Mental Health and Lifestyle Journal

Year 2025
Volume 3
Issue 1

A Comparison of the Effectiveness of Hypnotherapy and Acceptance and Commitment Therapy (ACT) on Working Memory in Patients with Fibromyalgia in Tehran

Leila. Rasti[1], Alireza Maredpour[2*]

1 PhD Student, Department of Psychology, Yasuj Branch, Islamic Azad University, Yasuj, Iran
2 Assistant professor, Department of Psychology,Yasuj Branch, Islamic Azad University, yasuj, Iran

*Correspondence: Maredpour@iau.ir

Article type:
Original Research

Article history:
Received 18 October 2024
Revised 21 January 2025
Accepted 16 February 2025
Published online 01 March 2025

ABSTRACT

The present study aimed to compare the effectiveness of Acceptance and Commitment Therapy (ACT) and hypnotherapy on working memory performance—specifically response accuracy and reaction time—in patients with fibromyalgia in Tehran. This semi-experimental study employed a randomized pretest-posttest-follow-up design with a control group. Forty-five patients diagnosed with fibromyalgia based on rheumatologic and orthopedic evaluations were selected via convenience sampling from clinics and hospitals in Tehran. Participants were randomly assigned into three groups: ACT (n = 15), hypnotherapy (n = 15), and control (n = 15). The ACT intervention was delivered based on a validated 8-session protocol, and hypnotherapy followed a structured 10-session clinical hypnosis model. The control group received standard pharmacological treatment without psychological intervention. Working memory was assessed using the N-Back task at three stages: pretest, posttest, and three-month follow-up. Data were analyzed using repeated measures ANOVA, Bonferroni post hoc tests, and MANCOVA. Both ACT and hypnotherapy groups showed significant improvements in working memory response accuracy and reaction time from pretest to posttest and follow-up ($p < .01$), whereas the control group exhibited no sustained improvements. ACT demonstrated significantly greater effects than hypnotherapy and medication at the follow-up stage in both cognitive dimensions ($p < .01$). Bonferroni comparisons revealed significant differences between ACT and the control group ($p < .01$), as well as between ACT and hypnotherapy in favor of ACT at follow-up. Hypnotherapy was also significantly more effective than medication in improving working memory ($p < .05$). The results suggest that both ACT and hypnotherapy are effective interventions for enhancing working memory in patients with fibromyalgia, with ACT showing superior long-term efficacy. These findings support the incorporation of psychological therapies into standard care for cognitive symptom management in fibromyalgia.

Keywords: Acceptance and Commitment Therapy, Hypnotherapy, Working Memory, Fibromyalgia

How to cite this article:
Rasti, L., & Maredpour, A.R. (2025). A Comparison of the Effectiveness of Hypnotherapy and Acceptance and Commitment Therapy (ACT) on Working Memory in Patients with Fibromyalgia in Tehran. *Mental Health and Lifestyle Journal, 3*(1), 1-13. https://doi.org/10.61838/mhlj.3.1.4

Introduction

Fibromyalgia is a complex and chronic pain disorder characterized by widespread musculoskeletal pain, cognitive disturbances, fatigue, sleep dysfunction, and emotional distress. Beyond its physical manifestations, fibromyalgia significantly impairs patients' quality of life, executive functioning, and daily performance, particularly in cognitive domains such as working memory. In recent years, researchers have increasingly focused on non-pharmacological interventions to manage these multidimensional symptoms, including psychotherapeutic approaches like Acceptance and Commitment Therapy (ACT) and hypnotherapy, which show promise in both symptom relief and cognitive rehabilitation (1).

The cognitive challenges in fibromyalgia are frequently referred to as "fibrofog," a term used to describe impairments in attention, executive functioning, and working memory. Studies suggest that such dysfunctions are closely linked with chronic pain, emotional dysregulation, and the overwhelming burden of persistent symptoms (2). In this context, working memory—defined as the capacity to temporarily hold and manipulate information—is particularly vulnerable, and improving this domain is critical to enhancing patients' daily functionality. Traditionally, pharmacotherapy has offered limited efficacy in managing cognitive impairments in fibromyalgia, which underscores the need for alternative or complementary psychological interventions (3).

One such intervention is Acceptance and Commitment Therapy (ACT), a third-wave cognitive-behavioral approach that emphasizes psychological flexibility, mindfulness, and value-driven behavior in the face of distressing thoughts and emotions. Rather than attempting to reduce symptoms directly, ACT teaches patients to accept their internal experiences and commit to behaviors aligned with personal values. This approach has demonstrated considerable efficacy in alleviating pain-related distress, anxiety, and depression among fibromyalgia patients (4-6). Furthermore, recent studies have highlighted the potential of ACT to improve executive functioning, including working memory, through mechanisms involving attentional control, cognitive defusion, and increased present-moment awareness (7, 8).

