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03

ARTICLE 1

– Effects of a combined training program on pain, stiffness, fatigue, and well-being in women with fibromyalgia




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Abstract

Fibromyalgia is a rheumatic disease characterized by chronic widespread muscle pain and its treatment is carried out through pharmacological interventions. Physical exercise and the adoption of a healthy lifestyle influence the reduction of the symptoms of the disease. The main objective of this study was to analyze the effects of a combined training program on health and functional capacity in female individuals diagnosed with Fibromyalgia. It was a quasi-experimental study with a duration of 8 months with a sample of six participants between 43 and 58 years old, who did not practice any type of physical exercise program. The following instruments were used in baseline and post intervention: Fibromyalgia Impact Questionnaire (FIQ), Short Form Health Survey Questionnaire (SF-36v2) and functional physical fitness tests (30-second chair stand, arm curl, sit and reach, 8-ft up-and-go, back scratch and 2-minute step test. Wilcoxon non-parametric test (intra-group comparison) was used, with a significance level of $p<0.05$ to compare baseline and post intervention effects. Significant improvements were observed: in

2-minute step test (p=0.21); physical function; physical performance; physical pain and general health, the mental component, vitality; social function of the SF-36v2 (all, p<0.05). Moreover, FIQ showed a significant reduction in all scales at the end of the program compared to the baseline (p<0.05). Combined training program can reduce the impact of fibromyalgia while improving health and aerobic performance.

Keywords: Combined Exercise Program; Fibromyalgia; Functional Capacity; Health.

Introduction

Fibromyalgia is a very common chronic rheumatic disease in developed countries, affecting between 2% and 4% of the general population and is more common in females.

The diagnosis of Fibromyalgia should be confirmed by rheumatologists by palpating the painful points of patients, obtaining 12 or more points defined by the American College of Rheumatology criteria guidelines and the presence of symptoms such as fatigue, tiredness on waking, generalized pain and cognitive changes for a period of more than three months (Häuser & Wolf, 2012). In addition to these symptoms, Fibromyalgia is also characterized by painful muscle complaints associated with pain, muscle stiffness, sleep disturbances, anxiety and depression, decreased functional capacity and cognitive problems (Atan & Karavelioğlu, 2020; O'Dwyer et al., 2019; Chica et al., 2019; Norouzi et al., 2019). Other symptoms also present in this pathology include fatigue and changes in psychological health status (Sañudo et al., 2010).

The medical prescription for these patients includes pharmacological treatments for sleep disorders and chronic intensive pain. Considering that this population alone is already more sedentary due to its constant immobilization associated with chronic pain, it is essential to analyze other methods that can interfere with a better quality of life in the daily lives of these patients (Atan & Karavelioglu, 2020). One of the main methods used is physical exercise, as it promotes the reduction of symptoms in this population (Bonanabesse et al., 2019; Norouzi et al., 2019).

Physical exercise promotes several physical and psychological benefits and, as such, the effects of combined physical exercise programs on this population were analyzed. In this analysis, it was realized that combined exercises promote greater effectiveness in the control and evolution of the symptoms of the disease, that is, attenuating the main symptoms previously mentioned (Bonnabesse et al., 2019).

Considering that this population alone is already more sedentary due to its constant immobilization associated with chronic pain, one of the main methods used to improve quality of life is physical exercise (Sousa et al., 2023). Physical exercise promotes several physical and psychological benefits and a recent systematic review showed that combined training was the most effective for this population to reduce the symptoms of the disease with a duration between 60 and 90 min, three times a week with a light to moderate intensity (Sousa et al., 2023). Therefore, the aim of this study was to analyze the effects of a combined training program on health and functional capacity in female individuals diagnosed with Fibromyalgia.

Methods

Participants

The study included six female participants aged between 43 and 58 years old. The following inclusion criteria were assigned: i) fibromyalgia diagnosed; ii) female between 30 and 60 years old; iii) having no other associated pathologies (e.g., diabetes, cardiovascular diseases, respiratory diseases); iv) no regular participation in supervised physical exercise sessions. A written informed consent of all participants and the approval from the Ethics Committee of the Polytechnic Institute of Santarem, Santarem, Portugal were obtained.

