Feasibility and preliminary effects of a 12-week sensorimotor training program in women with fibromyalgia: a proof-of-concept pilot study

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Summary. Background. Fibromyalgia (FM) is a complex, multifactorial condition characterized by chronic widespread pain, fatigue, and other somatic and psychological symptoms. It predominantly affects women, who represent the vast majority of diagnosed cases. While exercise is the only strongly recommended intervention by current EULAR guidelines, research on body awareness and motor control-oriented modalities remain limited. This pilot study assessed the feasibility and preliminary effects of a 12-week sensorimotor training program on pain, symptoms, sleep quality, psychological aspects, and physical function in women with FM. **Methods.** Five women with FM (mean age 56 ± 7.7 years) completed a 12-week supervised sensorimotor training program (2 sessions/week). Assessments were conducted pre- and post-intervention using validated questionnaires (BPI, FIQR, PSQI, SF-36, TSK) and physical tests (Sit-to-Stand, flexibility, balance). Due to the small sample, non-parametric analyses were used. **Results.** The intervention was feasible, with full adherence, no drop out and no adverse events. Significant improvements were observed in perceived pain (BPI, p=0.043, g = -2.14), FIQR total and function domain scores (p=0.043, g=-1.26), and sleep quality (PSQI, p=0.042, g=-1.42). Physical function improved significantly in Sit-to-Stand, Sit and Reach, Trunk Rotation, and static/dynamic balance tests (p<0.05), with moderate-large effect size. No significant changes were found in quality of life and kinesiophobia. **Conclusions.** Sensorimotor training is a feasible and potentially effective intervention for fibromyalgia symptoms, with preliminary benefits on pain, sleep, disease symptoms and physical function. These findings support further investigation in larger randomized controlled trials to establish its clinical utility and long-term outcomes.

Key words. Fibromyalgia, pain, symptoms, sensorimotor training.

Fattibilità ed effetti preliminari di un programma di esercizio sensomotorio di 12 settimane in donne con fibromialgia: uno studio pilota

Riassunto. Background. La fibromialgia (FM) è una condizione complessa e multifattoriale caratterizzata da dolore cronico diffuso, affaticamento e altri sintomi somatici e psicologici. Colpisce prevalentemente le donne, le quali rappresentano la vasta maggioranza dei casi diagnosticati. Sebbene l'esercizio fisico sia l'unico intervento fortemente raccomandato dalle attuali linee guida EULAR, la ricerca su modalità orientate alla consapevolezza corporea e al controllo motorio rimane limitata. Questo studio pilota ha valutato la fattibilità e gli effetti preliminari di un programma di allenamento sensomotorio di 12 settimane su dolore, sintomi, qualità del sonno, aspetti psicologici e funzione fisica in donne affette da FM. **Metodi.** Cinque donne con FM (età media 56 ± 7,7 anni) hanno completato un programma supervisionato di allenamento sensomotorio della durata di 12 settimane (2 sessioni/settimana). Le valutazioni sono state condotte prima e dopo l'intervento utilizzando questionari validati (BPI, FIQR, PSQI, SF-36, TSK) e test fisici (Sit-to-Stand, flessibilità, equilibrio). A causa del campione ridotto, sono state utilizzate analisi non parametriche. **Risultati** L'intervento è risultato fattibile, con adesione completa, nessun abbandono e nessun evento avverso. Sono stati osservati miglioramenti significativi nel dolore percepito (BPI, p=0,043, g = -2,14), nei punteggi totali FIQR e nel dominio della funzione (p=0,043, g=-1,26), e nella qualità del sonno (PSQI, p=0,042, g=-1,42). La funzione fisica è migliorata significativamente nei test Sit-to-Stand, Sit and Reach, Rotazione del Tronco e nei test di equilibrio statico/dinamico (p < 0,05), con una dimensione dell'effetto (effect size) da moderata a grande. Non sono state riscontrate modifiche significative nella qualità della vita e nella chinesiofobia. **Conclusioni.** L'allenamento sensomotorio è un intervento fattibile e potenzialmente efficace per i sintomi della fibromialgia, con benefici preliminari su dolore, sonno, sintomi della malattia e funzione fisica. Questi risultati supportano ulteriori indagini in studi randomizzati controllati più ampi per stabilirne l'utilità clinica e gli esiti a lungo termine.

Parole chiave. Fibromialgia, dolore, sintomi, allenamento sensomotorio.

Introduction

Fibromyalgia (FM), or fibromyalgia syndrome, is a relatively common condition, with an estimated prevalence of approximately 2% in the general population[1]. Despite its frequency, the clinical recognition of FM remains a considerable challenge for both patients and healthcare providers. The diagnostic process is often prolonged and complex; it may take over two years to establish a definitive diagnosis. This delay is associated with a high consumption of healthcare resources, even several years prior to diagnosis, compared to individuals without FM[2]. Although chronic pain is the hallmark symptom, it is not the only factor that impacts quality of life: fatigue, non-restorative sleep, mood disturbances, intestinal disorders and cognitive impairments are frequently reported and contribute to the heterogeneous and multifaceted nature of the condition[3].

