Journal of Bodywork & Movement Therapies 23 (2019) 382–389

Contents lists available at ScienceDirect

Journal of Bodywork & Movement Therapies

journal homepage: www.elsevier.com/jbmt

PREVENTION & REHABILITATION: Randomized Controlled Trial

Sophrology versus resistance training for treatment of women with fibromyalgia: A randomized controlled trial

Hugo Jário de Almeida Silva, José Cortez Assunção Júnior, Franciele Santos de Oliveira, Jaine Maria de Pontes Oliveira, Glauko André Figueiredo Dantas, Caio Alano de Almeida Lins, Marcelo Cardoso de Souza*

Universidade Federal do Rio Grande do Norte, Faculdade de Ciências da Saúde do Trairi– (UFRN/FACISA), Santa Cruz, RN, Brazil

Keywords:
Fibromyalgia
Sophrology
Resistance training
Pain
Quality of life

A B S T R A C T

Introduction: Physical training has been recommended to improve overall well-being in patients with fibromyalgia. Body relaxation exercises also seem to have some beneficial effect, however there is no consensus regarding this modality.
Objective: Comparing the effectiveness of sophrology and resistance training in improving the pain of women with fibromyalgia.
Method: A randomized controlled clinical trial with a blind evaluator. Sixty (60) women with a medical diagnosis of fibromyalgia were randomized and included in two groups: sophrology group (SG) who participated in a relaxation program based on sophrology (n = 30), and resistance group (RG) (n = 30) who participated in a resistance training program **for biceps, pectoral, triceps, knee extensors, trapezius, knee flexors, hip abductors.** Both groups were treated twice a week for 12 weeks and reevaluated every 4 weeks. The assessment instruments used were the Visual Analog Scale for Pain (VAS), the one-repetition maximum test (1 RM), the overall quality of life (SF-36), the 6-min walk test (6MWT), the Timed Up and Go test (TUG) and the Fibromyalgia Impact Questionnaire (FIQ).
Results: We found that the RG presented statistically significant decreases in pain (VAS) during the evaluations ($p < 0.05$) and increased strength of the evaluated muscles ($p < 0.05$). A statistically significant decrease in pain ($p < 0.05$) was observed in the SG compared to T0, with no significant differences in muscle strength. Differences between groups were observed, with better indices only for 6MWT and functional capacity domain of the SF36 for the RG ($p < 0.05$).
Conclusion: No differences in pain were found between the groups. Resistance training was more effective than sophrology in improving strength and functional capacity of women with fibromyalgia.

1. Introduction

Fibromyalgia (FM) is a disease characterized by generalized chronic pain and sleep disorder, fatigue, reduced muscle strength, depression, anxiety, irritable bowel, and other symptoms that impair/effect quality of life (Dobkin et al., 2005; Figueroa et al., 2008; Gowans et al., 2004; Valim, 2006). It is associated with genetic, neuroendocrine and psychological factors. Chronic pain, which leads to the activation of the stress system, most likely contributes to increased fatigue in patients with fibromyalgia, generally reducing productivity in the work environment (Moldofsky, 1989).

The prevalence of FM in the general population ranges from 0.66 to 4.4%, varying according to the profile of patients evaluated and the study methodology (Cavalcante et al., 2006). Most studies indicate that FM is more prevalent in women than in men at a ratio of 8 to 1, especially in the age group between 35 and 60 years (Castro et al., 2011). A study carried out in Brazil confirms that fibromyalgia is the second most frequent rheumatic disease in outpatient clinics, only behind osteoarthritis (Heymann et al., 2010).

* Corresponding author. Universidade Federal do Rio Grande do Norte, Faculdade de Ciências da Saúde do Trairi, Master's Program of Collective Health FACISA/UFRN, Vila Trairi st, S/N, Centro, Santa Cruz 59200-000, RN, Brazil.
E-mail address: marcelocardoso@facisa.ufrn.br (M.C. de Souza).

https://doi.org/10.1016/j.jbmt.2018.02.005
1360-8592/

1.1. Fibromyalgia and physical training

Physical training has been recommended to improve overall well-being in patients with fibromyalgia, with the main objective of repairing the effects of a lack of physical conditioning and improving the symptoms, especially pain and fatigue (Chaitow, 2002; Kelley et al., 2010). In a literature review, Valim (2006) showed that physical exercises for fibromyalgia present benefits, low-cost, and promote a reduction in pain and in other symptoms of the disease.

Studies with resistance training compared to aerobic training for improving pain intensity in patients with fibromyalgia have shown satisfactory results in the treatment of this disease (Hooten et al., 2012; Valim, 2006). Other studies with aerobic and resistance training/exercises have proven their benefits in improving physical fitness, functional capacity and in reducing disease symptoms, in addition to other exercise modalities such as Yoga, Tai Chi Chuan and vibration platforms, which have been investigated to determine their effects (Busch et al., 2011).

1.2. Fibromyalgia and sophrology

Body relaxation exercises also seem to show some beneficial effect; however, there is no consensus on this, since more active exercise than passive is always recommended. Techniques such as yoga, tai chi, acupuncture and music are being cited in the literature as complementary alternatives with promising effects (da Silva et al., 2007; Garza-Villarreal et al., 2015; Wang et al., 2015).