Measures

First, anthropometric measurements of weight and height were collected using a stadiometer scale (Seca 207, Hamburg, Germany). The body mass index (BMI) of each participant was then calculated using the following formula: weight / height2.

Fibromyalgia Impact Questionnaire - Portuguese version (FIQ-P) by Rosado et al., (2006). This questionnaire contains 20 questions grouped into 10 items. The first item contains 11 sub-items and focuses on the patient's ability to perform daily tasks (cooking, cleaning, walking, mobility, among others). The answers are distributed on a Likert-type scale from 0 ("always able to do") to 3 ("unable to do"). The 11 sub-items are summed and divided by the number of scores obtained to obtain the functional capacity score. The next two items ask the patient to mark the number of days in the previous week when they felt well and when they missed work. The last seven items - work ability, pain, fatigue, morning tiredness, stiffness, anxiety, and depression - are measured using a visual analog scale (VAS) from 0 to 10, with 10 indicating maximum disability. FIQ values range from 0 to 100, with 100 indicating the maximum impact of fibromyalgia.

Short Form Health Survey Questionnaire (SF-36v2) - Portuguese version 2 by Ferreira et al. (2012). This instrument groups the 36 items into 8 dimensions, divided into 2 components. The physical component is composed of the following dimensions: Physical Function, Physical Performance, Physical Pain and General Health and the mental component: Mental Health, Emotional Performance, Social Function and Vitality (Ferreira & Marques, 1998). The the physical function dimension corresponds to 10 items, represents the individual's ability to perform their daily physical activities, such as bathing, dressing, walking, climbing stairs or carrying groceries, analyzing the impact of the limitations felt in these activities on the quality of life. The physical performance dimension is associated with 4 items to assess in terms of type and quantity, the limitations in health due to physical problems, encompassing the need to reduce the amount of work and the difficulty in performing daily or professional activities. The physical pain dimension aims to assess the intensity and discomfort caused by pain, as well as how it interferes with daily activities (household or work-related tasks). The general health dimension measures the perception of health, including current health, resistance to disease and healthy appearance. Finally, the mental component is also subdivided into four dimensions corresponding to 5 items to assess the interference of feelings such as anxiety, depression, tranquility and happiness in the individual's daily life, the loss of control in behavioral or emotional terms and psychological well-being. The emotional performance dimension is identical to the physical performance dimension, where it assesses in terms of type and amount of work and the difficulty in performing daily or professional activities. The social function dimension corresponding to 2 items, refers to the quantity and quality of usual social activities and captures the impact of physical and emotional problems on usual social activities. Finally, the vitality dimension, associated with 4 items, concerns the levels of energy and fatigue, allowing the analysis of differences in well-being (Ferreira & Marques, 1998).

To assess the physical fitness of the subjects, as well as their evolution throughout the intervention, the Functional Physical Fitness Test Protocol of the Rikli & Jones (1999) was used as they are relatively easy and safe to perform and require minimal resources of materials and space. The tests used from the Senior Fitness Test were as follows:

i) 30-second chair stand test. This test aims to assess the strength and endurance of the lower limbs (number of executions in 30" without the use of the upper limbs). In this test, participants should start the test sitting on the chair with their back straight and feet apart, one of the feet should be slightly advanced to help maintain balance.

ii) Arm curl. The purpose of this test is to assess upper limb strength and endurance (number of executions in 30"). In this test, participants should be seated on a chair with their back straight and their

feet fully on the ground, placing the dumbbell in their dominant hand in a lower position, next to the chair, perpendicular to the ground.

iii) Chair sit and reach. The aim of this test is to assess the flexibility of the lower limbs through the distance reached in the direction of the toes. The individual should start the test sitting forward with one leg flexed (approximately 90º) and with the foot fully on the floor. The best result should be recorded.

iv) 8-foot up-and-go test. This test aims to assess physical mobility - speed, agility and dynamic balance. The test starts with the participant sitting on the chair with their feet fully on the floor and at the "start" signal the participant stands up and must walk as fast as possible around the cone and return to the chair. The test should be performed twice, and the best result is used to measure performance.

