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Effect of EMDR Combined with Multimodal Treatment on Pain and Depressive Symptoms in Adults with Fibromyalgia: A Preliminary Randomized Controlled Study

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Abstract

Background: Fibromyalgia is associated with chronic pain, affective burden, and limited response to pharmacological treatment alone; emerging evidence suggests psychological interventions, including Eye Movement Desensitization and Reprocessing, may be beneficial. Chronic pain associated with fibromyalgia represents a complex clinical challenge due to its multifaceted symptomatology and its substantial impact on quality of life. This study evaluated the effect of Eye Movement Desensitization and Reprocessing therapy combined with a multimodal treatment, compared to an active control group, on pain perception, anxiety and depressive symptoms, and quality of life in adults aged 18 to 65 years diagnosed with fibromyalgia.

Methods: An experimental pretest–posttest design with an active control group was implemented, comprising 33 randomized participants, with a final analytic sample of 28 participants.

Results: The findings revealed significant reductions in pain perception and depressive symptoms in the experimental group (Eye Movement Desensitization and Reprocessing + multimodal treatment), whereas anxiety and quality of life showed no clinically meaningful changes. In contrast, the active control group maintained stable values, with only a slight improvement observed in the psychological component of quality of life.

Conclusion: These findings suggest that integrating Eye Movement Desensitization and Reprocessing into multimodal management may constitute a promising adjunctive strategy for fibromyalgia treatment, particularly for reducing pain intensity and depressive symptomatology. However, larger samples and longer follow-up periods are necessary to confirm its efficacy.

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1. Introduction

Fibromyalgia is a chronic pain syndrome characterized by widespread musculoskeletal pain, fatigue, sleep disturbance, cognitive difficulties, and emotional distress. Epidemiological studies estimate that fibromyalgia affects approximately 2–4% of the general population, with higher prevalence among women and individuals with comorbid mood and anxiety disorders (Clauw, 2014; Häuser et al., 2015). Beyond persistent pain, fibromyalgia is associated with substantial impairment in daily functioning and quality of life, as well as increased healthcare utilization and disability (Häuser et al., 2015). Despite advances in pharmacological and non-pharmacological treatments, many patients continue to experience significant symptom burden, highlighting the need for improved therapeutic strategies.

Contemporary models conceptualize fibromyalgia as a nociplastic pain condition, in which alterations in central nervous system processing contribute to amplified pain perception in the absence of ongoing peripheral tissue damage (Clauw, 2014; Häuser et al., 2015). Neuroimaging studies have identified functional and structural alterations in brain regions involved in pain modulation, emotional processing, and threat detection, including the insula, anterior cingulate cortex, amygdala, and prefrontal cortex (Apkarian et al., 2009; Schmidt-Wilcke & Diers, 2017). These findings support the concept of central sensitization, whereby dysregulated neural processing leads to heightened sensitivity to sensory stimuli and impaired inhibitory control of nociceptive signals. Importantly, central sensitization appears to be influenced not only by neurophysiological mechanisms but also by psychological and environmental factors, including stress exposure and emotional dysregulation.

A growing body of research suggests that traumatic experiences and chronic stress may play a significant role in the development and maintenance of fibromyalgia symptoms. Individuals with fibromyalgia report higher rates of adverse life events and trauma exposure compared with the general population, and post-traumatic stress symptoms have been associated with increased pain severity, emotional distress, and functional impairment (Afari et al., 2014; Häuser et al., 2015). The relationship between trauma and chronic pain is complex and likely involves interactions among stress-response systems, emotional regulation processes, and neurobiological pathways implicated in central sensitization (Lumley et al., 2017). Trauma-related alterations in autonomic and neuroendocrine regulation may contribute to persistent hyperarousal and increased sensitivity to pain signals, thereby reinforcing nociplastic pain mechanisms.

Consistent with the biopsychosocial model of fibromyalgia, psychological interventions have been increasingly incorporated into multimodal treatment approaches. Systematic reviews and

meta-analyses have demonstrated that psychological therapies can produce modest but clinically meaningful improvements in pain intensity, emotional distress, and functional outcomes in individuals with fibromyalgia. Cochrane reviews have concluded that cognitive-behavioral therapies and related psychological interventions yield small-to-moderate reductions in pain and depressive symptoms while improving coping and functional adjustment (Bernardy et al., 2013, 2018). Similarly, broader systematic reviews examining psychotherapy for fibromyalgia indicate that psychological treatments may reduce pain severity and emotional burden, although treatment effects vary across interventions and methodological heterogeneity remains substantial (Albajes & Moix, 2021; Gómez-de-Regil & Estrella-Castillo, 2020). These findings underscore the importance of addressing psychological processes that may contribute to pain amplification and symptom persistence.

In recent years, trauma-focused psychotherapies have attracted increasing interest as potential interventions for chronic pain conditions. One such approach is Eye Movement Desensitization and Reprocessing (EMDR) therapy, a structured psychotherapy originally developed for the treatment of post-traumatic stress disorder (Shapiro, 2014).