Unlike nociceptive pain conditions such as osteoarthritis, the pain experienced in FM is primarily attributed to central sensitisation, a dysfunction in the way the central nervous system processes sensory information. Central sensitisation explains the discrepancy often observed between the severity of symptoms and the absence of detectable peripheral damage in FM, as well as the diffuse and persistent nature of the pain[4,5].

In 2016, the European League Against Rheumatism (EULAR)[6] updated its recommendations for the management of fibromyalgia (FM), emphasizing a personalized and multidisciplinary approach. These guidelines advocate for non-pharmacological strategies as first-line treatment, with patient education and physical exercise as key components. Among these, exercise is the only intervention strongly recommended, supported by robust evidence for its effectiveness in reducing pain and fatigue and improving sleep quality.

The guidelines also call for further research to compare different exercise modalities and assess the value of multimodal interventions. Numerous studies have confirmed the benefits of physical activity programs - particularly aerobic and resistance exercises - in improving pain, fatigue, sleep quality, and overall well-being in individuals with FM[7,8]. However, exercise modalities specifically targeting body awareness and motor control, such as neuromuscular or sensorimotor training, remain underexplored.

Emerging pilot studies suggest that sensorimotor interventions - which aim to enhance proprioception, balance, and neuromuscular control - may offer additional benefits by addressing altered sensorimotor integration often associated with central sensitization[9]. Despite these potential advantages, sensorimotor training is still rarely used in FM, especially regarding its impact on psychophysical aspects such as sleep quality, quality of life, and kinesiophobia.

In this context, it is worth noting that higher levels of physical activity are linked to improved quality of life in people with FM, partly due to reduced perceptions of fatigue [10]. Yet, many patients tend to reduce their daily activity levels or avoid exercise altogether, fearing symptom exacerbation[11]. This behaviour, often driven by kinesiophobia, contributes to a pattern of predominantly light activity and prolonged sedentary behaviour, leading to physical deconditioning[12].

These considerations highlight the need for tailored physical activity programs that account for the specific limitations and capabilities of people with FM. To this end, this pilot study investigates the feasibility and adherence to a 12-week sensorimotor training program in FM patients. In addition, the study explores its effects on pain, functional fitness, and related psychological outcomes. Findings may support the integration of sensorimotor training into clinical practice, offering a more holistic and cost-effective approach to FM management and informing future large-scale research.

Materials and methods

Ethical approval

All experimental methods conformed to the Declaration of Helsinki, with the exception of prior registration in a public database[13]. All participants provided written informed consent before enrolment on the study.

Participants

Five women with FM (age 56 ± 7.7 years; BMI 28.6 ± 8.3 kg/m^2) were recruited. Inclusion criteria included age 40–65, clinical diagnosis of FM, chronic pain, and low physical activity levels (<150 min/week). Exclusion criteria included cardiovascular comorbidities or contraindications to exercise. Medication regimens were maintained throughout the study. Participant characteristics are shown in table 1.

Experimental design

Participants underwent a 12-week supervised sensorimotor training intervention, attending two sessions per week (approximately 60 minutes each), for a total of 22 sessions. Outcome measures were assessed before (T0) and after (T1) the intervention period. All assessments were conducted between 8:00 and 10:00 am to control for potential circadian rhythm effects. As this was a pilot study, results are reported for the first five participants enrolled (IG = 5).

Table 1. Baseline characteristics Abbreviations: SD, standard deviation; BMI, body mass index; BPI Brief Pain Inventory questionnaire; FIQR, Revised Fibromyalgia Impact Questionnaire.

Baseline parameters	Intervention group (n=5) (mean ± SD)
Age	566 ± 77
BMI	286 ± 83
BPI	61 ± 13
FIQR tot	543 ± 143

Intervention protocol

The intervention consisted of a 12-week sensorimotor training program (2×/week, ~60 minutes/session), combining coordination, stabilization, and multi-joint strengthening exercises, with a focus on proprioception, breathing, stretching, and myofascial release. Sessions, supervised by two kinesiologists specialized in Adapted Physical Activity, followed a gradual progression from basic to complex motor patterns, adapted to each participant. Exercises, inspired by Pilates, yoga, dance, and tai chi, were performed in various positions (standing, seated, lying) using mats, chairs, and sticks. Each session began with a 15-minute warm-up emphasizing breathing, joint mobility, foot proprioception, and neuromuscular activation. An example session is provided in table 2.

Intervention assessments

Perceptual measures

Participants completed a battery of validated questionnaires to evaluate pain, symptom burden, sleep quality, psychological factors, and perceived health status: Brief Pain Inventory (BPI) was used to identify pain location, severity and the degree of which pain interferes with daily activities[14]; Revised Fibromyalgia Impact Questionnaire (FIQR) was used to assess the impact of fibromyalgia symptoms over the previous 7 days[15]; Pittsburgh Sleep Quality Index (PSQI) was administered to evaluate sleep quality and disturbances over a 1-month period[16]; Tampa Scale for Kinesiophobia (TSK) was used to assess fear of movement and re-injury in individuals with chronic musculoskeletal pain[17]; and the 36-Item Short Form Survey (SF-36) measured self-reported health across eight domains, including physical, emotional, and social functioning[18].