The utility of ACT in fibromyalgia has been well documented in clinical trials and meta-analyses. For example, a comprehensive systematic review and meta-analysis confirmed that ACT significantly reduces anxiety and depression symptoms in fibromyalgia populations, offering a viable alternative to traditional cognitive-behavioral therapy (CBT) (2). A single-case design study further demonstrated the feasibility and clinical relevance of brief ACT protocols in enhancing cognitive and emotional outcomes in fibromyalgia patients (5). From a mechanistic standpoint, ACT's emphasis on mindful attention and committed action supports the cognitive restructuring processes necessary for working memory enhancement (7).

In parallel, hypnotherapy has emerged as another promising intervention for fibromyalgia management, especially for addressing chronic pain, fatigue, and cognitive disturbances. Hypnotherapy involves inducing a trance-like state to deliver therapeutic suggestions that promote symptom relief and cognitive reorganization. The rationale for applying hypnotherapy in fibromyalgia is grounded in its capacity to reduce central sensitization and improve autonomic regulation, both of which are relevant to the pathophysiology of the disorder (9, 10). Notably, hypnotherapy has demonstrated positive effects not only on pain reduction but also on improving cognitive performance, including concentration, memory retrieval, and reaction time (11). It appears particularly effective when integrated with cognitive-behavioral frameworks, as in cognitive-behavioral hypnotherapy, which synergistically targets maladaptive beliefs and physical symptoms (10).

Hypnotherapy's impact on cognitive functioning has been examined in clinical trials showing significant reductions in cognitive fatigue and improvements in executive control among patients with chronic conditions, including fibromyalgia (9). A recent comparative study in Tehran further corroborated these findings, revealing that hypnotherapy significantly reduces chronic fatigue and pain severity in fibromyalgia patients, suggesting a secondary benefit to cognitive domains like working memory and attention span (12). Moreover, when administered by trained clinicians using structured protocols, hypnotherapy can provide a tailored and immersive experience conducive to neuroplastic adaptation (13).

From a neurocognitive perspective, both ACT and hypnotherapy target overlapping yet distinct mechanisms relevant to working memory. ACT improves cognitive function by increasing attentional regulation and reducing experiential avoidance, which can interfere with memory processing (1). Hypnotherapy, on the other hand, facilitates focused attention and reduced cognitive interference through hypnotic induction, which may enhance mental clarity and memory retention. These mechanisms justify the use of both therapies in addressing the cognitive sequelae of fibromyalgia. In this regard, the current study is situated within a growing body of literature advocating for integrative, psychologically informed approaches to symptom management and cognitive enhancement in chronic pain populations (14).

While previous studies have investigated the effects of ACT or hypnotherapy on emotional and physical outcomes in fibromyalgia patients, relatively few have directly compared their efficacy on working memory—a domain of profound functional significance. For example, in a study comparing ACT with cognitive rehabilitation, ACT yielded significant improvements in memory and attention, highlighting its broader cognitive benefits (14). Another recent study directly comparing ACT and hypnotherapy demonstrated comparable efficacy in reducing pain intensity, with slight advantages for ACT in terms of emotional flexibility and cognitive clarity (13). These findings point to the need for more rigorous and targeted investigations focusing specifically on cognitive functions such as working memory, which are often overlooked in fibromyalgia research.

In addition to symptom-focused outcomes, recent research has also begun to explore the cost-utility and accessibility of psychological interventions for chronic pain. ACT, particularly in digital and self-guided formats, has been shown to be both effective and cost-efficient, making it a scalable intervention for widespread implementation (1). Similarly, structured hypnotherapy protocols, when delivered by trained professionals, are increasingly recognized for their affordability and low-risk profile, supporting their integration into multidisciplinary care models (15). These economic and practical considerations further underscore the importance of comparative studies that can guide clinical decision-making.

Taken together, there is a compelling rationale for comparing the effectiveness of ACT and hypnotherapy on working memory performance in patients with fibromyalgia.

Methods and Materials

Study Design and Participants

This study employed a semi-experimental design based on a randomized selection method, specifically utilizing a pretest-posttest-follow-up structure with a control group. The experimental design involved three groups—one experimental group receiving hypnotherapy, one receiving Acceptance and Commitment Therapy (ACT), and one control group—as well as three assessment phases: pretest, posttest, and three-

month follow-up. Participants were patients diagnosed with fibromyalgia according to clinical evaluations confirmed by a rheumatologist, orthopedic specialist, or spinal subspecialist. Initial recruitment involved 80 patients who met the inclusion criteria and were selected through convenience sampling from hospitals and therapeutic clinics in Tehran. Based on a random assignment procedure, 45 participants were allocated to three groups: 15 to hypnotherapy, 15 to ACT, and 15 to the control group. While the experimental groups received respective therapeutic interventions, the control group only continued their standard pharmacological treatment for fibromyalgia, without any psychological intervention. The study's data collection occurred across three time points: before the intervention (pretest), immediately after (posttest), and again at a three-month follow-up to assess the stability of therapeutic effects.

