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CME Objectives:

Upon completion of this article, the reader should be able to (1) discuss the symptomatic impact of fibromyalgia syndrome, (2) understand the role of exercise in the short-term management of fibromyalgia, and (3) understand the potential role of regular exercise in the long-term management of fibromyalgia.

Level: Advanced

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Effects of Exercise Training and Detraining in Patients with Fibromyalgia Syndrome

A 3-Yr Longitudinal Study

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ABSTRACT

Sañudo B, Carrasco L, de Hoyo M, McVeigh JG: Effects of exercise training and detraining in patients with fibromyalgia syndrome: a 3-yr longitudinal study. Am J Phys Med Rehabil 2012;91:00–00.

Objective: This study aimed to evaluate the immediate effects of a 6-mo combined exercise program on quality-of-life, physical function, depression, and aerobic capacity in women with fibromyalgia syndrome and to determine the impact of repeated delivery of the intervention.

Design: Forty-one women with fibromyalgia were randomly assigned to a training group (EG; $n = 21$) and a control group (CG; $n = 20$). Quality-of-life and physical function were assessed using the 36-item Short-Form Health Survey (SF-36) and the Fibromyalgia Impact Questionnaire, and depression was measured using the Beck Depression Inventory. Physical fitness was measured using the 6-min Walk Test. Outcomes were assessed at baseline and after each 6-mo intervention, which was delivered over 30 mos (6 mos of training and 6 mos of detraining).

Results: After a 6-mo combined exercise program, there was a significant improvement in the Fibromyalgia Impact Questionnaire ($P < 0.0005$) for the training group over the control group. Repeated-measures analysis of variance across all time points demonstrated significant main effects for time for the Fibromyalgia Impact Questionnaire, SF-36, Beck Depression Inventory and the 6-min Walk Test, but there were no between-group interaction effects. For the EG, there were significant within-group changes in the Fibromyalgia Impact Questionnaire, SF-36, and Beck Depression Inventory at the final time point; however, there were no within-group changes for the control group. Improvement achieved for the training group were maintained during the detraining period.

Conclusions: A long-term exercise program can produce immediate improvements in key health domains in women with fibromyalgia. The benefits achieved with regular training can be maintained for 30 mos. The lack of difference between groups over time may be caused by attrition and consequent lack of power at the final time point.

Key Words: Fibromyalgia, Physical Therapy, Exercise, Detraining, Longitudinal Study

Fibromyalgia (FM) syndrome is a chronic disorder characterized by widespread pain, fatigue, sleep, mood disturbances, and muscle stiffness.[1] The quality-of-life (QoL) of patients with FM is severely affected and functional, and work disabilities are common. However, the severity of the symptoms seems to remain relatively stable over time.[2] The etiology of FM is unknown, and the pathogenesis is unclear, although many studies have now demonstrated abnormal pain processing mechanisms together with aberrant central pain mechanisms.[3] In addition, psychologic factors may be implicated in the development and maintenance of the syndrome.[4]

Clinical guidelines recommend a broad range of pharmacologic and nonpharmacologic therapies in FM; however, many treatments have only limited impact on function and QoL.[5] Nevertheless, regular physical exercise has been demonstrated to be useful in treating patients with FM.[5–7] In recent years, many studies have focused on short-term treatment effects of exercise therapy, and improvements have been reported in pain,[8–11] depression,[9,11–13] QoL,[9,10,12,13] physical function,[8–10,12,14] and physical fitness.[9–14] Despite this, there is very limited evidence of the impact of prolonged treatment interventions in FM and further, there have been few studies that have conducted long-term follow-up on patients.

Longitudinal studies have primarily focused on whether initial treatment gains were maintained at follow-up.[15] However, relatively few trials have also evaluated a follow-up treatment period in women with FM.[2,9,15–19] The few trials that have assessed follow-up treatment have reported that symptomatic gains were lost after detraining. Increased functional disability and worse psychologic status (higher levels of anxiety and depression) at a 4-yr follow-up examination compared with baseline was reported[16]; also reported were higher scores for pain and symptom severity at a 7-yr follow-up examination.[2] In another study, Gusi et al.[9] analyzed the effects of aquatic exercise and subsequent detraining on muscular strength and QoL, but again benefits after this study were not maintained at follow-up. Finally, Tomas-Carus et al.[19] showed that water training increased physical fitness and QoL in women with FM, but these short-term gains were lost after a short detraining period.