Among body relaxation exercises, sophrology is well known in European countries (Saidi and Soulhi, 2017) and has been gaining space in the national scenario. Sophrology originates from the words: *sos* = serenity, harmony; *phren*: mind, awareness and *logos*: study knowledge. Thus, etymologically "Sophrology" means: the study of consciousness in equilibrium. It is the science of the serene spirit applied to the human consciousness (Chéné and Ermakova, 2012). Sophrology encompasses specific techniques and methods. When psychiatrist and neurologist Alfonso Caycedo created Sophrology in 1960, having spent a number of years studying meditation and yoga, notably in India and Japan, he had in mind to improve the quality of life and mental health of psychiatric patients. Caycedo spent some years in Asia, immersed in Yoga, Tibetan Buddhism and Japanese Zen and this led him to develop Caycedian Sophrology. We believe that sophrology also has roots in the Jacobsens progressive muscular relaxation (Jacobson, 1987).

These techniques can be adapted by each professional and for each patient. It also allows the patient to maintain strength and range of motion, since the method includes static and dynamic exercises; sophrology gives the patient a commitment to work alone, setting goals for their life, making them aware of their well-being and their ability to help themselves. It is also guided by a principle of positive action, activating positive forces of being (Campos, 2015). A study carried out with cancer patients showed that sophrology decreased stress, improving the well-being of these individuals (Dudoit et al., 2012).

Sophrology was chosen as a new treatment to test its effectiveness in reducing the symptoms in women with FM. Sophrology has already shown significant results in the domains of pain, social aspects, and general health status of the SF36 and TUG in an intragroup evaluation conducted in a pilot study. de Oliveira et al. (2016) describe that sophrology improves the functionality of fibromyalgia assessed by TUG and FIQ after 12 weeks of treatment, but with a very small sample and very shallow analysis of the data.

FM determines a relevant negative impact on the pain, quality of life and other symptoms of affected patients. There are several studies available in the literature proving that physical exercises are effective in treating fibromyalgia, especially aerobic ones. Thus, considering the various forms of non-pharmacological treatment, the objective of this study was to compare the effectiveness of sophrology and resistance training in improving the pain of women with fibromyalgia.

2. Method

This is a randomized, controlled clinical trial with a blind evaluator in which sixty women diagnosed with fibromyalgia were recruited. The sample size was calculated based on the VAS variable, considering a power of 95% and a significance of 5%. The calculation was based on comparisons of two samples by MINITAB 14 software, 27 patients in each group would be needed, considering possible losses, 30 patients were included in each group.

Women with a clinical diagnosis of fibromyalgia with medical referral were included according to the Classification Criteria of the *American College of Rheumatology* (Wolfe et al., 1990), aged between 18 and 60 years. All patients read and signed the 2-way free and informed consent form. It is important to remember that in 2010, American College of Rheumatology (Wolfe et al., 2010) fibromyalgia diagnostic criteria were published that abandoned the tender point count and placed increased emphasis of patient symptoms. The 2010 criteria also contained severity scales and offered physicians the opportunity to assess polysymptomatic distress on a continuous scale (Wolfe and Häuser, 2011). We classify our patients by the 1990 criteria, due to the fact that these criteria are important for inclusion of patients in scientific studies.

The sample was selected by convenience through the waiting list of the FACISA/UFRN Physiotherapy School Clinic. Randomization was carried out using a computer program, and cards were made from this result and placed in opaque and sealed envelopes to maintain allocation secrecy. The volunteers were randomly after baseline evaluation and divided into two groups: the intervention group (SG) who participated in sophrology sessions (n = 30), and the resistance group (RG) who participated in an overall resistance training program (n = 30). Both groups were submitted to treatments twice a week with for 12 weeks.

Patients with arterial insufficiency, decompensated systemic arterial hypertension, decompensated cardiorespiratory disease, history of syncope or arrhythmias induced by physical exercise, decompensated diabetes, severe psychiatric illness, history of regular physical exercise (at least 2 times per week) in the last 6 months, or any other condition that made it impossible for the patient to perform physical exercises were excluded from the sample.

The study was approved by *CEP/FACISA* (Number: 1.245.074) and was carried out at the Clinical School of Physical Therapy of the Faculty of Health Sciences of Trairi of the Federal University of Rio

Fig. 1. Sophrology session.

Fig. 2. Sophrology session.

Grande do Norte - *FACISA*/*UFRN*, in the city of Santa Cruz-RN, Brazil.

2.1. Sophrology group (SG)

SG performed 2 body relaxation sessions per week based on the sophrology technique. Each session lasted 40 min for a period of 12 weeks. The patients remained lying on comfortable mats with relaxing music playing in the background in a room with pleasant temperature (Figs. 1 and 2).

Figs. 1 and 2: Group of women with fibromyalgia performing relaxation according to the sophrology technique.

A physiotherapist recited a few phrases such as: *"close your eyes," "analyze your breathing and your heartbeat in order to slow them down," "imagine your body progressively relaxing, muscle by muscle," "I feel my left arm very relaxed, very relaxed, more and more relaxed," "Imagine a river in a forest", "feel the waters of this river passing between your feet", "these waters are carrying away all your pain, your tiredness …"*

Upon entering a state of relaxation, the patients were invited to think about their illness, their life, imagining positive and negative points and to analyze everything; the physiotherapist asked them to focus on the negative aspects and concentrate on these negative points, and they were asked to try to see good aspects of each point.