From an integrative neurobiological perspective, EMDR may influence mechanisms that are directly relevant to nociplastic pain conditions such as fibromyalgia. Trauma-related maladaptive memory networks are associated with persistent activation of stress-response systems, including heightened amygdala reactivity and dysregulated hypothalamic–pituitary–adrenal (HPA) axis functioning. These alterations may contribute to sustained hyperarousal, impaired emotional regulation, and increased pain sensitivity, which are central features of central sensitization. By facilitating the adaptive reprocessing of distressing experiences, EMDR may reduce the emotional and physiological reactivity associated with these memory networks, potentially leading to downstream modulation of neural circuits involved in pain processing. In this sense, EMDR may not only reduce psychological distress but also indirectly influence nociplastic pain mechanisms through the regulation of stress-related neurobiological pathways.

EMDR is based on the Adaptive Information Processing model, which proposes that distressing experiences may become stored in maladaptive memory networks when they are insufficiently processed. These maladaptive memory representations can continue to trigger emotional, cognitive, and somatic responses when activated by internal or external cues. Through bilateral stimulation and guided processing of distressing memories, EMDR aims to facilitate adaptive integration of these experiences and reduce their emotional and physiological impact.

From a mechanistic perspective, maladaptive memory processing may contribute to the maintenance of chronic pain conditions by sustaining heightened emotional reactivity and stress responses. In individuals with fibromyalgia, pain experiences may become associated with emotionally charged memories and cognitive appraisals that reinforce fear, catastrophizing, and physiological arousal. Such processes may interact with central sensitization mechanisms to amplify pain perception and maintain symptom chronicity (Lumley et al., 2017; Tesarz et al., 2014). Interventions that promote adaptive reprocessing of distressing memories and reduce emotional reactivity may therefore influence both psychological distress and pain-related physiological responses.

Emerging clinical evidence suggests that EMDR therapy may be beneficial for individuals with chronic pain conditions. Clinical studies have reported reductions in pain intensity, emotional distress, and trauma-related symptoms following EMDR interventions in patients with chronic back pain and other persistent pain syndromes (Gerhardt et al., 2016; Tesarz et al., 2014). Systematic reviews indicate that EMDR shows potential as a therapeutic approach for chronic pain populations, although the current evidence base remains limited by relatively small sample sizes, variability in treatment protocols, and heterogeneous follow-up periods (Singla et al., 2025; Valiente-Gómez et al., 2017). Within fibromyalgia specifically, early clinical studies suggest that EMDR may contribute to reductions in pain severity, depressive symptoms, and sleep disturbances, although further randomized trials are needed to confirm these findings and clarify the role of EMDR within comprehensive treatment programs (Zat Çiftçi et al., 2024).

Despite the growing interest in trauma-informed approaches to chronic pain management, high-quality randomized controlled trials examining the effects of EMDR remain scarce in individuals with fibromyalgia, particularly when integrated into multimodal treatment strategies commonly used in clinical practice. Multimodal treatment approaches for fibromyalgia typically combine pharmacological management, physical activity, and psychological support, reflecting the multifactorial nature of the disorder (Häuser et al., 2015). Evaluating whether trauma-focused interventions such as EMDR can enhance the effectiveness of multimodal care represents an important step toward improving outcomes for patients with fibromyalgia.

Therefore, the present study aimed to examine the effects of Eye Movement Desensitization and Reprocessing therapy combined with multimodal treatment on pain intensity, anxiety, depression, and quality of life in adults with fibromyalgia using a randomized controlled design. Based on previous research on psychological interventions for chronic pain and emerging evidence regarding EMDR, we hypothesized that participants receiving EMDR in addition to multimodal treatment would demonstrate greater reductions in pain intensity and greater

improvements in anxiety, depression, and quality of life compared with those receiving multimodal treatment alone.

We further hypothesized that the EMDR group would show greater improvements in depressive symptoms, anxiety levels, and quality of life following the intervention.

2. Methods

2.1 Design

This study employed a quantitative experimental design to evaluate the effects of Eye Movement Desensitization and Reprocessing (EMDR) combined with multimodal treatment in adults diagnosed with fibromyalgia. The study followed a two-arm pretest–posttest randomized controlled trial with an active control group receiving multimodal treatment alone. Outcomes included pain intensity, depression, anxiety, and quality of life measured before and after the intervention.

The study was designed as a pilot randomized controlled trial to assess feasibility and generate preliminary estimates of treatment effects. In line with methodological recommendations for pilot trials, the primary objective was not hypothesis testing but estimation of effect sizes and assessment of study procedures. Therefore, a formal a priori power calculation was not conducted, and sample size was determined based on feasibility within the available recruitment period (Leon et al., 2011; Whitehead et al., 2016).

