

Acute effect of strength training on mood of patients with fibromyalgia syndrome

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SUMMARY

Fibromyalgia syndrome (FM) is a musculoskeletal disorder characterized by chronic pain and frequently associated changes in mood states. The aim of this study was to analyze the acute effect of strength training (ST) sessions on the mood states of patients with fibromyalgia. A total of 110 FM patients were eligible for this study. After the inclusion criteria, twenty-eight women with FM (mean age: 51.88±10.22 years) performed three sessions of ST. Each training session worked the main muscle groups and lasted 60 min. Three sets of 12 repetitions were performed with 1-min intervals between them. Outcome measures were assessed at baseline, after one session, and after three ST sessions. The Brunel Mood Scale (BRUMS) was used to assess mood states, and the Wilcoxon test was used to verify differences in mood after one and three ST sessions. The ST practice had positive effects on the patients' mood states after a single session. Reductions in anger, mental confusion, mood depression, fatigue, and tension were observed. The results of the 3rd ST session were similar. We concluded that a single ST session was sufficient to improve the mood states of patients with fibromyalgia.

Key words: *Fibromyalgia; exercise; resistance training mood; affective disorder.*

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■ INTRODUCTION

Fibromyalgia syndrome (FM) is a musculoskeletal disease that combines generalized pain for a period of more than three months in four out of five regions of the body (quadrants and axial skeleton) (1). In addition to pain, other common symptoms are changes in mood, anxiety, depression, sleep disorders, cognitive problems, and fatigue (2-5).

It has been noted that FM patients who experience mood changes have similar psychological characteristics, presenting feelings of vulnerability and helplessness (5). Some studies have shown that these patients have high rates of psychological disorders, especially depression and excessive anxiety (6). Interventions to improve the health of patients with FM should therefore consider mood changes, alongside physical symptoms such as pain and fatigue. Mood reflects a complex pattern of behaviors, feelings, thoughts, and physical and emotional states; a mood consists of six factors: anger, confusion,

mood depression, fatigue, vigor, and tension (7-10).

To improve the physical and psychological symptoms and consequently the general health of patients with FM, physical exercise has been recommended as an alternative treatment in recent years (11-15). Among various types of physical exercise, strength training (ST) has been shown to be an effective treatment option in helping to reduce the most common symptoms of the syndrome (16-20). However, few studies have investigated the effects of ST on particular psychological variables (14). In a meta-analysis conducted by Busch et al. (14), only three studies evaluated the effects of ST on psychological variables. It is important to analyze the acute effects of physical exercise on patients with several pathologies; some studies have already presented positive results (21-23). A study carried out by Herring et al. (24) has found that exercise significantly improves anxiety, energy levels, and fatigue.

When considering the acute effects of ST, the gap is even greater; to date, no stud-

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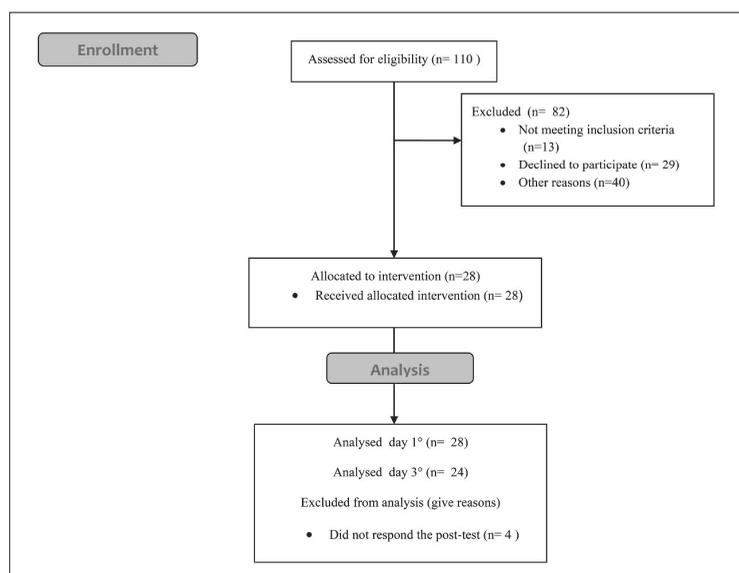


Figure 1 - The flowchart of eligibility of study participants.

ies have evaluated the acute effects of ST on the psychological variables of patients with FM. Investigating treatment alternatives that have the potential to reduce psychological symptoms quickly is fundamental to improving the quality of life of this population. The aim of the present study is therefore to analyze the acute effect of ST on the mood states of patients with FM, after one and three strength training sessions.