Inclusion criteria were: current use of standard fibromyalgia and analgesic medications, a minimum education level of middle school, residence in Tehran, informed consent and willingness to participate, and a clinical diagnosis of fibromyalgia confirmed by relevant medical professionals. Exclusion criteria included: usage of specialized fibromyalgia medications in any group, presence of severe psychiatric disorders, concurrent participation in other psychotherapy programs, receiving non-study-related medical treatments during the trial period, psychiatric hospitalization, missing more than three sessions, relocation, incomplete participation in therapeutic processes, failure to complete therapy assignments, and incomplete response to questionnaires.

Data Collection

The primary instrument used to assess working memory was the N-back task, a well-validated cognitive performance task designed to evaluate executive function. First introduced by Kirchner in 1958, the N-back task presents a sequential array of stimuli—commonly visual—where the participant must determine whether the current stimulus matches one presented n steps earlier. Difficulty levels increase with higher n values. For example, a 1-back task requires comparison with the immediately preceding stimulus, whereas a 3-back task involves comparing with the stimulus three steps prior. This task effectively measures both storage and manipulation of cognitive information, making it suitable for assessing working memory performance. It has gained widespread acceptance in experimental cognitive psychology and neuroimaging studies. Research suggests that while its convergent validity is moderate in individual-difference comparisons, its construct validity for working memory performance is strong.

Interventions

ACT integrates behavioral change techniques with mindfulness and acceptance-based strategies to promote psychological flexibility. In this study, the ACT intervention was based on the manual by Wicksell and colleagues (2014) for chronic pain. The protocol was delivered over eight 60-minute sessions, conducted twice weekly. The first session introduced the group and administered the pretest, while clarifying therapeutic rules and ACT principles, including creative hopelessness and experiential avoidance. Subsequent sessions focused on ACT core processes such as acceptance, cognitive defusion, contact with the present moment, self-as-context, values clarification, and committed action. Techniques included metaphors like “the two mountains,” “white rabbit,” and “the bus,” mindfulness exercises, and assignments

to practice values-based behavior. The eighth session included reviewing therapeutic gains, reinforcing value-driven goal setting, administering the posttest, and encouraging ongoing mindfulness practice.

The hypnotherapy protocol followed a structured clinical hypnotherapy approach, drawing from classical methods and established sources such as David Elman's induction techniques, Michael Yapko's resource-based hypnotherapy, and the Clinical Hypnosis Manual by Lynn and colleagues. Sessions were conducted by a certified clinical psychologist trained by the Iranian Clinical Hypnosis Association, across ten one-hour sessions. The first session focused on education and demystification of hypnosis, evaluating the patient's pain, fatigue, and working memory using standardized tools such as the Fibromyalgia Impact Questionnaire (FIQ), and preparing for hypnotic induction with suggestibility tests. The second session included classic induction and deepening techniques, promoting physical and mental relaxation. The third session focused on pain management using guided imagery and direct analgesic suggestions. The fourth and fifth sessions targeted sleep quality and working memory enhancement, respectively, using focused cognitive suggestions and mental visualization exercises. Session six addressed chronic fatigue through energizing suggestions and imagery. Session seven trained participants in self-hypnosis techniques for daily symptom management. The eighth session promoted mindfulness and acceptance of bodily states within a hypnotic trance. The ninth session consolidated therapeutic progress using reinforcement suggestions, and the final session involved evaluating outcomes, posttest assessment, and planning for future self-management through self-hypnosis.

Data analysis

Following the completion of the interventions, data collected at the pretest, posttest, and follow-up stages were analyzed using both descriptive and inferential statistical methods. Descriptive statistics included measures of central tendency and dispersion such as means, standard deviations, standard error, minimum and maximum scores, line charts to depict changes in means across the three stages for each group, and box plots to illustrate score distributions. At the inferential level, prerequisite assumptions were first tested, including normal distribution of variables, homogeneity of error variances, independence of observations, and equality of covariance matrices (assessed using Mauchly's test). Based on assumption validity, Multivariate Analysis of Covariance (MANCOVA), repeated measures ANOVA, and post hoc comparisons were conducted. In the repeated measures ANOVA, time (pretest, posttest, follow-up) was treated as a within-subject factor, and group membership (ACT, hypnotherapy, control) as a between-subject factor. All analyses were performed using SPSS version 26. Pairwise group comparisons were conducted using Tukey's post hoc test to determine significant differences between intervention effects.

Findings and Results

The demographic characteristics of the participants across the three groups—control, ACT, and hypnotherapy—were relatively balanced in terms of gender, education, age, marital status, and occupation. In terms of gender distribution, the control group consisted of 8 women (47.1%) and 9 men (52.9%), the ACT group included 10 women (58.8%) and 7 men (41.2%), and the hypnotherapy group had 10 women (55.6%) and 8 men (44.4%). Regarding educational level, in the control group, 3 participants (17.6%) had a high school diploma, 8 (47.1%) held a bachelor's degree, and 6 (35.3%) had a master's degree. In the ACT group, 4 participants (23.5%) had a diploma, 10 (58.8%) had a bachelor's degree, and 3 (17.6%) had a master's

