients. Conversely, no difference was observed in G2 after the treatment. **Conclusions:** It is suggested that the muscle stretching may have had a positive impact on fibromyalgia, with reductions in morning tiredness and stiffness among the patients evaluated.

**Key words:** physical fitness; muscle stretching exercises; fibromyalgia; questionnaires; exercise therapy.

### Resumo

**Objetivo:** Verificar os efeitos de exercícios de alongamento muscular e condicionamento físico no tratamento fisioterápico da fibromialgia (FM). **Casística e métodos:** Foram avaliadas 15 mulheres com diagnóstico de FM, segundo os critérios do Colégio Americano de Reumatologia, divididas em dois grupos: Grupo 1 (G1) com oito pacientes, realizou tratamento por meio de alongamentos musculares e Grupo 2 (G2), sete pacientes, condicionamento físico. Foram avaliados qualidade do sono, fatores de piora e melhora da dor, sintomas associados e medicamentos utilizados. Além disso, foi aplicado o *Fibromyalgia Impact Questionnaire* (FIQ), para avaliar o impacto da FM. O tratamento durou oito semanas, sendo uma sessão semanal com duração de 40 a 45 minutos. As variáveis do FIQ antes e depois dos tratamentos foram comparadas pelo teste *t* para amostras dependentes ( $\alpha < 0,05$ ) e as demais foram analisadas descritivamente. **Resultados:** A maioria das pacientes apresentava sono não reparador (86,67%), piora da dor com serviços domésticos (40%), nenhum fator de melhora da dor (28,57%), distúrbios do sono como sintomas associados (100%) e utilizava antidepressivos (69,23%). Em relação às variáveis do FIQ, observaram-se diferenças estatisticamente significantes no sono ( $p = 0,0428$ ) e rigidez matinal ( $p = 0,0130$ ) nas pacientes do G1. Já no G2, não foram observadas diferenças significantes após o tratamento. **Conclusões:** Sugere-se que os alongamentos musculares realizados podem gerar impacto positivo na FM, promovendo melhora do sono e rigidez matinal das pacientes avaliadas.

**Palavras-chave:** aptidão física; exercícios de alongamento muscular; fibromialgia; questionários; terapia por exercício.

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## Introduction ::::

Fibromyalgia (FM) is a rheumatic syndrome whose etiology is still unknown. It predominately occurs in women aged between 40 to 55. It is characterized by widespread chronic pain and tenderness at specific points (tender points) sensitive to touch in anatomically determined regions. Other symptoms are chronic fatigue, sleep disturbance, short periods of morning rigidity, panic syndrome and anxiety<sup>1-3</sup>. FM is predominant in women. It is found in 2% of the general population from which 3.4% are women and 0.5% are men<sup>4,5</sup>. It occurs mainly in white people, and 14% to 20% of these cases are detected by a rheumatologist<sup>6-8</sup>.

The exact causes of FM are still unknown, however, a genetic predisposition, neuroendocrine, psychosomatic and sleep disturbance could cause FM, including other external factors such as trauma, peripheral arthritis and muscular micro-trauma caused by de-conditioning. Besides that, climate changes, physical conditioning and emotional stress are other variables which could have an impact on the symptoms<sup>6,9</sup>.

Physical therapy plays an important role in the treatment of FM when the program includes stretching, muscular strengthening, hydrotherapy and aerobic exercises, such as walking, biking and swimming. Generally, lower intensity exercises are more efficient in the treatment of FM and diminish its impact in patients' quality of life<sup>10</sup>.

Richards and Scott<sup>11</sup> studied FM patients and aimed to verify their level of well-being using a scale from level 1 (much worse) to level 7 (much better). One hundred and thirty two FM patients were divided into two groups. The participants in the first group received an individual aerobic exercise program in which the use of a motorized treadmill or bicycle ergometer was recommended along with progressive increases in exercise time; at the end of 12 weeks, this group was doing two 25 minute sessions, twice a week. The participants of the second group were given one hour of stretching and relaxation classes twice a week. In three weeks, 35% of the patients in the first group felt better (6 or 7 on the scale) whereas only 18% of the participants in the second group felt better. No statistically significant differences were observed in the results obtained using the Fibromyalgia Impact Questionnaire (FIQ), Chalder's fatigue scale, SF-36 questionnaire or McGill's pain questionnaire (secondary objectives).

