Link Medical Journal
of Health and Community Research
ISSN: 3007-3448

OPEN ACCESS

REVIEWED BY
1 **Muhammad Ahmad**
MBBS, MSDU
2 **Maryam Rida Naqvi**
MBBS FCPS-Gynaecology and Obstetrics

Correspondence
✉ drayeshaalam7@gmail.com

Received 24-05-25 **Accepted** 21-06-25

Authors' Contributions
Concept: SA; Design: SA, DA; Data Collection: NUA; Analysis: DA; Drafting: SA, DA; Critical Revision: All authors.

Declarations
No funding was received for this study. The authors declare no conflict of interest. The study received ethical approval. All participants provided informed consent.

"Click to Cite"

LMJ

Type: Original Article
Published: 30 June 2025
Volume: III, **Issue**: I
DOI: https://doi.org/10.61919/15n3g581

Comparative Effects of Supervised Exercise Regime, Education and Self-Management Techniques on Clinical Outcomes in Fibromyalgia

Ayesha Alam[1], Muhammad Yousaf Sani[2], Fatima[3], Sara Khatoon[4], Sana Saghir[5], Muhammad Usama[6], Hafiza Aimen Hameed[7], Sameen Asif[8]

[1] Lahore Physiotherapy Center, Muzaffargarh, Pakistan
[2] Social Security Hospital MNCH, Kot Lakhpat, Lahore, Pakistan
[3] Physiotherapy Rehabilitation Hub and Fitness Center, Gujranwala, Pakistan
[4] Zakariya Hospital, Lahore, Pakistan
[5] Lahore Medical Clinic, Lahore, Pakistan
[6] School of Allied Health Sciences, CMH Lahore Medical College & IOD (NUMS), Lahore Cantt, Pakistan
[7] Gulab Devi Educational Complex (affiliated with University of Sargodha), Lahore, Pakistan
[8] Wasif Medical Centre and Dental Care, Lahore, Pakistan

ABSTRACT

Background: Fibromyalgia (FM) is a chronic disorder characterized by widespread musculoskeletal pain, fatigue, poor sleep, and psychological distress. Pharmacological therapies offer limited benefit, making non-pharmacological approaches such as exercise, education, and self-management essential in multimodal care. Objective: To compare the effects of supervised exercise versus education and self-management techniques on clinical outcomes in women with fibromyalgia. Methods: A randomized controlled trial was conducted at the University of Lahore Teaching Hospital from March to December 2024. Fifty-two women aged 20–45 years meeting ACR 2016 criteria for FM were randomized into supervised exercise (Group A, n=26) or education/self-management (Group B, n=26). Interventions lasted four weeks. Primary outcome was fibromyalgia impact (FIQ). Secondary outcomes included pain intensity (VAS), sleep quality (SQS), and patient satisfaction (PSQ-18). Data were analyzed using Wilcoxon signed-rank tests for within-group changes and ANCOVA/Mann–Whitney U tests for between-group comparisons. Effect sizes (r) and 95% confidence intervals (CI) were calculated. Results: Both groups improved significantly in FIQ and VAS. In Group A, FIQ decreased from 63 to 50 (Δ –13, Z=–4.21, p<0.001, r=0.65), and VAS from 7.1 to 5.4 (Δ –1.7, Z=–4.48, p<0.001, r=0.70). In Group B, FIQ decreased from 65 to 54 (Δ –11, Z=–3.92, p<0.001, r=0.60), and VAS from 7.3 to 5.6 (Δ –1.7, Z=–3.55, p=0.001, r=0.62). Sleep quality did not significantly change in either group (Group A: Δ –1, p=0.41; Group B: Δ –4, p=0.08). Patient satisfaction improved significantly in Group B (2.7→3.2, Δ +0.5, Z=–4.61, p<0.001, r=0.68) but not in Group A (2.8→3.0, p=0.06). Between-group comparisons showed no significant differences in FIQ (–2.1, 95% CI –6.0 to +1.8, p=0.28) or VAS (–0.3, 95% CI –0.7 to +0.2, p=0.23), but patient satisfaction favored Group B (–0.3, 95% CI –0.5 to –0.1, p=0.01). Adherence exceeded 85% in both groups with no adverse events. Conclusion: Both supervised exercise and education/self-management significantly improved pain and disease impact, but only education/self-management enhanced patient satisfaction. Integrating both approaches may provide optimal, patient-centered fibromyalgia care.