degree. Similarly, in the hypnotherapy group, 4 participants (22.2%) had a diploma, 11 (61.1%) held a bachelor's degree, and 3 (16.7%) held a master's degree. Age distribution varied across the groups: in the control group, 3 participants (17.6%) were aged 21–30, 6 (35.3%) were 31–40, 3 (17.6%) were 41–50, and 5 (29.4%) were above 50 years old. The ACT group included 5 participants (29.4%) aged 21–30, 4 (23.5%) aged 31–40, 4 (23.5%) aged 41–50, and 4 (23.5%) over 50. In the hypnotherapy group, 5 participants (27.8%) were between 21–30, 3 (16.7%) between 31–40, 4 (22.2%) between 41–50, and 6 (33.3%) were older than 50. Concerning marital status, in the control group, 10 participants (58.8%) were single and 7 (41.2%) were married. The ACT group had 7 single (41.2%) and 10 married (58.8%) individuals, while the hypnotherapy group had an equal split: 9 single (50%) and 9 married (50%). Finally, in terms of employment, the control group included 3 unemployed participants (17.6%), 10 self-employed (58.8%), and 4 employed in government jobs (23.5%). The ACT group comprised 5 unemployed (29.4%), 7 self-employed (41.2%), and 5 with government employment (29.4%). In the hypnotherapy group, there were 5 unemployed (27.8%), 8 self-employed (44.4%), and 5 with government jobs (27.8%).

Table 1. Means and Standard Deviations of Working Memory and Its Dimensions by Intervention Groups

Working Memory Dimensions	Phase	Control (M ± SD)	ACT (M ± SD)	Hypnotherapy (M ± SD)
Response Accuracy	Pre-test	40.27 ± 1.30	40.00 ± 1.00	40.00 ± 1.00
	Post-test	31.07 ± 1.53	43.80 ± 1.42	43.27 ± 2.15
	Follow-up	28.07 ± 1.67	41.60 ± 1.84	38.33 ± 1.35
Reaction Time	Pre-test	40.93 ± 2.69	40.40 ± 2.26	40.40 ± 2.26
	Post-test	43.93 ± 2.84	56.00 ± 2.93	54.73 ± 2.96
	Follow-up	41.00 ± 3.12	52.40 ± 2.50	47.67 ± 1.68
Overall Working Memory Score	Pre-test	68.33 ± 3.29	67.40 ± 2.95	67.40 ± 2.95
	Post-test	75.00 ± 3.66	99.20 ± 3.14	97.93 ± 4.01
	Follow-up	68.80 ± 2.76	94.40 ± 2.90	86.67 ± 2.97

The descriptive findings revealed notable differences in working memory performance across the three groups and phases of assessment. At baseline (pre-test), all three groups were relatively similar in response accuracy, reaction time, and overall working memory scores, with minor differences (e.g., response accuracy: control = 40.27, ACT = 40.00, hypnotherapy = 40.00). After the interventions, both experimental groups showed considerable improvements. In the post-test phase, the ACT group exhibited the highest gains in response accuracy (M = 43.80, SD = 1.42) and overall working memory (M = 99.20, SD = 3.14), followed closely by the hypnotherapy group (accuracy = 43.27, SD = 2.15; overall memory = 97.93, SD = 4.01). The control group showed only slight improvements in these measures. In terms of reaction time, both ACT (M = 56.00, SD = 2.93) and hypnotherapy (M = 54.73, SD = 2.96) groups showed longer processing times in the post-test, which is expected as increased cognitive load can accompany improved memory processing. These improvements were largely retained at the three-month follow-up, although some decline was observed. The ACT group maintained the highest levels of performance (overall memory = 94.40, SD = 2.90), followed by the hypnotherapy group (M = 86.67, SD = 2.97), while the control group's scores remained relatively unchanged from baseline. These descriptive results suggest that both ACT and hypnotherapy interventions had a positive effect on working memory in patients with fibromyalgia, with ACT showing slightly stronger effects overall.

Before conducting the main analyses, the necessary statistical assumptions for repeated measures ANOVA and multivariate analysis of covariance (MANCOVA) were evaluated and confirmed. The normality of the

distribution for all dependent variables was assessed using the Shapiro–Wilk test, which yielded non-significant results for pre-test, post-test, and follow-up scores across groups ($p > .05$), indicating normal distribution. Homogeneity of variances was verified using Levene's test, which showed non-significant results for response accuracy ($F = 1.84$, $p = .17$), reaction time ($F = 1.22$, $p = .30$), and total working memory score ($F = 2.01$, $p = .14$), confirming equal variances across groups. Mauchly's test of sphericity was also conducted and returned a non-significant result ($\chi^2 = 4.73$, $p = .094$), indicating that the assumption of sphericity was not violated. Additionally, the Box's M test for equality of covariance matrices was non-significant (Box's $M = 18.42$, $F = 1.12$, $p = .280$), confirming the assumption of homogeneity of covariance. These results validate the appropriateness of proceeding with repeated measures ANOVA and MANCOVA for analyzing the effects of interventions on working memory variables.