Table 2. Example of a sensorimotor training session for fibromyalgia.

Warm up 15' Activation of the whole system and joint mobilization in standing and seated positions Focus on the feet, plantar support, and breathing	• Exercises performed seated, supine, and standing • Plantar self-massage • Gait variations (eg, forefoot walking, heel walking, foot rolling, with arm swing, arm push, trunk flexion/extension/rotation) • Diaphragmatic and thoracic-lateral breathing exercises (in standing, supine, side-lying, and "rest position") • Joint mobilization with particular attention to the cervical and thoracic spine (eg, lateral twists, head nods, crunches) • Pelvic mobilization (Gyrokinesis and Pilates methods: anterior/posterior tilt, bridging, hip work and variations) • Trunk mobilization: side bending (arch and curling), flexion and rotation, circular and spiral movements (spinal rotation, cat stretch, spine stretch with arms, C curve, mermaid, back extension, quadruped stabilization)
Parte centrale 40' Strengthening of upper and lower limbs with emphasis on the core and pelvic floor • Mainly isometric exercises • Work load: 8–12 reps x 2–3 sets • Recovery time: 45–60 seconds • Some exercises performed in pairs • Progressive overload principle applied	• Shoulder bridge and variations • Push-ups and variations • Squats (with chair, against wall bars, and variations) • Lunges (with variations) • Isometric exercises in various positions (supine, prone, side-lying) • Balance: single-leg elevation on various planes, relevé
Cool-down 5' Processing proprioceptive input achieved during the session Improve flexibility, promote relaxation, and enhance self-perception and emotional stimulation	• Active/passive static stretching • Expressive movement experiences (individual, in pairs, in groups) – Mirror work – Trust exercises – Dance – "Blindfolded" explorations

Functional test

Given the lack of consensus on fitness assessment in FM, a set of widely used tests in rheumatologic research was selected to evaluate physical function, flexibility, and balance. Each test was repeated three times, with the best performance recorded. The following tests were administered in sequence: Handgrip Test[19]; 30-Second Sit-to-Stand Test[20]; Single Leg Stance Test using an inertial sensor (Gyko by Microtech); Trunk Rotation Test[21]; Sit and Reach Test[22]; Scratch Test[23]; Step Test.

Statistical analysis

Given the pilot nature of the study and the small sample size (n = 5), all data were analysed using non-parametric methods. Specifically, the Wilcoxon signed-rank test was used to compare pre- and post-intervention measures, as it provides a more robust approach in the context of small samples and does not assume normality. Data are reported as median and interquartile range (Q1–Q3). The significance level was set at $p < 0.05$. The absolute difference between pre- and post-intervention values was calculated for each parameter to provide a more detailed overview of the individual trends. Additionally, for each significant results the effect size using Hedge's g was reported.

All analyses were completed in SPSS (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp).

Results

Participants

Out of a total of 7 women with FM who initially expressed interest in the sensorimotor exercise programme, 5 participants completed all 12 weeks of training and were included in the statistical analysis. Among the individuals initially interested, one withdrew after completing the baseline assessments due to scheduling incompatibility with work commitments. Another chose not to begin the programme and did not complete the initial assessments, citing a lack of continued interest in the project.

Adherence

The participants showed complete adherence to the training programme, with a participation rate of 100% to the 24 training sessions required by the protocol. Due to the small number of participants, the two trainers were able to be extremely helpful with the participants, meeting everyone's needs and adapting the training schedule so that not a single lesson was missed.

Pain

BPI scores showed a significant reduction between pre- and post-intervention (p=0.043), with a mean absolute decrease of -3.2 points, showing a large effect size (Hedges' g = -2.14). This change exceeds the minimal clinically important difference, indicating a clinically meaningful reduction in pain perception. Pre intervention participants showed a median of 5.7 a.u. (Q1-Q3: 4.8 – 7.3), while post intervention the median decrease at 2.8 a.u. (Q1-Q3: 2.2 – 3.7).

In addition, for each participant, the trend of perceived pain before and after each training session over the 12-week was graphically represented and confirmed the decreasing evidenced in the analysis of the whole group. The results are shown in figure 1.

Fibromyalgia symptoms

The scores of the FIQR questionnaire showed statistically significant reductions for the third domain and the total score (both p=0.043), with an absolute mean reduction of -10.8 (pre: median 33.5 a.u., Q1-Q3 28.5 – 34.5; post: median 19.5 a.u., Q1-Q3 14.7 – 26.3, g=-1.93) and -15.9 (pre: median 55.5 a.u., Q1-Q3 43 – 65; post: median 34.4 a.u., Q1-Q3 26.3 – 49, g=-1.26), respectively. These changes exceed the minimal clinically important difference suggesting a clinically meaningful improvement and highlighting a strong effect on symptom burden.