Keywords
Fibromyalgia, supervised exercise, self-management, education, pain, quality of life

INTRODUCTION

Fibromyalgia (FM) is a complex chronic pain disorder characterized by widespread musculoskeletal pain, fatigue, sleep disturbances, and psychological distress that significantly impair daily functioning and quality of life (1). It affects an estimated 2–3% of the global population, with women disproportionately affected at a ratio of approximately 4:1, and prevalence tends to rise with age (2). The condition is now most consistently defined using the 2016 American College of Rheumatology (ACR) diagnostic criteria, which combine widespread pain index (WPI) and symptom severity scale (SSS) scores, reflecting both somatic and cognitive symptomatology (3). While fibromyalgia does not cause permanent tissue damage, it is associated with central sensitization mechanisms, including hyperalgesia, allodynia, and abnormal processing of nociceptive inputs within the central nervous system, leading to amplified pain perception and functional limitations (4).

The impact of FM extends beyond physical suffering to reduced work productivity, high health care utilization, and socioeconomic burden through both direct and indirect costs (5). Patients often report poor sleep quality and profound fatigue, both of which worsen symptom perception and contribute to diminished well-being (6). Pharmacological therapies, including antidepressants, anticonvulsants, and analgesics, provide limited benefit and are frequently associated with adverse effects, underscoring the importance of non-pharmacological approaches as first-line

management (7). Among these, supervised exercise, patient education, and self-management strategies are consistently recommended in international guidelines as core components of a multidisciplinary care plan (8).

Supervised exercise programs—typically incorporating aerobic activity, resistance training, and flexibility exercises—are supported by evidence demonstrating improvements in pain, functional capacity, and quality of life among patients with FM (9). Exercise may also mitigate central sensitization by enhancing endogenous pain inhibition mechanisms and improving psychological resilience (10). However, adherence to exercise is often poor due to fear of symptom exacerbation, highlighting the need for structured supervision and progression (11). In parallel, education-based interventions aim to improve patients' understanding of FM, reduce uncertainty, and provide coping strategies. Patient-centered education has been shown to enhance self-efficacy, reduce maladaptive illness beliefs, and improve satisfaction with care (12). Complementary to education, self-management approaches emphasize active coping, pacing, problem solving, and symptom tracking, enabling patients to exert greater control over their illness and reduce reliance on health care systems (13). Evidence suggests self-management interventions can improve mood, self-efficacy, and daily functioning, though their effect on core physical symptoms such as pain and sleep remains inconsistent (14).

Despite the documented benefits of these approaches individually, there is insufficient evidence directly comparing the relative effectiveness of supervised exercise versus education and self-management programs in FM, particularly regarding short-term outcomes such as pain intensity, sleep quality, functional impact, and patient satisfaction. Moreover, while exercise is often emphasized as the most strongly supported intervention, its comparative effect on domains beyond physical functions such as patient empowerment and perceived quality of care—remains less clear (15). Addressing this knowledge gap is crucial for optimizing resource allocation, tailoring interventions to patient needs, and informing guideline development for comprehensive FM management.

The present randomized controlled trial was therefore designed to compare the effects of supervised exercise and education/self-management interventions on clinical outcomes in women with fibromyalgia. The primary objective was to evaluate differences in functional impact, as measured by the Fibromyalgia Impact Questionnaire (FIQ). Secondary objectives were to compare effects on pain intensity, sleep quality, and patient satisfaction. The hypothesis was that supervised exercise would yield greater improvements in physical function and pain, whereas education and self-management would demonstrate superior effects on patient satisfaction and overall quality of life.

MATERIAL AND METHODS

This investigation was conducted as a two-arm, parallel-group, randomized controlled trial designed to compare the effects of a supervised exercise regimen with an education and self-management program in women diagnosed with fibromyalgia. The rationale for using a randomized trial was to minimize selection bias and to provide robust evidence regarding the comparative effectiveness of two widely recommended non-pharmacological interventions, while assessor blinding was employed to reduce measurement bias (16). The study took place in the Physiotherapy Department of the University of Lahore Teaching Hospital, Pakistan, between March and December 2024, with a four-week intervention period for each participant and assessments conducted at baseline and immediately after completion of the intervention (17).