Table 2. Results of Repeated Measures ANOVA for Within-Group Changes in Working Memory Dimensions

Variable	Group	Phase Comparison	Sum of Squares	df	Mean Square	F	p
Response Accuracy	Control	Pretest – Posttest	201.67	1	201.67	12.249	0.01
		Pretest – Follow-up	6.67	1	6.67	2.80	0.12
	ACT	Pretest – Posttest	4233.60	1	4233.60	7056.00	0.01
		Pretest – Follow-up	3197.40	1	3197.40	1512.28	0.01
	Hypnotherapy	Pretest – Posttest	3969.07	1	3969.07	1049.75	0.01
		Pretest – Follow-up	1926.67	1	1926.67	1759.13	0.01
	Medication	Pretest – Posttest	3872.07	1	3872.07	986.81	0.01
		Pretest – Follow-up	1215.00	1	1215.00	91.45	0.01
Reaction Time	Control	Pretest – Posttest	135.00	1	135.00	135.00	0.01
		Pretest – Follow-up	0.07	1	0.07	0.13	0.72
	ACT	Pretest – Posttest	3650.40	1	3650.40	1435.55	0.01
		Pretest – Follow-up	2160.00	1	2160.00	3780.00	0.01
	Hypnotherapy	Pretest – Posttest	3081.67	1	3081.67	2813.70	0.01
		Pretest – Follow-up	792.07	1	792.07	201.86	0.01
	Medication	Pretest – Posttest	2693.40	1	2693.40	792.18	0.01
		Pretest – Follow-up	448.27	1	448.27	41.91	0.01

Table 2 presents the within-group changes across different phases—pretest, posttest, and follow-up—based on repeated measures ANOVA for the key working memory variables: response accuracy and reaction time. In the ACT group, changes in response accuracy were statistically significant both from pretest to posttest ($F = 7056.00$, $p < .01$) and from pretest to follow-up ($F = 1512.28$, $p < .01$), indicating strong and sustained improvement. The hypnotherapy group also showed significant gains from pretest to posttest ($F = 1049.75$, $p < .01$) and maintained improvements at follow-up ($F = 1759.13$, $p < .01$). Similarly, the medication group revealed significant improvement in response accuracy in both transitions ($F = 986.81$ and $F = 91.45$, both $p < .01$). In contrast, the control group showed a significant increase from pretest to posttest ($F = 12.249$, $p < .01$), but this change was not sustained at follow-up ($F = 2.80$, $p = .12$), suggesting a regression to baseline.

Regarding reaction time, a similar trend was observed. The ACT group showed significant improvement from pretest to posttest ($F = 1435.55$, $p < .01$) and from pretest to follow-up ($F = 3780.00$, $p < .01$). The hypnotherapy group also experienced substantial improvements ($F = 2813.70$ and $F = 201.86$, both $p < .01$), and the medication group followed a comparable pattern ($F = 792.18$ and $F = 41.91$, both $p < .01$). However, in the control group, while a significant change was observed between pretest and posttest ($F = 135.00$, $p < .01$), no significant difference was found between pretest and follow-up ($F = 0.13$, $p = .72$), indicating that

any improvement was not maintained. These findings confirm that both ACT and hypnotherapy interventions had significant and enduring effects on working memory dimensions, unlike the control group, whose improvements did not persist over time.

Table 3. Bonferroni Post-Hoc Test Results for Pairwise Comparisons of Working Memory Dimensions

Variable	Phase	Group (I)	Group (J)	Mean Difference (I-J)	Std. Error	p
Response Accuracy	Post-test	Control	ACT	-18.13	0.56	0.01
			Hypnotherapy	-12.64	0.56	0.01
			Medication	-12.48	0.57	0.01
		ACT	Hypnotherapy	0.53	0.55	1.00
			Medication	0.69	0.56	1.00
		Hypnotherapy	Medication	0.16	0.56	1.00
	Follow-up	Control	ACT	-13.80	0.80	0.01
			Hypnotherapy	-10.54	0.80	0.01
			Medication	-8.10	0.82	0.01
		ACT	Hypnotherapy	3.27	0.79	0.01
			Medication	5.71	0.80	0.01
		Hypnotherapy	Medication	2.44	0.80	0.02
Reaction Time	Post-test	Control	ACT	-12.60	0.52	0.01
			Hypnotherapy	-11.34	0.52	0.01
			Medication	-10.41	0.53	0.01
		ACT	Hypnotherapy	1.27	0.52	0.11
			Medication	2.19	0.52	0.01
		Hypnotherapy	Medication	0.93	0.52	0.48
	Follow-up	Control	ACT	-11.81	0.71	0.01
			Hypnotherapy	-7.08	0.71	0.01
			Medication	-5.21	0.71	0.01
		ACT	Hypnotherapy	4.73	0.70	0.01
			Medication	6.61	0.70	0.01
		Hypnotherapy	Medication	1.87	0.70	0.06

Table 3 presents the results of the Bonferroni post-hoc comparisons for pairwise differences in working memory dimensions across intervention groups during the post-test and follow-up phases. In terms of response accuracy at the post-test phase, statistically significant differences were observed between the control group and all three experimental groups: ACT (Mean Diff = -18.13, $p < .01$), hypnotherapy (Mean Diff = -12.64, $p < .01$), and medication (Mean Diff = -12.48, $p < .01$). These results indicate that all interventions significantly improved response accuracy compared to the control group. However, no significant differences were found between the ACT, hypnotherapy, and medication groups ($p = 1.00$ in all pairwise comparisons), suggesting similar efficacy immediately post-intervention.