It is recommended that patients with FM become more active; however, getting patients with FM to initiate and maintain an exercise program is challenging.[20] How best to sustain exercise once it is initiated is still debated and is an important consideration when clinicians design therapeutic exercise programs for patients. Clinically, individuals with FM are advised to continue to exercise because it is thought that ongoing exercise is required for ongoing benefit. However, this association has not been clearly demonstrated in this patient group. Therefore, the aim of the present study was to evaluate the immediate effects of a prolonged combined exercise program on QoL, physical function, depression, and aerobic capacity in women with FM. A second objective of this study was to investigate the impact of regular periods of training, followed by periods of no exercise or "detraining," and to present how long the adaptations caused by therapy last. The aims of the study were achieved by assessing the same outcomes over 30 consecutive months with alternating 6 mos of exercise and 6 mos without physical exercise.

METHODS

Participants

Women who met the American College of Rheumatology criteria for the classification of FM[1] were recruited to the study from physician practices and local FM support groups in Seville, Spain. The exclusion criteria included the presence of concomitant conditions such as inflammatory rheumatic diseases, respiratory or cardiovascular diseases, and severe psychiatric illness. Fifty-three volunteers, of whom 12 women were excluded because of the previously mentioned criteria, were examined. Therefore, 41 women with FM participated in the study. They were randomly assigned to a training group (EG; n = 21) and a control group (CG; n = 20). Randomization was undertaken by a member of the research team not directly involved in the recruitment or assessment of patients, and the randomization sequence was not disclosed to the researcher responsible for the day-to-day running of the trial (B. Sañudo) until the patients had completed their baseline assessments. This research was carried out in accordance with the Declaration of Helsinki of the World Medical Association, and ethical approval for the study was obtained initially for the first 6-mo intervention and then for the subsequent follow-up interventions from the ethics committee of the University of Seville. Written informed consent was obtained from all participants.

Sample size for this study was estimated following the recommendations of McCrum-Gardner[21] using PS software (http://biostat.mc.vanderbilt.edu/wiki/Main/PowerSampleSize). Using a mean difference between the two groups of 14, which is

considered the minimally important clinical difference for the Fibromyalgia Impact Questionnaire (FIQ), the primary outcome measure[22] and an SD[15] of 14 gives a sample size of 17 per group. Allowing for an attrition rate of approximately 20% gives a total sample of 41, providing 80% power at the 95% significance level.

Procedure

Participants randomly assigned to the EG performed twice-weekly exercise sessions of 45- to 60-min durations for 6 mos. Each session included 10 mins of warm-up activities (slow walking and gentle movements of progressive intensity; e.g., arm swinging); 10 to 15 mins of aerobic exercise at 65% to 70% of maximal heart rate, 15 to 20 mins of muscle strengthening exercises (one set of eight to ten repetitions for eight different muscle groups, with a load of 1–3 kg), and 10 mins of flexibility exercises (one set of three repetitions for eight to nine different exercises, maintaining the stretched position for 30 secs). Strengthening and flexibility exercises focused on the main areas of pain in patients with FM (deltoids, biceps, neck, hips, back, and chest). Patients alternated between 6 mos of training and 6 mos with no exercise intervention for a 30-mo period. During the no exercise or "detraining" period, the EG was asked not to participate in any structured exercise program. The usual-care CG received usual medical treatment of FM and continued their normal daily activities during the intervention period, which did not include structured exercise. None of the women in the CG did any regular exercise other than easy walking.

Outcome Measures

Assessment of outcomes was undertaken at baseline and immediately after the 6-mo intervention and again for this follow-up report, the participants were tested at the beginning and end of two more exercise programs (each lasting 6 mos) and at the same time points for the usual-care CG.