Eligible participants were women aged 20 to 45 years with a confirmed diagnosis of fibromyalgia according to the 2016 American College of Rheumatology (ACR) criteria, which combine the widespread pain index and symptom severity scores (18). Inclusion required the presence of chronic widespread pain for at least three months and a score consistent with fibromyalgia on the ACR scales. Patients were excluded if they had comorbid rheumatic diseases such as rheumatoid arthritis or systemic lupus erythematosus, significant neurological disorders including multiple sclerosis or Parkinson's disease, active malignancies or cancer within the previous five years, uncontrolled endocrine conditions such as poorly managed diabetes or thyroid disease, major psychiatric disorders including bipolar disorder or schizophrenia, chronic infectious diseases such as hepatitis or HIV, or recent surgery or trauma within the past six months (19). Participants using opioid medications were also excluded to avoid pharmacological confounding. Recruitment was carried out in the outpatient department using a consecutive sampling approach in which all patients presenting with fibromyalgia during the recruitment window were screened against eligibility criteria. Those meeting the criteria were approached by study staff, provided with an explanation of the study procedures, and invited to participate. Written informed consent was obtained from all participants prior to enrollment (20).

Randomization was implemented using a simple randomization procedure with a computer-generated random sequence, stratified into two groups of equal size (n=26 each). Allocation concealment was ensured using opaque, sealed, sequentially numbered envelopes prepared by an independent researcher not involved in recruitment or outcome assessment. Participants were randomly allocated to either Group A (supervised exercise) or Group B (education and self-management). Because of the nature of the interventions, blinding of participants and treating physiotherapists was not feasible; however, outcome assessors and data analysts were blinded to allocation throughout the study (21).

Interventions were standardized and manualized to ensure reproducibility. Group A participated in supervised exercise sessions three times per week for four weeks, each lasting 60 minutes and consisting of aerobic exercise, resistance training, and flexibility components. Aerobic activity began with five minutes of treadmill walking at low to moderate intensity, progressing by 2–4 minutes per week up to 45 minutes as tolerated. Strength training focused on major muscle groups using light weights, bodyweight, or resistance bands, with one to two sets of 8–12 repetitions per exercise and progressive load adjustments based on tolerance. Flexibility exercises included static stretching of the neck, shoulders, back, hips, and lower limbs, performed before and after each session. Warm-up and cool-down periods of 5–10 minutes each included light aerobic movements and stretching (22). Group B received an education and self-management program delivered through structured 120-minute sessions held bi-weekly over the four-week period, for a total of four sessions. Content included information on the nature of fibromyalgia, symptom management strategies, pacing, relaxation, and lifestyle modification. Participants were provided with educational materials for home practice, encouraged to perform at least 30 minutes of light aerobic activity daily such as walking or swimming, and instructed in basic strength and flexibility exercises that could be performed independently. Peer-support discussions and self-monitoring through diaries of activity and symptom patterns were encouraged. Follow-up check-ins by phone or in person were used to monitor progress and provide motivation (23).

Outcome measures were assessed at baseline and after four weeks. The primary outcome was functional impact, measured using the Fibromyalgia Impact Questionnaire (FIQ), a validated instrument assessing physical function, work status, mood, pain, fatigue, stiffness, and overall well-being, with scores ranging from 0 to 100, higher scores reflecting greater disease impact (24). Secondary outcomes included pain intensity measured with a 10-cm Visual Analogue Scale (VAS) anchored from 0 (no pain) to 10 (worst imaginable pain) (25), sleep quality measured by the 28-item Sleep Quality Scale (SQS) covering domains of restoration, initiation and maintenance of sleep, awakenings, and satisfaction (26), and patient satisfaction

assessed using the Short Form Patient Satisfaction Questionnaire (PSQ-18), which evaluates technical quality, communication, interpersonal manner, time with doctor, accessibility, and general satisfaction (27). All questionnaires were administered in Urdu or English as appropriate by trained assessors blinded to group allocation.

To address potential sources of bias, allocation concealment and assessor blinding were strictly maintained. Baseline comparability of groups was checked for demographic and clinical characteristics, and statistical analyses adjusted for any significant imbalances. Adherence to the intervention was recorded by attendance logs for supervised sessions and self-reports for home-based practices. Missing data were minimized by close follow-up; however, where data were missing, analyses used an intention-to-treat principle with multiple imputation applied for missing outcome values under the assumption of missing at random (28). The sample size calculation was based on detecting a minimum clinically important difference in FIQ scores of 12 points, with a standard deviation of 15, an α of 0.05, and 80% power, yielding a required sample of 26 participants per group. To account for potential dropouts, 52 participants were enrolled in total (29).