■ MATERIALS AND METHODS

Design

This has been a clinical trial carried out among patients with FM. It was conducted in accordance with the ethical standards required by the Declaration of Helsinki and Resolution 466/12 of the National Health Council of Brazil; it was approved by the Research Ethics Committee Involving Humans, Santa Catarina State University (UDESC): protocol no. 24584213.0.0000.0118; opinion No 706,588. The present study has been registered in the Brazilian registry of clinical trials under the number RBR-74pcmw.

A total of 110 FM patients were eligible to participate in the study, having met the following inclusion criteria:

- 1) a medical diagnosis of FM, based on the American College of Rheumatology (1, 25);
- 2) female gender;
- 3) age greater than 18 years;
- 4) no physical exercise in the last three months. Patients were recruited through newspaper advertisements and pamphlets distributed in hospitals, as well as health postings in the cities of Florianópolis and São José, SC, Brazil.

Patients interested in participating in the study were contacted by telephone. During an initial evaluation, researchers explained the objectives, evaluation procedures, and relevance of the study. Patients were guaranteed complete confidentiality; those who chose to participate completed written consent forms. Reasons for exclusion: patients with others severe health conditions, who performed physical exercise, did not want to participate in the acute protocol and those who did not have time for the study activities were excluded (4). At the end of the selection process, 28 patients with FM were analyzed (Figure 1).

Measurements

The data were obtained via two instruments: a self-reported instrument was used to obtain sociodemographic and clinical data; the Brunel Mood Scale (BRUMS) was used to verify mood states (5, 26).

Demographic and clinical characteristics

The study questionnaire gathered information about the participants' sociodemographic and clinical characteristics, including age, marital status, occupation, time of diagnosis, most common symptoms, and medical diagnosis of depression.

Brunel Mood Scale (BRUMS)

The Brunel Mood Scale (BRUMS) (5, 26) was used to evaluate mood states. The questionnaire consisted of 24 questions and participants responded to each question by selecting a numerical response between zero (not at all) and four (extremely). The BRUMS was applied four times: i) immediately before the first session of strength training; ii) after the first session; iii) be-

fore the third session; and iv) after the third session.

Intervention

Patients took part in strength training three times a week at Santa Catarina State University (UDESC), with a 48-h interval between sessions. Each session lasted 60 minutes. All exercises were overseen by experienced physical education teachers and physiotherapists. A training session consisted of a 10-minute warm-up, followed by 50 minutes of resistance exercises for large and small muscle groups. Each participant had an individualized ST program, prescribed within a safe and healthy range. The weights used in each exercise were assessed subjectively by the participants, who were instructed to aim for *slight discomfort* in the final repetitions. The patients performed three sets of 12 repetitions, with a 1-minute interval between each series. The main part of each session consisted of exercises targeting major muscle groups, including the muscles of the chest, the latissimus dorsi, biceps, triceps, quadriceps, hamstrings, shoulders, and calves. Patients performed the following exercises: knee extension, knee flexion, bench press, fly, adductors, low rowing, high pulley, elbow extension, lateral raise, arm curl, standing calf raise, and abdominal crunch.