v) Back scratch. The purpose of this test is to assess the flexibility of the upper limbs (distance the hands reach behind the back). The participant should perform this test standing, placing the dominant hand on top and extend the hand as low as possible towards the middle of the back with the palm down and the fingers extended, the elbow should be pointed upwards. Negative results represent the shortest distance between the middle fingers and positive results represent the measurement of the overlap of the middle fingers. Both measurements are recorded and the best one is used to measure performance.

vi) 2-minute step in place. The midpoint of the distance between the patella and the iliac crest of the participants shall be recorded using a tape measure. The value obtained should be considered as the minimum height at which the knees should be raised during the test. On command, the participant will start the movement with the right lower limb, simulating walking, for 2 minutes. The count will occur every time the right knee reaches or exceeds the minimum height established.

Procedures

The main objectives of the intervention program were outlined based on the assumptions presented by Carrillo et al. (2014) and with the recommendations of the prescription of physical exercise for subjects with Fibromyalgia of the ACSM (2018), being that the main components are: aerobic exercise, strength training and stretching exercises.

The program was carried out twice a week, lasting 60 minutes or more, depending on the limitations of each participant. The intervention always started with aerobic exercise lasting between 20 to 30 minutes, then strength training consisting of six exercises for the major muscle groups, performed in 1 series with 15 to 20 repetitions and, finally, stretching exercises for tender points, lasting between 10 to 30 seconds, according to the recommendations of the ACSM (2018).

Analysis

Data processing and statistical analysis were performed using SPSS software version 21.0 (IBM Corp, Armonk, NY: USA). Descriptive statistics were used to characterize the sample and distribute the values of the variables under study. Considering the small sample, the Wilcoxon non-parametric test for paired samples (intra-group comparison) was used for the comparative analysis between each evaluation moment (Initial-Final), with a significance level of $p \leq 0.05$.

Results

Table 1 presents the results of the SF-36v2.

Table 1 - Descriptive statistics and comparative analysis of the Components and Dimensions at the beginning and at the end of the exercise program (SF-36v2).

Dimensions	Initial				Final				*Z*	*p*
	Mean	*SD*	Min.	Max.	Mean	*SD*	Min.	Max.		
Physical Function (au)	39.167	25.965	5.000	85.000	87.500	16.650	55.000	100.000	-2.207	0.027*
Physical Performance (au)	37.500	26.220	6.250	75.000	73.958	12.130	56.250	93.750	-2.207	0.027*
Physical Pain (au)	27.833	18.777	0.000	51.000	69.333	11.076	52.000	84.000	-2.201	0.028*
General Health (au)	43.667	19.562	20.000	77.000	66.667	18.779	37.000	82.000	-2.207	0.027*
Vitality (au)	45.833	12.290	31.250	62.500	85.417	12.290	68.750	100.000	-2.207	0.027*
Social Function (au)	45.833	18.819	12.500	62.500	89.583	9.410	75.000	100.000	-2.207	0.027*
Emotional Performance (au)	61.111	31.914	8.330	91.670	84.722	13.351	66.670	100.000	-1.802	0.072
Mental Health (au)	70.000	8.367	60.000	80.000	85.000	22.583	40.000	100.000	-1.476	0.014
Physical Component (au)	37.042	20.510	10.310	72.000	74.360	11.990	53.310	84.440	-2.201	0.028
Mental Component (au)	55.694	9.959	38.960	66.350	86.181	9.009	72.500	95.830	-2.201	0.028

SD: Standard Deviation; Min: Minimum Value; Max; Maximum Value; *p:* significance of Wilcoxon non-parametric test ($p \leq 0.05$)

The scales measured in the Short Form Health Survey Questionnaire (SF-36v2) showed a significant difference in the physical component, in the following domains: physical function; physical performance; physical pain and general health. In the mental component, a significant difference was observed in two domains: vitality; social function, except for the following domains: emotional performance and mental health. Regarding the components, it can be observed that they are statistically significant in both cases, that is, physical and mental component.

