

Original Article

## Effect of Core Stability Exercises on Low Back Pain in Women Suffering from Fibromyalgia: A Randomized Controlled Trial

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### Abstract:

**Purpose:** This study aimed to determine the effect of core stability exercises on LBP in women fibromyalgia. **Subjects:** Forty women (age: 25-35 years, body mass index (BMI): 19-25 kg/m<sup>2</sup>) with fibromyalgia and LBP were randomly recruited from El-Eman Hospital, Assiut. The sample was split into two equal groups; the control group A practiced a six-week self-care routine of good sleep, healthy diet, mental relaxation, and mindfulness, while the study group B combined this routine with a three-level core stability exercise program. **Methods:** Assessment of LBP intensity and functional disability was done using the visual analogue scale (VAS) and Oswestry disability index (ODI), respectively, before and six weeks after interventions. **Results:** There were statistically significant differences ( $P < 0.05$ ) in both VAS and ODI mean values when comparing pre- to post-study results in both groups (A & B). The intergroup comparison revealed a statistically significant greater improvement ( $P < 0.05$ ) in VAS and ODI scores favoring group B over group A. **Conclusion:** Both self-care routine and core stability exercises are effective in decreasing LBP in women with fibromyalgia, but core stability exercises added to the self-care routine have a superior effect.

**Keywords:** Fibromyalgia, low back pain, core stability exercises.

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## 1. Introduction

Fibromyalgia is an idiopathic and persistent condition in nature [1] that affects around 2.5 to 5% of persons worldwide [2]. It is tenfold more common in females than in males [2]. It manifests as widespread, poly-regional pain and a diverse set of symptoms like headaches, fatigue, anxiety, sleeping disruptions, mood swings, perceptual problems, and cognitive dysfunction [1].

When it was first discovered, fibromyalgia was thought to be a pain disorder without any specific lesions [3]. The American College of Rheumatology (ACR) and the American Pain Society have modified fibromyalgia diagnosis multiple times in recent years because of the absence of objective biomarkers as well as the overlap of symptoms with other diseases [4, 5]. According to the ACR, the diagnosis of fibromyalgia was based on a tender point evaluation and 41

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somatic symptoms. The somatic symptoms noted by the clinical physician were later replaced with six self-reported symptoms (disabled rest, exhaustion, poor cognition, headaches, sadness, and stomach pain) as part of the revised diagnostic criteria [6].

Although the exact pathophysiology of fibromyalgia is unknown, a few pathogenic pathways, such as central sensitization, were suggested [7]. Also, elevated substance P was hypothesized to be associated with low-grade inflammation and fibromyalgia [8]. Moreover, it has been proposed that oxidative stress and persistent inflammation induce spinal cord hyperexcitability [9].

It has been observed that women with fibromyalgia had lower levels of physical activity [10], weaker muscles [11], and exercise-avoidance behavior due to the concern of exacerbating their symptoms [12].

Moreover, women with fibromyalgia were reported to display changes in their trunk posture and difficulties in maintaining the position of the trunk. Thus, the curvatures of the lumbar spine in patients with fibromyalgia were recommended to be investigated for possible restrictions [13]. Because of this decrease in spinal stability, fibromyalgia patients are prone to have low back pain (LBP) [14].

The cornerstones of fibromyalgia treatment include education, workplace interventions, exercise therapies, and psychiatric and behavioral therapy. Physical exercise represents an initial therapeutic line for fibromyalgia, recommended by the European Fibromyalgia Treatment Guidelines [15].

Several types of exercise were beneficial in managing various clinical aspects of fibromyalgia, including intensity of pain, strength of muscles, fatigue levels, life quality, and functionality [16].

Earlier research has proven the benefits of core stability exercises in managing back pain, reducing disability, and improving anxiety and overall quality of life in most rehabilitation programs [17, 18]. Yet, research is lacking regarding the effect of these stabilization exercises on altered body mechanics found in women complaining of fibromyalgia. Thus, this study aimed to investigate a specific program of core stability exercise on low back pain and disability in women suffering from fibromyalgia.

## **2. Materials and Methods**

### **2.1. Study participants and recruitment criteria:**

Forty women were engaged in this study, drawn randomly from El-Eman Hospital after a physician's referral and through social media. They fulfilled the American College of Rheumatology's diagnostic criteria for fibromyalgia, including either a Widespread Pain Index (WPI)  $\geq 7$  and Symptom Severity (SS) score  $\geq 5$ , or WPI 3-6 and SS score  $\geq 9$ . Symptoms persisted for a minimum of 3 months, with no other explanations for the pain [5].