The other two domains did not show significant reductions (1st domain p=0.138; 2nd domain p=0.223) but still exhibited a trend towards reduction of -2.4 (pre: median 12.8 a.u., Q1-Q3 9.4 – 18; post: median 9.3 a.u., Q1-Q3 7.6 – 15.6) and -2.6 (pre: median 9 a.u., Q1-Q3 4.5 – 12.5; post: median 4.5 a.u., Q1-Q3 3.5 – 9), respectively.

In addition, pre and post values of each participant for the three domains and the total score are graphically reported in figure 2.

Sleep quality

Sleep quality, assessed through the PSQI, showed a significant reduction with p=0.042 (g= -1.422). Participant showed a median of 12.5 a.u. (Q1-Q3 9 – 14.5) pre intervention, and a median of 8.5 a.u. (Q1-Q3 6 – 11.5) post intervention, with a reduction of -3.2 a.u. in terms of absolute mean, with a meaningful clinical reduction. The score of each participant is showed in figure 3.

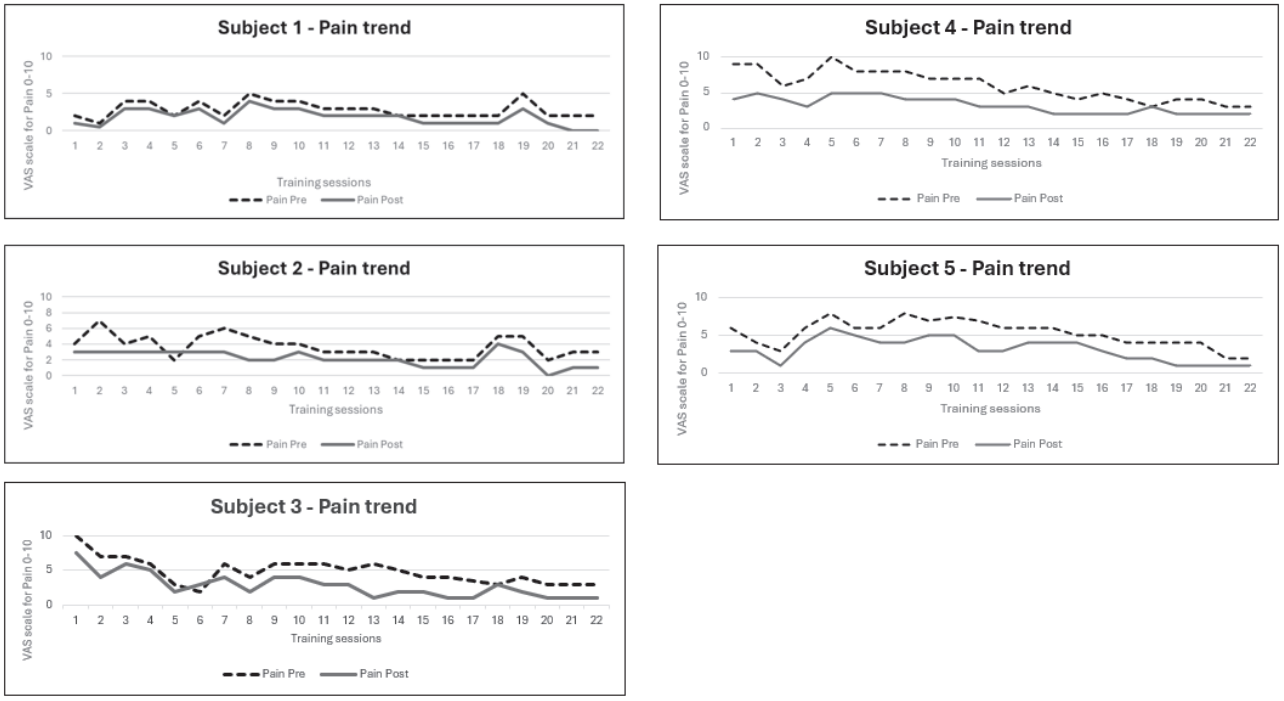

Figure 1. Pain trend for each subject measured before and after each training session through VAS scale.

