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Evaluating the Relative Effectiveness of Electrical Muscle Stimulation versus Dry Cupping on Female Patients with Fibromyalgia

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ABSTRACT

Background: Fibromyalgia syndrome (FMS) is a chronic musculoskeletal illness distinguished by widespread fatigue, pain, sleep disturbances, and reduced quality of life (QOL), with higher prevalence among females. Non-pharmacological interventions such as electrical muscle stimulation (EMS) and dry cupping have shown potential in managing fibromyalgia symptoms; however, their comparative effectiveness remains insufficiently investigated.

Aim: To find out the effects of electrical muscle stimulation compared to dry cupping on pain, quality of life and sleep quality in female patients with fibromyalgia.

Patients and methods: Sixty females aged 45-55 years with FMS (BMI 25-34 kg/m²) were randomized into three groups (n=20 each): Group A received weekly 20-min EMS session plus the Mediterranean diet for 6 weeks; Group B underwent twice-weekly dry cupping sessions on tender points plus Mediterranean diet; Group C followed the Mediterranean diet alone.

All patients continued taking their usual drugs as described by their rheumatology specialist and had an individual fixed visit. Fibromyalgia impact questionnaire (FIQ), Pittsburg sleep quality index (PSQI), pain pressure threshold (PPT) was measured.

Results: Both intervention groups showed significant improvements versus control ($p<0.001$), with Group B demonstrating superior gains: PPT increases (e.g., right tender point 1: MD=0.36 kg/cm²), FIQ reduction (MD=34.39 points), and PSQI improvement (MD=8.7 points) compared to Group A ($p<0.05$).

Conclusion: Dry cupping yielded greater enhancements in pain relief, QOL, and sleep quality than EMS, supporting its integration into FMS management alongside diet.

KEYWORDS: Fibromyalgia, Dry Cupping, Electrical Muscle Stimulation, Quality of Life.

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INTRODUCTION

Fibromyalgia exemplifies an illness characterized by pervasive chronic generalized musculoskeletal pain. Fibromyalgia has long been a disregarded, ignored, and trivialized condition. Initially characterized vaguely as muscle rheumatism in 1815. In 1990, the World Health Organization (WHO) officially acknowledged fibromyalgia as a separate disease (1).

The pathophysiological mechanisms of FM are still not fully understood and, to date, there are no imaging or laboratory markers that can be used for diagnostic purposes in daily clinical practice. The diagnosis of FM is purely clinical. The presence of symptoms and their severity are therefore the diagnostic cornerstones of FM. This aspect is emphasised in the American College of Rheumatology (ACR) criteria based on the concept of the polysymptomatic distress scale (PDS) from 2010 onwards. (2).

Fibromyalgia disease had a negative impact on the patients' quality of life and disability level. Additionally, there was a statistically significant correlation between total disability levels and overall fibromyalgia patient quality of life (3).

The global occurrence of fibromyalgia varies from 0.2% to 8%. In Egypt, the occupancy of fibromyalgia (FM) has been evaluated in case cohorts with comorbid conditions, revealing that 1.9% of cases with chronic liver disease exhibited FM. females have a significantly greater occurrence of cognitive dysfunction, fatigue, headache, sleep disturbance, and abdominal pain (4).

The Egyptian physician community revealed an increased occurrence, likely reflecting the elevated occurrence of fibromyalgia identified among Egyptian medical students, estimated at 12.5% (5).

females with FM can safely participate in and benefit from a program of mat Pilates exercises combined with EMS, as it provides a reliable and efficient technique for enhancing the anxiety, pain, and depression of female cases diagnosed with fibromyalgia (6).

It was discovered that the inclusion of cupping intervention in addition to conventional treatment in the experimental group three

times per week for four weeks reduced pain, improved the PPT, and improved cardiorespiratory parameters in females with fibromyalgia who were between the ages of 40 and 60 (7).

