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The effect of neurofeedback-assisted emotion regulation-based psychotherapy on psychological symptoms in individuals with trauma experiences

Mustafa Koç[1]
Tuğba Seda Çolak Turan[2]
Ahmet Sapancı[3]
Şehide Kelek[4]
Gülşah Koç[5]

Abstract

Research Aim: The aim of this study is to explore the effects of emotion regulation-based psychotherapy, supplemented by neurofeedback, on psychological symptoms, while considering the brain's neurological alterations resulting from trauma.

Method: The study was conducted with a total of ten trauma-exposed individuals between the ages of 8-15, consisting of three males and seven females. The participants were assigned to two groups at random: an experimental group and a control group. The experimental group received neurofeedback-supported emotion regulation sessions, while the control group received only emotion regulation-based therapy sessions. The psychological symptoms of the participants were assessed using the SCL-90-R scale. The pre-test, post-test, and follow-up test scores were analyzed through a Mixed Design ANOVA, with two factors (experimental group, control group) and three time points (pre-test, post-test, follow-up test).

Findings: The results indicated a significant improvement in psychological symptoms for both groups across pre-test, post-test, and follow-up test measures. This suggests that emotion regulation-based therapy was effective for trauma-exposed individuals. However, the experimental group, which received neurofeedback in addition to emotion regulation therapy, showed greater symptom reduction across all sub-dimensions. Notably, the reduction in symptoms for the depression and hostility sub-dimensions was statistically significant, with a large effect size, suggesting that

[1]Prof. Dr., Duzce University, Education Faculty, Department of Guidance and Psychological Counseling, mustafa.koc@duzce.edu.tr Orcid ID: 0000-0002-8644-4109
[2]Assoc. Prof. Dr., Duzce University, Education Faculty, Department of Guidance and Psychological Counseling; tugbacolak@duzce.edu.tr Orcid ID: 0000-0002-7219-1999
[3] Assist. Prof. Dr., Duzce University, Education Faculty, Department of Guidance and Psychological Counseling, ahmetsapanci@duzce.edu.tr Orcid ID: 0000-0003-4688-6890
[4] Research Assistant, Duzce University, Education Faculty, Department of Guidance and Psychological Counseling, sehidekelek@duzce.edu.tr Orcid ID: 0000-0002-8444-0614
[5] Expert Psychological Counselor/Ph.D Candidate, Duzce University, Education Faculty, Department of Guidance and Psychological Counseling, gulsahgeyikkoc@gmail.com Orcid ID: 0000-0003-2894-9640

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neurofeedback contributed to the improvement in these areas. Furthermore, these improvements were more permanent in the experimental group during the follow-up measures.

Conclusions: The research concluded that while emotion regulation therapy was impactful in alleviating psychological symptoms associated with trauma, the addition of neurofeedback in the experimental group led to a greater and more sustained reduction, particularly in the depression and hostility sub-dimensions. The permanence of the effects observed in the neurofeedback group underscores the potential value of incorporating neurofeedback into therapy for trauma-exposed individuals.

Keywords: trauma; neurofeedback; emotion regulation; psychological symptoms; experimental design

Introduction

Trauma occurs as a result of event/events that have a significant impact on the individuals' lives. Experiencing trauma during childhood serves as a major risk factor for the development of various psychiatric conditions that manifest themselves in other periods of life (Fergusson et al., 2013). Research has shown that childhood traumas are associated with many psychological problems such as depression and anxiety in adolescence and adulthood (Huh et al., 2017; Spinhoven et al., 2010), obsessive-compulsive disorder (Barzilay et al., 2019; Mathews et al., 2008), anger (Taft et al., 2007), substance abuse (Ouimette, & Brown, 2003; Waldrop et al., 2007), self-harm (van der Kolk et al, 1991), PTSD (Hetzel & McCanne, 2005; Rodriguez et al., 1996), social difficulties (Brigs-Gowan et al., 2012), somatization (Barsky et al., 1994; Sansone et al., 2001), psychotic experiences (McGrath et al., 2017) and personality disorders (Rogosch & Cicchetti, 2005). In addition, as the opioid level increases in individuals experiencing trauma, a feeling of detachment from the body emerges with results such as numbness, dissolution, loss of self, loss of reality (Cozolino, 2015).