Quality-of-Life

The impact of FM on participants was measured using the FIQ. The FIQ is a self-administered questionnaire developed and validated for use in patients with FM.[23] The FIQ measures perceived physical function, work status, and overall well-being; it also contains six visual analog scales for pain, sleep, fatigue, morning stiffness, anxiety, and depression. The questionnaire includes ten items that measure aspects of normal physical functioning in patients with FM, such as climbing stairs, doing shopping, and doing housework.[23] The range of the total score is between 0 and 80 (without job-related items), where a higher score indicates a more negative impact. The global score of the Spanish version of the SF-36[24] was also used to evaluate QoL. The SF-36 assesses eight dimensions of health: physical function, role physical, body pain, general health, vitality, social functioning, role emotional, and mental health, although just the global score was used in the present trial. The total score of the SF-36 ranges from 0 (very poor) to 100 (very good).

Aerobic Performance

Cardiovascular fitness was assessed using the 6-min Walk Test (6MWT), which is a reliable and valid measure of aerobic fitness in patients with FM.[25] Participants were instructed to walk at a fast but comfortable pace for 6 mins. The outcome for each participant was the total distance covered in 6 mins. Both groups received the same instructions during the test, and the participants were allowed to take rest breaks if necessary.

Depression

Depression was assessed using the Beck Depression Inventory (BDI). This is a 21-item inventory (range, 0–63), with higher scores indicating greater depression; the BDI is recommended for assessment of change in depression after exercise interventions in patients with a diagnosis of FM.[6]

Statistical Analysis

Normality of data was initially tested using the Kolgomorov-Smirnov test. The results are expressed as mean ± SD or 95% confidence interval. The effect of the initial exercise intervention was tested using analyses of covariance with baseline scores used as the covariate, with Bonferroni correction for multiple comparison. A repeated-measures between-group analysis of variance (ANOVA), with time and group as the factors, was conducted to explore the impact of the exercise intervention on outcome measures over time. The significance level was set at $P < 0.05$, and the analyses were done using SPSS 17.0 (SPSS Inc. Chicago, IL).

A per-protocol analysis was conducted to demonstrate the effects of the intervention on those who adhered to the program. Although there is the risk that this may introduce bias or inflate the effects of treatment, a per-protocol analysis more accurately

reflects the impact of poor exercise adherence, which can be a problem with this patient population. Compliance with the exercise intervention was set at attendance at more than 80% of the exercise interventions.

RESULTS

There were a number of dropouts during the study; three participants in the EG withdrew, one had an accident, one withdrew because of family problems, and one withdrew without giving a reason. One participant in the CG withdrew after baseline assessment without giving a reason. Therefore, data from 18 women in EG and 19 in CG were included in the initial analysis. During the course of the study, a further 12 participants dropped out. Reasons for withdrawal included personal reasons (two participants) and accidents not related to the trial (two participants); another two participants did not attend the posttest, and five refused to participate. At the final time point, there were 13 participants in the EG and 12 in the CG (Fig. 1).

The data of the complete case, presenting outcome scores across all time points, can be seen in Table 1. At baseline, there were no significant differences between EG and CG in any of the outcome measures.

Outcomes

Data analysis after the initial exercise intervention (6 mos) was conducted using analysis of covariance, with the baseline scores of each outcome measure used as a covariate and Bonferroni correction for multiple testing used throughout. Analysis revealed that there was a significant improvement for the EG over the CG in FIQ scores, ($F[1, 34] = 20.618$, $P < 0.0005$, $\eta^2 = 0.377$) at the 6-mo time point; there were no significant changes in any of the other outcomes measured (SF-36: $F[1, 34] = 2.423$, $P = 0.129$, $\eta^2 = 0.067$; BDI: $F[1, 34] = 1.895$, $P = 0.178$, $\eta^2 = 0.053$; 6MWT: $F[1, 34] = 0.426$, $P = 0.518$, $\eta^2 = 0.012$).