A recent investigation involving twenty-two FM cases demonstrated that a sixteen-week Mediterranean diet, with or without elevated doses of tryptophan, resulted in numerous advantageous effects on emotional processing, as well as reductions in fatigue, anxiety, and depression. Additionally, it alleviated potential eating disorders and body image dissatisfaction, with particularly pronounced enhancements observed in the group receiving the Mediterranean diet alongside supplements (8).

A personalized Mediterranean diet with fewer proinflammatory substances seems to reduce the disability and fatigue associated with FM. The key measures indicating disability did improve, especially the FIQ and the sub scores of the brief pain inventory, which relate to disability and pain's interference with physical and occupational activities (9).

This study aimed to find out the effects of electrical muscle stimulation compared to dry cupping on pain, quality of life, and sleep quality in female patients with fibromyalgia.

METHODS AND PATIENTS:

Sixty females have been diagnosed as suffering from fibromyalgia syndrome (FMS) by rheumatologist, and their ages varied from 45 to 55 years old. This experimental randomized controlled trial study was performed in the physical therapy outpatient clinics of Gamal Aldin Al Afghany Hospital, All patients continued taking their usual drugs as described by their rheumatology specialist ; after assessment, they were randomly allocated into three groups equal in number: **Group A** (Electrical muscle stimulation, EMS): Twenty females received one EMS session per week (20 mins/session) and followed a Mediterranean diet for 6 weeks. **Group B** (dry cupping): twenty females received dry cupping sessions, The cups were placed on predefined locations (TP1, TP4 and TP8), bilateral tender points (1) TP1 located in the forehead, just below the hair line, (2) TP4 located in the supraspinatus muscle above the medial border of the scapular spine, (3) TP8 located just posterior to the trochanteric prominence (2 sessions / week) after 10 to 15 minutes cups were removed. One treatment session lasted about 20-30 minutes in total. (10). and followed a Mediterranean diet for 6 weeks. **Group C** (Control group): twenty females followed a Mediterranean diet only for 6 weeks.

Inclusion criteria: Sixty females have been diagnosed by rheumatologist as suffering from fibromyalgia syndrome; their ages range from forty-five to fifty-five years old, their body mass index varies from 25 to 34 (overweight and obese type 1), and they have a willingness to participate in this research.

Exclusion criteria: Patients were excluded if they had peripheral vascular diseases, smokers, had chest disease (either obstructive or restrictive), pregnant, had other rheumatologic or neurological diseases, had any underlying medical condition (e.g., tumor or fracture), being under pharmacological pain killer treatment (e.g., analgesics) three days before their participation or had clinical signs of severe cardiac events (e.g., congestive heart disease).

Methods

Measuring and Equipment

Evaluative Equipment: Weight and height scale, Egyptian algometer used in the assessment of the pain pressure thresholds (PPTs) in tender points and tested by Ibrahim, (11) fig 1, adapted Arabic version of the Fibromyalgia Impact Questionnaire(A-FIQ), Pittsburgh Sleep Quality Index (PSQI), and Widespread Pain Index

Treatment Equipment: Electrical muscle stimulation in the form of a suit vest (I-MOTION GROUP GLOBAL IBÉRICA, S.L. CL LABRADORES, 13 P.E. PRADO DEL ESPINO - 28660 - BOADILLA DEL MONTE -MADRID – SPAIN-STANDARD ISO 9001:2015) , as in fig. 2. acrylic glass cups & manual suction pump as shown in fig. 3.

Fig. (1): Egyptian Algometer

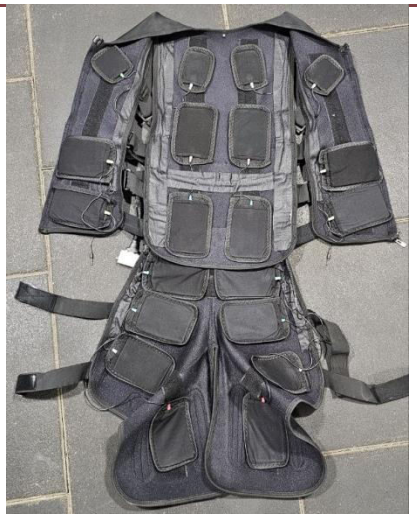

Fig (2): Electrical muscle stimulation suit.