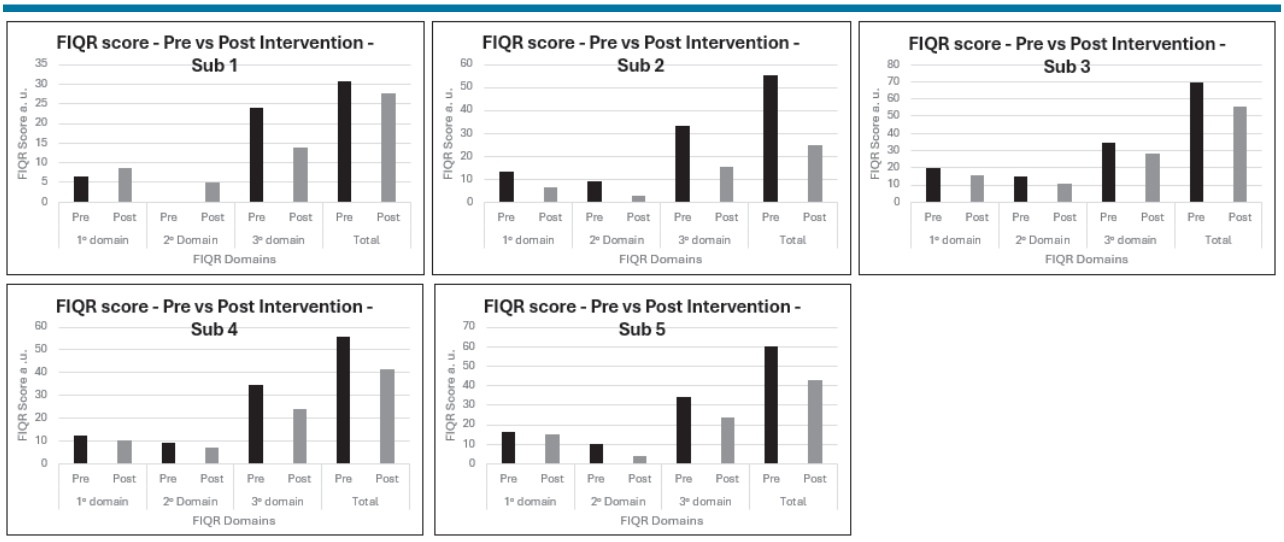

Figure 2. Revised Fibromyalgia Impact Questionnaire score of single domains and total for each participant.

Quality of life and kinseiophobia

None of the SF-36 domains showed statistically significant reductions. Median, Q1-Q3, p-value, and absolute mean difference are reported in table 3.

Kinseiophobia level showed no significant difference (p=0.588), still showing a positive trend reduction in the absolute mean difference pre-post of -1.4. (Pre: median 27.5 a.u., Q1-Q3 24 – 34; Post: median 26.5 a.u., Q1-Q3 24 – 31) (table 3).

Functional assessments

For the analysis of functional parameters, tests of strength, flexibility and ROM, and static and dynamic balance were analysed. For strength parameters, only 30 sec Sit to Stand test showed a significant increase (+ 4.6 reps, p=0.043, g=1.453). In terms of flexibility and ROM, Sit and Reach test (+ 4.1 cm, p=0.042, g=0.783) and Trunk Rotation Right test (+ 10.8°, p=0.043, g=2.351) showed significant results.

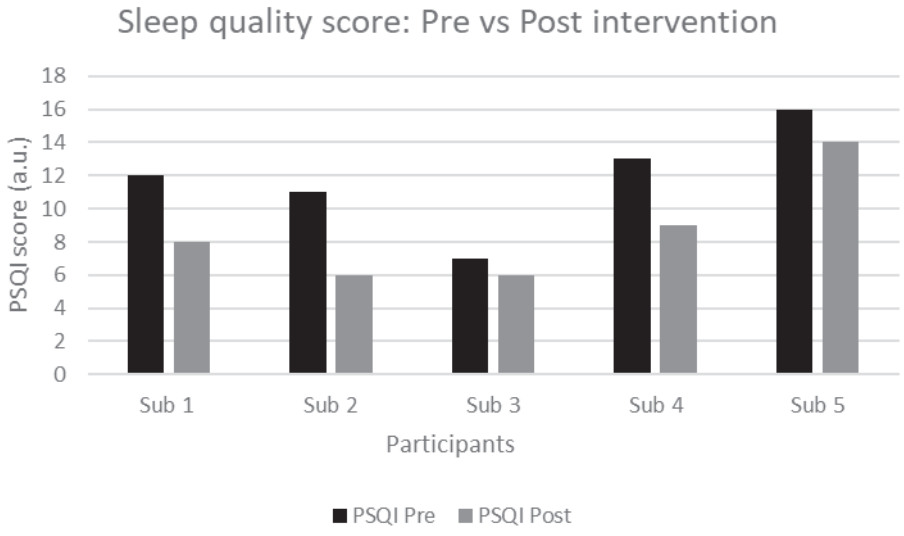

Figure 3. Pittsburgh Sleep Quality Index score pre and post intervention of each participant.

Table 3. The 36-Item Short Form Survey and Tampa Scale of Kinesiofobia results. Median scores for pre- and post-intervention measures across each domain of Tampa Scale for Kinesiofobia and the SF-36 questionnaire, along with the physical health and mental health components, are shown. The data are represented as median values to capture the central tendency, with separate bars for pre- and post-intervention measures.

SF-36 Domains	Pre (median, Q1-Q3)	Post (median, Q1-Q3)	P value	Mean difference pre-post
Role limitations due to physical health	12 (0 – 25)	37 (0 – 62)	0.157	20
Role limitations due to emotional problems	66 (16 – 100)	66 (16 – 100)	0.564	13.3
Emotional well-being	62 (50 – 76)	66 (60 – 76)	0.465	7.2
General health	42 (25 – 62)	37 (22 – 52)	0.715	-8
Health change	25 (12 – 87)	62 (37 – 100)	0.102	25
Energy/Fatigue	32 (22 – 47)	32 (17 – 42)	0.257	-6
Social functioning	43 (37 – 62)	62 (43 – 75)	0.357	10
Pain	40 (33 – 45)	45 (28 – 67)	0.197	11
Physical functioning	62 (35 – 70)	65 (40 – 80)	0.285	5
Physical component	35 (29 – 45)	44 (29 – 62)	0.109	7
Mental component	47 (38 – 61)	53 (46 – 65)	0.465	6
Tampa Scale of Kinesiophobia	27.5 (24 – 34)	26.5 (24 – 31)	0.588	-1.4

Lastly, static balance showed an increase in the right leg, with a decrease in the Ellipse Area (-138.85 mm^2, p=0.043, g=-0.555), while dynamic balance showed an increase in the right leg through the Step test (+2.8 reps, p=0.041, g=1.240). All the results of the functional parameters tests are reported in table 4.