2.2 Participants

Participants were recruited from IPS Neurocentro, a specialized neurological and psychological treatment center located in Pereira, Colombia, between October 2024 and March 2025. Patients attending the center for consultation or treatment who had a prior physician diagnosis of fibromyalgia were informed about the study and referred to the research team for eligibility screening. Participants were required to demonstrate sufficient cognitive capacity to complete study procedures and self-report assessments, which was operationalized as a score of 26 or higher on the Montreal Cognitive Assessment (MoCA). All individuals provided written informed consent prior to participation.

Participants were excluded if they presented with severe psychiatric disorders that could interfere with the implementation of psychotherapy or the interpretation of study outcomes. Specifically, exclusion criteria included current psychotic disorders, bipolar disorder, severe major depressive episodes requiring immediate specialized treatment, or active substance use disorders. Individuals with neurological conditions associated with significant cognitive impairment were also excluded. Additional exclusion criteria included inability to complete the assessment procedures or refusal to provide informed consent.

Following confirmation of eligibility and completion of baseline assessments, participants were subsequently allocated to study conditions (see Randomization and Blinding section).

Out of 40 initially screened patients, 33 met inclusion criteria and were randomized into the study groups (see Figure 1, CONSORT flow diagram). Before initiation of the intervention, five participants allocated to the experimental group withdrew from the study for personal or scheduling reasons unrelated to the intervention or study procedures. Consequently, the final analytic sample consisted of 28 participants (12 in the experimental group and 16 in the control group). Participants were recruited using a convenience sampling approach from patients receiving care at the study site and subsequently randomly assigned to the study groups. Analyses were conducted using a per-protocol approach, including only participants who completed both baseline and post-intervention assessments.

The study was approved by the institutional ethics committee of IPS Neurocentro and Universidad de Manizales under registry: CBE13_2024_Ad Referendum. All participants provided written informed consent before participation. The study was not prospectively registered; however, it received prior ethical approval and was conducted in accordance with the Declaration of Helsinki.

2.3 Randomization and Blinding

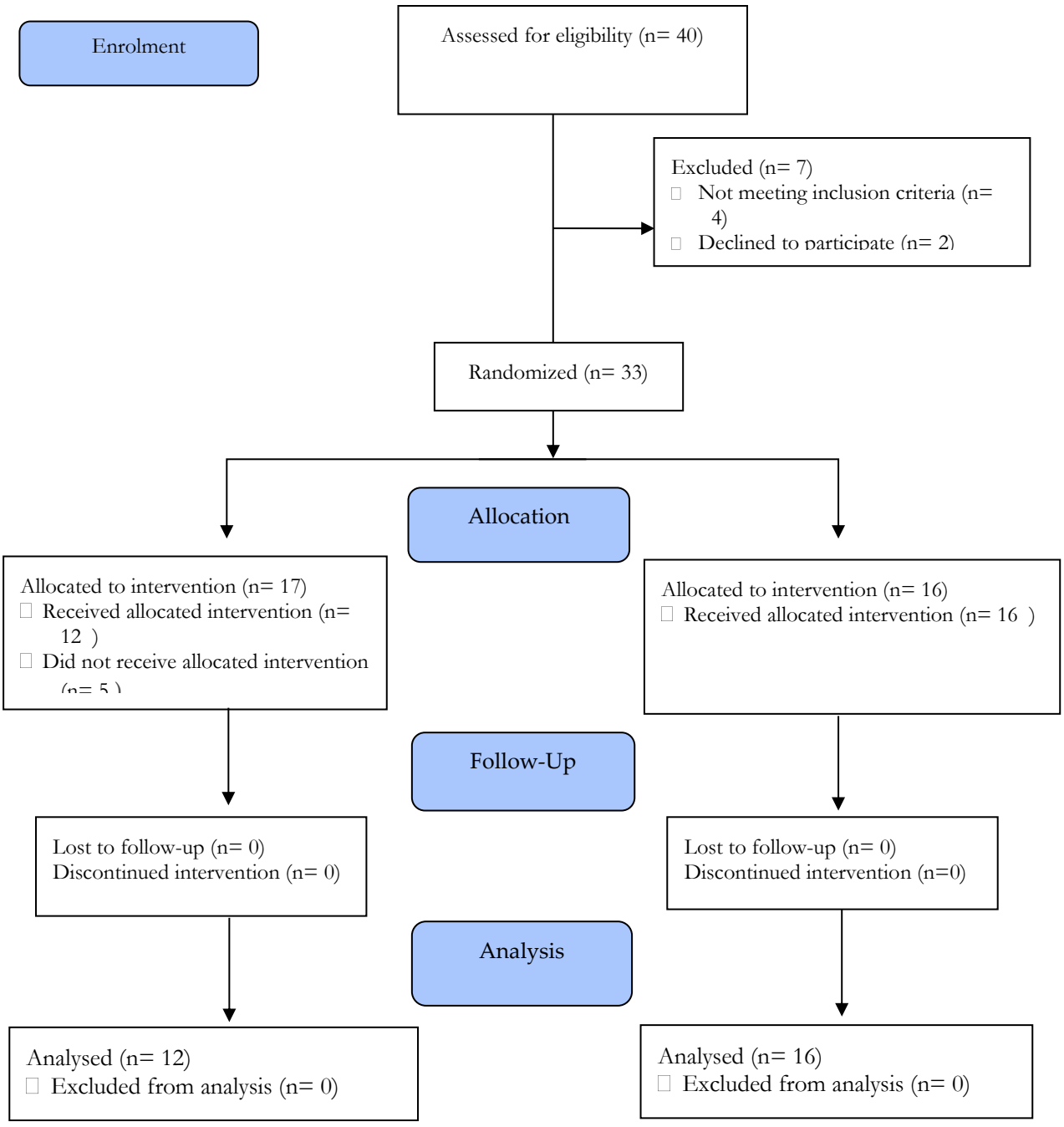
Participants who met eligibility criteria and completed baseline assessments were randomly assigned to one of two study conditions: (1) EMDR therapy combined with multimodal treatment or (2) multimodal treatment alone. Randomization was conducted using a computer-generated randomization sequence created with Research Randomizer, an online randomization tool commonly used in clinical research.