Fig (3): Acrylic glass cups & manual suction pump

Procedures

Evaluating procedure: The height and weight have been measured for each subject in the three groups (A, B, and C); pain evaluation was done through using an algometer; quality of life and psychological status evaluation was done through completing the Arabic version of the FIQ-A Questionnaire; sleep quality was evaluated through completing the Arabic version of the Pittsburgh Sleep Quality Index; and the Widespread Pain Index was used to help the patient express her painful points. All patients continued taking their usual drugs as described by their rheumatology specialist and had an individual fixed visit.

Treatment procedure:

All subjects in all groups A, B&C were following a Personalized Mediterranean Diet, as prescribed isocaloric diet plan based on the Mediterranean diet (only with food, no supplements). That diet plan was based on this macronutrient distribution: 55% carbohydrate (mainly complex carbohydrates, with a limit of sugar and sweeteners), 15% protein, and 30% fat (mainly from olive oil and walnuts (12). Calorie intake average was 1700 ± 300 Kcal; macronutrient and distribution regarding body weight was: 3.5 ± 0.6 g of carbohydrate/kg body weight; 0.9 ± 0.2 g of proteins/kg body weight; 1.9 ± 0.2 g of fats/kg body weight for all groups. (8)

Then subjects were divided into 3 groups:

Group A: twenty females received one EMS session/week with applied 6 forms of pilates exercise training, all exercises was performed in a single set, with 10 repetitions, (Spine Stretch, The Spine Twist, The One leg circle, The Plank, Swimming, and Swan) (20 mins/session) and followed a Mediterranean diet for 6 weeks. **Group B:** twenty females received dry cupping on certain tender points (bilateral 3 points) (2 sessions / week) and followed a Mediterranean diet for 6 weeks. Dry cupping was applied by manual suction pump, acrylic cups of medium diameter (3.5 cm), suctions by the hand pumps, "moderate" suction were applied; For participants who reported considerable discomfort,the pressure was slightly minimized according to the individual sensation. (13).**C (control group):** twenty females following a Mediterranean diet only for 6 weeks.

Ethical consideration: This study was approved by the Ethical Committee of Faculty of Physical Therapy, Cairo University P.T.REC/012/004622. **Patient consent form:** All enrolled subjects in the study were informed about the aim, technique, and experimental protocol of this study before participation. A written informed consent was assigned prior to participation.

Statistical Analysis

The data has been gathered from cases before and after 6 weeks of management protocol, and it was classified into pre- and post-treatment values. **Descriptive statistics:** The mean and standard deviation have been determined for each group. **Inferential**

analysis: ANOVA was used to compare among three groups at a level of significance of 0.05.

RESULTS

Demographic Characteristics: Table (1) illustrates the patients' characteristics of three groups. There were statistically insignificant variances with regard to patients' general characteristics between the three groups (p-value not less than 0.05).
Mixed-design multivariate analysis has been carried out to investigate the effect of management on the measured variables. A statistically significant variance has been observed among groups as Wilk's A = 0.06, F (16, 100) = 19.33, P-value under 0.001, and Partial Eta Squared (η^2) = 0.76. Additionally, a statistically significant effect has been observed on time (pre-post treatment) as Wilk's A = 0.04, F (8, 50) = 154.23, p-value under 0.001, and η^2 = 0.96, as well as for the interaction among groups and time as Wilk's A = 0.02, F (16, 100) = 36.65, p-value < 0.001, and η^2 = 0.85.