Childhood trauma exposure is closely linked to developmental, psychosocial, and medical issues in individuals spanning childhood to adulthood. Emotion dysregulation serves as a pivotal factor in explaining this strong correlation (Dvir et al., 2014). Furthermore, emotional dysregulation is link to various psychopathologies, including internalizing and externalizing problems (Berking & Wupperman 2012; Eisenberg et al., 2010). Althoff et al. (2010) conducted a 14-year longitudinal study revealing that children grappling with severe emotion regulation difficulties face significant challenges in regulating affect, behavior, and cognition during early adulthood. Additionally, research suggests that social-emotional problems persist beyond childhood abuse experiences, leading affected individuals to struggle with emotion regulation in adulthood, often resulting in interpersonal difficulties and increased impulsivity (Street et al., 2005). Positive mood enhances cognitive flexibility, whereas negative mood diminishes it (Magnavita, 2002). Consequently, during traumatic experiences, individuals struggle to process new, impactful information swiftly, leading to intense emotions and traumatic effects. Typically, individuals experience intense fear during the trauma and subsequent feelings of anger, guilt, shame, and sadness during the evaluation processes (Amstadter & Vernon, 2008).

Why Emotion Regulation in Trauma?

Emotions play a crucial role in shaping individuals' reaction to situations and navigating their actions. Negative emotions often stem from early experiences and may be actively avoided, potentially leading to pathology. In ancient Greek culture, expressed emotions were seen as mechanisms for improving behavior and providing relief. In psychotherapy, emotional disclosure aids in addressing underlying symptoms by releasing pent-up energy spent on suppression or confrontation (Prochaska & Norcross, 2010). Acknowledging and accepting emotions, even negative ones, is key to initiating change and fostering adaptation. Greenberg (2016) focuses on enhancing emotional processing through acceptance and interpretation in therapy sessions. Greenberg (2014) suggests that exposing clients with traumatic experiences to new experiences can help reorganize

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memories and reduce the impact of traumatic memory. Indeed, studies indicate changes in memories due to experience-based interventions. Braun et al. (2002) observed that autobiographical references to advertisement films and improbable childhood events (e.g., shaking hands with Mickey Mouse or Bugs Bunny) were recalled as real experiences.

New experiences have the potential to alter stored memories. Theories such as need satisfaction or emotional processing propose that working with emotions can replace non-functional emotions with functional ones by addressing needs and making sense of them (Greenberg, 2014). For instance, Emotional Processing Theory suggests that exposure is most effective when emotions are mobilized and negative emotions are activated, leading to corrective learning through the integration of conflicting information (Baker et al., 2010). Greenberg (2014) further suggests that memory undergoes updating with each recall, allowing for memory changes through stages such as establishing emotional rapport, empathizing, making sense of the experience, regulating emotions, and transforming emotions with new experiences presented in therapy sessions.

According to Greenberg (2016), emotions are the key to change. Many theories focus on emotions, with Emotion-Focused Therapy (EFT) being the most prominent due to its emphasis on emotion. EFT, an experiential therapy grounded in current research and emotion theories, highlights empathy and the "here and now" in sessions. Greenberg (2002) distinguishes between talking with emotion and talking from emotion, highlighting the importance of activating and expressing client emotions in therapy. This authentic expression of emotion forms the basis for transforming emotions. EFT enables clients to change emotions by processing new emotional experiences, as demonstrated when clients verbalize the need for self-soothing to address loneliness (Greenberg, 2014).

Avoiding unwanted feelings, thoughts, memories, and subjective experiences is highlighted as a significant contributor to psychological disorders (Hayes et al., 1996). Research indicates that controlling, suppressing, or eliminating negative emotions is negatively correlated with psychological health (Gross & John, 2003). Conversely, awareness, identification, and evaluation of negative emotions support adaptive social behaviors (Salovey et al., 1995). Avoidance of internal experiences, including emotions related to traumatic events, is a hallmark feature of PTSD (APA, 2013), playing a central role in its development and maintenance (Chawla & Ostafin, 2007; Salters-Pedneault et al., 2004). Empirical studies suggest that individuals with PTSD commonly engage in emotional avoidance (Plumb et al., 2004; Roemer et al., 2001). Recognizing, accepting, and expressing emotions is crucial for trauma survivors. Bolton et al. (2003) demonstrated that self-disclosure to supportive individuals effectively reduces posttraumatic stress disorder symptoms. Greenberg & Stone (1992) found health benefits associated with disclosing serious traumas. Emotional disclosure positively impacts psychological health, particularly when it involves disclosing traumatic events, which enhances the ability to meet personal needs (Hemenover, 2003).