Studies show that aerobic exercise benefits people because it relieves muscular tension, physical dysfunctions and pain. It also psychologically benefits individuals because it improves self-esteem and diminishes the effects of depression and anxiety. Although it seems that aerobic exercise always helps FM patients, research indicates that it

increases the intensity of the symptoms at first and then it gradually improves health<sup>12-14</sup>. In the treatment of FM, aerobic exercise programs have been conducted in many different ways and they normally include walking<sup>15-17</sup>, biking<sup>16</sup> and group games<sup>14</sup>. Benefits are noted whichever modality is performed.

Physical conditioning programs are also considered when examining evidence of the positive effects of supervised aerobic exercise. They involve aerobic, stretching and strengthening exercises. However, it is difficult to identify which modality of exercise or which association between them have the best results when they are all performed together.

FM is a chronic syndrome and its occurrence is often related to a large number of side effects. For this reason, it is important to find an effective treatment of FM based on stretching or physical conditioning exercises, which minimize the impact of the syndrome in patients' daily lives. Appropriately, this study aimed to verify the effects of physical therapeutic treatment of FM patients and consisted of muscular stretching and physical conditioning exercises.

## Methods ::::

### Sample

Fifteen women diagnosed as Fibromyalgia patient, according to The ACR Criteria (1990), were evaluated. The women were recruited at the fibromyalgia clinic of the Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo (HC-FMUSP). All participants signed an Informed Consent Form and the procedures of the study were approved by the HC-FMUSP Ethics Committee (protocol number 1030/03). The patients were also required to show an adequate cognitive level so as to understand the orientations and procedures and were asked not to modify their level of physical activities while the study was carried out.

After the evaluation, the patients were randomly divided into two groups: eight participants were selected for group 1 (G1), they went under a treatment consisting of muscular stretching exercises; seven people were put in group 2 (G2), where they underwent a treatment consisting of physical conditioning exercises.

### Materials

A form containing personal data (name, age, weight, height, marital status, race, academic level), medicines used, factors responsible for the improvement or worsening of

pain, sleeping patterns and side effects. The FIQ, an instrument proposed by Burckhardt et al.<sup>20</sup>, recently translated into Portuguese, was used to evaluate the impact of FM<sup>21</sup>.

## Procedures

The evaluation and treatment were performed at the Rheumatology Clinic of HC-FMUSP. Initially, the patients were evaluated through an interview which was focused on the items of the evaluation form, and through the administration of the FIQ questionnaire.

The treatment was carried out for eight consecutive weeks and consisted of a 40-45 minute weekly session. The participants of G1 underwent a treatment based on static muscular stretching of the triceps surae, isquiotibial, gluteal, paravertebral, latissimocordiloides, pectoral, trapezius and respiratory muscles. Stretching was performed in dorsal decubitus or sitting. The exercises were performed in a series of five repetitions, remaining in the same position for 30 secs. The practice of stretching at home was recommended and some orientations were given in an instructive brochure which was previously used by Matsutani<sup>22</sup>.

The participants of G2 underwent a physical conditioning treatment consisting of walking for a period of 30 minutes using a motorized treadmills (five minutes warm-up, 25 minutes walking, five minutes rest). The walking speed was determined at 60-75% of the maximum heart rate, deducting patients' age from 220 (fixed value). During the series, maximum heart rate was measured by equipment connected to the treadmill. At the end of the eight weeks, all patients were re-evaluated following the previously described procedures.

## Data analyses

The variables sleeping patterns, factors in the improvement and worsening of pain, side effects and medicines in use were descriptively analysed. Statistical analyses were performed at a 5% level of significance. The normality of the data was tested using the Anderson-Darling test. The demographic data, as well as that obtained using the FIQ, before and after the treatment, were compared using *t*-tests for dependent variables, excluding fatigue and sleeping patterns of G1. The latter did not show normal distributions and were compared using the *Wilcoxon* test.