Between-groups comparison: Baseline and after 6 weeks of intervention
At baseline, there were statistically insignificant variances between three groups in all determined parameters (P-value not more than 0.05), as illustrated in table (2). Following six weeks of intervention, statistically significant distinctions have been seen across groups A, B, and C across all evaluated variables, with group B exhibiting more favorable outcomes (P-value under 0.05), as illustrated in the tables (2, 3).

Within-groups comparison
A statistically significant variance has been observed in all result measures when comparing the pre- and post-intervention outcomes (p-value under 0.05) in group A, with more favor to group B, while in group C there were no statistically significant variances in all result measures, as illustrated in table (4).

*Table 1: Baseline Demographic Characteristics of participants (N=60) **

Characteristics	Group A (number=20)	Group B (number =20)	Group C (20)	F-value	P Value
Age (years)	**47.1±2.43**	**48.25±2.47**	**48.65±3.27**	1.72	**0.19**
BMI (kg/m²)	**31.73±2.44**	**32.34±1.76**	**31.32±1.47**	1.4	**0.26**
Fibromyalgia chronicity (years)	**3.69±1.75**	**3.6±1.31**	**4.38±1.16**	1.76	**0.18**
WPI (score)	**6.8±1.64**	**7.35±1.5**	**6.9±1.41**	0.74	**0.48**
SSS (score)	**7.55±2.01**	**8.1±1.68**	**8.3±1.8**	0.98	**0.42**
FIRST (score)	**5.15±0.59**	**5.25±0.58**	**5±0.79**	0.34	**0.71**

BMI, body mass index;* Information are mean± SD for all demographics; P-Value under 0.05 indicate statistical significance; Kg/cm^2: kilogram per centimeter square; WPI: widespread pain index; SSS: symptoms severity scale; FIRST: fibromyalgia rabid screening tools.

*Table2. Clinical characteristics of participants at baseline and after 6 weeks intervention (N=60) **

Outcomes	time	Group A (number =20)	Group B (number =20)	Group C (number =20)	F-value	P-Value
PPT of tender point 1 at RT side **(kg/cm2)**	*Baseline*	1.06±0.18	1.03±0.22	1.01±0.19	0.34	0.72
	After 6 weeks	1.17±0.13	1.38±0.16	1.02±0.22	22.71	0.001
PPT of tender point 1 at LT side **(kg/cm2)**	*Baseline*	1.02±0.21	1.01±0.21	1.02±0.18	0.04	0.99
	After 6 weeks	1.18±0.11	1.37±0.21	1.03±0.21	19.35	0.001
PPT of tender point 4 at RT side **(kg/cm2)**	*Baseline*	1±0.27	1.06±0.28	1.05±0.15	0.28	0.76
	After 6 weeks	1.2±0.13	1.42±0.2	1.06±0.13	26.53	0.001
PPT of tender point 4 at LT side **(kg/cm2)**	*Baseline*	0.99±0.21	0.97±0.18	0.97±0.13	0.08	0.92
	After 6 weeks	1.24±0.16	1.35±0.15	1.04±0.09	26.18	0.001
PPT of tender point 8 at RT side **(kg/cm2)**	*Baseline*	1.06±0.16	1.07±0.2	1.02±0.13	0.54	0.59
	After 6 weeks	1.27±0.17	1.49±0.19	1.03±0.13	39.03	0.001
PPT of tender point 8 at LT side **(kg/cm2)**	*Baseline*	0.92±0.26	0.91±0.08	0.93±0.1	0.07	0.93
	After 6 weeks	1.23±0.16	1.43±0.29	0.95±0.16	25.86	0.001
FIQ **(score)**	*Baseline*	72.09±3.2	71.51±3	70.38±3.37	1.49	0.24
	After 6 weeks	57.22±4.84	37.13±6.07	69.96±3.02	236.97	0.001
PSQI **(score)**	*Baseline*	16.2±1.44	16.6±2.04	16.15±1.09	0.49	0.61
	After 6 weeks	10.95±2.76	7.9±2.31	15.85±1.08	68.1	0.001

* Data are mean ± SD, P-Value under 0.05 illustrates statistical significance, PPT: pain pressure threshold, RT: right side, Kg/cm2: kilogram per centimeter square, LT: left side, FIQ: fibromyalgia impact questionnaire, PSQI: pittsburg sleep quality index.