They were equally divided into groups A and B. Group (A) consisted of twenty women. They followed a self-care routine of good sleep, a healthy diet, mental relaxation, and mindfulness. Group (B) consisted of twenty women. They followed a program of core stability exercises of three levels in addition to the same self-care routine as group (A). Women were included in the study if their age range was between 25 and 35 years, with a body mass index (BMI) of 19-25 kg/m<sup>2</sup>. All chosen women were clinically diagnosed with fibromyalgia and complained of LBP.

The study excluded women if they had LBP of any other etiologies not related to fibromyalgia, women who underwent spinal surgeries, a history of malignancy, mental disorders, disc herniation, their BMI less than 25 or greater than 35, and those who were participating in any form of physical activity throughout the study course.

### **2.2. Study Design:**

This study was designed as a pre-test, post-test, randomized controlled design. Ethical approval was obtained from the Ethical Research Committee at the Faculty of Physical Therapy, Cairo University, before study initiation (P.T.REC/012/004345) on the 10th of January 2023.

All participants were given a thorough explanation and full instructions about the assessment and treatment procedures to gain their confidence and cooperation. Then, each participant consented to this study by signing an informed consent form before joining. The study was done at El-Eman Hospital, Assiut Governorate, Egypt.

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### 2.3. Randomization:

Women were informed of the study's purpose, voluntary participation rights, and data privacy. Computer-based randomization split participants into two equal groups (A and B). All 40 subjects completed the study.

### 2.4. Study interventions:

All women in both groups (A& B) followed a self-care routine of good sleep hygiene, a healthy diet, mental relaxation, and mindfulness.

For education about good sleep, women were asked to avoid stimulants such as caffeine and alcohol [19] and to follow an effective nighttime routine that involved establishing a regular sleep and wake schedule [20].

Regarding the healthy diet, a diet of low saturated fat, low carbohydrates, and higher fiber, vitamins, and minerals was recommended for each woman to follow. Also, they were advised to have a plant-based diet, which has been shown to alleviate chronic musculoskeletal pain [21]. Additionally, women were taught mindfulness to intentionally direct their attention to the current moment and observe their thoughts and emotional responses without reacting automatically. In this way, the typical pattern of thinking-feeling-acting could be interrupted [22]. They were regularly asked about their adherence to the self-care routine by recording their commitment in a notebook daily.

Females in the study group B participated in a program of core stability exercises divided into three levels. For each level, they completed three weekly sessions over two weeks, adhering to the specific exercises of that level, totaling 18 sessions within a six-week timeframe. The session included two sets of ten repetitions and ten seconds of holding.

Level I comprised simple strengthening exercises involving abdominal bracing techniques, progressing from a single knee-to-chest to a heel slide, and finally, a double knee-to-chest maneuver [23].

Level II involved medium-intensity strengthening exercises involving abdominal draw-ins with legs on a medicine ball, supine dead bugs, elbow-supported side bridging with single leg hip abduction, contralateral arm, and leg raises with weighted resistance from quadruped, bridging with the head on a physio-ball, and abdominal crunches on the physio-ball [23].

Level III included difficult strengthening exercises, such as prone bridging on hands, side bridging incorporating hip abduction, flexion, and extension movements, progressing to bridging with head support on a physio-ball, and ultimately, plank [23].

### 2.5. Assessment of outcome measures

Assessment of LBP intensity and functional disability was done using the visual analogue scale (VAS) and Oswestry disability index (ODI), respectively, before and six weeks after interventions.

**2.5.1. Visual analogue scale (VAS):** The VAS represents a valid, reliable, and appropriate method for measuring pain intensity in clinical practice. This self-reported scale comprises a horizontally or vertically oriented line (often 10 cm or 100 mm) with two anchors at either end to indicate the degree of discomfort. "No pain" is implied at one end, and "unbearable pain" is implied at the other [24]. A 2-cm difference represented the minimal clinically important difference (MCID) [25].

**2.5.2. Oswestry Disability Index (ODI):** It is a gold standard for measuring functional disability and is composed of ten components, each concentrating on a distinct facet of daily living; the degree of discomfort, personal hygiene, lifting, walking, sitting, standing, sleeping, sexuality, social relationships, or traveling. The patient was instructed to score the impact of LBP on each of the four life domains.