Discussion

The results of this pilot study suggest that a 12-week sensorimotor training program may provide significant benefits for women with FM, particularly in terms of pain perception, overall symptom burden, and sleep quality. Although the sample size was limited (n=5), the data consistently revealed improvements in both symptoms and functional outcomes with large effect size reflecting clinically important difference, supporting the hypothesis that an approach focused on motor control and body awareness may represent a valid and complementary therapeutic option to current EULAR recommendations.

Table 4. Functional parameters results. Median scores for pre- and post-intervention measures are shown. The data are represented as median values to capture the central tendency, with separate bars for pre- and post-intervention measures. Abbreviations: rep, repetitions; kg, kilograms; cm, centimetres; sec, seconds.

Functional parameters	Pre (median, Q1-Q3)	Post (median, Q1-Q3)	P value	Mean difference pre-post
Sit to Stand (rep)	9 (7 – 11)	14 (12 – 15)	**0.042**	4.6
Handgrip right(kg)	30 (29 – 39)	29 (26 – 39)	0.500	-1.1
Handgrip left(kg)	27 (23 – 38)	26 (25 – 36)	0.500	-0.5
Sit and Reach (cm)	-10 (-13 - -3.2)	-2 (-9.5 – 0.5)	**0.042**	-4.1
Trunk Right (°)	33 (25 – 36)	43 (36 – 46)	**0.043**	10.8
Trunk Left (°)	34 (29 – 37)	42 (32 – 56)	0.138	10.9
Scratch Right (cm)	33.5 (24 – 39)	27.5 (22 – 34)	0.109	-3.8
Scratch Left (cm)	41.5 (36 – 43)	34 (31 – 39)	**0.043**	-4.6
Single leg stand right (sec)	30 (30 – 30)	30 (30 – 30)	1.000	0
Single leg stand left (sec)	24 (15 – 30)	27.5 (25 – 30)	0.180	4
Ellipse area right (cm^2)	78.3 (17 – 317)	21 (7.4 – 37)	**0.043**	-138
Ellipse area left (cm^2)	28 (11 – 113)	34 (15 – 85)	0.893	-7.25
Step right (rep)	7.5 (7 – 9)	11 (9 – 12.5)	0.059	2.8
Step left (rep)	7 (7 – 9)	11 (9.5 – 13)	**0.041**	3.6

Pain perception, the study's primary outcome, showed a statistically significant reduction both in the pre-post intervention comparison and in intra-session trends. This reduction, consistently observed in all participants, highlights the beneficial effects of adapted physical exercise. Given the nature of pain in fibromyalgia, this result may suggest improved pain regulation. Specifically, it is plausible that high-proprioceptive sensorimotor activities enhance pain regulation, as they may engage central pain control mechanisms more effectively.

The decrease in FIQR scores further confirms a global improvement in symptom management, with positive effects not only on pain but also on daily life impact.

The improvement in Pittsburgh Sleep Quality Index scores represents another relevant outcome, given the centrality of sleep disturbances in FM. This change may be attributed to the combined effects of low-impact exercises, breathing regulation, and relaxation strategies, which are known to benefit circadian regulation and autonomic tone.

Although no significant improvements were found in the SF-36 domains, a general trend toward enhancement, particularly in the physical component, was observed, in line with previous studies[24,25]. A longer intervention duration or larger sample size may be required to detect more pronounced changes. Similarly, kinesiophobia showed a non-significant yet positive trend, suggesting a reduction in movement-related fear as participants gained confidence throughout the training. This is particularly relevant for women with FM, for whom pain-related fear may lead to avoidance behaviours and physical deconditioning[26,27].

The improvements in physical performances further validate the efficacy of the training program, extending beyond pain modulation to encompass broader functional enhancement. This is consistent with emerging literature supporting somatosensory-based approaches and awareness-focused training methods (e.g., yoga, tai chi, Pilates) in the treatment of FM[24,28,29].

Importantly, FM is a multifactorial syndrome characterized by a complex and heterogeneous symptom presentation, which varies greatly across individuals. This variability reinforces the importance of adopting multidimensional and holistic interventions. Sensorimotor and neuromuscular training, which combines movement quality, body awareness, and functional re-education, may offer an effective strategy to address the full spectrum of symptoms in FM. By integrating both physical and perceptual components, this type of intervention can promote not only symptom reduction but also greater patient engagement and a sense of empowerment in managing their condition.

