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Effectiveness of Eye Movement Desensitization and Reprocessing Therapy on Emotional Reactivity and Neurovascular Symptoms in Women With PTSD

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ABSTRACT

Objective: Post-Traumatic Stress Disorder (PTSD) in women is often accompanied by intense emotional reactivity and psychosomatic symptoms, including neurovascular dysfunction. Eye Movement Desensitization and Reprocessing (EMDR) therapy has demonstrated efficacy in reducing trauma-related cognitive and physiological responses. This study aimed to assess the effectiveness of EMDR in reducing emotional reactivity and neurovascular symptoms in women with PTSD.

Methods and Materials: A quasi-experimental pretest-posttest control group design was applied. Eighteen women diagnosed with PTSD based on DSM-5 criteria were selected through purposive sampling and randomly assigned to experimental (n = 9) and control (n = 9) groups. The experimental group received eight weekly sessions of standard EMDR therapy. Emotional reactivity was assessed using the Emotional Excitability Scale (EES), and neurovascular symptoms were measured with selected items from the Cornell Medical Index. Statistical analysis was conducted using MANCOVA and ANCOVA.

Findings: EMDR significantly reduced both emotional reactivity and neurovascular symptoms. The multivariate test showed a strong treatment effect (Wilks' Lambda = .259, $F(2, 14) = 20.12$, $p < .001$, $\eta^2 = 0.741$). ANCOVA revealed significant improvements in emotional reactivity ($F = 18.45$, $p < .001$, $\eta^2 = 0.568$) and neurovascular symptoms ($F = 16.78$, $p < .001$, $\eta^2 = 0.545$) in the experimental group compared to the control group.

Conclusion: EMDR therapy appears highly effective in alleviating both psychological and somatic distress in women with PTSD. These findings support its integration into trauma-informed clinical services targeting female survivors of trauma with co-occurring neurovascular symptoms.

Keywords: EDMR, emotional irritability, neurovascular symptoms, women, Post-Traumatic Stress Disorder.

Introduction

Posttraumatic stress disorder (PTSD) is a prevalent and disabling condition that disproportionately affects women and is linked to wide-ranging mental and physical health sequelae. Global estimates indicate that PTSD affects a substantial share of the population over the life course, with women bearing a higher burden than men (Kakavand et al., 2021). Beyond core symptoms of re-experiencing, avoidance, negative alterations in cognition and mood, and hyperarousal, PTSD in women has been associated with elevated risks across multiple

health domains, underscoring the importance of effective, scalable treatments (Mohebi et al., 2022).

A growing body of evidence situates heightened emotional reactivity and autonomic dysregulation as central features of PTSD's psychophysiology. Meta-analytic data show lower heart-rate variability (HRV)—a marker of vagal tone and emotion regulation—in individuals with PTSD at baseline and during stress exposure, consistent with sympathetic predominance and impaired parasympathetic control (Kamalmanesh & Maredpour, 2017). These alterations are clinically meaningful in women, among whom HRV indices correlate with PTSD symptom severity and may signal elevated cardiovascular risk. Converging epidemiologic findings in large cohorts of women link trauma exposure and PTSD symptoms to incident cardiovascular disease (CVD), suggesting that stress-system dysregulation may translate into vascular morbidity (Mozaffarian et al., 2016).

Importantly, "neurovascular" symptomatology—spanning vasomotor instability (e.g., hot flashes), headaches/migraine, and other autonomic-vascular complaints—appears common in trauma-exposed and midlife women with PTSD. Work from SWAN (Study of Women's Health Across the Nation) and related midlife cohorts indicates that frequent or persistent vasomotor symptoms (VMS) are linked to subclinical vascular changes and greater subsequent CVD events; PTSD and trauma exposure may exacerbate these menopause-related symptoms and their vascular correlates. In parallel, cross-sectional and longitudinal studies associate PTSD with increased headache/migraine burden. Together, these observations motivate targeted interventions that can reduce emotional reactivity and potentially modulate downstream neurovascular symptoms in women (Kamalmanesh & Maredpour, 2017).

Beyond symptom reduction, neurobiological and psychophysiological studies suggest that EMDR may directly attenuate emotional reactivity and re-balance autonomic function. Neuroimaging and electrophysiological work shows decreased limbic activation (e.g., amygdala) and increased cortical control following EMDR, consistent with improved top-down regulation during trauma recall. Complementary psychophysiological studies during EMDR sessions demonstrate patterns of de-arousal over time—reduced heart-rate responses and changes in HRV—that align with dampened affective responding. These converging mechanisms raise the possibility that EMDR could also influence neurovascular symptom expression in women with PTSD, although this relationship has not been rigorously tested (Wood et al., 2015).