Why Neurofeedback Support in Trauma?

The neurobiological underpinnings of trauma involve the amygdala seizing control of the brain's executive functions, suppression of cortical executive functions, inhibition of left frontal regions responsible for verbal expression, impairment of the social brain system, heightened focus on threat detection, and disruption of the balance between the parasympathetic and sympathetic nervous systems due to chronic threat (Cozolino, 2018). Neurobiological research offers insights into the connection between childhood trauma and emotion dysregulation. Neuroimaging research on individuals who have experienced childhood trauma indicates changes in brain areas related to emotion regulation, such as decreased hippocampal and amygdala volumes (Janiri et al., 2017). Additionally, a reduction in gray matter volume in the left dorsolateral prefrontal cortex has been observed, regardless of the presence of depressive symptoms (Lu et al., 2019). Functional brain imaging research in individuals with PTSD indicate hyperactivity in the amygdala and insula, coupled

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with decreased involvement of the anterior cingulate cortex (ACC) while processing negative content and emotions (Bradley et al., 2011).

Promising research in areas like neuroplasticity seeks optimistic methods for restructuring the brain. Neurofeedback, often referred to as EEG biofeedback, presents a promising method for addressing neuropsychiatric conditions. EEG measurements are valuable for diagnosing and treating neurological functions as they reflect varying levels of consciousness, from deep coma to heightened alertness (Lubar, 1991). Long-term follow-up studies have shown that the functional integration and benefits achieved through biofeedback therapy endure (Tansey, 1993). Neurofeedback is a comprehensive system successfully utilized in treating conditions like depression, anxiety, unresolved emotional issues, PTSD, addiction and personality disorders. It facilitates growth and change at the cellular level of the brain, addressing weaknesses in cognitive and brain functioning (Demos, 2005). Operating based on the brain's electrical activity characteristics—such as frequency, location, and amplitude—neurofeedback is a type of biofeedback (Gosepath et al., 2001).

Trauma-induced changes often manifest as excessive activity in the right temporal brain region and slow-wave activity in the frontal region responsible for rational decision-making. Consequently, the brain's thalamus may struggle to adequately filter information, causing individuals to be hypersensitive to stimuli (van der Kolk, 2014). Training waves in the orbitofrontal cortex improves self-regulation by establishing neural networks crucial for goal-oriented behavior in the brain (Paret et al., 2019). The challenge at TSBB is to foster openness to new possibilities. Neurofeedback aims to modify chronic brain patterns—such as fear, anger, and shame circuits—that result from trauma. For instance, relaxing the fear pattern reduces the brain's sensitivity to previous automatic stress responses, facilitating focus on ordinary situations and events (van der Kolk, 2014).

Successful emotion regulation correlates with decreased amygdala activity. Studies on reducing amygdala activation have shown that neurofeedback training significantly influences emotion control (Herwig et al., 2019). Neurofeedback maintains brain balance and enhances resilience, enabling individuals to choose their responses. The trance state induced by theta activity facilitates conditioning responses to triggering stimuli (e.g., sound, light, visual cues) encountered in daily life, reducing their perceived threat. Alpha/theta training allows re-experiencing traumatic events to form new associations and learnings (van der Kolk, 2014).

Neurofeedback therapy has shown promising outcomes in treating posttraumatic stress disorder (Chiba et al., 2019). Peniston and Kulkosky (1991) conducted experimental research with patients suffering from war-related chronic PTSD, revealing significant reductions in somatic symptoms, depression, anxiety, paranoia, and overall PTSD symptoms following neurofeedback treatment.

The purpose of this study was to evaluate the effects of psychotherapy focused on emotion regulation, enhanced by neurofeedback, on psychological symptom levels in individuals. Specifically, the focus was on enhancing emotional processes—such as awareness, recognition, sense-making, and expression—related to traumatic experiences through brain wave control. SCL-90-R, a commonly used psychological assessment tool in clinical trials providing a comprehensive assessment of mental health, was employed to evaluate psychological symptoms.