Blocked randomization with variable block sizes of four and six was used to maintain allocation balance during recruitment. Participants were assigned in a 1:1 allocation ratio to the experimental and control conditions. The randomization sequence was generated prior to recruitment by a member of the research team who was not involved in outcome assessment or statistical analysis. After completion of baseline assessment and confirmation of eligibility, participants were assigned sequentially according to the randomization list.

Due to the nature of the psychotherapeutic intervention, participants and therapists could not be blinded to treatment allocation. However, data coding and statistical analyses were conducted with masked group labels to minimize analytical bias. Participant flow throughout the study is presented in Figure 1. The procedures for assessment and intervention delivery are described below.

Figure 1.

CONSORT flow diagram of participant enrollment, allocation, follow-up, and analysis



2.4 Procedure

Participant assessment was conducted virtually. Following initial contact, participants received a Google Forms link via WhatsApp containing the assessment instruments. After completion, investigators reviewed the responses to identify any missing or inconsistent data.

The evaluation process comprised two sessions:

1. Session 1 (Screening): After signing informed consent, participants completed three instruments to verify eligibility: the BDI-II, the BAI, and the MoCA. To ensure accuracy in the

MoCA responses, each participant underwent a synchronous video session via Microsoft Teams with a trained evaluator. Based on the results, eligible participants were identified for inclusion.

2. Session 2 (Baseline Assessment): Eligible participants completed a second Google Form containing an ad hoc sociodemographic questionnaire, the Numeric Rating Scale for Pain (NRS), and the WHOQOL-BREF. All collected data were securely stored and monitored by one investigator to ensure data integrity and confidentiality.

2.5 Intervention

Participants in the experimental group received a combined protocol consisting of EMDR therapy plus multimodal treatment, while the active control group continued with multimodal treatment alone as prescribed by their physician.

The EMDR intervention followed the standard eight-phase protocol and comprised eight weekly sessions of 60–90 minutes each, conducted by therapists trained and certified in the EMDR standard protocol in both in-person and virtual formats. The protocol included: history-taking, preparation, assessment, desensitization, installation, body scan, closure, and reevaluation.

Multimodal treatment corresponded to standard clinical management prescribed by the treating physician and could include pharmacological treatment (e.g., analgesics, serotonin–norepinephrine reuptake inhibitors, or anticonvulsant pain modulators), recommendations for moderate physical exercise, and supportive psychological counseling when clinically indicated. The specific combination of treatments varied according to individual medical evaluation, reflecting routine clinical practice.

Assessments were performed at two time points: baseline (pretest) and post-intervention (after 8 weeks). The following standardized and validated instruments were applied: NRS, BDI-II, BAI, and WHOQOL-BREF. Adherence was supported through weekly supervision, medical follow-up on pharmacological adherence, monitoring of side effects, and therapy attendance verification.

2.6 Outcome Measures

2.6.1 Primary Outcome

Pain perception was the primary outcome, evaluated using the Numeric Rating Scale (NRS), a unidimensional measure of pain intensity widely used in adults with chronic pain (Hawker et al., 2011; McCaffery & Beebe, 1989). Participants selected a whole number from 0 (“no pain”) to 10 (“worst possible pain”) reflecting perceived intensity (Table 1).

2.6.2 Secondary Outcomes

Anxiety, depression, and quality of life were assessed as secondary outcomes using the following instruments:

• Beck Anxiety Inventory (BAI) – a 21-item self-report instrument that assesses the severity of anxiety symptoms (Beck et al., 1988). Each item is rated on a 0–3 scale, evaluating both physical and emotional symptoms (Table 1).

• Beck Depression Inventory–II (BDI-II) – a 21-item self-report instrument assessing depressive severity (Beck et al., 1996). Total scores range from 0 to 63, with higher scores indicating more severe symptoms (Table 1).

• WHOQOL-BREF – developed by the World Health Organization to measure quality of life across four domains: physical health, psychological well-being, social relationships, and environment (Lucas-Carrasco, 2012). The instrument consists of 26 items rated on a 5-point Likert scale ($\alpha > 0.70$) (Table 1).