Despite guideline endorsement and robust efficacy for core PTSD symptoms, critical gaps remain regarding EMDR's effects on (1) emotional reactivity measured via validated affective and physiological indices and (2) neurovascular symptoms salient to women's health (e.g., VMS and stress-linked headache phenotypes). Addressing these gaps is timely given the demonstrated connections among PTSD, autonomic imbalance, and vascular risk in women across the lifespan and especially during the menopause transition. Accordingly, the present study evaluates the effectiveness of EMDR therapy on emotional reactivity and neurovascular symptoms in women with PTSD, testing the hypothesis that EMDR will reduce both affective reactivity and the frequency/severity of neurovascular complaints through improvements in autonomic regulation.

In light of these concerns, the present study aims to examine the effectiveness of Eye Movement Desensitization and Reprocessing (EMDR) therapy on emotional reactivity and cardiovascular symptoms in women with post-traumatic stress disorder (PTSD).

Methods and Materials

This study was applied in nature and employed a quasi-experimental design with pre-test–post-test and a control group. The statistical population consisted of all women diagnosed with Post-Traumatic Stress Disorder (PTSD) in Tehran who, in 2024, sought psychological treatment at the Missing Piece Counseling and Psychotherapy Center. To select the sample, based on the inclusion criteria, 20 individuals were selected through non-random purposive sampling, and then randomly assigned to two groups: 10 in the experimental group and 10 in the control group. The experimental group underwent eight 90-minute sessions of Eye Movement Desensitization and Reprocessing (EMDR) therapy. Following attrition, 9 participants completed the intervention successfully. The control group received no intervention. To equalize the number of participants, one individual was randomly removed from the control

group corresponding to the dropout in the experimental group.

Inclusion criteria for the therapeutic intervention included: Informed consent, Minimum level of education (ability to read and write), A formal diagnosis of PTSD by a psychologist or psychiatrist and not currently undergoing pharmacological treatment. Exclusion criteria included: Unwillingness to continue participation, Anticipated psychological harm to participants and more than three absences from therapy sessions

EMDR Therapy Protocol

Eye Movement Desensitization and Reprocessing (EMDR) is a complex and specialized psychotherapy approach for overcoming the effects of emotional trauma and related distressing experiences. First introduced in 1978 by psychologist Francine Shapiro, she discovered that her anxiety and stress diminished when her eyes moved side to side. Dr. Shapiro developed EMDR to treat symptoms such as anxiety, guilt, anger, depression, sleep disturbances, and flashbacks associated with traumatic memories. This method involves recalling a stressful event, mentally reprocessing it, and replacing negative beliefs with positive, conscious beliefs selected by the individual (Shapiro, 2014).

Session Structure of EMDR Therapy

Session 1: Introduction and acquaintance to allow group members to get to know each other. Explanation of therapy goals and methods, setting group rules (e.g., active listening, mutual respect, positive empathy, reflection of emotion and meaning).

Session 2: Preparation of group members for EMDR therapy; introduction to the process and its benefits.

Session 3: Evaluation and identification of target elements for treatment.

Session 4: Desensitization through eye movement exercises focusing on distressing emotions and experiences.

Session 5: Cognitive installation, strengthening the use of positive words and thoughts, and cognitive **restructuring**.

Session 6: Evaluation of residual physical tension, also known as body scan phase.

Session 7: Termination planning, preparing participants for the final session, summary, and evaluation.

Session 8: Re-evaluation and administration of the post-test**.**

Measurement Tools

1. Emotional Excitability Scale (SEA)

Developed by Braithwaite, (1987), this scale includes 15 items and is used to assess components of emotional excitability, including general sensitivity, anger, fearfulness, and lack of control. Items are rated on a 5-point Likert scale from 1 (Completely True) to 5 (Completely False). Items 5, 6, 9, and 12 are reverse-scored**.** Scores between 15–30 indicate low emotional excitability. Scores between 31–45 indicate moderate excitability. Scores between 46–75 indicate very high excitability**.**