**Table 1.** Means and standard deviations (SD) for age, weight, height and p-value.

Demographic data	Group 1 (n=8)		Group 2 (n=7)		p
	Mean	SD	Mean	SD	
Age (yrs)	49.00	7.00	44.00	8.00	0.1477
Weight (kg)	67.14	9.49	68.43	8.13	0.3916
Height (m)	1.55	0.09	1.59	0.06	0.1363

## Results

When age, weight and height were compared between the groups, no statistically significant differences were observed for any of these variables (Table 1). Furthermore, the majority of the patients were married (42.96%), white (71.43%) and had not finished high school (46.67%).

In relation to their sleeping patterns, the majority of the patients (86.67%) showed non restorative sleep, 60% of them showed disturbed sleep, 40% woke up tired and 20% took a long time to sleep. Concerning those factors which caused worsening of pain, the majority of the patients (40%) showed worsening of pain when they performed housework or any kind of physical effort (33.33%). Related to the factors that caused improvements of pain, the majority of the patients (28.57%) stated that nothing could improve their pain whereas 21.43% stated that the symptoms improved when they exercised. Regarding the side effects, 100% of the patients showed sleep disorders and 40% suffered from migraines.

The most common medicines in use were antidepressants (69.23%) and muscular relaxants (30.77%). Analgesic Drugs and anti-inflammatories were used by 23.08% of the patients. Other medicines were used by 53.85% of the patients, and included gastritis, ulcer and antihypertensive drugs.

Table 2 shows the results for G1, obtained through the application of FIQ before and after the treatment. Statistical significant differences were found for the sleeping patterns ( $p=0.0428$ ) and stiffness ( $p=0.0130$ ) variables whereas the other variables did not change after the treatment.

The results for G2 are reported in Table 3. There were no statistically significant differences for any of the variables in this group. It is important to note that the number of individuals in Table 2 and 3 varied because some data were not correctly filled in and therefore were not considered.

## Discussion

This study aimed to evaluate the effects of muscular stretching and physical conditioning exercises in the treatment of FM patients, verifying their impact on the disease. The results allowed us to suggest that muscular stretching exercises generated a positive impact on the symptoms of FM. They improved sleeping patterns and they also decreased rigidity in FM patients. Although physical conditioning exercises improved some of the variables analysed using the FIQ, no significant differences were observed.

No significant differences regarding demographic characteristics were found between the groups. This suggests that, in

**Table 2.** Means and standard deviations (SD) of symptoms reported at FIQ before and after treatment for Group 1.

Symptoms	Before			After			<i>p</i>
	n	Mean	SD	n	Mean	SD	
Physical function	8	11.75	6.73	8	10.63	5.18	0.6830
Feeling well (days)	8	2.25	2.19	8	3.38	2.33	0.3964
Job disability	7	6.04	2.33	7	6.40	2.36	0.1677
Pain (cm)	8	7.14	2.05	8	5.56	2.26	0.1332
Fatigue (cm)	8	8.11	2.67	8	7.15	1.69	0.1730
Morning tiredness (cm)	8	8.43	1.95	8	5.41	3.19	0.0251*
Stiffness (cm)	8	7.76	1.60	8	4.95	2.03	0.0130*
Anxiety (cm)	8	8.59	1.04	8	6.76	2.23	0.0896
Depression (cm)	8	6.59	3.26	8	4.85	2.29	0.1138

\* significant difference after treatment ( $p < 0.05$ )**Table 3.** Means and standard deviations (SD) of symptoms reported in the FIQ before and after treatment for Group 2.