A repeated-measures ANOVA, with time and group as the factors, conducted across all time points, demonstrated that there were significant main effects for time for the FIQ, SF-36, BDI, and 6MWT (Table 2). There were however, no between-subject interaction effects for any of the outcomes with repeated-measures ANOVA. Figure 2*A–D* demonstrate mean scores for both groups at each time

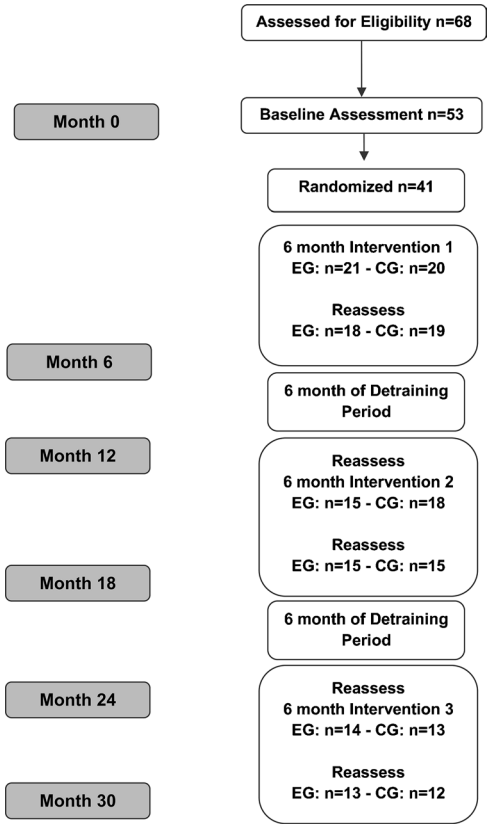

FIGURE 1 *Enrollment, randomization, and retention of study sample. EG, training group; CG, control group.*

TABLE 1 Characteristics of women with FM who followed the three exercise programs and controls

		First Year			Second Year		Third Year	
		0 mos		6 mos	12 mos	18 mos	24 mos	30 mos
		Pretreatment	*P*	Posttreatment	Pretreatment	Posttreatment	Pretreatment	Posttreatment
Participants, n	EG	21	—	18	15	15	14	13
	CG	20	—	19	18	15	13	12
FIQ (0–80)	EG	58.56 (12.15)	0.523	48.46 (9.39)	50.28 (9.57)	45.60 (7.28)	45.78 (11.91)	38.52 (11.32)
	CG	55.59 (12.49)		55.38 (12.56)	56.55 (11.60)	51.31 (15.11)	54.25 (17.12)	49.50 (10.24)
SF-36 (0–100)	EG	41.43 (14.71)	0.119	49.49 (16.99)	42.88 (18.15)	51.84 (14.69)	52.12 (15.41)	60.50 (12.65)
	CG	33.46 (11.67)		37.91 (10.95)	35.13 (11.89)	41.34 (11.88)	36.27 (15.77)	42.02 (16.14)
BDI (0–63)	EG	19.87 (7.57)	0.845	14.67 (7.40)	17.13 (8.42)	14.27 (6.40)	14.50 (6.72)	9.67 (3.82)
	CG	20.43 (7.73)		16.64 (6.37)	17.36 (6.78)	14.21 (8.24)	22.36 (11.62)	17.91 (8.42)
6MWT, m	EG	493.25 (88.60)	0.203	513.87 (98.83)	456.93 (112.34)	488.29 (94.33)	486.97 (50.23)	510.65 (54.39)
	CG	454.17 (71.13)		459.07 (69.54)	425.78 (69.07)	436.08 (75.28)	476.76 (72.85)	486.03 (83.16)

Values are mean (SD).

FIQ, Fibromyalgia Impact Questionnaire; SF-36, 36-item Short-Form Health Survey; BDI, Beck Depression Index; 6MWT, 6-min Walk Test distance; EG, training group; CG, control group.