2.7 Cognitive Screening

To ensure cognitive integrity, the Montreal Cognitive Assessment (MoCA) was used. This tool evaluates eight domains (visuospatial/executive, naming, memory, attention, language, abstraction, delayed recall, and orientation) and has demonstrated high sensitivity for mild cognitive impairment (Bruijnen et al., 2020; Nasreddine et al., 2005). It is validated for the Colombian adult population (Clavijo-Morán et al., 2022) (Table 1).

Table 1.

Description and Psychometric Properties of Assessment Instruments

Instrument	Construct assessed	Structure / scoring	Reliability evidence	Validity evidence	Key reference
Montreal Cognitive Assessment (MoCA)	Global cognitive functioning	30-point screening tool assessing attention, executive functions, memory, language, visuospatial abilities, abstraction, and orientation. Scores ≥26 typically indicate normal cognition.	Excellent internal consistency ($\alpha \approx .83$) and high test–retest reliability (ICC ≈ .92).	Demonstrates strong concurrent validity with the Mini-Mental State Examination and high sensitivity for detecting mild cognitive impairment.	Nasreddine et al., 2005
Beck Anxiety Inventory (BAI)	Severity of anxiety symptoms	21-item self-report questionnaire assessing somatic and cognitive symptoms of anxiety over the past week; scores range from 0–63.	High internal consistency ($\alpha \approx .90–.94$) and good test–retest reliability ($r \approx .75$).	Demonstrates strong convergent validity with other anxiety measures and discriminant validity from depression scales.	Beck et al., 1988
Beck Depression Inventory-II (BDI-II)	Severity of depressive symptoms	21-item self-report measure assessing depressive symptoms during the past two weeks; total scores range from 0–63.	Excellent internal consistency ($\alpha \approx .91$) and high test–retest reliability ($r \approx .93$).	Strong convergent validity with clinical ratings of depression and sensitivity to treatment-related changes.	Beck et al., 1996

WHOQOL-BREF	Health-related quality of life	26 items across four domains: physical health, psychological health, social relationships, and environment.	Good internal consistency across domains ($\alpha \approx .66–.84$).	Demonstrates strong construct validity and cross-cultural validity across multiple populations.	WHOQOL Group, 1998
Numeric Rating Scale (NRS) for Pain	Pain intensity	Single-item scale from 0 ("no pain") to 10 ("worst imaginable pain") assessing average pain intensity.	Demonstrates high test–retest reliability ($r \approx .95$).	Strong concurrent validity with visual analogue scales and sensitivity to clinical change.	Farrar et al., 2001

2.8 Sociodemographic Questionnaire

A semi-structured, researcher-designed survey collected sociodemographic and clinical data such as treatment adherence duration, use of non-prescription medications, and illness onset age. This facilitated control of potential confounding variables such as pain-related sleep disturbances or medication overuse.

2.9 Statistical Analysis Plan

Data were coded and analyzed using R software (R Core Team, 2024). Descriptive statistics were used to summarize sociodemographic and clinical variables: frequencies and percentages for categorical data, and means ± standard deviation or medians with interquartile ranges for continuous variables. Pain intensity (NRS) was specified as the primary outcome, while anxiety, depression, and quality of life were considered secondary outcomes.

Baseline comparability between groups was assessed using Mann–Whitney U tests for continuous variables and χ^2 or Fisher's exact tests for categorical variables. Bayes Factors (BF_{10}) were computed to evaluate evidence strength in favor of the alternative or null hypotheses. Within-group pre–post changes were examined using paired Wilcoxon tests (frequentist and Bayesian versions), reporting effect sizes (r biserial) and Bayes Factors. Between-group effects were tested using linear mixed-effects models with random intercepts per participant, restricted maximum likelihood (REML) estimation, and Satterthwaite's degrees of freedom correction. The key parameter was the Time × Group interaction, adjusted for age, treatment duration, and age at fibromyalgia onset. Coefficients (β), standard errors, p-values, and 95% confidence intervals were reported.

Categorical outcomes (e.g., pain and depression severity levels) were compared using χ^2 tests and Bayesian analyses. Statistical significance was set at $\alpha = .05$ (two-tailed). No imputation procedures were required, as analyses were restricted to participants with complete pre- and post-intervention data.

3. Results

3.1 Sociodemographic and Clinical Characteristics

All analyses were conducted on a per-protocol sample including participants who completed both pre- and post-intervention assessments (n = 28; experimental = 12, control = 16). At baseline, the sample was predominantly female in both groups. The onset of fibromyalgia symptoms most commonly occurred between 18 and 29 years of age—reported by 93.3% of the active control group and 77.8% of the experimental group (Table 2). In both groups, pain intensity on the Numeric Rating Scale (NRS) was high at baseline (60.0% in the control group; 61.1% in the experimental group), indicating clinically significant pain severity at study entry.

Descriptive baseline characteristics are reported for the randomized sample, whereas inferential analyses are based on the per-protocol sample.