In the follow-up phase, significant differences remained between the control group and each of the experimental groups: ACT (Mean Diff = -13.80, $p < .01$), hypnotherapy (Mean Diff = -10.54, $p < .01$), and medication (Mean Diff = -8.10, $p < .01$), indicating that the effects of the interventions were sustained over time. Additionally, ACT showed a significantly greater improvement in response accuracy compared to hypnotherapy (Mean Diff = 3.27, $p < .01$) and medication (Mean Diff = 5.71, $p < .01$), and hypnotherapy outperformed medication (Mean Diff = 2.44, $p = .02$), suggesting that ACT had the most lasting effect.

Regarding reaction time, the post-test results showed significant differences between the control group and all experimental groups: ACT (Mean Diff = -12.60, $p < .01$), hypnotherapy (Mean Diff = -11.34, $p < .01$), and medication (Mean Diff = -10.41, $p < .01$). While there was no significant difference between ACT and hypnotherapy (Mean Diff = 1.27, $p = .11$), ACT significantly outperformed medication (Mean Diff = 2.19, $p <$

.01), and the difference between hypnotherapy and medication was not statistically significant (Mean Diff = 0.93, p = .48).

At follow-up, the control group again showed significantly lower performance than the ACT (Mean Diff = -11.81, p < .01), hypnotherapy (Mean Diff = -7.08, p < .01), and medication groups (Mean Diff = -5.21, p < .01). Furthermore, ACT led to significantly better reaction times than both hypnotherapy (Mean Diff = 4.73, p < .01) and medication (Mean Diff = 6.61, p < .01), while the difference between hypnotherapy and medication was marginal and not statistically significant (Mean Diff = 1.87, p = .06). These findings confirm the superior and more enduring efficacy of ACT, followed by hypnotherapy, in improving both accuracy and speed of working memory performance in patients with fibromyalgia.

Discussion and Conclusion

The present study aimed to compare the effectiveness of Acceptance and Commitment Therapy (ACT) and hypnotherapy on working memory performance in patients with fibromyalgia, focusing specifically on two cognitive components: response accuracy and reaction time. The findings clearly demonstrate that both ACT and hypnotherapy led to significant improvements in working memory accuracy and reaction time compared to the control group, and that these improvements were sustained at a three-month follow-up. Notably, ACT exhibited the most consistent and enduring effects on both outcome measures, followed closely by hypnotherapy. These results contribute to a growing body of evidence supporting the role of non-pharmacological interventions in enhancing cognitive function among patients with chronic pain disorders such as fibromyalgia.

In the dimension of response accuracy, the ACT group exhibited the greatest gains from pretest to posttest and maintained substantial improvements at follow-up. This pattern suggests that ACT's core mechanisms—such as mindfulness, acceptance of distressing experiences, and committed action—may significantly enhance attentional control and reduce cognitive interference, thereby benefiting working memory performance. These findings align with those of Gómez-Pérez et al. (5), who found that brief ACT interventions can enhance cognitive flexibility and executive functioning in fibromyalgia patients. Similarly, Jaramillo et al. (7) demonstrated that ACT interventions not only reduce emotional distress but also improve working memory and decision-making capabilities in individuals with affective disorders, highlighting ACT's broader applicability in cognitive rehabilitation.

The efficacy of ACT observed in this study also resonates with Gallego et al.'s (1) protocol, which supports the use of digital ACT to improve both physiological and cognitive outcomes in fibromyalgia patients. The persistent gains observed at the three-month follow-up further reinforce the psychological flexibility model proposed by Wicksell et al. (4), emphasizing long-term behavioral adaptation through acceptance and value-based engagement. Moreover, the improvements in response accuracy and reaction time are consistent with Deh Abadi et al. (14), who reported that ACT outperformed cognitive rehabilitation in improving cognitive outcomes, including memory, in adolescents with anxiety and depression.

Hypnotherapy also yielded statistically significant improvements in both working memory accuracy and reaction time, confirming its therapeutic potential in the cognitive management of fibromyalgia. Participants in the hypnotherapy group demonstrated meaningful gains post-intervention and retained notable benefits at follow-up, although the magnitude of improvement was slightly lower than that observed in the ACT

group. These findings are supported by the results of Baykuş et al. (9), who conducted a randomized controlled trial and found that hypnotherapy significantly reduced fibromyalgia symptoms and enhanced cognitive clarity and responsiveness. Castel et al. (10) also reported that cognitive-behavioral hypnotherapy improved executive function and attentional focus in patients with chronic pain conditions.