Each woman was asked to rate how much LBP has affected each aspect of ODI, choose the most appropriate answer representing her current state, and mark it. Each question underwent assessment on a scale ranging from 0 to 5. The scores for all items were added together to derive the total score, which was subsequently scaled to a maximum of 50 and then converted to a percentage by multiplying by 100. A percentage of 0 indicated no disability, while 100% meant the highest level of disability [26]. To calculate MCID for the ODI scale, a difference of 10 points was expected [27].

### 2.6. Data and statistical analysis

All statistical measures were performed through the statistical package for social studies (SPSS) version 25 for Windows (IBM SPSS, Chicago, IL, USA). Through the application of the Shapiro-Wilk test, the data distribution's normality was confirmed, indicating a normal distribution. Consequently, descriptive statistics were expressed through mean and standard deviation (SD) values. To evaluate the changes in study variables within each group before and after the

interventions, paired t-tests were employed. Additionally, unpaired t-tests were conducted to compare the study variables between the two groups (A and B). The significance level for all statistical tests was set at  $p < 0.05$ .

### 3. Results

#### 3.1. Participants' characteristics:

**Table 1** reveals statistically insignificant differences ( $p > 0.05$ ) in age, weight, height, and BMI between the two groups of women.

**Table 1.** Comparison of women's characteristics in both groups.

	Mean $\pm$ SD*		MD*	t-value*	p-value*
	Group A	Group B			
Age (years)	27.8 $\pm$ 4.6	28.3 $\pm$ 4.6	-0.6	-0.4	0.7
Weight (kg)	68.3 $\pm$ 8.4	69.9 $\pm$ 9.6	-1.6	-0.6	0.6
Height (cm)	157.6 $\pm$ 7.1	158.1 $\pm$ 7.2	-0.6	-0.2	0.8
BMI (kg/m <sup>2</sup> )	27.4 $\pm$ 2.3	27.9 $\pm$ 2.8	-0.6	-0.5	0.6

\* SD, standard deviation; MD, mean difference; p-value, probability value; Significant at P value  $< 0.05$ ; BMI, body mass index.

#### 3.2. Effect of the treatment on study variables:

##### 3.2.1. Within-group comparison

**Table 2** reveals significant reductions in VAS and ODI scores post-study for both groups ( $p > 0.001$ ). Group A showed improvements of 31.4% (VAS) and 35.27% (ODI), while Group B demonstrated greater changes of 59.2% (VAS) and 49.94% (ODI).

##### 3.2.2. Between-group comparison

At baseline, the intergroup comparisons did not yield statistically significant differences in VAS ( $p = 0.63$ ) or ODI ( $p = 0.78$ ) scores. Following treatment, a significant reduction was noted in both VAS and ODI mean values in study group B compared to group A ( $p = 0.001^*$ ) (**Table 2**).

**Table 2.** Mean values of the VAS and ODI pre- and post-interventions of both groups

	Mean $\pm$ SD*		MD*	t-value*	p-value*
	Group A	Group B			
VAS*					
P0*	6.1 $\pm$ 1.4	6.3 $\pm$ 1.3	-0.2	-0.5	0.6
P1*	4.2 $\pm$ 1.2	2.6 $\pm$ 1.0	1.6	4.6	0.001
MD	1.9	3.7			
% of change	31.4	59.2			
t-value	7.0	15.3			
p-value	0.001	0.001			
ODI (%) *					
P0	42.3 $\pm$ 7.9	43.1 $\pm$ 10.6	-0.8	-0.3	0.8
P1	27.4 $\pm$ 5.7	21.6 $\pm$ 4.2	5.8	3.7	0.001
MD	14.9	21.5			
% of change	35.3	49.9			
t-value	10.7	11.4			
p-value	0.001	0.001			

\*P0, pre-study; P1, post-study; SD, standard deviation; MD, mean difference; p-value, probability value; Significant results at P value  $< 0.05$ ; VAS, visual analogue scale; ODI, Oswestry disability index