Regarding depressive symptomatology (BDI-II), greater variability was observed in the experimental group, where 16.7% of participants exhibited severe symptoms, compared with none in the control group. Conversely, the control group showed a higher proportion of mild and moderate depression levels.

Overall, the findings suggest baseline comparability between the groups in clinical characteristics, with a slightly higher severity of depressive symptoms in the experimental group—a difference statistically controlled for in subsequent mixed-model analyses.

Table 2.

Sociodemographic Characteristics and Baseline Clinical Measures of Pain Intensity and Depressive Symptom Severity

Variable	Category	Active Control Group (n = 16)	Experimental Group (EMDR + Multimodal) (n = 17)
Age at Onset of Fibromyalgia	< 18 years	6.7% (n = 1)	11.1% (n = 2)
	18–29 years	93.3% (n = 14)	77.8% (n = 14)
	40–49 years	0%	11.1% (n = 2)
Pain Intensity (Numeric Rating Scale, Pretest)	High	60.0% (n = 9)	61.1% (n = 11)
	Moderate	26.7% (n = 4)	22.2% (n = 4)
	Low	6.7% (n = 1)	16.7% (n = 3)
Depressive Symptom Severity (BDI-II, Pretest)	Minimal	20.0% (n = 3)	38.9% (n = 7)
	Mild	46.7% (n = 7)	16.7% (n = 3)
	Moderate	33.3% (n = 5)	27.8% (n = 5)
	Severe	0.0%	16.7% (n = 3)

3.2 Baseline Comparisons Between Groups

Preliminary analyses indicated no significant baseline differences between the experimental (n = 17) and control (n = 16) groups across all clinical variables (Table 3).

For pain intensity (NRS), means were similar between groups (control: 7.07 ± 2.34; experimental: 6.78 ± 2.91), showing no statistically significant difference (U = 142.50, p = .797, r = –0.06, BF_{10} = 0.33).

Similarly, there were no group differences in depression (U = 138.50, p = .914, r = –0.04, BF_{10} = 0.35) or anxiety (U = 153.50, p = .515, r = –0.11, BF_{10} = 0.37).

Across the WHOQOL-BREF domains, there were also no significant differences: physical (p = .197), psychological (p = .173), social (p = .714), and environmental (p = .716). These results confirm that both groups were statistically comparable at baseline.

Table 3.

Comparison between groups at pretest: descriptive statistics and Mann-Whitney contrasts (frequentist and Bayesian)

Variable	Group	N	$\bar{x}$	SD	U	p	r biserial (IC95%)	BF_{10}
NRS (pain)	Control	16	7.07	2.34	142.50	.797	–0.056 [–0.428, 0.333]	0.332
	Experimental	17	6.78	2.91				
BDI-II	Control	16	17.27	4.89	138.50	.914	–0.044 [–0.403, 0.359]	0.345
	Experimental	17	18.78	10.60				
BAI	Control	16	22.33	13.11	153.50	.515	–0.111 [–0.493, 0.258]	0.366
	Experimental	17	18.78	15.74				
WHO-Physical	Control	16	11.54	1.81	99.00	.197	0.267 [–0.128, 0.588]	0.723
	Experimental	17	12.32	1.96				
WHO-Psychological	Control	16	10.53	2.42	97.00	.173	0.281 [–0.112, 0.599]	0.674
	Experimental	17	11.39	2.47				
WHO-Social	Control	16	11.47	2.51	124.50	.714	–0.078 [–0.313, 0.446]	0.374
	Experimental	17	11.89	2.57				
WHO-Environment	Control	16	11.33	1.72	124.50	.716	–0.078 [–0.313, 0.446]	0.374
	Experimental	17	12.67	2.28				

3.3 Pre–Post Changes in the Experimental Group (EMDR + Multimodal Treatment)

In the experimental group, statistically significant reductions were observed in both pain intensity and depressive symptoms following the intervention (Table 4). Mean pain scores on

the Numeric Rating Scale decreased from 6.78 (SD = 2.73) at baseline to 3.83 (SD = 2.29) post-intervention (W = 28.0, p = .022, BF_{10} = 13.21). Similarly, depressive symptoms declined from 18.78 (SD = 10.60) to 10.42 (SD = 5.90) (W = 32.5, p = .047, BF_{10} = 4.37).

No statistically significant change was observed in anxiety levels (W = 20.5, p = .779, BF_{10} = 0.31), and no significant pre–post changes were detected across WHOQOL-BREF domains (all p > .05).

Table 4.