TABLE 2 Effects of the 3-yr exercise training programs on the outcome measures

		First Year			Second Year			Third Year		
		Change from Baseline to 6 mos, mean (95% CI)	Intragroup *P*	*P*	Change from 12 to 18 mos, mean (95% CI)	Intragroup *P*	*P*	Change from 24 to 30 months, mean (95% CI)	Intragroup *P*	*P*
FIQ (0–80)	EG	−10.09 (−15.83 to −4.36)	0.009[a]	0.103	−4.67 (−8.65 to −0.70)	0.218	0.201	−7.26 (−12.99 to −1.53)	0.089	0.024[b]
	CG	−0.21 (−2.82 to 2.41)	0.967		−5.23 (−10.37 to −0.10)	0.302		−4.75 (−13.24 to 3.74)	0.406	
SF-36 (0–100)	EG	8.06 (3.25–12.86)	0.162	0.039[b]	8.97 (3.19–14.74)	0.120	0.044[b]	8.38 (3.29–13.47)	0.193	0.006[b]
	CG	4.44 (0.20–8.68)	0.367		6.21 (2.05–10.36)	0.209		5.75 (−2.64 to 14.13)	0.302	
BDI (0–63)	EG	−5.20 (−6.95 to −3.45)	0.045[a]	0.449	−2.87 (−5.96 to 0.22)	0.264	0.985	−4.83 (−7.99 to −1.68)	0.094	0.006[b]
	CG	−3.79 (−5.97 to −1.60)	0.226		−3.14 (−6.30 to 0.02)	0.314		−4.45 (−8.53 to −0.37)	0.207	
6MWT, m	EG	20.62 (1.80–39.45)	0.524	0.098	31.36 (−10.22 to 72.93)	0.334	0.113	23.68 (0.40 to 46.96)	0.513	0.406
	CG	4.90 (−3.81 to 13.62)	0.860		10.30 (−14.75 to 35.35)	0.711		9.27 (−10.21 to 28.75)	0.768	

[a]Intragroup differences.

[b]Differences between groups.

FIQ, Fibromyalgia Impact Questionnaire; SF-36, 36-item Short-Form Health Survey; BDI, Beck Depression Index; 6MWT, 6-min Walk Test distance; 95% CI, 95% confidence interval; EG, training group; CG, control group.