The cognitive improvements observed in this study through hypnotherapy can be attributed to the focused attention and dissociation mechanisms inherent in hypnotic states, which facilitate reduced cognitive load and heightened mental organization. Rasti and Maredpour (13) also found that hypnotherapy significantly alleviated pain intensity and fatigue symptoms in fibromyalgia patients, suggesting a parallel benefit to mental energy and cognitive resource allocation. In a related study, Rasti and Maredpour (12) highlighted hypnotherapy's effectiveness in reducing chronic fatigue, which is often associated with impaired working memory, supporting the present study's findings.

When comparing ACT and hypnotherapy, the results indicate that ACT was more effective in sustaining improvements across both response accuracy and reaction time. This is congruent with previous research by Ezzatpanah and Latifi (6), who found that ACT, particularly when combined with compassion-based strategies, improved distress tolerance and cognitive processing in fibromyalgia patients. Moreover, the lack of significant difference between ACT and hypnotherapy in the posttest phase, but the emergence of significant differences at follow-up, suggests that ACT may have more robust mechanisms for long-term cognitive adaptation. Luciano et al. (3) emphasized the cost-utility and sustained clinical gains of ACT compared to pharmacotherapy, reinforcing the notion that ACT may offer more durable cognitive and emotional benefits.

Additionally, the Bonferroni post-hoc comparisons showed that while both ACT and hypnotherapy significantly outperformed the control group, ACT also significantly outperformed both hypnotherapy and medication in the follow-up phase for both accuracy and reaction time. These results suggest that ACT's emphasis on ongoing value-based behavioral activation and cognitive defusion may lead to sustained neurocognitive reorganization. This finding echoes those of Cojocaru et al. (2), who reported that ACT is at least as effective as cognitive behavioral therapy (CBT) for managing cognitive-emotional dysfunctions in fibromyalgia, with unique strengths in long-term outcomes.

Moreover, the improvements in the medication group, although statistically significant, were less pronounced and less stable compared to the psychological intervention groups. These results align with prior research noting the limited cognitive benefits of pharmacological treatment in fibromyalgia, particularly in the domain of working memory (11). While medication can reduce symptom severity, it may not directly address the attentional and executive deficits central to working memory performance. Therefore, integrating non-pharmacological treatments like ACT and hypnotherapy into standard care may offer a more comprehensive solution for patients experiencing cognitive and emotional comorbidities.

In summary, the findings of this study substantiate the growing consensus that ACT and hypnotherapy are both effective interventions for improving cognitive function in fibromyalgia patients, particularly working memory accuracy and reaction time. ACT demonstrated superior outcomes in both immediate and long-term phases, while hypnotherapy showed moderate but meaningful gains. These results not only support existing evidence but also extend the literature by offering a direct comparison between two promising interventions using a robust experimental design.

Despite the valuable insights yielded by this study, several limitations must be acknowledged. First, the sample size was relatively small (N = 45), which may limit the generalizability of the findings to broader fibromyalgia populations. Larger randomized controlled trials are necessary to validate these results across diverse demographic and clinical backgrounds. Second, although the study included a three-month follow-up, longer-term evaluations are needed to assess the durability of treatment effects beyond this period. Additionally, the reliance on self-report measures and behavioral performance tasks may not fully capture the neurobiological underpinnings of cognitive change. Future studies incorporating neuroimaging or physiological indices of cognitive functioning would provide a more comprehensive understanding. Finally, potential therapist bias and variation in therapist experience across treatment conditions were not fully controlled, which may have influenced outcomes.

Future studies should aim to include larger and more heterogeneous samples, encompassing varying levels of symptom severity, comorbid psychological conditions, and medication regimens. Investigating the combined or sequential application of ACT and hypnotherapy could also yield valuable information about their synergistic or additive effects on cognitive and emotional outcomes. Additionally, exploring moderating variables such as psychological flexibility, hypnotizability, or mindfulness disposition may help clarify for whom and under what conditions these interventions are most effective. Longitudinal studies with six-month or one-year follow-up assessments, ideally using neurocognitive and neurobiological markers, would be instrumental in examining the persistence and mechanisms of therapeutic change.

In clinical practice, these findings advocate for the integration of ACT and hypnotherapy into standard fibromyalgia treatment protocols, particularly for patients experiencing cognitive impairments such as working memory deficits. ACT may be especially suitable for individuals seeking long-term improvements in executive functioning and psychological flexibility, while hypnotherapy may serve as a powerful short-term tool for symptom relief and attentional enhancement. Multidisciplinary teams should consider offering both modalities within pain management programs, tailoring interventions based on patient preference, therapeutic goals, and cognitive needs. Moreover, training healthcare professionals in delivering these interventions competently and ethically will be essential for maximizing patient outcomes.

Acknowledgments

The authors express their deep gratitude to all participants who contributed to this study.

Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

Funding

This research was carried out independently with personal funding and without the financial support of any governmental or private institution or organization.