Furthermore, given its emphasis on postural control, coordination, and psycho-physical well-being, this training modality should be systematically compared with other exercise approaches, such as strength or aerobic training, which are more commonly studied in FM literature[25,30]. These comparisons would help clarify the specific and potentially

complementary benefits of each modality, enabling more personalized and effective treatment planning based on patient needs and preferences.

Another noteworthy finding of this study is the exceptionally high adherence to the training protocol. All participants (100%) completed the 12-week programme without dropping out, with a session attendance rate of over 90%. This level of adherence is particularly striking when compared to previous studies on physical activity in FM sufferers, where drop-out rates are often between 20% and 50%, largely due to exacerbation of pain, fatigue or motivational decline[31,32]. The structured but adaptable nature of sensorimotor training, combined with the focus on gentle, body-conscious movement and psychophysical integration, may have contributed to a greater sense of safety, commitment and perceived benefit among participants. The low-impact format, emphasis on proprioceptive feedback and progressive individualisation probably increased participants' confidence and reduced fear of worsening symptoms. The high adherence not only reinforces the feasibility and acceptability of this approach, but also underscores its potential for real-world application, where long-term commitment is key to achieving lasting benefits. These findings support the inclusion of sensorimotor strategies in FM rehabilitation, not only for their clinical effects but also for their ability to promote adherence, an essential but often overlooked aspect of treatment success.

However, the study has several limitations. The small sample size and lack of a control group limit the generalizability of the findings and preclude definitive causal inferences. Nonetheless, as a pilot study, these results offer a valuable basis for future research, demonstrating both the feasibility and acceptability of the proposed protocol. In addition, the large effect size for of the results, with differences that exceeded the minimal clinically important difference, suggesting a clinically meaningful improvement and highlighting a strong effect on symptom burden.

Interindividual variability in symptom expression and exercise response in FM also represents a potential limitation, suggesting the need for more tailored interventions. Furthermore, the 12-week duration might not be sufficient to modify more stable psychological constructs such as quality of life and kinesiophobia.

In light of these results, future research should focus on randomized controlled trials with larger samples and long-term follow-up.

Conclusion

This 12-week pilot study indicates that sensorimotor training is a promising non-pharmacological approach for women with fibromyalgia, with potential benefits in reducing pain, improving sleep quality, and enhancing physical function. By promoting motor control and body awareness, this type of intervention may also contribute to improved quality of life. While further research is needed to confirm these findings, the results support the integration of sensorimotor training into clinical practice as part of a multidisciplinary, patient-centred management strategy in line with current EULAR recommendations.

Conflicts of interest. The authors declare that there is no conflict of interest.

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Authors' contributions. Conceptualization: AP, CM and EG; Methodology: CDM, MS; Validation: CM and EG; Formal Analysis: CM; Investigation: CC; Resources: CDM; Data curation: CM and MS; Writing, Original Article: CM and AP; Writing, Review and Editing: EG and DF; Visualization: CM and EG; Supervision: DF and EG; Project administration: CM.

References

1. Sarzi-Puttini P, Giorgi V, Marotto D, Atzeni F. Fibromyalgia: an update on clinical characteristics, aetiopathogenesis and treatment. Nat Rev Rheumatol 2020; 16: 645-60.
2. Giorgi V, Sirotti S, Romano ME, et al. Fibromyalgia: one year in review 2022. Clin Exp Rheumatol 2022; 40: 1065-72.
3. Siracusa R, Paola RD, Cuzzocrea S, Impellizzeri D. Fibromyalgia: pathogenesis, mechanisms, diagnosis and treatment options update. Int J Mol Sci 2021; 22: 3891.
4. Woolf CJ. Central sensitization: implications for the diagnosis and treatment of pain. Pain. 2011; 152 (3 Suppl): S2-S15.
5. Nijs J, George SZ, Clauw DJ, et al. Central sensitisation in chronic pain conditions: latest discoveries and their potential for precision medicine. Lancet Rheumatol 2021; 3: e383-e392.
6. Macfarlane GJ, Kronisch C, Dean LE, et al. EULAR revised recommendations for the management of fibromyalgia. Ann Rheum Dis 2017; 76: 318-28.
7. Sosa-Reina MD, Nunez-Nagy S, Gallego-Izquierdo T, Pecos-Martín D, Monserrat J, Álvarez-Mon M. Effectiveness of therapeutic exercise in fibromyalgia syndrome: a systematic review and meta-analysis of randomized clinical trials. Biomed Res Int 2017; 2017: 2356346.
8. Estévez-López F, Maestre-Cascales C, Russell D, et al. Effectiveness of exercise on fatigue and sleep quality in fibromyalgia: a systematic review and meta-analysis of randomized trials. Arch Phys Med Rehabil 2021; 102: 752-61.
9. Kashikar-Zuck S, Black WR, Pfeiffer M, et al. Pilot randomized trial of integrated cognitive-behavioral therapy and neuromuscular training for juvenile fibromyalgia: the FIT teens program. J Pain 2018; 19: 1049-62.
10. Alvarez MC, Albuquerque MLL, Neiva HP, et al. Exploring the relationship between fibromyalgia-related fatigue, physical activity, and Quality of Life. Int J Environ Res Public Health 2022; 19: 4870.
11. Segura-Jiménez V, Álvarez-Gallardo IC, Estévez-López F, et al. Differences in sedentary time and physical activity