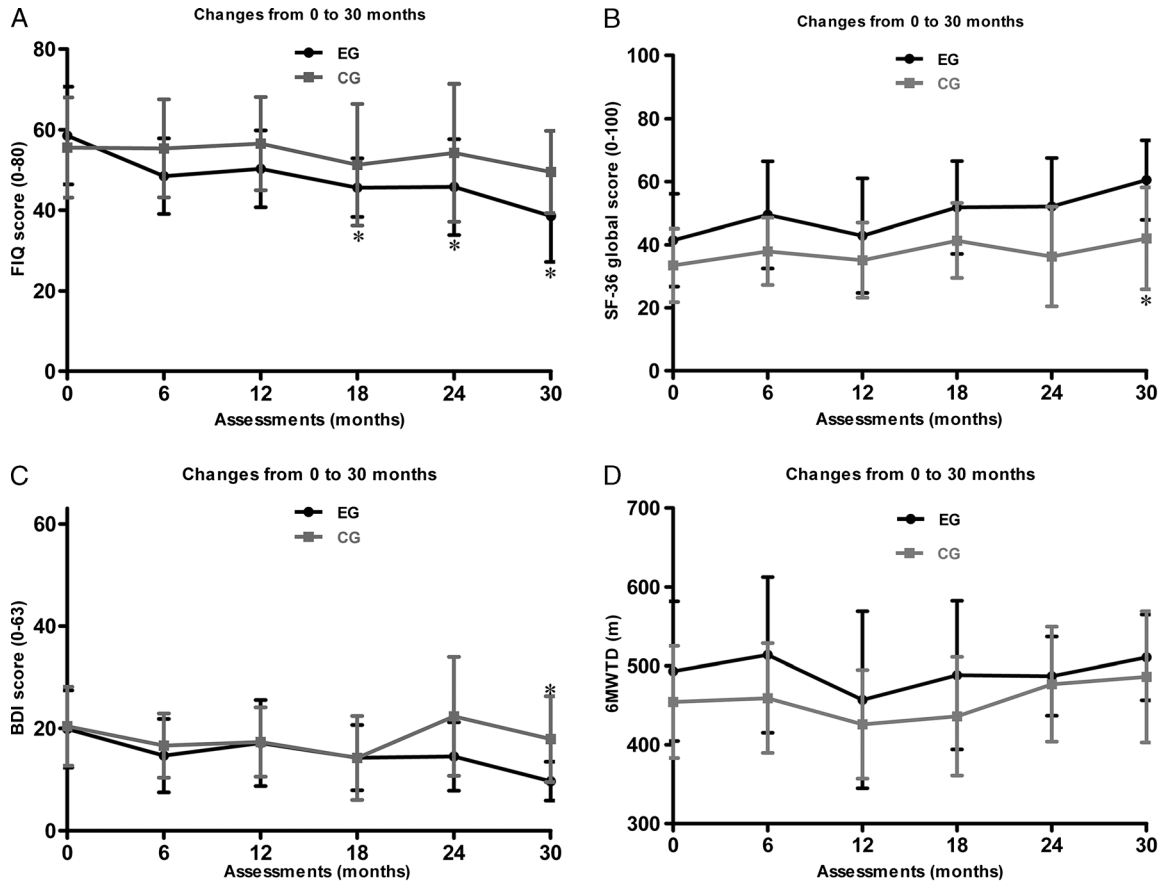

FIGURE 2 *A, Mean (95% CI) FIQ global score for subjects in the efficacy analyses. B, Mean (95% CI) SF-36 global score for subjects in the efficacy analyses. C, Mean (95% CI) BDI global score for subjects in the efficacy analyses. D, Mean (95% CI) 6-min walk distances for subjects in the efficacy analyses. FIQ, Fibromyalgia Impact Questionnaire; BDI, Beck Depression Inventory; SF-36, 36-item Short-Form Health Survey; 6MWTD, 6-min Walk Test distance; EG, training group; CG, control group.*

point; however, it should be noted that the ANOVAs are conducted on participants with outcome scores at each time point; therefore, the mean values used in the analysis and those presented in Figure 2*A–D* (and Table 1) may be different.

Within-group effects were tested using a repeated-measures ANOVA with a Greenhouse-Geisser correction; this demonstrated significant within-group improvements for the EG in the FIQ ($F[5, 8] = 8.663$, $P < 0.0005$, $\eta^2 = 0.419$), the SF-36 ($F[5, 8] = 8.055$, $P = 0.001$, $\eta^2 = 0.402$), and the BDI ($F[5, 7] = 8.067$, $P < 0.0005$, $\eta^2 = 0.423$). There was no significant improvements in the 6MWT for the EG ($P = 0.177$). For the control group, there were no significant within-group changes in any of the outcome measures.

Over the course of this study, the mean FIQ score for the EG dropped by 20 points (14 points is considered the minimally important clinical difference) in comparison with a change of just 6 points for the CG. Although there were no between-group differences in outcomes over time, attrition from the study resulted in small group comparisons; consequently, this study may not be sufficiently powered to detect between-group differences. Although cognizance was given to attrition when calculating the sample size for this study, the eventual attrition rate was almost twice the value allowed for in the sample size calculation. Future research, particularly long-term studies in FM, should allow for a substantial attrition rate.

Detraining Periods

Most of the benefits achieved through exercise training were maintained at the follow-up periods, although patients in the EG lost an average of 2 points in FIQ. When compared with baseline values, FIQ scores were improved at the end of the 6 mos of exercise and at 18-, 24-, and 30-mo follow-ups, which suggests that gains made during the exercise period are maintained during the detraining periods.

Table 1 demonstrates that during the three exercise periods, the mean FIQ scores for the EG improved by 10.1 points, 4.68 points, and 7.26 points. However, during the detraining periods, mean FIQ scores for the EG deteriorated by just 1.82 points and 0.18 points, perhaps suggesting that the effects of regular exercise in FMS are cumulative. For the SF-36 global score, patients in the EG experienced a decrease of 7 points during the first follow-up period (from 6 to 12 mos); however, in the second follow-up period (18 to 24 mos), this loss was less than 2 points. In both the FIQ and SF-36, patients in the CG remained relatively stable. The distance covered by participants during the 6MWT was similar in both groups, with no significant differences found at any of the follow-up time points.