Statistical analysis

Data were analyzed using descriptive statistics (mean, standard deviation) and inferential statistics. A Shapiro-Wilk test verified the normality of the data. When the data were distributed normally, a paired Student t test was used. A Wilcoxon test was used to analyze non-parametric data. The significance level of all tests of hypotheses was 5% ($p < 0.05$). In addition, to assess the difference between pre-ST and post-ST results, the effect size (r) was calculated using equations $r = Z/\sqrt{N}$ for non-parametric data and $Hedges\ g = (M_1 - M_2)/SD^*_{pooled}$, interpreted as follows: $r < 0.30$ (small); $r > 0.30$ and < 0.50 (medium); and $r > 0.50$ (large). To represent the acute effect of the ST session on mood, the delta (Δ) and $\Delta\%$ were calculated, based on the difference between

the mean post-intervention mood and the pre-intervention mood divided by the mean pre-intervention mood multiplied by 100 [$\Delta\% = ((\bar{x} Mood_{pós} - \bar{x} Mood_{pré}) / \bar{x} Mood_{pré}) * 100$].

The sample size calculations used to detect a statistical difference for a single-tailed hypothesis test, based on an effect size of 0.5, involved a $1 - \beta$ error probability of 0.8 and a $p < 0.05$ for the dependent variable. The data were analyzed using G*Power (27) and SPSS 20.0 software (IBM, U.S.).

RESULTS

The study included 28 women with FM; their mean age was 51.88 ± 10.22 . Participants had an average time of diagnosis of 7.75 ± 7.70 years, were married (64.3%), had not finished elementary school (28.6%), were currently working (78.6%) and most patients had a medical diagnosis of depression (85.7%). The main symptoms they reported were generalized pain (89.3%), tiredness (85.7%), non-restorative sleep (71.4%), joint stiffness (67.9%), and fatigue (71.4%). The data are shown in Table I.

ST had a positive effect on the patients' mood states (Table II). After a single ses-

Table I - Sociodemographic and clinical profile of fibromyalgia patients participating in the study.

	Group ST (n=28) ($\bar{x} \pm dp$)
Age, years	51.9 \pm 10.22
Diagnostic time	7.8 \pm 7.7
Marital status	
With partner	18 (64.3)
Without partner	10 (35.7)
Work	
Yes	22 (78.6)
No	5 (17.9)
#	1 (3.6)
Diagnosis of depression	
Yes	24 (85.7)
No	4 (14.3)
Most common symptoms	
Generalized pain	25 (89.3)
Tiredness	24 (85.7)
Sleep disturbances	20 (71.4)
Stiffness	19 (67.9)
Fatigue	20 (71.4)

missing data.

Table II - Effect of ST practice on the mood state after the first session and after three practice sessions.

Mood	Assessment 1 st session (n=28)			Assessment 3 rd session (n=24)		
	Before ($\bar{x} \pm dp$)	After ($\bar{x} \pm dp$)	p	Before ($\bar{x} \pm dp$)	After ($\bar{x} \pm dp$)	p
Anger	3.46±5.17	1.04±1.95	0.017*	3.2±5.0	1.0±2.1	0.05
Mental confusion	3.57±4.19	2.11±2.92	0.004*	3.4±4.1	2.0±2.9	0.005*
Mood Depression	4.93±3.93	1.82±2.20	0.0001*	4.8±4.0	1.9±2.3	0.0001*
Fatigue	7.29±4.78	5.00±3.63	0.018*	7.0±4.8	4.8±3.7	0.034
Tension	6.32±3.92	3.86±2.95	0.001*	6.1±3.7	4.0±3.0	0.002*
Vigor	6.89±2.66	7.36±3.23	0.404	6.5±2.3	7.0±2.9	0.231

$\bar{x} \pm dp$: mean \pm standard deviation; *significant difference.

sion, reductions were observed in anger ($Z=-2.394$, $p=0.017$; $r=0.45$, moderate), mental confusion ($Z=-2.880$, $p=0.004$; $r=0.54$, large), mood depression ($Z=-3.927$, $p=0.000$; $r=0.74$, large), fatigue ($t=-2.521$, $p=0.018$; $r=0.44$, moderate), and tension ($Z=-3.367$, $p=0.001$; $r=0.64$, large). The only variable that did not undergo a significant change was vigor ($t=0.847$, $p=0.404$).