between female patients with fibromyalgia and healthy controls: the al-Ándalus project. Arthritis Rheumatol 2015; 67: 3047-57.
12. Fernandez-Feijoo F, Samartin-Veiga N, Carrillo-de-la-Peña MT. Quality of life in patients with fibromyalgia: Contributions of disease symptoms, lifestyle and multimedication. Front Psychol 2022; 13: 924405.
13. "World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. JAMA 2013; 310: 2191-4.
14. Caraceni A, Mendoza TR, Mencaglia E, et al. A validation study of an Italian version of the Brief Pain Inventory (Breve Questionario per la Valutazione del Dolore). Pain 1996; 65: 87-92.
15. Salaffi F, Franchignoni F, Giordano A, Ciapetti A, Sarzi-Puttini P, Ottonello M. Psychometric characteristics of the Italian version of the revised Fibromyalgia Impact Questionnaire using classical test theory and Rasch analysis. Clin Exp Rheumatol 2013; 31 (6 Suppl 79): S41-9.
16. Curcio G, Tempesta D, Scarlata S, et al. Validity of the Italian version of the Pittsburgh Sleep Quality Index (PSQI). Neurol Sci 2013; 34: 511-9.
17. Monticone M, Giorgi I, Baiardi P, Barbieri M, Rocca B, Bonezzi C. Development of the Italian version of the Tampa Scale of Kinesiophobia (TSK-I): cross-cultural adaptation, factor analysis, reliability, and validity. Spine (Phila Pa 1976) 2010; 35: 1241-6.
18. Apolone G, Mosconi P. The Italian SF-36 Health Survey: translation, validation and norming. J Clin Epidemiol 1998; 51: 1025-36.
19. Lee SC, Wu LC, Chiang SL, et al. Validating the capability for measuring age-related changes in grip-force strength using a digital hand-held dynamometer in healthy young and elderly adults. Biomed Res Int 2020; 2020: 6936879.
20. Martín-Martínez JP, Collado-Mateo D, Domínguez-Muñoz FJ, Villafaina S, Gusi N, Pérez-Gómez J. Reliability of the 30 s chair stand test in women with fibromyalgia. Int J Environ Res Public Health 2019; 16: 2344.
21. Batavia M, Gianutsos JG. Test-retest reliability of the functional rotation test in healthy adults. Percept Mot Skills 2003; 96: 185-96.
22. Mayorga-Vega D, Merino-Marban R, Viciana J. Criterion-related validity of sit-and-reach tests for estimating hamstring and lumbar extensibility: a meta-analysis. J Sports Sci Med 2014; 13: 1-14.
23. Woodward TW, Best TM. The painful shoulder: part I. Clinical evaluation. Am Fam Physician 2000; 61: 3079-88.
24. Caglayan BC, Basakci Calik B, Gur Kabul E, Karasu U. Investigation of effectiveness of reformer pilates in individuals with fibromyalgia: A randomized controlled trial. Reumatol Clin (Engl Ed) 2023; 19: 18-25.
25. Assumpção A, Matsutani LA, Yuan SL, et al. Muscle stretching exercises and resistance training in fibromyalgia: which is better? A three-arm randomized controlled trial. Eur J Phys Rehabil Med 2018; 54: 663-70.
26. Leon-Llamas JL, Murillo-Garcia A, Villafaina S, Domínguez-Muñoz FJ, Morenas J, Gusi N. Relationship between kinesiophobia and mobility, impact of the disease, and fear of falling in women with and without fibromyalgia: a cross-sectional study. Int J Environ Res Public Health 2022; 19: 8257.
27. KoÇyİĞİt BF, Akaltun MS. Kinesiophobia levels in fibromyalgia syndrome and the relationship between pain, disease activity, depression. Arch Rheumatol 2020; 35: 214-9.
28. Wang C, Schmid CH, Fielding RA, et al. Effect of tai chi versus aerobic exercise for fibromyalgia: comparative effectiveness randomized controlled trial. BMJ 2018 21; 360: k851.
29. Verma A, Shete SU, Doddoli G. Yoga therapy for fibromyalgia syndrome: A case report. J Family Med Prim Care 2020; 9: 435-8.
30. Masquelier E, D'haeyere J. Physical activity in the treatment of fibromyalgia. Joint Bone Spine 2021; 88: 105202.
31. Vancampfort D, Van Damme T, Brunner E, et al. Dropout from exercise interventions in adults with fibromyalgia: a systematic review and meta-analysis. Arch Phys Med Rehabil 2024; 105: 571-9.
32. Sarmento CVM, Liu Z, Smirnova IV, Liu W. Exploring adherence to moderate to high-intensity exercises in patients with fibromyalgia: the role of physiological and psychological factors. A narrative literature review. Physiologia 2023; 3: 472-83.

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