Table 3. Between Groups Effects after 6 weeks of intervention

Outcome	Group A vs Group B		Group A vs Group C		Group B vs Group C	
	MD (95% CI)	P-Value	MD (95% CI)	P-Value	MD (95% CI)	P-Value
PPT of tender point 1 at RT side **(kg/cm2)**	-0.22(-0.35, -.08)	0.001	0.16(0.02,0.29)	0.02	0.37(0.23,0.51)	0.001
PPT of tender point 1 at LT side **(kg/cm2)**	-0.19(-0.33, -0.05)	0.004	0.17(0.02,0.31)	0.02	0.36(0.21,0.5)	0.001
PPT of tender point 4 at RT side **(kg/cm2)**	-0.22(-0.34, -0.09)	0.001	0.15(0.02,0.27)	0.01	0.36(0.24,0.48)	0.001
PPT of tender point 4 at LT side **(kg/cm2)**	-0.1(-0.21, -0.01)	0.04	0.2(0.09,0.31)	0.001	0.31(0.2,0.41)	0.001
PPT of tender point 8 at RT side **(kg/cm2)**	-0.23(-0.35, -0.1)	0.001	0.23(0.11,0.36)	0.001	0.46(0.33,0.59)	0.001
PPT of tender point 8 at LT side **(kg/cm2)**	-0.2(-0.36, -0.03)	0.003	0.29(0.12,0.45)	0.001	0.48(0.31,0.65)	0.001
FIQ **(score)**	-20.09(-23.84, -16.34)	0.001	-12.74(8.99,16.5)	0.001	-32.83(-36.59, -29.08)	0.001
PSQI **(score)**	-3.05(-4.75, -1.36)	0.001	-4.9(-6.6, -3.21)	0.001	-7.95(-9.65, -6.26)	0.001

MD, Mean Difference; CI, confidence interval; P-Value under 0.05 illustrates statistical significance; PPT: pain pressure threshold, RT: right side, Kg/cm2: kilogram per centimeter square, LT: left side, FIQ: fibromyalgia impact questionnaire, PSQI: pittsburg sleep quality index.

Table 4. Within group changes after 6 weeks of intervention

Outcome	Group A (n=20)		Group B (n=20)		Group C (n=20)	
	MD (95% CI)	P-Value	MD (95% CI)	P-Value	MD (95% CI)	P-Value
PPT of tender point 1 at RT side **(kg/cm2)**	-0.11(-0.19, -0.03)	0.008	-0.36(-0.44, -0.28)	0.001	-0.01(-0.09,0.08)	0.9
PPT of tender point 1 at LT side **(kg/cm2)**	-0.16(-0.23, -0.09)	0.001	-0.35(-0.42, -0.29)	0.001	-0.01(-0.07,0.06)	0.89
PPT of tender point 4 at RT side **(kg/cm2)**	-0.2(-0.29, -0.11)	0.001	-0.36(-0.45, -0.27)	0.001	-0.02(-0.11,0.08)	0.75
PPT of tender point 4 at LT side **(kg/cm2)**	-0.25(-0.34, -0.16)	0.001	-0.38(-0.47, -0.29)	0.001	-0.07(-0.16,0.02)	0.12
PPT of tender point 8 at RT side **(kg/cm2)**	-0.21(-0.27, -0.14)	0.001	-0.43(-0.49, -0.36)	0.0001	-0.02(-0.08,0.05)	0.64
PPT of tender point 8 at LT side **(kg/cm2)**	-0.32(-0.42, -0.21)	0.001	-0.52(0.41,0.63)	0.001	-0.02(-0.13,0.09)	0.71
FIQ (score)	14.87(12.47,17.27)	0.001	34.39(31.9,36.78)	0.001	0.41(-1.98,2.81)	0.73
PSQI **(score)**	5.25(4.29,6.21)	0.001	8.7(7.74,9.66)	0.001	0.3(-1.26,0.66)	0.54