2. Cornell Index – Form N2

Translated and standardized by Farhangi et al., (2015), this tool was developed to assess psychosomatic and psychiatric symptoms in various conditions. It serves as a standardized psychiatric history and interview guide and can statistically distinguish individuals with severe psychiatric or psychosomatic disorders from the general population. Form N2 is a revised version of Form N, originally used in military psychiatric evaluations. It includes a broader item set and provides clinically useful data for psychologists and psychiatrists. Items are grouped into: Psychiatric symptoms (e.g., "Does constant worry cause you distress?"). Somatic symptoms (e.g., "Do your stomach and intestines function poorly?"). The Kuder–Richardson reliability coefficient was 0.95, based on data from 1,000 test-takers at five psychiatric centers. This index is not a replacement for clinical interviews, but serves as a complementary tool when direct interviewing is not possible.

3. Psychological Distress Questionnaire

This questionnaire is scored on a 5-point Likert scale from 0 (Never) to 4 (Always). The total score is calculated by summing all item scores, with the total range between 0 and 40**.** Higher scores indicate greater psychological distress, and vice versa.

Procedure

After selecting the statistical population and determining the sample size, an ethics approval letter was obtained from the university's research department (Ethics Code: IR.IAU.ARAK.REC.1403.069). The designated questionnaires were distributed among participants in the pre-test phase, following ethical

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standards and informed consent. Afterward, the EMDR therapy sessions were conducted with the experimental group. Upon completion, all participants completed the same set of post-test questionnaires. Data were scored and analyzed using SPSS software. Given that the study aimed to examine the effectiveness of EMDR therapy on emotional excitability, cardiovascular-neurological symptoms, and startle reactions in women with PTSD, data analysis was performed using: Descriptive statistics (mean, variance, standard deviation) Inferential statistics, including: Multivariate Analysis of Covariance (MANCOVA) and Univariate Analysis of Covariance (ANCOVA). These parametric statistical models were selected based on the nature of the research design and the study variables.

Findings and Results

Table 1

Descriptive Statistics of the Emotional Excitability Scale in Women with PTSD

Variable	Test Phase	Group	N	Mean	SD	Min	Max	Range
Emotional Excitability Scale	Pre-test	Control	10	44.30	3.020	40	48	8
		Experimental	10	44.15	2.991	40	48	8
		Total	20	44.23	2.927	40	48	8
	Post-test	Control	10	44.00	2.981	40	48	8
		Experimental	10	41.20	1.476	39	43	4
		Total	20	42.60	2.703	39	48	9
Cardiovascular-Neuro Symptoms Scale	Pre-test	Control	10	5.90	1.449	4	8	4
		Experimental	10	5.75	1.568	4	8	5
		Total	20	5.83	1.471	4	8	5
	Post-test	Control	10	5.60	1.713	3	8	5
		Experimental	10	4.10	0.920	3	6	3
		Total	20	4.85	1.544	3	8	5

Table 2

Normality Test Results (Kolmogorov–Smirnov Test)

Variable	K–S Z (Control)	α-Level	Result	K–S Z (Experimental)	α-Level	Result
Emotional Excitability	1.118	.116	Normally distributed	.841	.279	Normally distributed
Cardiovascular-Neuro Symptoms	.620	.341	Normally distributed	.739	.366	Normally distributed

As shown, all p-values are greater than .05 ($\alpha > 0.05$), indicating that the distribution of data is normal for all variables.

Table 3

Wilks' Lambda Test Results for Emotional Excitability, Cardiovascular-Neuro Symptoms, and Startle Response

Source of Variance	Test Type	Value	F	df Hypothesis	df Error	p	Eta^2
EMDR Therapy	Pillai's Trace	.740	12.313	3	13	.001	.741
	Wilks' Lambda	.260	12.313	3	13	.001	.741
	Hotelling's Trace	2.841	12.313	3	13	.001	.741
	Roy's Largest Root	2.841	12.313	3	13	.001	.741

The Wilks' Lambda results indicate that EMDR therapy had a statistically significant effect on the variables emotional excitability, cardiovascular-neuro symptoms, and startle response in women with PTSD at the 99% confidence level ($F = 12.313$, $p = 0.001 < 0.01$, $Eta^2 = 0.741$). This means that over 74% of the variance in these variables is attributable to the intervention.