In the final moments of the session, the patients returned from relaxation through the commands: *"close your hands tightly, the more calm and relaxed, we will close our hands harder, when you have the impression that you have recovered enough you will open your eyes and stretch and yawn deeply. You will get back in touch with every positive that surrounds you".*

Fig. 3. (A) Biceps (B) Pectoral (C) Triceps (D) Knee extensors (E) Trapezius (F) Knee flexors (G) Hip abductors.

2.2. Resistance group (RG)

The RG performed a resistance training program using weight training for calculating one repetition maximum (1 RM), twice a week for 40 min for a period of 12 weeks. The exercise program is described below:

- ✓ 3 sets of 12 repetitions, with an interval of 1–2 min for recovery between one set to another, alternating lower limbs.
- ✓ Loads with 60% of 1RM in the first month, 70% of a new 1 RM test in the second month, and 80% of a new 1 RM test in the third month.
- ✓ Patients were reevaluated at the end of every 4 weeks for their load progression.

The following muscles were trained: biceps brachial, triceps, pectoralis, trapezius, knee extensors, knee flexors and hip abductors. The exercises are shown in Fig. 3.

The evaluations were performed by a blind physiotherapist at the following moments: Initial evaluation (T0), 4 weeks (T4), 8 weeks (T8) and 12 weeks (T12), using the following instruments:

- **Pain (T0, T4, T8 and T12):** pain evaluation carried out using the VAS (visual analog scale) (Maeda et al., 2006), in which the patient indicates the degree of their pain using a score ranging from 0 to 10 cm, where zero is the absence of pain and ten is unbearable pain.
- **One-repetition maximum test - 1RM (T0, T4, T8 and T12):** The maximum load that can be lifted in a single complete repetition (Pereira and Gomes, 2003).
- **Quality of life related to the disease (T0 and T12):** The evaluation was performed by the FIQ - Fibromyalgia Impact Questionnaire, a questionnaire that assesses anxiety, depression and physical performance with fibromyalgia. The translated version for the Brazilian population was used (Marques et al., 2006).

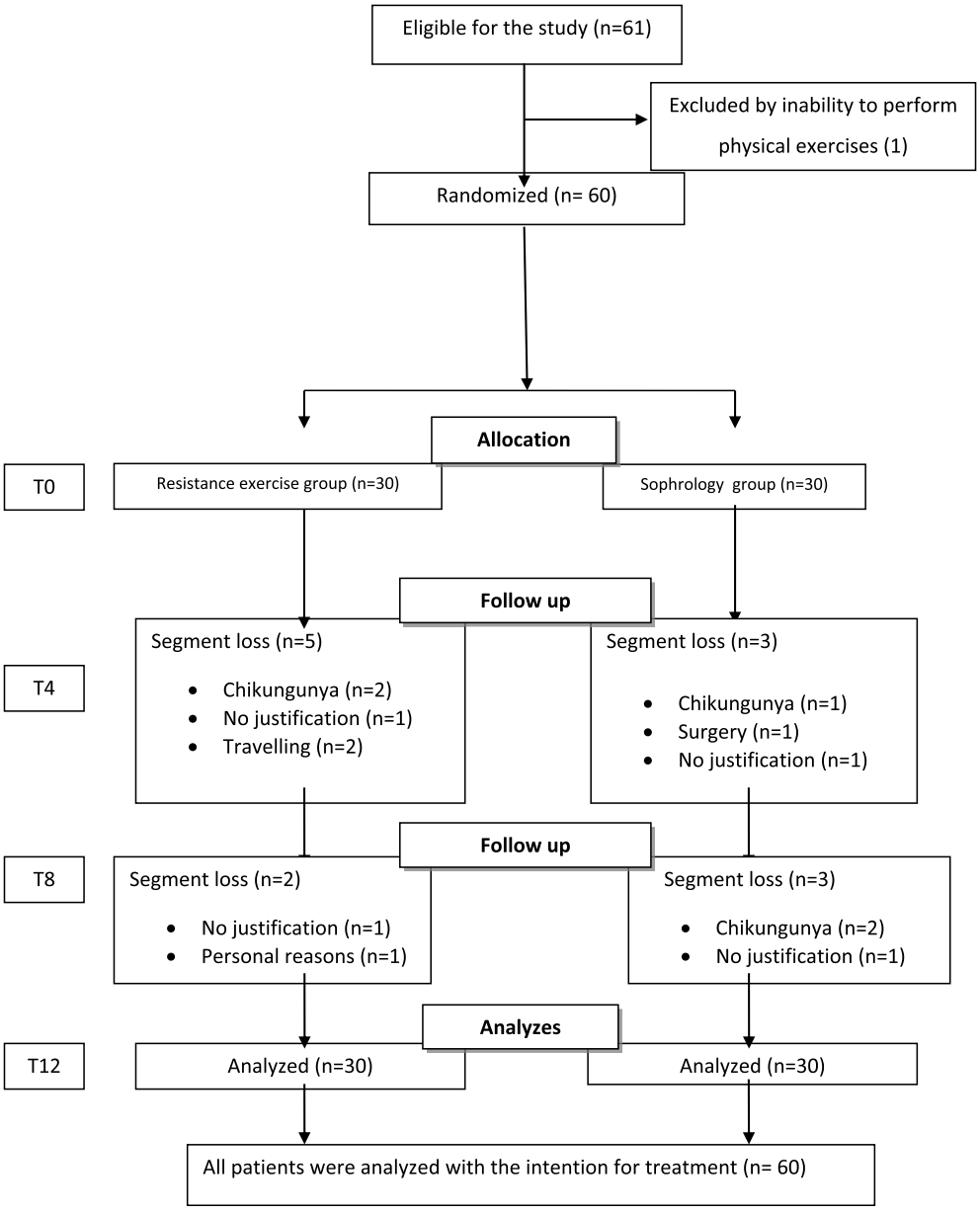

Fig. 4. Study flowchart.