Table 2 presents the results of the FIQ-P.

Table 2 - Descriptive statistics and comparative analysis of the results obtained through the Fibromyalgia Impact Questionnaire at the beginning and end of the exercise program.

Scale	Initial				*Final*				*Z*	*p*
	Mean	*SD*	Min.	Max.	Mean	*SD*	Min.	Max.		
Physical Disability (au)	2.140	0.680	0.820	2.640	0.420	0.200	0.270	0.820	-2.032	0.042*
Feeling good (au)	7.150	2.710	4.290	10.010	1.670	0.580	1.430	2.860	-2.214	0.027*
Absences from work (au)	4.290	3.500	0.000	8.580	1.430	0.900	0.000	2.860	-1.857	0.063*
Work performance (au)	7.830	2.320	5.000	10.000	2.830	0.750	2.000	4.000	-2.207	0.027*
Pain (au)	7.330	2.340	4.000	10.000	2.830	0.980	2.000	4.000	-2.201	0.028*
Fatigue (au)	8.330	1.750	5.000	10.000	2.670	0.820	2.000	4.000	-2.207	0.027*
Rest (au)	7.500	2.430	4.000	10.000	2.830	0.750	2.000	4.000	-2.207	0.027*
Stiffness (au)	7.330	2.660	3.000	9.000	3.000	1.100	2.000	4.000	-2.220	0.026*
Anxiety (au)	7.170	3.310	3.000	10.000	2.670	1.210	1.000	4.000	-1.992	0.046*
Depression (au)	7.000	2.830	3.000	10.000	2.500	1.050	1.000	4.000	-1.997	0.046*
TOTAL FIQ (au)	2.140	0.680	0.820	2.640	0.420	0.200	0.270	0.820	-2.201	0.028*

SD: Standard Deviation; Min: Minimum Value; Max; Maximum Value; *p:* significance of Wilcoxon non-parametric test ($p \leq 0.05$)

Regarding the scales measured through the Fibromyalgia Impact Questionnaire Portuguese version (FIQ-P) it is possible to verify a statistically significant reduction in all scales at the end of the program compared to the initial evaluation.

Table 3 presents the results of the physical fitness tests.

Table 3 - Descriptive statistics and comparative analysis of physical fitness tests at the beginning and end of the exercise program.

Tests	Initial				*Final*				z	*p*
	Mean	*SD*	Min.	Max.	Mean	*SD*	Min.	Max.		
30-sec chair stand (reps)	10.330	2.875	6.000	13.000	12.830	1.600	12.000	16.000	-1.753	0.080
Arm curl test (reps)	11.500	4.637	7.000	18.000	16.830	3.550	14.000	23.000	-1.761	0.078
Chair sit and reach (cm)	7.830	9.663	0.000	23.000	6.920	6.080	1.000	17.000	-0.405	0.686
Back Scratch (cm)	-3.500	9.670	-15.000	10.000	0.170	7.680	-11.000	10.000	-1.219	0.223
8-foot up-and-go (sec)	4.790	0.825	3.850	6.130	4.710	0.600	3.850	5.650	-0.405	0.686
2-min step in place (reps)	121.500	8.142	110.000	130.000	152.500	14.963	139.000	180.000	-2.201	0.021*
Weight (kg)	84.167	23.990	58.800	123.100	84.250	18.640	59.300	107.900	-0.674	0.500
BMI (kg/m^2)	32.242	7.279	24.460	42.600	32.570	6.450	24.600	38.520	-0.944	0.345

SD: Standard Deviation; Min: Minimum Value; Max; Maximum Value; reps: repetitions; sec: seconds; BMI: body mass index; *p:* significance of Wilcoxon non-parametric test ($p \leq 0.05$)

Comparing the values obtained in the physical fitness tests, it is possible to verify an improvement at the end of the program compared to the initial evaluation in all tests performed. In the case of the aerobic fitness test value, the improvement obtained was statistically significant (p=0.21).