Pre-post-performance in the experimental group (EMDR+ Multimodal): descriptive statics and Bayesian Wilcoxon contrasts

Variable	N (Pre/Post)	Mean (SD) Pre	Mean (SD) Post	W	p (two-tailed)	Rank- biserial (r)	BF_{10} (Bayes)
NRS (pain)	17 / 12	6.78 (2.73)	3.83 (2.29)	28.0	.022	1.00 (±0.40)	13.21
BDI-II (Depression)	17 / 12	18.78 (10.60)	10.42 (5.90)	32.5	.047	0.81 (±0.38)	4.37
BAI (Anxiety)	17 / 12	18.78 (11.57)	18.58 (13.59)	20.5	.779	0.14 (±0.38)	0.31
WHO-Physical	17 / 12	12.32 (1.96)	11.62 (1.89)	6.0	.181	1.00 (±0.55)	0.69
WHO-Psychological	17 / 12	11.82 (2.48)	12.67 (1.91)	4.0	.855	–0.20 (±0.50)	0.31
WHO-Social	17 / 12	11.63 (2.99)	11.56 (3.74)	3.0	.999	0.00 (±0.55)	0.35
WHO-Environment	17 / 12	12.71 (2.13)	12.71 (1.82)	3.5	.999	0.17 (±0.55)	0.34

3.4 Pre–Post Changes in the Control Group (Multimodal Treatment Only)

In the active control group, no statistically significant changes were observed in pain intensity, depressive symptoms, or anxiety between pretest and posttest assessments (Table 5). Pain scores showed minimal variation from baseline (M = 7.07, SD = 2.34) to post-intervention (M = 6.73, SD = 2.43; W = 17.5, p = .611, BF_{10} = 0.34). Similarly, depressive symptoms remained stable (M = 17.27, SD = 4.89 vs. M = 17.93, SD = 9.21; W = 15.0, p = .933, BF_{10} = 0.28), as did anxiety levels (M = 22.33, SD = 13.11 vs. M = 24.13, SD = 13.28; W = 8.0, p = .675, BF_{10} = 0.34).

A statistically significant improvement was observed only in the psychological domain of the WHOQOL-BREF (W = 0.0, p = .035, BF_{10} = 3.27), whereas the remaining domains did not show significant changes.

Table 5.

Descriptive results and pre-post comparisons in the active control group (Multimodal Treatment) using classical and Bayesian Wilcoxon tests

Variable	N (Pre/Post)	Mean (SD) Pre	Mean (SD) Post	W	p (two-tailed)	Rank- biserial (r)	BF_{10} (Bayes)
NRS (pain)	16 / 16	7.07 (2.34)	6.73 (2.43)	17.5	.611	0.25 (±0.40)	0.34
BDI-II (Depression)	16 / 16	17.27 (4.89)	17.93 (9.21)	15.0	.933	0.07 (±0.40)	0.28
BAI (Anxiety)	16 / 16	22.33 (13.11)	24.13 (13.28)	8.0	.675	–0.24 (±0.43)	0.34
WHO-Physical	16 / 16	11.54 (1.81)	11.47 (1.58)	0.0	.058	–1.00 (±0.46)	1.51
WHO-Psychological	16 / 16	10.53 (1.68)	11.47 (1.81)	0.0	.035	–1.00 (±0.43)	3.27
WHO-Social	16 / 16	11.73 (2.51)	11.13 (2.68)	0.0	.174	–1.00 (±0.55)	0.61
WHO-Environment	16 / 16	12.33 (1.71)	12.13 (1.76)	13.0	.674	0.24 (±0.43)	0.32

3.5 Between-Group Differences: Linear Mixed-Effects Models

Linear mixed-effects analyses revealed significant Time × Group interaction effects for pain intensity and depressive symptoms (Table 6). For pain (NRS), a significant interaction was observed ($\beta = -0.57$, SE = 0.26, t = 2.16, p = .040), indicating a greater reduction over time in the EMDR + multimodal group compared with the control group. A similar pattern was found for depressive symptoms (BDI-II; $\beta = -2.37$, SE = 1.02, t = 2.38, p = .024), reflecting greater improvement in the experimental group.

A significant interaction effect was also observed for the physical domain of quality of life (WHOQOL-Physical; $\beta = 0.19$, SE = 0.07, t = 2.72, p = .010), while no significant interaction effects were detected for the psychological, social, or environmental domains (all $p > .05$).

These results indicate significant Time × Group interaction effects for pain and depressive symptoms.

Table 6.

Results of linear mixed models: Time × Group interaction in clinical and quality-of-life variables

Variable	β	SE	t	p
NRS (pain)	− 0.567	0.263	2.16	.040
BDI-II (Depression)	− 2.374	1.020	2.38	.024
WHO-Physical	0.190	0.070	2.72	.010
Psychological	0.140	0.159	0.89	.385
WHO-Social / WHO-Environment	—	—		> .05

3.6 Post-Intervention Clinical Distribution

Post-intervention distributions indicated differences between groups in pain and depressive symptom categories. In the experimental group, a higher proportion of participants reported low pain levels (50.0%) compared with the control group (20.0%), while a greater proportion of control participants remained in the high-pain category (60.0% vs. 16.7%).

Similarly, depressive symptom distributions favored the experimental group, with 58.3% of participants reporting minimal symptoms and no participants remaining in the severe range, whereas a small proportion of control participants continued to exhibit severe depressive symptoms (6.7%).