Table 1
Table 1 shows the mean and standard deviation values of the analyzed variables (VAS, knee extensors, knee flexors, hip abductors, biceps, triceps, pectoral and trapezius) and intragroup differences in the four evaluation moments (T0, T4, T8 and T12) for both groups evaluated.

Variables	RESISTANCE TRAINING (n = 30)				SOPHROLOGY (n = 30)			
	Mean ± SD (95% CI)				Mean ± SD (95% CI)			
	T0	T4	T8	T12	T0	T4	T8	T12
VAS (cm)	6.67 (1.47)	5.56* (2.32)	5.23* (2.16)	4.06*+# (2.58)	6.27 (1.36)	5.16* (1.51)	4.90* (1.73)	5.1* (1.62)
1RM Knee extensors (kg)	13.76 (6.6)	16.9* (7.4)	20.3*+ (9.2)	22.8*+# (9)	13.7 (8.3)	14.46 (8.4)	14.16 (8.1)	14.13 (7.7)
1RM Knee flexors (kg)	6.16 (3.1)	8.1* (3.45)	9.1*+ (3.6)	11.1*+# (4.3)	5.26 (2.57)	6.1 (2.88)	6 (2.9)	6.8 (3.4)
1RM Hip abductors (kg)	4.3 (1.4)	5.3* (1.7)	5.6* (1.7)	6.6*+# (2.1)	4.5 (1.9)	4.6 (1.4)	4.5 (1.6)	4.7 (1.7)
1RM Biceps (kg)	8.8 (2.9)	10.2* (2.6)	11*+ (3)	12.6*+# (4)	8.6 (4)	9.03 (3.8)	9.3 (4.1)	9.5 (4)
1RM Triceps (kg)	8.3 (2.9)	10.2* (2.8)	11.1* (3)	12.1*+# (3.4)	7.8 (3.6)	8.8 (4)	9 (4.2)	9.1 (4)
1RM Pectoral (kg)	9.2 (4.6)	11.1* (4.6)	12.8*+ (5.4)	14.3*+# (6)	10 (6)	10.5 (5.9)	10.4 (5.8)	10.1 (5.3)
1RM Trapezius (kg)	15.6 (7)	20.1* (7.8)	22*+ (9.1)	26.9*+# (10.5)	14.5 (8)	15.3 (8.5)	15.2 (8.4)	16.1 (9.3)

*Statistically significant difference for the T0 moment, $p < 0.05$. + Statistically significant difference for the T4 moment, $p < 0.05$. # Statistically significant difference for the T8 moment, $p < 0.05$. VAS = Visual Analog Scale for Pain. 1RM = one-repetition maximum (1RM) test. Kg = kilograms.

Table 2
Mean and standard deviation values of the other variables analyzed (FIQ, 6MWT, SF36 and TUG) in the study and the intragroup differences between the two assessment moments (T0 and T12) for both evaluated groups.

Variables	RESISTANCE TRAINING (n = 30)		SOPHROLOGY (n = 30)	
	Mean ± SD (95% CI)		Mean ± SD (95% CI)	
	T0	T12	T0	T12
FIQ	6.67 (1.2)	4.8 (2.2)	6.3 (1.2)	7.4 (1.1)
Six-minute walk test (m)	429 (92)	472* (91)	404 (69)	415 (80)
TUG (s)	11.6 (2.8)	9.3* (2.3)	12.4 (3.2)	10.6* (2.6)
Social Aspects - SF36	52 (29.7)	67.3* (28.2)	53.5 (21.8)	63.9* (21.4)
General health status - SF36	35.5 (23.3)	47.2* (21)	38.6 (16)	44.6* (21.2)
Functional capacity - SF36	36.6 (20)	53.1* (21)	33.3 (16)	40 (20)
Limitation due to physical aspects - SF36	15.8 (28.9)	45.8* (41)	18.3 (35.3)	28.6 (38.1)
Limitations due to Emotional Aspects - SF36	32.4 (39.6)	49.4* (38)	32.1 (40.3)	37.5 (43.4)
Pain - SF36	22.4 (18.3)	34.9* (23.4)	23.1 (17.1)	29.9* (17.2)
Mental Health - SF36	50.9 (30)	59.5* (23.6)	53.3 (22.6)	58.6 (23.6)

*Statistically significant difference for the T0 moment $p < 0.05$. FIQ = Fibromyalgia Impact Questionnaire. TUG = Timed up and go test. SF-36 = Short Form Health Survey.