Symptoms	Before			After			<i>p</i>
	n	Mean	SD	n	Mean	SD	
Physical function	7	10.00	3.00	7	10.57	5.47	0.7123
Feeling well (days)	7	0.86	0.90	7	2.29	2.49	0.1059
Job disability	6	7.13	2.92	6	6.67	2.89	0.7307
Pain (cm)	6	7.82	1.21	6	6.03	1.92	0.1624
Fatigue (cm)	7	7.50	2.19	7	8.29	1.75	0.1533
Morning tiredness (cm)	7	8.00	1.28	7	7.11	2.87	0.3378
Stiffness (cm)	7	7.57	2.69	7	7.91	2.26	0.8255
Anxiety (cm)	7	8.50	1.10	7	7.61	2.01	0.2185
Depression (cm)	7	6.41	2.40	7	5.97	3.98	0.8022

relation to age, weight and height, the participants were homogeneous. The most common side effect observed in our sample was sleep disturbance, which occurred in 100% of patients from which 8.67% showed non restorative sleep. According to Moreira and Carvalho<sup>23</sup>, some studies show that sleeping disorders occur in 100% of FM patients. Migraine headaches, edema, formication, morning stiffness, abdominal pain, dizziness, depression and occasional arthritis occur less frequently. Haun et al.<sup>24</sup>, Kaziyama et al.<sup>25</sup> e Ido et al.<sup>26</sup> also observed the same symptoms, however, in different proportions.

Other literature on the subject shows that many factors worsen pain in patients, including climate changes, fatigue, bad sleeping patterns, physical inactivity, anxiety and stress<sup>8,24,26,27</sup>. For the patients in this study, the factors that worsened their symptoms were housework, physical effort, nervousness, climate changes, carrying excess weight and depression. Not all factors reported in the literature were observed in this study since the answers were given freely. However, some of these factors coincide with the ones related by other researchers in previous studies.

In relation to the factors which improved pain, 28.57% of the patients related that nothing could relieve their pain and 21.43% of them stated that it only improved when they exercised. Other factors, which were found to contribute to the relief of pain, were rest, medicine, walks and warm showers. Some of these factors

coincided with those found by Antônio<sup>27</sup>: warm showers or warm compresses, physical activities, and strengthening exercises. The fact that a large number of patients stated that nothing could relieve their pain demonstrated the difficulty specialists are faced with when they try to suggest treatments to relieve the symptoms in FM patients, especially pain. In this study, only two specific modalities of exercises were used. As physical conditioning programs involve different types of exercises, it is difficult to identify which exercises provide the best results<sup>18,19</sup>.

The most often used medicines related in the literature for the treatment of FM are Analgesic Drugs, anti-inflammatories, antidepressants and muscular relaxants<sup>8,25,27</sup>. In accordance with the literature, the medicines which were most used by FM patients in this study were antidepressants and muscular relaxants followed by Analgesic Drugs and anti-inflammatories.

Nowadays, the treatment of FM only through the use of medicines is not sufficient to control symptoms and improve the quality of life at the same time. The applications of other therapies such as cognitive-behavioural therapy, biofeedback, educational programs, acupuncture, as well as physical therapy are necessary. At present, many other resources are available such as electrotherapy, massotherapy, hydrotherapy, aerobic and muscular stretching exercises.

In relation to the treatments applied in this study and evaluated using the FIQ, the results showed statistically

significant differences in the sleeping patterns and stiffness variables in the G1, after treatment. Although, in G2, some variables showed positive results, no statistically significant differences were observed. That suggests that the treatments applied somehow improved, even though minimally, their impact on FM. Marques et al.<sup>10</sup> affirm that physical exercise programs lower the effects of the FM symptoms in patients' daily lives. Since the types, intensities and durations of these programs vary, it is difficult to compare which exercises have the best results. Low-intensity, as well as those types of exercises in which patients can identify their effort and pain limits, seem to be most effective. Besides that, engaging in exercise programs is the best way to extend therapeutic relief. The exercises performed in this study were of low-intensity, since the speed of the walking performed in the physical conditioning program was between 60 and 75% of their maximum heart rate and the stretching exercises were performed according to the limits of each patient.

Martin et al.<sup>18</sup> observed a significant reduction in the number of tender points, in the myalgic scores, and an increase in aerobic capacity in the group of patients who performed the physical exercises, but did not observe the same for the group which performed stretching exercises. The researcher observed no differences in the FIQ. However, the group that performed physical exercise showed some improvements when compared to the group who performed stretching exercises. These results are similar to those found for G2 in the present study, although higher mean values in the present case were found with the FIQ questionnaire after the treatment, no statistical significant differences were revealed.