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## 4. Discussion

This study aimed to explore the impact of core stability exercises on low back pain in women suffering from fibromyalgia. Physiotherapists increasingly employ core stability strengthening as a new therapeutic exercise approach for diverse medical conditions. This training has recently gained popularity and is starting to significantly improve rehabilitation [28]. Strengthening the core muscles is the primary goal of this kind of training to rebalance muscles [29]. Based on four clearly defined principles—correct alignment and control, breathing, fluidity of movement, and core muscle activation—core stability training targets movement disorder rehabilitation [30]. Systematic reviews and meta-analyses recently indicate that exercise enhances pain management, physical function, stiffness, mood, fatigue, overall well-being, and health-related quality of life [31]. In particular, it has been demonstrated that core stability training helps women with various diseases feel less pain and live better [32]. Furthermore, some researchers have discovered that this kind of exercise improves mental states, symptoms of depression, and physical function and flexibility [18]. Furthermore, after finishing the treatment, several studies have found improvements in pain, anxiety, and quality of life [33].

Chronic widespread pain is a prominent symptom of fibromyalgia, coupled with fatigue, sleeping disruptions, and depressive states [34]. Exercise is an effective approach for managing fibromyalgia, with strong evidence supporting its use [35].

The findings of this research demonstrated that both groups reported reduced LBP severity and bettered QOL, as indicated by the reduction of functional disability level, with more improvement noticed in the study group, who performed core stability exercises.

There is much research discussing the relationship between exercise and fibromyalgia. Still, there is no research discussing the relationship between core stability exercises and low back pain, in particular in women complaining of fibromyalgia. Hence, this study tried to close this gap, and the results of this study were pro and against other results.

Regarding the impacts of self-care routine on fibromyalgia, Galvani et al. [36] suggested that an integrated postural counseling program based on self-management tactics has a positive influence on chronic pain and tiredness. It makes it possible for fibromyalgia sufferers to resume their own lives and identity reconstruction. Additionally, Maddox et al. [37] found that diets rich in plant-derived nutrients exhibit a more pronounced capacity for lowering pain symptoms, indicating that food may be useful in helping people with fibromyalgia symptoms. Furthermore, they verified that fibromyalgia patients can experience increased pain in response to inconsistent sleep patterns.

Also, Galvez-Sánchez et al. [38] noted that psychoeducation is unquestionably a crucial part of multi-component fibromyalgia therapy.

This study's findings align with Garrido-Ardila et al. [39], who observed QOL improvement, pain relief, joint stiffness reduction, ease of work, and depression alleviation in women suffering from fibromyalgia following a physiotherapy program focused on core stability and acupuncture.

Also, Martínez-Rodríguez et al. [40] found that implementing core stabilization exercises and a four-week Lacto-vegetarian dietary regimen resulted in pain alleviation and enhanced body composition among fibromyalgia patients with LBP. Additionally, Ekici et al. [18] observed that conducting core stability training programs with individuals suffering from fibromyalgia resulted in alleviated pain, reduced anxiety, and enhanced QOL.

Another study conducted by Altan et al. [41] noticed pain intensity lowering in women complaining of fibromyalgia when incorporating core stability exercises in their rehabilitation. A more recent study [42] proved that fibromyalgia management through Swiss ball strengthening exercises not only improved pain, QOL, and muscular strength but also reduced the reliance on disease-related drugs compared to stretching exercises, with no harmful impacts. Also, Bañuelos-Terés et al. [43] explored the impact of strength training on muscle strength, well-being, physical condition,

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and favorable outcomes in people with fibromyalgia. The findings suggested the safety and benefits of this training in controlling pain and improving individual physical condition and functionality.

Conversely, Wang et al. [44] reported that Tai Chi, as a mind-body therapy, achieved equal or better symptom relief than aerobic exercise. Extended periods of Tai Chi practice were associated with greater benefits, positioning this approach as a potential therapy in the holistic management of fibromyalgia.

The current work investigates how core stability exercises impact the management of a significant prevailing condition that affects females' QOL. The assessment included two aspects of the syndrome using reliable methods. However, one study limitation was the suboptimal cooperation from some female participants. Also, other aspects of fibromyalgia need to be evaluated for better monitoring of the treatment effects.

## 5. Conclusions

It can be concluded that a self-care routine composed of good sleep, a healthy diet, and mind-body relaxation and mindfulness, added to core stability exercises, can greatly decrease LBP in women with fibromyalgia and improve their functional disability. Also, core stability exercises, performed at three levels for six weeks, led to more improvement in both measures than following only the self-care routine.

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