- **Overall Quality of life (T0 and T12):** quality of life was assessed by the SF-36 (Ciconelli et al., 1999), a quality of life questionnaire, translated into Portuguese and containing 36 questions. The results are given in 8 domains: functional capacity, physical aspects, pain, general health, vitality, emotional aspects, mental health and emotional aspects, with scores ranging from 0 to 100, where zero indicates the worst condition and one hundred the best.
- **Six-minute walk test (6MWT) (T0 and T12):** a sub-maximal test to evaluate the functional capacity carried out on a 30 m flat site for 6 min (Brooks and Solway, 2003).
- **Timed Up and Go (TUG) (T0 and T12):** a functional test that quantifies the functional mobility in seconds according to the time in which the individual performs the task, meaning how many seconds they need to stand up from a standard chair with E bracket arms (approx. 46 cm high and arms 65 cm high), walk 3 m, turn around, return to the chair and sit again. The test was designed primarily to assess the risk of falls in the elderly, and uses the following scores: less than 20 s for performance corresponds to a low risk of falling, between 20 and 29 s is an average risk of falls, and 30 s or more is a high risk of falls (Podsiadlo and Richardson, 1991).

The data were analyzed by SPSS software version 20.0 (Chicago, IL). The continuous variables between the two groups at baseline were compared using Student's *t-test* (for variables with normal distribution) and the Mann–Whitney test (for the variables with non-normal distribution). The categorical variables were compared using the chi-square test. To assess the response to intervention, the intention to treat analysis was used, with the last evaluation carried forward when necessary. The analysis of variance (ANOVA) with repeated measures was used to assess the response to therapy over time. The effect size was calculated between groups for variables that showed differences between groups at any time, with the confidence interval of 95%. The level of statistical significance was 5%.

3. Results

The groups showed homogeneous initial characteristics without any significant differences ($p < 0.05$) regarding age

Table 3
- Differences between groups in the T4, T8 and T12 evaluations for both evaluated groups (strengthening and sophrology) for the analyzed variables: VAS (cm), 1RM knee extensors, knee flexors, hip abductors, biceps, triceps, pectoral and trapezius (kg).

Variables	Differences between groups Adjusted by mean difference (95% CI)					
	T4 (95% CI), p		T8 (95% CI), p		T12 (95% CI), p	
	Resistance training VS Sophrology	p	Resistance training VS Sophrology	p	Resistance training VS Sophrology	p
VAS (cm)	0.4 (−0.6/1.4)	0.43	0.33 (−0.6/1.3)	0.51	−1.04 (−2.1–0.08)	0.07
1RM Knee extensors (kg)	2.44 (−1.6/6.5)	0.24	6.14 (1.7/10.6)	0.008*	8.5 (4.3/13.0)	<0.001*
1RM Knee flexors (kg)	2 (0.35/3.6)	0.02*	3.1 (1.5/4.9)	<0.001*	4.3 (2.2/6.2)	<0.001*
1RM Hip abductors (kg)	0.66 (−0.2/1.5)	0.14	1.1 (0.2/2.0)	0.01*	1.5 (0.56/2.5)	0.003*
1RM Biceps (kg)	1.2 (−0.5/2.9)	0.16	1.7 (−0.2/3.5)	0.08*	3.1 (0.98/5.2)	0.005*
1RM Triceps (kg)	1.4 (−0.38/3.2)	0.12	2.1 (0.11/3.9)	0.03*	3 (0.97/4.9)	0.004*
1RM Pectoral (kg)	0.6 (−2.1/3.4)	0.64	2.4 (−0.53/5.3)	0.10	4.2 (1.2/7.1)	0.006*
1RM Trapezius (kg)	4.8 (0.64/9.0)	0.02*	6.8 (2.2/11.3)	0.004*	10.8 (5.9/15.7)	<0.001*

*Statistically significant differences for T4, T8 and T12, $p < 0.05$. VAS = Visual Analog Scale for Pain. 1RM = 1 maximum repetition test. Kg = kilograms.

(RG = 44.93 ± 10.30 and SG = 49.40 ± 8.30 years), and body mass index (BMI) (26.38 ± 8.62 and 26.61 ± 4.86, respectively).

Thirteen women dropped out of the study due to a diagnosis of chikungunya (5), surgery (1), travelling (2), personal reasons (1) and no justification (4); however, all were analyzed with the intention for treatment (Fig. 4).

Table 1 shows the values obtained for VAS and 1RM test of seven muscle groups in the 12-week period (T0, T4, T8 and T12) for both groups. A statistically significant decrease in pain (VAS) during the evaluations ($p < 0.05$) and an increase in strength of the evaluated muscles ($p < 0.05$) were observed in the RG. In SG there were statistically significant decreases in pain ($p < 0.05$) compared to T0, and there were no significant differences in relation to 1RM.

The other variables at T0 and T12 are analyzed in Table 2. With respect to RG, statistically significant improvements were observed in the 6-min walk test, TUG, and in the SF-36 domains ($p < 0.05$). Statistically significant differences were observed for SG in the domains of pain, general health status and social aspects ($p < 0.05$) on the SF36 and TUG ($p < 0.05$). No significant differences were observed for the other variables.