DISCUSSION

The aim of the current study was to evaluate the effects of a 6-mo combined exercise program (and subsequent detraining) on physical function, QoL, depression, and aerobic capacity in women with FM. A secondary aim was to determine whether a continuous (and extended) treatment period was required to achieve additional benefits over a 30-mo follow-up period. This study demonstrates that a long-term exercise program resulted in significant improvements after the initial treatment period and that when the exercise intervention was reinforced during a prolonged period, significant within-group improvements were demonstrated for the exercise group; however, there were no significant between-group differences during the course of the treatment period. Attrition from this study was problem, and it may be the case that the study was underpowered to detect between-group differences.

To date, many of the exercise programs used in clinical trials in FM are limited because of the short duration of the interventions,[13,14,26] even though programs of at least 6 mos have been recommended to attain most of the possible effects.[27] Despite this, even some short-term interventions have been demonstrated to be beneficial for this population in terms of physical function.[13,18,26] However, the improvements reported are smaller than those reflected in the present study and tend to be of limited duration. In addition, the improvements in individual SF-36 global score observed in the EG after the intervention were similar to that reported after aerobic exercise and strength-training interventions.[12,13,28]

Various studies have reported increases in 6MWT distances with aerobic exercise programs,[13,15,26] and in the current study, participants in the EG group had similar (although nonsignificant) improvements in the 6MWT. It has been demonstrated that an increase in the distance walked may be attributed in part to the increase in muscular strength,[13,29] and this may be the case in the current study. Importantly, participants lost the gains in aerobic capacity measured by 6MWT after detraining, whereas functional capacity and QoL improvements were maintained, repeating the exercise program, and the exercise intervention characteristics (mainly the intensity) may be the key for preserving relevant changes in physical fitness for a longer period. Finally, the results of this study are consistent with recent literature, suggesting that combined exercise programs resulted in significant improvements in depressions for patients with FM.[9,10,12,14] It seems that long-term interventions resulted in improvements similar to that achieved in this study[12,15,28] and that combined exercise (aerobic, strengthening and flexibility exercises together) may elicit a greater effect particularly with respect to psychologic well-being.[29] The improvement in depression in FM may also be related to the duration and intensity of the exercise program, and the benefits attained in the current study support the assertion that improvements in depression in FM are related to exercise intervention variables, as previously reported by Gowans et al.[15]

To our knowledge, this is the first study that has examined the effects of exercise therapy (and detraining) on QoL, fitness, and depression during a 30-mo period. The findings of this study contrasts with the results of previous work that argued that physical therapy in patients with FM had only a short-term or limited effect on general well-being and symptoms.[30] However, this current study is limited by the sample size related to the primary outcome, which could limit the statistical power to detect changes in some of the other variables. Another limitation of the study is that at the final endpoint, only 25 participants were available for evaluation. However, given that this was a 3-yr study, perhaps it is not surprising that the attrition figure was fairly high. This large attrition figure should be taken into consideration when determining sample size at the outset in future studies. It is also important to note that it is possible that participants who completed the study differed in some way from those who withdrew from the trial. Although there were no significant between-group differences at the outset, and there were similar dropouts from both groups, it is still possible that some factor not measured may have influenced

participant adherence to the study and that those who completed the study were fundamentally different from those who dropped out. Future long-term studies that are appropriately powered should avoid any problems this may cause.

Despite the limitations of this study, this work demonstrates that exercise is an important component for the treatment of FM and that the benefits achieved can be maintained with regular training for up to 3 yrs. On the other hand, this study also demonstrated that for the CG, physical function and QoL remain relatively stable over time. It seems that exercise effects usually disappear when exercise is discontinued[12] and that a long-term exercise program seems to be essential to help facilitate effective lifestyle changes for this population group.

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INSTRUCTIONS TO OBTAIN CATEGORY 1 CME CREDITS:

1. Read the Designated CME Articles in this issue.
2. Read the following CME Self-Assessment Exam Questions.
3. Photocopy and complete the CME Self-Assessment Exam Answering Sheet and CME Evaluation.
4. Send the completed Answering Sheet and Evaluation to: CME Department, AAP National Office, 7250 Parkway Drive, Suite 130, Hanover, MD 21076.