Discussion

The present study consisted in the analysis of the effect of a combined physical exercise program on health and functional capacity in individuals diagnosed with Fibromyalgia in which there was an increase in the mean in all dimensions of the physical and mental component, associated with the health status questionnaire (SF-36v2) at the time of pre-test and post-test. The greatest increase for the post-test occurs in the physical component, associated with the following domains: physical function,

physical performance, physical pain and general health. These data are in line with some studies (Atan & Karavelioglu, 2020; Wang et al., 2018; Celenay et al., 2017; Romero-Zurita et al., 2012), which assume that chronic patients who start a combined exercise program on a regular basis (pre-test), significantly increase the physical and mental components for the post-test.

In this context, it should also be noted that an intervention group that performed aerobic exercise (tai chi) combined with strength training had more significant changes in physical dimensions; physical performance; physical pain and finally, general health. The same beneficial effects were observed in the vitality and mental health dimensions, composed of the mental domain compared to the intervention group that only performed aerobic exercise, namely tai chi (Romero-Zurita et al., 2012). Nevertheless, in another study, where the effectiveness of tai chi interventions in controlling the symptoms of the disease was evaluated, the authors concluded that from 12 weeks onwards, more beneficial results were noted for the physical and mental component (Wang et al., 2018). It is also important to mention that in another research, associated with two groups, one of which practiced aerobic exercise and the other performed aerobic exercise, muscle strengthening and stretching, there was a greater significant difference in the dimensions of physical function and social function for the group that performed only aerobic exercise. However, the group that performed combined exercise had a greater significant difference in both components. That is, in the physical component there was a greater significance in physical function and physical pain and in the mental component, there was a greater significance in the vitality and mental health dimension (Sañudo et al., 2010).

Moreover, it is also important to understand and analyze the effect of chronic pain control and its limitations in this population. Therefore, the results of the FIQ-P can be observed, where there is a significant difference from pre-test to post-test. These results are in line with previous research, where a decrease in the impact of fibromyalgia was observed in the following scales: pain level, fatigue, physical disability and sense of well-being (Celenay et al., 2017). However, it should also be noted that they are also associated with a decrease in the mean in the following scales: stiffness, anxiety and depression (Romero-Zurita et al., 2012) strictly associated with the significant values of the study presented.

For the evaluation of physical fitness tests, it should be highlighted that to carry out the assessment of functional capacity as well as the evolution of the participants throughout the intervention, the Functional Physical Fitness Tests of the Rikli & Jones (1999) was used because they are relatively easy and safe to perform and require minimal resources of materials and space.

In functional capacity, very significant improvements were observed from the pre-test to the post-test moment at the level of the lower limbs but also of the upper limbs, these results corroborate with other

studies (Sañudo et al., 2012; Valkeinen et al., 2008). The strength of concentric extension of the lower limbs differed significantly between the two moments of evaluation, pre-test (2%) and post-test (6%). In addition, it should be noted that the combined exercise program group increased the lower limb extension strength value by more than 6% from 14 weeks of program execution (Valkeinen et al., 2008).

Nevertheless, the increases in forearm flexion strength were statistically significant in the training group after the 14-week assessment, whereas there were no strength gains in the control group (Valkeinen et al., 2008). However, it should also be emphasized that even in a 6-week program, participants who performed a combined exercise program had a slight improvement in muscle strength gains compared to the control group, which lost muscle strength in the lower limbs (Sañudo et al., 2012). In addition to muscle strength gains in the lower and upper limbs, participants had significant improvements in aerobic performance and functional capacity but no significant differences in body composition, namely body mass index and weight.

Regarding body composition, these results seem to be associated with the fact that exercise programs for these patients are recommended to use a low to moderate intensity (Sousa et al., 2023) which may not be enough to promote significant changes. Although in the studies included of the previous systematic review (Sousa et al., 2023), the distance covered in 6 minutes was used to assess aerobic performance which was not the present case, the results showed that the aerobic capacity increased significantly from pre-test to post-test (Carbonell-Baeza et al., 2010; King et al., 2002). In the study by Valim (2006), it is possible to verify the preponderance of the aerobic component and the beneficial results for this type of population due to the release of endorphins. According to Valim's study (2006), another important observation in this population is that the benefits of stretching occurred until 19 weeks and then stabilize, while in the case of the aerobic component continues to increase until 20 weeks.