The intergroup comparison shown in Table 3 at T4 found difference in knee and trapezius flexors, ($p = 0.02$); at T8, knee extensors ($p = 0.008$), knee flexors ($p = 0.001$), abductors ($p = 0.01$), biceps. ($P = 0.08$), triceps ($p = 0.03$) and trapezium ($p = 0.004$); knee extensors, knee flexors, trapezius ($p < 0.001$), respectively; hip abductors ($p = 0.003$), biceps ($p = 0.005$), triceps ($p = 0.004$) and pectoralis ($p = 0.006$). No significant difference was obtained with respect to VAS when compared between groups.

Table 4 shows that the analysis between the groups at T12 was better for strengthening when compared to the sophorology group in the 6MWT ($p = 0.019$) and in the functional capacity for the SF36 ($p = 0.02$). No significant differences were observed for the other variables.

4. Discussion

Pain is one of the main symptoms of fibromyalgia, which triggers several other factors that detract from the quality of life of these women. The effectiveness of progressive resistance training in treating fibromyalgia is poorly reported in the literature; in addition, there is little evidence from the systematic review presented by Busch et al. (2013). The results found in the present study in the progressive resistance training group showed that the higher the added load over time, the lower the VAS; however, it is still not significant at three months, thereby maybe requiring longer treatment time.

It is recommended that resistance training be used progressively to improve muscle strength, and consequently agility, balance and coordination (Jones, 2015). The progressive loading of the study was increased over twelve weeks from 60% to 70% and finally 80% of 1RM. All women were given increased load without any withdrawal due to exercise and without interruption due to increased pain. For progressive resistance training there was an increase in the functional capacity of these women evaluated by the 6MWT and the functional capacity domain of SF36 when compared to the sophrology group at 12 weeks. Functional capacity is

Table 4
- Analysis between groups for the comparison of the other variables at T12.

Variables	Differences between groups Adjusted by mean difference (95% CI)	
	T12 (95% CI), p	
	Resistance training VS Sophrology	p
FIQ	−2.6 (−6.8/1.6)	0.22
6MWT	57 (12.6/101)	0.01*
TUG	−1.3 (−2.5/−0.01)	0.06
Social Aspects - SF36	−1.6 (−4.2/0.87)	0.19
General health status - SF36	2.6 (−8.2/13.5)	0.63
Functional capacity - SF36	13.1 (2.1/24.1)	0.02*
Limitations due to physical aspects - SF36	17.1 (−3.2/37.7)	0.09
Limitations due to Emotional Aspects - SF36	11.9 (−9.4/33.1)	0.27
Pain - SF36	5 (−5.6/15.6)	0.35
Mental Health - SF36	0.9 (−11.3/13.1)	0.88

*Statistically significant difference for T12 moment <0.05. FIQ = Fibromyalgia Impact Questionnaire. 6MWT = 6 min walking test. TUG = Timed up and go test. SF-36 = Short Form Health Survey.

inversely proportional to fatigue. Ericsson et al. (2016) showed that progressive resistance exercise from 40% to 80% of 1RM decreases fatigue and other symptoms of FM after fifteen weeks of treatment compared to an active control group, which corroborates our findings.

The dosage of the exercise is important so that there are no withdrawals or injuries caused by the resistance exercise. High-intensity exercise presents little adherence, since it presents greater acute muscular pain from the exercise (Wallden, 2015). It is possible that the exercise is initially low intensity, so that it can only be gradually increased. The implemented protocol was initially of low intensity, and loads were added over time.

One of the criteria for not including the study is regular exercise in the last six months, and this may favor overweight. A study by Bjersing et al. (2017) shows that progressive resistance exercise improves strength, fatigue and pain in women with fibromyalgia above normal BMI.

The results shown in the current research show statistically significant improvement of the seven exercises performed over twelve weeks, improving the overall strength of women with FM, as well as improving functional capacity.

A limiting factor of the study was the loss of a segment due to external diseases/illness. The main reason for these losses was a great increase of chikungunya cases that occurred in Brazil in 2016. It is transmitted by the Aedes aegypti mosquito, and this condition often leads to musculoskeletal limitations in patients (Brazil. Ministry of Health, 2017). Even with the presented losses, all patients were analyzed with the intention for treatment. We believe that the treatment period could have been longer and the larger sample.

Our study is relevant, we achieved 88% patient adherence, but should be interpreted with caution to define a better management of exercise therapy in women with fibromyalgia. In this way, the techniques can be used by trained and experienced health professionals, taking into account patients' beliefs and expectations.

5. Conclusion

Sophrology showed significant intra-group results for improvement on the TUG test and the domains of social aspects, general health status and pain of the SF36. Therefore, it can be used to decrease symptoms in women with fibromyalgia. However, new randomized clinical trials with the purpose of showing its effectiveness in treating women with FM are necessary.

Resistance training was effective for improving intra-group on the TUG, 6MWT and for all SF36 domains.

In comparing the groups, resistance training for 12 weeks was effective in improving muscle strength in the seven exercises performed, improving performance on the 6MWT and improving the functional capacity domain of the SF-36.

Conflict of interest

None.

Funding

None.

References

Bjersing, J.L., Larsson, A., Palstam, A., Ernberg, M., Bileviciute-Ljungar, I., Löfgren, M., Gerdle, B., Kosek, E., Mannerkorpi, K., 2017. Benefits of resistance exercise in lean women with fibromyalgia: involvement of IGF-1 and leptin. BMC Musculoskel. Disord. 18, 106. https://doi.org/10.1186/s12891-017-1477-5.