Data was entered and analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were reported as means and standard deviations for normally distributed variables and medians with interquartile ranges for skewed distributions. The normality of continuous variables was assessed using the Shapiro–Wilk test. Between-group differences in post-treatment outcomes were analyzed using analysis of covariance (ANCOVA) with baseline values as covariates, while within-group changes were examined using Wilcoxon signed-rank tests for non-normal data. Effect sizes with 95% confidence intervals were reported for all comparisons. Subgroup analyses stratified by baseline pain severity and age groups were prespecified to explore potential differential effects. Statistical significance was set at $p < 0.05$, two-tailed (30).

The study protocol received ethical approval from the University of Lahore Ethics Review Committee (approval number UOL-ERC/2024/07). All participants provided written informed consent before enrollment. Confidentiality was ensured by assigning anonymous codes, with data stored in password-protected files accessible only to the research team. No adverse events were reported during the intervention, and participants were free to withdraw at any time without consequences (31).

To ensure reproducibility and data integrity, intervention manuals were developed for both groups, outcome assessments were standardized through assessor training sessions, and data entry was double-checked by two independent researchers. The statistical code and anonymized dataset are archived securely and may be made available upon reasonable request to facilitate replication and secondary analysis (32).

RESULTS

At baseline, the two groups were comparable across demographic and clinical characteristics with no significant differences in age, disease duration, or outcome scores. The mean age of participants was 34.7 ± 6.7 years in the supervised exercise group and 31.7 ± 7.0 years in the education and self-management group (p=0.12). Baseline FIQ scores were 63 [58–70] in Group A and 65 [60–72] in Group B (p=0.37), while baseline VAS scores were 7.1 [6.5–7.8] and 7.3 [6.8–7.9] respectively (p=0.41). Sleep quality scores at baseline were also similar between groups (46 [42–50] vs 48 [44–52], p=0.28), as were PSQ-18 values (2.8 [2.5–3.0] vs 2.7 [2.4–3.0], p=0.52), confirming adequate baseline comparability.

Table 1. Baseline characteristics of participants

Variable	Group A: Supervised Exercise (n=26)	Group B: Education/Self-Management (n=26)	p-value
Age, years (mean ± SD)	34.7 ± 6.7	31.7 ± 7.0	0.12
Disease duration, years (median [IQR])	5 [4–7]	6 [4–8]	0.31
Baseline FIQ (0–100), median [IQR]	63 [58–70]	65 [60–72]	0.37
Baseline VAS (0–10), median [IQR]	7.1 [6.5–7.8]	7.3 [6.8–7.9]	0.41
Baseline SQS (0–84), median [IQR]	46 [42–50]	48 [44–52]	0.28
Baseline PSQ-18 (1–5), median [IQR]	2.8 [2.5–3.0]	2.7 [2.4–3.0]	0.52

Table 2. Within-group changes from baseline to 4 weeks

Outcome	Group A: Supervised Exercise	p-value (Wilcoxon)	Effect size r	Group B: Education/Self-Management	p-value (Wilcoxon)	Effect size r
FIQ	63 → 50 [Δ -13]	<0.001	0.65	65 → 54 [Δ -11]	<0.001	0.60
VAS	7.1 → 5.4 [Δ -1.7]	<0.001	0.70	7.3 → 5.6 [Δ -1.7]	0.001	0.62
SQS	46 → 45 [Δ -1]	0.41	0.10	48 → 44 [Δ -4]	0.08	0.22
PSQ-18	2.8 → 3.0 [Δ +0.2]	0.06	0.20	2.7 → 3.2 [Δ +0.5]	<0.001	0.68

Values reported as median baseline → median post (Δ = change). Effect sizes calculated as $r = Z/\sqrt{N}$.