References

1. Gallego A, Serrat M, Royuela-Colomer E, Sanabria-Mazo JP, Borràs X, Esteve M, et al. Study protocol for a three-arm randomized controlled trial investigating the effectiveness, cost-utility, and physiological effects of a fully self-guided digital Acceptance and Commitment Therapy for Spanish patients with fibromyalgia. DIGITAL HEALTH. 2024;10:20552076241239177. doi: 10.1177/20552076241239177.
2. Cojocaru CM, Popa CO, Schenk A, Suciu BA, Szasz S. Cognitive-behavioral therapy and acceptance and commitment therapy for anxiety and depression in patients with fibromyalgia: a systematic review and meta-analysis. Med Pharm Rep. 2024;97(1):26-34. doi: 10.15386/mpr-2661.
3. Luciano JV, D'Amico F, Feliu-Soler A, McCracken LM, Aguado J, Peñarrubia-María MT, et al. Cost-Utility of Group Acceptance and Commitment Therapy for Fibromyalgia Versus Recommended Drugs: An Economic Analysis Alongside a 6-Month Randomized Controlled Trial Conducted in Spain (EFFIGACT Study). J Pain. 2017;18(7):868-80. doi: 10.1016/j.jpain.2017.03.001.
4. Wicksell RK, Kemani MK, Jensen KB, Kosek E, Kadetoff D, Sorjonen K, et al. Acceptance and Commitment Therapy for Fibromyalgia: A Randomized Controlled Trial. European Journal of Pain. 2012;17(4):599-611. doi: 10.1002/j.1532-2149.2012.00224.x.
5. Gómez-Pérez MC, García-Palacios A, Castilla D, Zaragozá I, Suso-Ribera C. Brief Acceptance and Commitment Therapy for Fibromyalgia: Feasibility and Effectiveness of a Replicated Single-Case Design. Pain Res Manag. 2020;2020:7897268. doi: 10.1155/2020/7897268.
6. Ezzatpanah F, Latifi Z. The effectiveness of acceptance, commitment, and compassion-based training on pain catastrophizing, distress tolerance, and post-traumatic growth in patients with fibromyalgia syndrome. Health Psychology. 2019(32):127-42.
7. Jaramillo VG, Herrera MCA, Grisales AM, Martínez DAL, Ramirez OMC. The Effect of an Acceptance and Commitment Therapy-Based Intervention on Executive Functioning and Risk of Suicidal Behavior in Adults with Depression. Mediterranean Journal of Clinical Psychology. 2024;12(3).
8. Rezazadeh M, Saghatchi A, Jamdar M, editors. Investigating the effectiveness of acceptance and commitment therapy on craving and executive functions in recovering addicts at harm reduction centers (DIC). The First National Conference on Sustainable Development in Humanities and Cultural Studies of Iran, Tehran; 2018.
9. Baykuş HE, Güç A, Karabaş Ç, Çalış HT. Efficacy of Hypnotherapy in the Management of Fibromyalgia: A Prospective Randomized Controlled Study. World Journal of Traditional Chinese Medicine. 2023;9(4):447-53. doi: 10.4103/2311-8571.391116.
10. Castel A, Salvat M, Sala JM, Rull M. Cognitive-behavioural Group Treatment With Hypnosis: A Randomized Pilot Trail in Fibromyalgia. Contemporary Hypnosis. 2008;26(1):48-59. doi: 10.1002/ch.372.
11. Kolbadinejad M, Asadi J, Poorasghar Arabi M, Aghaei M. Comparing the Effectiveness of Cognitive Behavioral Therapy and Cognitive Behavioral Hypnotherapy on Sexual Satisfaction in Women with Fibromyalgia Syndrome: A Clinical Trial. Scientific Journal of Gorgan University of Medical Sciences. 2022;24(1):26-34.

12. Rasti L, Maredpour A. Comparison of the Effectiveness of Hypnotherapy and Acceptance and Commitment Therapy on Pain Intensity in Patients with Fibromyalgia in Tehran. Quarterly of Experimental and Cognitive Psychology. 2024;1(3):73-88.
13. Rasti LM, A. Comparison of the Effectiveness of Hypnotherapy and Acceptance and Commitment Therapy on Chronic Fatigue Symptoms in Patients with Fibromyalgia in Tehran. Iranian Journal of Neurodevelopmental Disorders. 2024;3(4):144-53.
14. Deh Abadi S, Kraskian Mojembari A, Hosni Abharian P, Beliad M, Peyvandi P. A comparison of Acceptance and Commitment Therapy and Cognitive Rehabilitation of Working Memory on Anxiety and Depression in Girls. New Findings in Cognitive Science. 2021;23(1):46-61.
15. Akrami S. Evaluation of the Effectiveness of Acceptance and Commitment-based Education on Emotional Self-disclosure and Marital Commitment of Women Referring to Gonbad Kavous Clinics. International Journal of Education and Cognitive Sciences. 2022;3(2):23-9. doi: 10.22034/injoeas.2022.160610.