Richards and Scott<sup>11</sup> observed that 35% of the patients who performed aerobic exercises showed improvements in well-being compared with 18% of the patients who performed only muscular stretching and relaxing exercises. The researchers observed no statistically significant differences in the FIQ, Chalder fatigue scale, SF-36 and McGill pain questionnaires. In the present study, no statistically significant differences were found in the FIQ scores of patients treated with physical conditioning program using treadmills. Nevertheless, in contrast to the above study, significant differences were found in the sleeping patterns and stiffness variables for the patients treated with muscular stretching. These differences could be explained by the fact that the aerobic exercises proposed by those authors had a progressive increase in exercise

time and that could have improved the patients' conditioning, which did not happen in the present study.

According to the results of this study and the related literature, most research shows that physical conditioning and muscular stretching exercise programs improve physical capacity, well-being and muscular strength among other benefits. However, no great differences were observed when quality of life was evaluated using adequate questionnaires.

According to Valim<sup>28</sup>, evidence shows that physical conditioning as well as muscular stretching exercises benefit FM patients. The present study only showed improvements in sleeping patterns and stiffness, when muscular stretching was performed and was evaluated using the FIQ. In this study, physical conditioning exercises were performed only once a week. This short time period could perhaps have been responsible for the unsatisfactory improvements in conditioning. Additionally, the small sample of patients could maybe explain why some variables did not show significant differences.

As was pointed out beforehand, FM impacts negatively on patients' quality of life. The symptomatology of this syndrome is complex and involves physical as well as social and emotional aspects. This kind of multidisciplinary approach was not found in the literature. This could possibly have occurred because these aspects have been omitted or even because they have not been considered in treatment. The majority of the articles only emphasised physical treatment using stretching, physical conditioning or other kinds of exercises. As a consequence, aspects of quality of life were not involved in the majority of studies related to FM when it could have been fundamental, since the main objective of this syndrome's treatment is to improve patients' quality of life.

In conclusion, the results of this research, considering the limitations of the experimental conditions, allowed us to suggest that physical therapeutic treatments, especially using muscular stretching, positively impacted FM. It also improved sleeping patterns and rigidity in FM patients. To the contrary, physical conditioning exercises did not significantly impact FM, even though some of the variables of the FIQ have shown some improvements after the treatments. Further research involving a larger sample of patients and a progressive increase in the duration of the exercises, with the primary aim of comparing the same treatment modalities and obtaining a definite conclusion on the subject, would be a welcome addition to the literature.