The results of the 3rd ST session show reductions in mental confusion ($Z=-2.777$, $p=0.005$; $r=0.57$, large), mood depression ($Z=-3.519$, $p=0.0001$; $r=0.72$, large), fatigue ($Z=-2.117$, $p=0.034$; $r=0.43$, moderate), and tension ($Z=-3.060$, $p=0.034$; $r=0.63$, large). No change was observed in anger ($Z=-1.962$, $p=0.05$) or vigor ($Z=0.198$, $p=0.231$).

Figure 2 shows the effects of the first ST session on the mood of patients with FM.

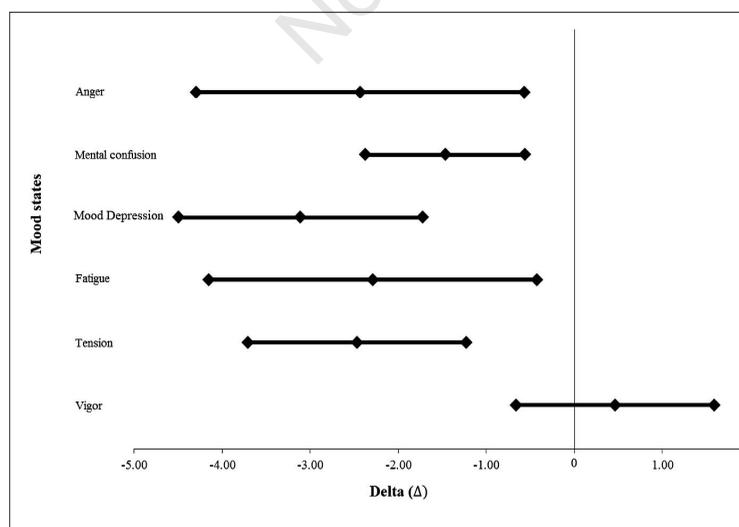
A single ST session improved vigor in 7% of patients ($\Delta=0.46$; 95% CI=-0.66 to 1.59), reduced anger in median 70% ($\Delta=-2.43$; 95% CI=-4.29 to -0.57), mental confusion in 41% ($\Delta=-1.46$; 95% CI=-2.37 to -0.56), mood depression in 63% ($\Delta=-3.11$; 95% CI=-4.50 to 1.72), fatigue in 31% ($\Delta=-2.29$; 95% CI = -4.15 to -0.43), and tension in 39% ($\Delta=-2.46$; 95% CI=-3.70 to 1.23).

After three sessions of ST, vigor improved in median 11% ($\Delta=0.71$; 95% CI=-0.48 to 1.90), with reductions of anger in 78% ($\Delta=-2.46$; 95% CI=-4.40 to 0.51), mental confusion in 47% ($\Delta=-2.46$; 95% CI=-3.70 to 1.23), mood depression in 60% ($\Delta=-2.83$; 95% CI=-4.57 to 1.10), fatigue in 39% ($\Delta=-2.75$; 95% CI=-4.68 to 0.82), and tension in 44% ($\Delta=-2.67$; 95% CI=-4.14 to 1.19). Figure 3 shows the delta (%) results of the effect of ST on the mood of FM patients after three practice sessions.

DISCUSSION

Our study analyzed the acute effect of one and three ST sessions on the mood states of patients with FM. The results demonstrate that an ST session improved the mood of these patients, significantly reducing anger, mental confusion, mood depression, fatigue, and tension. These results demonstrate acute positive responses to physical exercise, as have been found in patients with other diseases (22, 28).

The implications of the acute effect of physical exercise have been studied in relation to heart disease, diabetes, hyperlipemia, pulmonary diseases, psychological disorders, and other conditions. Previ-

**Figure 2** - Mood States after one session of Strength training.

ous studies have shown beneficial changes to the patients' mental health (29-31), confirming that several exercise modalities can positively modify mood. Research has also indicated that the acute effects of exercise can reduce anxiety, as well as improve cognition and executive function in people undergoing an intervention (21, 22, 32).