Brasil Ministério da Saúde, 2017. Monitoramento dos casos de dengue, febre de chikungunya e febre pelo vírus Zika até a Semana Epidemiológica, vol. 15, p. 2017. Boletim Epidemiológico.

Brooks, D., Solway, S., 2003. ATS statement on six-minute walk test. Am. J. Respir. Crit. Care Med. 167 https://doi.org/10.1164/ajrccm.167.9.950, 1287–1287.

Busch, A.J., Webber, S.C., Brachaniec, M., Bidonde, J., Bello-Haas, V.D., Danyliw, A.D., Overend, T.J., Richards, R.S., Sawant, A., Schachter, C.L., 2011. Exercise therapy for fibromyalgia. Curr. Pain Headache Rep. 15, 358–367. https://doi.org/10.1007/s11916-011-0214-2.

Busch, A.J., Webber, S.C., Richards, R.S., Bidonde, J., Schachter, C.L., Schafer, L.A., Danyliw, A., Sawant, A., Dal Bello-Haas, V., Rader, T., Overend, T.J., 2013. Resistance exercise training for fibromyalgia. Cochrane database Syst. Rev. https://doi.org/10.1002/14651858.CD010884. CD010884.

Campos, M., 2015. Sofrologia caycediana®: contributo para o tratamento da dor no doente oncológico.

Castro, A. do A. e, Kitanishi, L.K., Skare, T.L., 2011. Fibromialgia no homem e na mulher: estudo sobre semelhanças e diferenças de gênero. Arq. Catarinenses Med. 40, 63–69.

Cavalcante, A.B., Sauer, J.F., Chalot, S.D., Assumpção, A., Lage, L.V., 2006. A prevalencia de fibromialgia: Uma revisão de literatura. Rev. Bras. Reumatol. 46, 40–48. https://doi.org/10.1590/S0482-50042006000100009.

Chaitow, L., 2002. Síndrome da Fibromialgia - Um Guia para o Tratamento, 1ª. ed. Manole, São Paulo.

Chéné, P.A., Ermakova, C., 2012. An Introduction to Sophrology: and the Alfonso Caycedo Method and its Fundamental Structure. Praxis, Paris. Ell{é}bore {é}d.

Ciconelli, R.M., Ferraz, M.B., Santos, W., Meinão, I., Quaresma, M.R., 1999. Brazilian-Portuguese version of the SF-36 questionnaire: a reliable and valid quality of life outcome measure. Rev. Bras. Reumatol. 39, 143–150 doi:296502.

da Silva, G.D., Lorenzi-Filho, G., Lage, L.V., 2007. Effects of yoga and the addition of tui NA in patients with fibromyalgia. J. Alternative Compl. Med. 13, 1107–1113. https://doi.org/10.1089/acm.2007.0615.

de Oliveira, F.S., Silva, H.J.D.A., Oliveira, J.M. de P., da Silva, J.F.C., Gomes, V.L.S., Fonseca, D.S., Lins, C.A. de A., Souza, M.C., Oliveira, F.S. de, Silva, H.J. de A., Oliveira, J.M. de P., Silva, J.F.C. da, Gomes, V.L.S., Fonseca, D.S., Lins, C.A. de A., Souza, M.C. de, 2016. The sophrology as adjuvant therapy may improve the functionality of patients with fibromyalgia. A pilot randomized controlled trial. Man. Ther. Posturology Rehabil. J. 14, 386. https://doi.org/10.17784/mtprehabJournal.2016.14.386.

Dobkin, P.L., Abrahamowicz, M., Fitzcharles, M.A., Dritsa, M., Da Costa, D., 2005. Maintenance of exercise in women with fibromyalgia. Arthritis Care Res. 53, 724–731. https://doi.org/10.1002/art.21470.

Dudoit, E., Lheureux, E., Dany, L., Duffaud, F., 2012. Psychologie et sophrologie en oncologie: les voies d'un possible travail d'articulation. Psycho-Oncologie. https://doi.org/10.1007/s11839-012-0360-8.

Ericsson, A., Palstam, A., Larsson, A., Löfgren, M., Bileviciute-Ljungar, I., Bjersing, J., Gerdle, B., Kosek, E., Mannerkorpi, K., 2016. Resistance exercise improves physical fatigue in women with fibromyalgia: a randomized controlled trial. Arthritis Res. Ther. 18, 176. https://doi.org/10.1186/s13075-016-1073-3.

Figueroa, A., Kingsley, J., McMillan, V., Panton, L.B., 2008. Resistance exercise training improves heart rate variability in women with fibromyalgia. Clin. Physiol. Funct. Imag. 28, 49–54. https://doi.org/10.1111/j.1475-097X.2007.00776.x.

Garza-Villarreal, E.A., Jiang, Z., Vuust, P., Alcauter, S., Vase, L., Pasaye, E.H., Cavazos-Rodriguez, R., Brattico, E., Jensen, T.S., Barrios, F.A., 2015. Music reduces pain and increases resting state fMRI BOLD signal amplitude in the left angular gyrus in fibromyalgia patients. Front. Psychol. 6 https://doi.org/10.3389/fpsyg.2015.01051.

Gowans, S.E., DeHueck, A., Voss, S., Silaj, A., Abbey, S.E., 2004. Six-month and one-year followup of 23 weeks of aerobic exercise for individuals with fibromyalgia. Arthritis Care Res. 51, 890–898. https://doi.org/10.1002/art.20828.