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This is an adult learning experience and there is no requirement for obtaining a certain score. The objective is to have each participant learn from the total experience of studying the article, taking the exam, and being able to immediately receive feedback with the correct answers. For complete information, please see "Instructions for Obtaining Continuing Medical Education Credit" at the front of this issue.

Every question must be completed on the exam answering sheet to be eligible for CME credit. Leaving any item unanswered will make void the participant's response. This CME activity must be completed and postmarked by December 31, 2013. The documentation received will be compiled throughout the calendar year, and once a year in January, participants will receive a certificate indicating CME credits earned for the prior year of work. This CME activity was planned and produced in accordance with the ACCME Essentials.

CME Self-Assessment Exam Questions

CME Article 2012 Series Number 5: *Sañudo et al.*

1. Which of the following is thought to be the most likely cause of the fibromyalgia syndrome?
   A. Dysfunction at the central nervous system level
   B. A genetic predisposition
   C. Dysfunction at the muscle level
   D. The etiology of fibromyalgia is unknown

2. In individuals with fibromyalgia, exercise therapy has been shown to improve which of the following?
   A. Pain
   B. Depression
   C. Quality of life
   D. All of the above

3. In this study, combined exercise therapy included.
   A. aerobic exercise and flexibility exercises.
   B. aerobic exercise, strength training and flexibility exercises.
   C. pool-based exercises.
   D. aerobic exercises and relaxation.

4. In this study, the greatest relative improvement for the exercise group (EG) over the control group (CG) was seen in which of outcomes measures?
   A. FIQ
   B. SF-36
   C. Depression
   D. The 6-min walk test

5. In this study, the most likely reason for the lack of significant between group differences at the final time point was
   A. lack of compliance with the exercise program.
   B. the exercise intervention was not intense enough.
   C. participant dropout.
   D. the exercise prescription was incorrect.

The answers to any essay questions must be typed or computer printed on a separate piece of paper and attached to this page.

After finishing this exam:

1. Check your answers with the correct answers on page xxx.
2. Photocopy and complete the CME Evaluation and Certification on the next page and mail to CME Department, AAP National Office, 7250 Parkway Drive, Suite 130, Hanover, MD 21076.
3. This educational activity must be completed and postmarked by December 31, 2013. AAP Members may complete and submit this CME Answering Sheet and the following Standardized CME Activity Evaluation page and Certification page online through the membersonly section of the AAP web page at www.physiatry.org.

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Please photocopy this form and complete the information required for each CME Activity.

Journal Issue Month and Year _____
Volume Number _____ Issue Number _____
CME Article Number _____
CME Article Author's Name _____

Circle the appropriate answers.

1.	A	B	C	D
2.	A	B	C	D
3.	A	B	C	D
4.	A	B	C	D
5.	A	B	C	D

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CME Article Number _____ CME Article Author's Name_____

	Agree	Neutral	Disagree	Not Applicable
The CME activity was consistent with the stated objectives.	☐	☐	☐	☐
The activity prepared me to achieve its stated objectives	☐	☐	☐	☐
The activity enhanced my professional skills.	☐	☐	☐	☐
The activity confirmed the effectiveness of previous skills.	☐	☐	☐	☐
I learned new techniques or skills.	☐	☐	☐	☐
I learned new diagnostic strategies.	☐	☐	☐	☐
The activity was free of industry bias.	☐	☐	☐	☐
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These new skills will improve my work performance and professional competencies in the following areas:

(Check all that apply):

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- ☐ Communication with patients and families
- ☐ Teaching and educational tasks
- ☐ Administrative duties
- ☐ Research endeavors
- ☐ Team and co-worker interactions
- ☐ Medical knowledge
- ☐ Practice-Based learning and improvement
- ☐ Interpersonal and communication skills
- ☐ Professionalism
- ☐ Systems-based practice
- ☐ Other – *please list here:*

Please provide additional comments about the Activity and make any suggestions for improvement:

Please list any topics you would like to see presented in the future:

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