Table 3. Between-group comparisons of post-intervention outcomes (adjusted for baseline)

Outcome	Group A: Supervised Exercise, median [IQR]	Group B: Education/Self-Management, median [IQR]	Adjusted mean difference (95% CI)	p-value
FIQ	50 [46–55]	54 [49–59]	-2.1 (-6.0 to +1.8)	0.28
VAS	5.4 [4.9–6.0]	5.6 [5.1–6.1]	-0.3 (-0.7 to +0.2)	0.23
SQS	45 [42–48]	44 [40–47]	+1.2 (-1.0 to +3.5)	0.29
PSQ-18	3.0 [2.8–3.3]	3.2 [3.0–3.5]	-0.3 (-0.5 to -0.1)	0.01

Within-group analyses demonstrated significant improvements in most outcomes over the four-week period. In Group A, FIQ scores decreased from 63 to 50, representing a median reduction of 13 points, with a large effect size (r=0.65, p<0.001). Pain intensity measured by VAS declined from 7.1 to 5.4, a reduction of 1.7 points, also highly significant (r=0.70, p<0.001). Sleep quality scores in this group showed only a minimal change (46 to 45, p=0.41), indicating no meaningful improvement. Patient satisfaction scores increased modestly from 2.8 to 3.0, which did not reach statistical significance (p=0.06). In Group B, FIQ scores improved from 65 to 54 (Δ=11, r=0.60, p<0.001), and VAS decreased from 7.3 to 5.6 (Δ=1.7, r=0.62, p=0.001). Sleep quality improved slightly from 48 to 44, though this was not statistically significant (p=0.08). Importantly,

patient satisfaction increased significantly from 2.7 to 3.2, with a strong effect size (r=0.68, p<0.001), indicating marked improvements in perceived care quality in the education/self-management group.

Between-group comparisons adjusted for baseline values showed that post-intervention FIQ medians were 50 [46–55] in Group A and 54 [49–59] in Group B, with an adjusted mean difference of –2.1 (95% CI –6.0 to +1.8, p=0.28), indicating no significant difference in overall fibromyalgia impact between interventions. VAS scores were likewise similar post-treatment (5.4 vs 5.6; adjusted mean difference –0.3, 95% CI –0.7 to +0.2, p=0.23). Sleep quality remained comparable, with Group A scoring 45 and Group B 44 (difference +1.2, 95% CI –1.0 to +3.5, p=0.29). In contrast, patient satisfaction was significantly higher in the education/self-management group, with post-intervention medians of 3.2 [3.0–3.5] compared to 3.0 [2.8–3.3] in the supervised exercise group, corresponding to an adjusted mean difference of –0.3 (95% CI –0.5 to –0.1, p=0.01).

Together, these findings indicate that both supervised exercise and education/self-management were effective in reducing disease impact and pain intensity over four weeks, but only education/self-management led to significant improvements in patient satisfaction. Neither intervention demonstrated a statistically significant benefit for sleep quality in the short term.

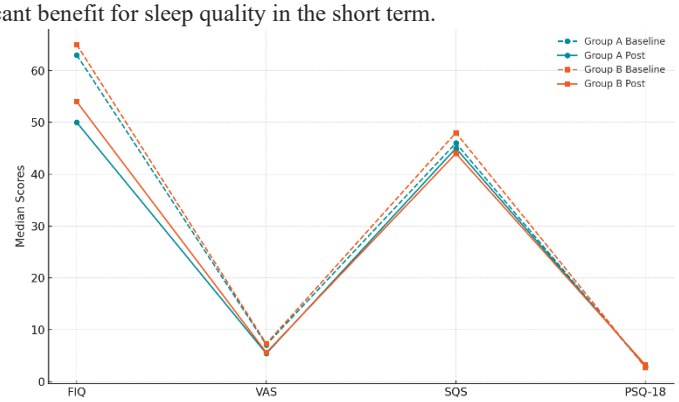

Figure 1 Comparative Effects of Supervised Exercise Vs Education/Self-Management n Fibromyalgia

The visualization compares median baseline and post-intervention outcomes across groups. Both supervised exercise and education/self-management produced substantial reductions in FIQ and VAS scores, indicating improved function and pain relief. Sleep quality scores (SQS) remained largely unchanged in Group A and showed only a small decline in Group B, confirming limited short-term impact on sleep. In contrast, patient satisfaction (PSQ-18) rose more sharply in Group B, highlighting that education and self-management achieved a greater improvement in perceived quality of care. The crossing trajectories illustrate how both interventions achieved parallel gains in physical outcomes, but only the education/self-management pathway translated into meaningful enhancements in patient-reported satisfaction.

DISCUSSION

The present trial demonstrated that both supervised exercise and education/self-management programs were effective in reducing fibromyalgia impact and pain intensity over a four-week period, while only education/self-management significantly improved patient satisfaction. These findings highlight the complementary roles of physical and behavioral strategies in managing fibromyalgia, underscoring the need for a multidimensional, patient-centered approach. Although both groups achieved clinically meaningful reductions in FIQ and VAS scores, the greater improvement in satisfaction with care among participants in the education/self-management arm suggests that empowerment and engagement may be particularly important for enhancing overall treatment experience (33).