MD, Mean Difference; CI, confidence interval; P-Value under 0.05 illustrates statistical significance; PPT: pain pressure threshold, RT: right side, Kg/cm2: kilogram per centimeter square, LT: left side, FIQ: fibromyalgia impact questionnaire, PSQI: pittsburg sleep quality index.

DISCUSSION

Regarding the effect of EMS versus dry cupping on FIQ in the present study, with respect to EMS combined with exercise, limited studies were identified as determining the effect of WB-EMS on FIQ (quality of life).

The findings of **Eseoğlu** (6) study demonstrated that electro-muscle stimulation combined with mat Pilates produced greater improvements in (FIQ) scores compared to mat Pilates alone. Specifically, the EMS group showed a larger effect size (ES = 2.16) than the Pilates group (ES = 1.43), indicating a more substantial reduction in the overall impact of fibromyalgia on daily life, symptoms, and quality of life.

Sara (14) conducted a pilot randomized controlled trial involving healthy adults assigned to physical training with or without whole-body electromyostimulation (WB-EMS) for one 20-minute session per week. The findings indicated that once-weekly physical training with WB-EMS in healthy adults led to either enhanced or stable cardiovascular risk biomarkers. Consequently, WB-EMS may offer an effective modality of physical training for individuals who are unable or disinclined to engage in traditional exercise.

The findings of **Jee (15)** indicated that WB-EMS didn't cause any adverse effects. Additionally, comparable to the physical adaptation to WB-EMS, there was a significant reduction in psychophysiological parameters such as anxiety, soreness, sleeplessness, and fatigue following the trial. That indirectly reflects improvement in quality of life.

EMS has proven effective in improving muscular function in several clinical contexts, such as post-surgical recovery, stroke rehabilitation, and sports medicine, by directly activating muscle fibers and mitigating atrophy and weakness. Overall, safety and few adverse effects were documented. Having the ability to enhance quality of life and decrease reliance on drugs emphasizes their role as integral components of modern treatment of pain and rehabilitation methods (16).

Only one study with low evidence for FIQ improvement applied dry cupping on fibromyalgia, as two articles with a total of 155 participants have been included. Large effect sizes have been detected for pain intensity, moderate for quality of life, and low for FIQ and sleep syndromes. Nevertheless, the certainty of the proof is reduced for most results except for sleep disorders (17).

Regarding the effect of EMS combined with exercise versus dry cupping on PPT in the present study, with respect to EMS, limited studies were identified as determining the effect of WB-EMS on pain.

Studies applying WB-EMS evaluated overall pain intensity, not specific to pain pressure threshold.

High-intensity strength training with EMS demonstrated greater enhancements in alleviating pain and disability reduction, as well as enhancements in kinematic and lower limb performance, compared to exercise without EMS (18).

Konrad's (19) research indicates that the initial pain severity in cases with non-specific chronic back pain (NSCBP) serves as a prognostic factor for pain alleviation using WB-EMS therapy, especially highlighting the substantial advantages for those with elevated initial pain intensities. Therefore, WB-EMS may be suggested as an excellent substitute (or adjunct) to traditional management modalities for NSCBP, particularly for those whose conditions are defined by more severe pain levels.

Conversely, there was minimal-quality proof (one trial, 22 + 18 participants) indicating that a single application of EMS had no impact on trigger point soreness compared to placebo treatment in cases with persistent neck pain. EMS was determined to be less effective than TENS for pain alleviation immediately post-treatment**.** (20).