It is common for patients with chronic pain to have some sort of mood disorder (33). Patients with FM present rates of depression above 80%, and anxiety over 32% (3, 34, 35). A depressed mood may be a predictor for certain treatment responses (36); for these reasons, it is necessary to investigate short-term treatment strategies that may reduce these symptoms. Despite the urgency of this issue, few studies have explored the effects of physical exercise, either on mood, or on psychological variables in patients with FM. The meta-analysis developed by Busch et al. (14) includes only three studies that evaluated the effect of physical exercise on mood states; none of these evaluated the acute effect. In a study by Bircan et al. (37), patients with FM engaged in eight weeks of ST or aerobic exercise, revealing the effect of exercise on depression, anxiety, and mental health. At the end of the study, mood depression was reduced in both groups, with no significant difference between them. However, anxiety and mental health issues were not mitigated, following the intervention. After 15 weeks of ST, Ericsson et al. (20) did not find significant differences in the levels of depression and anxiety in patients with FM. Despite these conflicting results, depression tends to decline after ST practice. The results of the present study demonstrate that a mood depression is reduced after a single session of ST, as well as after three sessions. Andrade et al. (3) analyzed 215 patients with FM and found that those who exercised regularly had fewer depressive symptoms; Häkkinen et al. (38) found a reduction in depression after 21 weeks of ST.

No previous study has evaluated the acute effect of TF on the psychological symptoms of patients with FM (14). According to Weinstein et al. (28), patients with se-

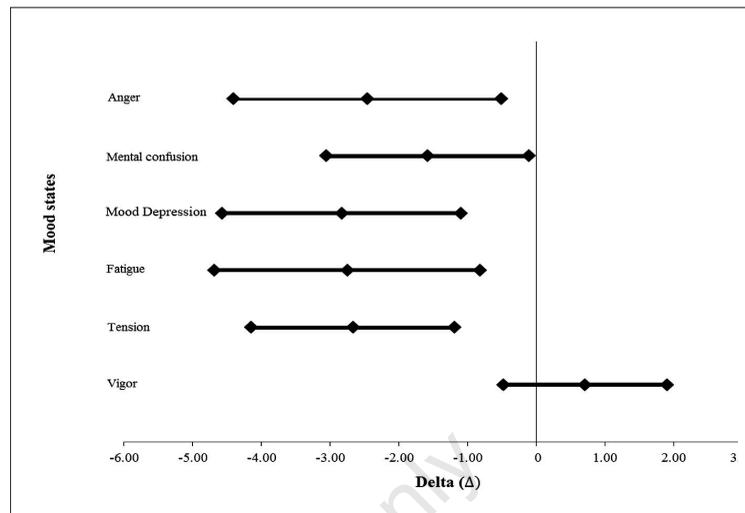


Figure 3 - Mood States after three session of Strength training.

vere depression who undertook a session of physical exercise had a less depressed mood shortly after the session; after 30 minutes, the depressed mood returned to baseline, demonstrating the need for regular physical exercise. In a study carried out by Meyer et al. (39), 24 patients with depression underwent 30 minutes of exercise on a cycle ergometer and presented improvements in mood. A study of multiple sclerosis patients undergoing walking and yoga interventions demonstrated that a few exercise sessions could improve the mood of these patients, significantly influencing feelings of anger, confusion, mood depression and tension (22). This result resembles the findings of the present study, although the former involved different interventions. Our study has some limitations, such as the absence of a control group. However, given the paucity of studies evaluating the acute effect of psychological variables on patients with FM, the results are relevant and present a new perspective on the subject. Further studies and larger samples are required to produce more generalized results. Despite the limitations of this study, it is important to emphasize that the results have immediate clinical implications for the treatment of patients with FM. Improvements in mood states are associated with greater adherence to exercise (40). Given that an improved mood can help

to relieve FM symptoms, the TF program may offer a non-pharmacological treatment for patients.

■ CONCLUSIONS

Based on the results, we can hypothesize that a single strength training session could improve the mood states of patients with fibromyalgia. Reductions in anger, mental confusion, mood depression, fatigue, and tension were observed. After the intervention, patients were also found to have an increase in vigor. We suggest that controlled studies be carried out in the future to confirm this hypothesis.

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