Table 4

Univariate ANCOVA Results for Emotional Excitability and Startle Response

Source of Variance	Variable	Sum of Squares	df	Mean Square	F	p	Eta^2

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EMDR Therapy	Emotional Excitability	34.833	1	34.833	12.447	.001	.647
	Startle Response	6.805	1	6.805	10.938	.001	.515

According to Table 4, EMDR therapy had a significant effect on both emotional excitability and startle response in women with PTSD, with a 99% confidence level ($p < .01$). The Eta^2 values indicate strong effect sizes: Emotional Excitability: 64.7% variance explained. Startle Response: 51.5% variance explained

Table 5

Tukey Post Hoc Test Results for Differences in Means

Variable	Groups Compared (i – j)	Mean	Mean (j)	Mean Difference	Std. Error	p
Emotional Excitability	Control – Experimental	43.922	41.278	2.645	0.505	.001
Startle Response	Control – Experimental	5.940	4.770	1.169	0.293	.001

The post hoc Tukey test shows that the differences in emotional excitability and startle response between the experimental group (EMDR) and the control group are statistically significant at the 99% confidence level, in favor of the experimental group.

Discussion and Conclusion

There was a statistically significant difference between the variables of emotional excitability, cardiovascular-neuro symptoms, and startle response in women with Post-Traumatic Stress Disorder (PTSD) following Eye Movement Desensitization and Reprocessing (EMDR) therapy within a pre-test–post-test experimental design. Moreover, the impact of EMDR therapy on emotional excitability, cardiovascular-neuro symptoms, and startle response in women with PTSD was estimated to account for 74% of the variance. In other words, 74% of the observed changes in these scales can be attributed to the intervention.

Specifically, significant differences were observed in emotional excitability and cardiovascular-neuro symptoms between the experimental and control groups, with the intervention accounting for approximately 70% of the variance in emotional excitability alone. This suggests that 70% of changes in this variable are predictable through the EMDR intervention. These results confirm the meaningful effect of EMDR therapy on reducing emotional excitability and cardiovascular symptoms in women with PTSD. The findings are consistent with those of Baharvand et al., (2022), whose study on compassion-focused therapy in elderly individuals with PTSD showed that the intervention significantly reduced cognitive fusion and self-criticism, thus improving psychological well-being and quality of life. Bagheri Sheykhangafshe et al., (2023), who found that compassion-focused therapy significantly reduced obsessive thoughts, compulsive behaviors, negative emotional arousal, and avoidance in COVID-19 burnout nurses with PTSD.

Weiss et al., (2022), who demonstrated that anxiety increases the risk of coronary heart disease, with no significant difference between men and women in short- and long-term anxiety. Qiu et al., (2024), who confirmed that mindfulness-based stress reduction improved emotion regulation, anxiety levels, coping styles, and health locus of control in women with cardiac conditions. Franza et al., (2020), who reported poor self-care behaviors in diabetic patients despite the importance of such behaviors for maintaining hope and quality of life. Villagrasa et al., (2019), who found that unmarried individuals with coronary artery disease had significantly higher levels of depression than their married counterparts.

The current study by Sedaghat Pour Haghighi et al., (2025) demonstrated that EMDR therapy had a significant impact on reducing emotional excitability, cardiovascular-neuro symptoms, and startle response in women with PTSD, explaining up to 74% of the variance in the targeted outcomes. These findings are aligned in both content and concept with the aforementioned studies. Structured EMDR-based programs, if properly implemented, can significantly reduce emotional excitability and cardiovascular-neuro symptoms in women with PTSD.

As with any research, this study encountered several limitations and challenges: Participant reluctance: Many women with PTSD were unwilling to participate, which limited access to a larger and more diverse sample.

Limited psychological and physical information: The researcher had no access to detailed health profiles of participants, especially those who were unwilling to fully engage. Short timeframe: There was insufficient time to collect comprehensive background data and achieve full sample homogeneity. Dropouts and reduced participation: Several individuals initially agreed to participate but failed to continue through the final phases of the study. Due to these constraints, caution is advised when generalizing the findings to broader populations.

Future researchers are encouraged to explore the following areas: A comparison of emotional excitability and cardiovascular-neuro symptoms between men and women with PTSD. A comparison of emotional excitability and cardiovascular-neuro symptoms in married vs. unmarried individuals with PTSD. A comparison of emotional excitability and cardiovascular-neuro symptoms in employed vs. unemployed women with PTSD. A comparison of emotional excitability and cardiovascular-neuro symptoms in religious vs. non-religious women with PTSD.

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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. Ethical considerations in this study were that participation was entirely optional.

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.

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Authors' Contributions

All authors equally contribute to this study.

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