Anxiety distributions showed less consistent differences between groups, with the control group displaying a higher proportion of severe anxiety cases. Overall, these distributions reflect differences between groups in pain and depressive symptom outcomes following the intervention period.

4. Discussion

This study examined the effects of Eye Movement Desensitization and Reprocessing (EMDR) combined with multimodal treatment in adults with fibromyalgia, compared with an active control group. The findings indicate that the combined intervention was associated with reductions in pain intensity and depressive symptoms, while anxiety levels and overall quality of life remained largely unchanged. Importantly, the pattern of findings was outcome-specific, with significant effects observed for pain and depressive symptoms, but not for anxiety or quality-of-life domains. In contrast, the active control group showed stable scores in pain, depression, and anxiety, with only a slight improvement in the psychological domain of quality of life.

These results are consistent with prior studies supporting the potential role of EMDR in the management of fibromyalgia and other chronic pain syndromes (Gerhardt et al., 2016; van Rood & de Roos, 2009; Zat Çiftçi et al., 2024). Reductions in pain perception may reflect processes consistent with the theoretical framework of EMDR, including the reprocessing of maladaptive memory networks and attenuation of affective responses associated with pain experiences (Landin-Romero et al., 2018). The concurrent reduction in depressive symptomatology observed here aligns with the hypothesis that EMDR facilitates reprocessing of dysfunctional affective material, thereby diminishing negative mood states that amplify chronic pain perception.

From a theoretical perspective, these findings can be interpreted within the Adaptive Information Processing (AIP) model, which posits that maladaptively stored memories contribute to persistent emotional and somatic symptoms (Shapiro, 2014). EMDR is proposed

to facilitate the integration of these memories into adaptive networks. Additionally, the working memory taxation hypothesis suggests that dual-attention tasks used during EMDR may reduce the vividness and emotional intensity of distressing representations (van den Hout & Engelhard, 2012), which may be particularly relevant in chronic pain conditions characterized by persistent affective–sensory coupling.

Nevertheless, the lack of significant improvement in anxiety and overall quality of life differs from certain studies reporting broader benefits following longer treatment durations (Zat Çiftçi et al., 2024). One plausible explanation is the relatively short follow-up period (8 weeks) of the current trial, which may be insufficient for changes in more stable constructs such as anxiety or psychosocial functioning to emerge. Moreover, the small sample size may have limited statistical power to detect medium or small effects in secondary outcomes.

From a clinical standpoint, these findings suggest that EMDR, by addressing both emotional and cognitive components of pain, may be relevant to mechanisms associated with central sensitization in fibromyalgia. The magnitude of reduction in pain intensity and depressive symptoms observed in the experimental group suggests changes that may be clinically meaningful, particularly given the chronic nature of the condition.

The study also presents methodological strengths, including the use of an experimental design with an active control group, validated psychometric instruments, and the application of linear mixed-effects and Bayesian analyses.

However, several limitations should be considered. The reduced sample size and attrition may have constrained statistical power and external validity. The use of a per-protocol analytic approach may have introduced bias by excluding participants who did not complete the intervention. The short-term follow-up prevents conclusions about long-term effects. Additionally, the heterogeneity of multimodal treatment components may have introduced confounding factors.

Despite these limitations, the findings suggest that EMDR integrated with multimodal care may be a valuable adjunct for patients with fibromyalgia, particularly those with comorbid depressive symptoms. Future studies with larger samples and longer follow-up are warranted.

5. Conclusion

The present study suggests that the integration of Eye Movement Desensitization and Reprocessing (EMDR) into multimodal treatment may be associated with reductions in pain intensity and depressive symptoms in adults with fibromyalgia. These effects were outcome-specific, as no significant changes were observed in anxiety or quality-of-life domains within the study timeframe.

Given the modest sample size, short follow-up period, and per-protocol analytic approach, these findings should be interpreted with caution. Nevertheless, the results provide preliminary evidence supporting the potential role of EMDR as an adjunctive intervention targeting affective and cognitive dimensions of chronic pain.

Ethical approval

The present study was approved by the Bioethics Committee of the university Of Manizales on December 20, 2024 (CBE13_2024_Ad Referéndum.).

Informed Consent Statement

All participants completed the informed consent form and agreed to take part in the study.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Conflict of interest statement

The authors declare that there is no conflict of interest regarding the research, authorship, or publication of this article.

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Authors' Contribution

WDM: contributed to the conceptualization, literature review, writing, and stylistic editing of the manuscript. MBG: participated in data collection, data interpretation, manuscript writing, and critical revision of the final version. DALM: Was responsible for methodological validation, text revision, stylistic editing, and final approval of the version to be published. All authors read and approved the final manuscript and agree to be accountable for all aspects of the work.

AI Disclosure Statement

The authors declare that no artificial intelligence (AI) tools, including generative AI systems, were used in the conception, design, analysis, interpretation of data, drafting, or writing of this manuscript. All intellectual content, scientific reasoning, and manuscript preparation were carried out solely by the authors.

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