Heymann, R.E., Paiva, E. dos S., Helfenstein Junior, M., Pollak, D.F., Martinez, J.E., Provenza, J.R., Paula, A.P., Althoff, A.C., Souza, E.J. do R. e, Neubarth, F., Lage, L.V., Rezende, M.C., Assis, M.R. de, Lopes, M.L.L., Jennings, F., AraÃ\textordmasculinejo, R.L.C. da C., Cristo, V.V., Costa, E.D.G., Kaziyama, H.H.S., Yeng, L.T., Iamamura, M., Saron, T.R.P., Nascimento, O.J.M., Kimura, L.K., Leite, V.M., Oliveira, J., AraÃ\textordmasculinejo, G.T.B. de, Fonseca, M.C.M., 2010. Consenso brasileiro do tratamento da fibromialgia. Rev. Bras. Reumatol. 50, 56–66.

Hooten, W.M., Qu, W., Townsend, C.O., Judd, J.W., 2012. Effects of strength vs aerobic exercise on pain severity in adults with fibromyalgia: a randomized equivalence trial. Pain 153, 915–923. https://doi.org/10.1016/j.pain.2012.01.020.

Jacobson, E., 1987. The American Journal of Psychology, vol. 100, pp. 522–537. No. 3/4, Special Centennial Issue (Autumn - Winter, 1987).

Jones, K.D., 2015. Recommendations for resistance training in patients with fibromyalgia. Arthritis Res. Ther. 17, 258. https://doi.org/10.1186/s13075-015-0782-3.

Kelley, G.A., Kelley, K.S., Hootman, J.M., Jones, D.L., 2010. Exercise and global well-being in community-dwelling adults with fibromyalgia: a systematic review with meta-analysis. BMC Publ. Health 10, 198. https://doi.org/10.1186/1471-2458-10-198.

Maeda, C., Martinez, J.E., Neder, M., 2006. Efeito da eutonia no tratamento da fibromialgia. Rev. Bras. Reumatol. 46, 3–10. https://doi.org/10.1590/S0482-50042006000100003.

Marques, A.P., Santos, A.M.B., Assumpção, A., Matsutani, L.A., Lage, L.V., Pereira, C.A.B., 2006. Validação da versão brasileira do Fibromyalgia Impact Questionnaire (FIQ). Rev. Bras. Reumatol. 46, 24–31. https://doi.org/10.1590/S0482-50042006000100006.

Moldofsky, H., 1989. Sleep and fibrositis syndrome. Rheum. Dis. Clin. N. Am. 15, 91–103.

Pereira, M.I.R., Gomes, P.S.C., 2003. Testes de força e resistência muscular: confiabilidade e predição de uma repetição máxima - revisão e novas evidências. Rev. Bras. Med. do Esporte 9, 325–335. https://doi.org/10.1590/S1517-86922003000500007.

Podsiadlo, D., Richardson, S., 1991. The timed "Up & Go": a test of basic functional mobility for frail elderly persons. J. Am. Geriatr. Soc. 39, 142–148. http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&dopt=Citation&list_uids=1991946.

Saidi, R., Soulhi, A., October, 2017. Sophrology as a new model for accompaniment of African managers, what prospects? International Journal of Research Science & Management 4 (10). https://doi.org/10.5281/zenodo.1006775.

Valim, V., 2006. Benefícios dos exercícios físicos na fibromialgia. Rev. Bras. Reumatol. 46, 49–55. https://doi.org/10.1590/S0482-50042006000100010.

Wallden, M., 2015. Designing effective corrective exercise programs: the importance of dosage. J. Bodyw. Mov. Ther. https://doi.org/10.1016/j.jbmt.2015.02.006.

Wang, C., McAlindon, T., Fielding, R.A., Harvey, W.F., Driban, J.B., Price, L.L., Kalish, R., Schmid, A., Scott, T.M., Schmid, C.H., 2015. A novel comparative effectiveness study of Tai Chi versus aerobic exercise for fibromyalgia: study protocol for a randomized controlled trial. Trials 16, 34. https://doi.org/10.1186/s13063-015-0548-x.

Wolfe, F., Smythe, H.A., Yunus, M.B., Bennett, R.M., Bombardier, C., Goldenberg, D.L., Tugwell, P., Campbell, S.M., Abeles, M., Clark, P., et al., 1990. The American College of Rheumatology 1990 criteria for the classification of fibromyalgia. Arthritis Rheum. 33, 160–172. https://doi.org/10.1016/j.pain.2008.02.009.

Wolfe, F., Clauw, D.J., Fitzcharles, M.A., Goldenberg, D.L., Katz, R.S., Mease, P., Russell, A.S., Russell, I.J., Winfield, J.B., Yunus, M.B., 2010 May. The American College of Rheumatology preliminary diagnostic criteria for fibromyalgia and measurement of symptom severity. Arthritis Care Res (Hoboken) 62 (5), 600–610. https://doi.org/10.1002/acr.20140.

Wolfe, F., Häuser, W., 2011 Nov. Fibromyalgia diagnosis and diagnostic criteria. Ann. Med. 43 (7), 495–502. https://doi.org/10.3109/07853890.2011.595734. Epub 2011 Jul 19.