With respect to dry cupping, many studies were identified as determining the effect of cupping on pain.

Great improvements in pain were observed when evaluated through PPT in the group who got cupping therapy, applied to patients suffering from fibromyalgia. The FM treatment plan should include cupping therapy in addition to conventional treatment to help patients improve their overall quality of life (7).

The results from a systematic review done by **Wood** (21) found that dry cupping improved PPT in asymptomatic participants and was more effective than passive and active stretching.

A randomized clinical trial by Nasb(22), examined the effectiveness of ischemic compression therapy, dry cupping in treating trigger points (TPs) associated with neck pain. The study measured PPT and other measures pre-treatment and at four weeks post-treatment, significant improvement in PPT in comparison to the pre-treatment results.

Conversely, numerous studies indicate that cupping therapy (Hijama) requires further proof to be classified as a therapeutic intervention for rheumatological diseases. Multiple investigations agree that cupping is most effective when utilized alongside medication. Conversely, other research indicates no significant advantageous effect of cupping. Although it remains uncommon, the induction of rheumatological illnesses through cupping could be clarified in part through the immunomodulatory effect that cupping exerts on the body. Additional research is required to clarify the significance of cupping in rheumatology**.** (23).

Regarding the effect of EMS versus dry cupping on PSQI in the present study, with respect to EMS, limited studies were identified as determining the effect of WB-EMS on PSQI.

The effect of EMS with exercise on sleep quality was only studied by **Jurado-Fasoli** (24), who concluded that **exercise** training programs that included high-intensity interval training with electrical muscle stimulation (HIIT-EMS) enhanced the PSQI global score in sedentary middle-aged adults, and HIIT-EMS was the only group that enhanced objective sleep quality and quantity from baseline levels (i.e., total sleep time, sleep efficacy, and wake following sleep onset).

Then other studies applied physical training only (aerobic exercise) to study its effect on sleep quality; 8 weeks of aerobic exercise was the most efficient method for enhancing the PSQI sleep quality component in middle-aged and older adults (25).

Physical exercise programs in older adults enhance sleep quality, specifically in facilities, and sleep efficiency determined with PSQI (26).

With respect to dry cupping, many studies were identified as determining the effect of cupping on PSQI.

The study by **Chen and Tang (27)** provides great evidence regarding the efficacy of dry cupping in enhancing sleep quality, as determined by the PSQI; 2 sessions/week for 8 weeks improved PSQI in baseball players.

In contrast, sleep quality, as determined by the PSQI, illustrated no significant difference after the dry cupping therapy in FM patients. This suggests that the intervention did not result in notable changes in overall sleep patterns, duration, or perceived restfulness. Although improvements were seen in selected mental health and social functioning measures, these effects did not extend to sleep-related outcomes (10).

Regarding the effect of following the Mediterranean diet (MedDiet) on fibromyalgia in the present study

A healthy diet that ensures optimal intakes of micronutrients could be a beneficial strategy for managing FM cases (28).

Proietti (29) suggests that a traditional Mediterranean diet, potentially enhanced with personalized adjustments and supplements, may alleviate fibromyalgia symptoms. While there is no particular dietary intervention, research indicates that weight management, adjusted high-antioxidant diets, and nutritional supplementation may mitigate fibromyalgia symptoms.

Mediterranean diet given that a higher proportion of protein intake has been linked to an increased pain threshold in individuals with FM. Moreover, the involvement of essential amino acids—particularly tryptophan—and their metabolites, such as serotonin, is currently under investigation due to their potential roles in inflammation, immune regulation, neurological function, and their influence on pain and fatigue in FM. (30).

CONCLUSION

The study results showed that both groups (A and B) had significant improvement compared to the control group; however, group B showed greater increases in pain pressure threshold at specific tender points and overall improvement (greater pain relief, better quality of life, and enhanced sleep quality) than group A.

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