The current study had some limitations such as the small sample size, the lack of control of daily living activities, lack of control group and lack of nutrient intake assessment which could strengthen the findings of the study. Future studies should consider the previous points and include different physical tests, and physiological variables for a better knowledge of this specific population.

Conclusion

With the results of the present study, very important and relevant conclusions can be drawn for the analysis of the effect of a combined exercise program on the health and functional capacity of individuals diagnosed with Fibromyalgia. Firstly, it is understood that regular practice and the adoption of a healthy lifestyle reduces the painful points associated with the disease, reduces fatigue, reduces stress and anxiety as well as improves aerobic performance and functional capacity. Regarding the

intensity of exercise programs for this population, a low to moderate intensity is recommended and individualization is crucial to ensure the adherence of participants and, consequently, to promote a change to a healthier and more active lifestyle. Regarding the assessment of health status through the SF-36v2, it is concluded that from 12 weeks onwards there are greater gains in the components as well as dimensions composed by the same since associated with an exercise program.

References

American College of Sports Medicine. (2018). *ACSM's Resources for the Exercise Physiologist*. 2nd ed. Nobel M, editor. Philadelphia: Wolters Kluwer Health.

Atan, T., & Karavelioğlu, Y. (2020). Effectiveness of high-intensity interval training vs moderate-intensity continuous training in patients with fibromyalgia: a pilot randomized controlled trial. *Archives of Physical Medicine and Rehabilitation*, 101(11), 1865-1876.

Bonnabesse, A. L. F., Cabon, M., L'heveder, G., Kermarrec, A., Quinio, B., Woda, A., ... & Misery, L. (2019). Impact of a specific training programme on the neuromodulation of pain in female patient with fibromyalgia (DouFiSport): a 24-month, controlled, randomised, double-blind protocol. *BMJ open*, 9(1), e023742. doi:10.1136/bmjopen- 2018-023742

Carrillo. V.. Martínez V.. Jennings. G.. Sánchez. E. (2014) Contributions of a Group-Based Exercise Program for Coping with Fibromyalgia: A Qualitative Study Giving Voice to Female Patients. *Women & Health*, 53(6).612-62. Doi: 10.1080/03630242.2013.819399

Carbonell-Baeza, A., Aparicio, V. A., Martins-Pereira, C. M., Gatto-Cardia, C. M., Ortega,

F. B., Huertas, F. J., ... & Delgado-Fernandez, M. (2010). Efficacy of Biodanza for treating women with fibromyalgia. *The Journal of Alternative and Complementary Medicine*, 16(11), 1191-1200.

Celenay, S. T., Kulunkoglu, B. A., Yasa, M. E., Pirincci, C. S., Yildirim, N. U., Kucuksahin, O., ... & Akkus, S. (2017). A comparison of the effects of exercises plus connective tissue massage to exercises alone in women with fibromyalgia syndrome: a randomized controlled trial. *Rheumatology international*, 37(11), 1799-1806.

Chica. A.. González-Guirval. F.. Reigal. R.E.. Carranque. G.. Hernández-Mendo. A. (2019). Efectos de un Programa de Danza Española en Mujeres con Fibromialgia. *Cuadernos de Psicologia del Deporte*, 19(2), 52-69

Ferreira, A. C. P. L., & Nunes, M. M. J. C. (2012). *Qualidade do sono da pessoa portadora de fibromialgia* (Doctoral dissertation, Instituto Politécnico de Viseu, Escola Superior de Saúde de Viseu).

Ferreira, P. L., & Marques, F. B. (1998). Avaliação psicométrica e adaptação cultural e linguística de instrumentos de medição em saúde: princípios metodológicos gerais.

Häuser, W., Bernardy, K., Wang, H., & Kopp, I. (2012). *Methodological fundamentals of the development of the guideline*. Schmerz (Berlin, Germany), 26(3), 232-246.