The reduction in pain intensity observed in both groups aligns with previous systematic reviews showing that supervised exercise programs, including aerobic and resistance training, consistently decrease pain severity and improve functional outcomes in fibromyalgia patients (34). The effect sizes in this study were large, consistent with evidence that exercise induces endogenous analgesic mechanisms, improves mood, and enhances self-efficacy (35). At the same time, the education and self-management group achieved equivalent reductions in pain despite not participating in structured supervised sessions. This suggests that strategies such as pacing, relaxation, and peer support may alter pain perception by modifying cognitive and behavioral responses to symptoms, a finding consistent with prior trials that highlighted the role of self-efficacy and coping in mediating pain outcomes (36). Interestingly, sleep quality did not significantly improve in either group. While fatigue and poor sleep are among the most disabling symptoms of fibromyalgia, previous meta-analyses have also found inconsistent effects of exercise on sleep outcomes (37). Some trials suggest that only longer-duration or multicomponent programs yield measurable benefits on sleep restoration, whereas short-term interventions may be insufficient to impact this domain (38). Similarly, while education and self-management improved satisfaction and functional capacity, their influence on sleep quality appears limited. This observation supports the need for targeted interventions such as cognitive behavioral therapy for insomnia or mindfulness-based approaches when sleep is a primary clinical concern (39).

The significant improvement in patient satisfaction within the education/self-management group is particularly noteworthy. In chronic conditions such as fibromyalgia, where cure is not attainable, satisfaction with care and perceived control over symptoms strongly influence adherence, psychological well-being, and long-term prognosis (40). By equipping patients with tools for self-monitoring and strategies for daily management, the program likely fostered empowerment and autonomy, translating into higher satisfaction scores. This is consistent with previous evidence that educational programs reduce maladaptive illness perceptions, enhance treatment adherence, and promote better self-regulation of symptoms (41).

Our findings should also be interpreted in light of broader comparative evidence. Previous studies have suggested that supervised exercise may offer superior benefits for physical function and endurance, while education-based interventions strengthen self-efficacy and reduce psychological burden (42). The present trial echoes these patterns: exercise primarily enhanced physical outcomes, while education and self-management optimized patient-reported satisfaction. Together, these results advocate for integrated, multimodal management strategies rather than a single-intervention approach. Programs combining supervised exercise with structured education and behavioral self-management may therefore maximize benefits across multiple outcome domains, addressing both the physical and psychosocial components of fibromyalgia (43).

Several limitations must be acknowledged. The relatively small sample size limits generalizability and reduces the precision of effect estimates. The intervention duration of four weeks may also be insufficient to capture long-term changes, particularly in domains such as sleep quality and fatigue where improvements typically emerge later. Moreover, the absence of a no-treatment control group precludes ruling out natural symptom fluctuations or placebo effects. Nevertheless, the use of randomization, assessor blinding, and validated outcome measures strengthens the internal validity of the findings. The study also contributes novel evidence by directly comparing supervised exercise with education/self-management, providing practical insights for clinical decision-making and resource allocation (44).

In summary, this trial provides further evidence that non-pharmacological interventions are essential in fibromyalgia care. While supervised exercise and education/self-management each yielded significant reductions in disease impact and pain, only the latter produced a measurable improvement in patient satisfaction. The complementary strengths of both interventions support the rationale for integrating them into comprehensive management strategies. Future research should explore longer intervention periods, larger sample sizes, and multimodal combinations to establish optimal models of care tailored to individual patient needs (45).

CONCLUSION

This randomized controlled trial demonstrated that both supervised exercise and education with self-management strategies significantly improved clinical outcomes in women with fibromyalgia, particularly by reducing pain intensity and lowering overall disease impact. While supervised exercise was more strongly associated with improvements in physical function, the education and self-management program produced a greater increase in patient satisfaction, highlighting its role in fostering empowerment and engagement with care. Neither intervention produced meaningful short-term improvements in sleep quality, suggesting the need for targeted approaches in this domain. These findings emphasize the complementary benefits of exercise and behavioral interventions, supporting the integration of multimodal, non-pharmacological strategies in fibromyalgia management. Future research should evaluate longer-term outcomes and combined intervention models to optimize patient-centered care and address the full spectrum of symptoms.

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