## References ...

1. Roizenblatt S, Hilário MOE, Goldenberg J, Tufik S. Fibromialgia juvenil. *Rev Bras Reumatol*. 1997;37(5):271-3.
2. Weinstein SL, Bulkwalter JA. *Ortopedia de Turek. Princípios e suas aplicações*. 5a ed. São Paulo: Manole; 2000.
3. Yoshinari NH, Bonfá ESDO. *Reumatologia para o clínico*. São Paulo: Roca; 2000.
4. Wolfe F, Ross K, Anderson J, Russell IJ, Herbert L. The prevalence and characteristics of fibromyalgia in the general population. *Arthritis Rheum*. 1995;38:19-28.
5. White KP, Speenckley M, Harth M, Ostbye T. Comparing self-reported function and work disability in 100 community cases of fibromyalgia syndrome versus controls in London, Ontario. *Arthritis Rheum*. 1999;42:76-83.
6. Kaziyama HHS. Fibromialgia x síndrome dolorosa e miofascial. *Acta Ortop Bras*. 1998;6(3):133-7.
7. Carvalho MAP, Rego RR. Fibromialgia. In: Moreira C, Carvalho MAP. *Reumatologia: diagnóstico e tratamento*. 2a ed. Rio de Janeiro: Medsi; 2001. p. 247-60.
8. Perea DCB. Fibromialgia: epidemiologia, diagnóstico, fisiopatologia e tratamento fisioterápico. *Fisioter Bras*. 2003;4(4):282-8.
9. Martínez JE. Fibromialgia: o que é, como diagnosticar e como acompanhar. *Acta Fisiátrica*. 1997;4(2):99-102.
10. Marques AP, Matsutani LA, Ferreira EAG, Mendonça LLF. A fisioterapia no tratamento de pacientes com fibromialgia: uma revisão de literatura. *Rev Bras Reumatol*. 2002;42(1):42-8.
11. Richards SC, Scott DL. Prescribed exercise in people with fibromyalgia: parallel group randomized controlled trial. *BMJ*. 2002;325:185-7.
12. Meyer BB, Lemley KJ. Utilizing exercise to affect the symptomatology of fibromyalgia: a pilot study. *Med Sci Sports Exerc*. 2000;32(10):1691-7.
13. Offenbächer M, Stucki G. Physical therapy in the treatment of fibromyalgia. *Scand J Rheumatol*. 2000;29(Suppl 113):78-95.
14. Ramsay C, Moreland J, Ho M, Joyce S, Walker S, Pullar T. An observer-blinded comparison of supervised and unsupervised aerobic exercise regimens in fibromyalgia. *Rheumatology*. 2000;39:501-5.
15. Nichols DS, Glenn TM. Effects of aerobic exercise on pain perception, affect and level of disability in individuals with fibromyalgia. *Phys Ther*. 1994;74:327-32.
16. Meiworm L, Jakob E, Walker UA, Peter HH, Keul J. Patients with fibromyalgia benefit from aerobic endurance exercise. *Clin Rheumatol*. 2000;19:253-7.
17. Meyer BB, Lemley KJ. Utilizing exercise to affect the symptomatology of fibromyalgia: a pilot study. *Med Sci Sports Exerc*. 2000;32:1691-7.
18. Martin L, Nutting A, MacIntosh BR, Edworthy SM, Butterwick D, Cook J. An exercise program in the treatment of fibromyalgia. *J Rheumatol*. 1996;23:1050-3.
19. Jentoft ES, Kvalvik AG, Mengshoel AM. Effects of pool-based and land-based aerobic exercise on women with fibromyalgia/chronic widespread muscle pain. *Arthritis Care Res*. 2001;45:42-7.
20. Burckhardt CS, Clark SR, Bennett RM. The Fibromyalgia Impact Questionnaire: development and validation. *J Rheumatol*. 1991;18:728-33.
21. Marques AP, Snetos AMB, Assumpção A, Matsutani LA, Lage LV, Pereira CAB. Validação da versão brasileira do Fibromyalgia Impact Questionnaire. *Rev Bras Reumatol*. 2006;46:24-31.
22. Matsutani LA. Eficácia de um programa de tratamento fisioterapêutico sobre a qualidade de vida de pacientes com fibromialgia [dissertação]. São Paulo (SP): FMUSP; 2003.
23. Moreira C, Carvalho MAP. *Reumatologia: diagnóstico e tratamento*. 2a ed. Rio de Janeiro: Medsi; 2001.
24. Haun MVA, Ferraz MB, Pollak DF. Validação dos critérios do Colégio Americano de Reumatologia (1990) para classificação da fibromialgia, em uma população brasileira. *Rev Bras Reumatol*. 1999;39(4):221-30.
25. Kaziyama HHS, Yeng LT, Teixeira MJ, Piagge FD. Síndrome fibromiálgica. *Rev Med Bras*. 2001;80(Pt 1):111-27.
26. Ido CS, Rothenbuhler R, Janz Júnior LL. Eletroestimulação nervosa transcutânea de baixa frequência nos "tender points" dos pacientes fibromiálgicos juvenis. *Rev Fisioter Univer São Paulo*. 2003;10(1):1-6.
27. Antônio SF. Fibromialgia. *Rev Bras Med*. 2001;58:215-24.
28. Valim V. Benefícios dos exercícios físicos na fibromialgia. *Rev Bras Reumatol*. 2006;46(1):49-55.