Method

In this study, a mixed-method design incorporating pre-test, post-test, and follow-up assessments was utilized to evaluate the impact of neurofeedback-assisted emotion regulation-based psychotherapy on psychological symptoms. The researchers employed an experimental design to elucidate cause-and-effect relationships between variables. The unbiased allocation of participants to groups is crucial in establishing causal relationships in experimental designs (Gliner & Morgan, 2000). This design incorporates both within-group and between-group comparisons, making it a mixed-pattern approach (Howitt & Cramer, 2011). Figure 1 presents the research design.

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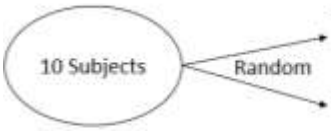
Figure 1. *Experimental Design Used in Research*



Group	Pre-test	Treatment	Post-test	Follow-up
Experimental Group (5 subjects)	SCL-90-R	Neurofeedback Supported Emotion Expression Application	SCL-90-R	SCL-90-R
Control Group (5 subjects)	SCL-90-R	Emotion Expression Application	SCL-90-R	SCL-90-R

Participants

Approval for this research was granted by the University's Scientific Research and Publication Ethics Board (2024/164). First, individuals who initiated the psychological counseling process due to complaints such as stress, anxiety, depression, and psychosomatic symptoms, and who had experienced childhood trauma (specifically, sexual abuse), were asked if they would be willing to participate in this research. In the preliminary interview, the selection of individuals with trauma experiences was based on participants' self-reports and declarations regarding their traumatic experiences. In the initial phase of the study, conducted one month before the sessions, all participants, both in the experimental and control groups, voluntarily completed the Psychological Symptoms Screening Form (SCL-90-R). Following the one-month interval, the same participants underwent the SCL-90-R assessment again. Those who did not exhibit significant changes in their psychological symptom levels within this period and remained above the threshold for experiencing psychological symptoms were identified. Subsequently, 18 participants meeting the predetermined psychological symptom score criteria for the study were selected. Of these 18 participants, two groups of five people were determined from the pool of 10 subjects who agreed to participate in the study, based on completely random selection. Moreover, Participants were assigned to the experimental and control groups randomly. Table 1 provides an overview of the gender and age distributions of participants across the groups.

Table 1. *Gender and Age of Individuals in the Experimental and Control Groups*

Groups	Cases									
	Case 1		**Case 2**		**Case 3**		**Case 4**		**Case 5**	
	Gender	*Age*	*Gender*	*Age*	*Gender*	*Age*	*Gender*	*Age*	*Gender*	*Age*
Experimental Group	Female	42	Male	38	Female	34	Male	40	Female	33
Control Group	Male	36	Female	39	Female	31	Female	41	Female	36

In the neurofeedback group (experimental), there are two male and three female participants, with a mean age of 37.4 years. Conversely, in the control group, one male and four female participants did not receive neurofeedback, with a mean age of 36.6 years. Common characteristics among individuals in both groups include having not sought psychological assistance previously, experiencing childhood trauma (specifically, sexual abuse) without prior disclosure to anyone, utilizing coping mechanisms such as repression, denial, and misdirection, and predominantly experiencing emotions such as anger, rage, hatred, grudge, fear, and guilt.

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Data Collection Tools

The Symptom Checklist-90-Revised

This self-reported psychiatric screening tool, was originally revised by Derogatis (1977). The scale consists of 90 items aimed at evaluating the intensity and specific domains of psychological symptoms individuals experience. Each item is rated on a five-point Likert scale. The total score reflects the "General Symptom Level," with higher scores indicating more pronounced psychological symptoms. The scale encompasses nine sub-dimensions: somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid thinking, and psychoticism. Additionally, an appendix addresses feelings of guilt, eating disorders, and sleep disturbances. The original scale demonstrated internal consistency coefficients between .77 and .90 across its sub-dimensions, while the test-retest reliability coefficients over a one-week period ranged from .78 to .90 (Derogatis, 1977).

In this research, the Turkish adaptation of the scale was utilized and adaptation studies were conducted by Dağ (1991). Results indicated that the scale maintained its factor structure within Turkish culture. Dağ (1991) reported a Cronbach's Alpha of .97 for the entire scale, with relationships between subscales and overall indicators ranging from .51 to .91. Furthermore, correlations between the SCL-90-R and similar subtests of the Minnesota Multiphasic Personality Inventory (MMPI) administered concurrently to university students ranged from .40 to .59 (Öner, 1997).

Process

Two measurements were conducted to ensure the suitability of subjects for the study: one month prior to the commencement of sessions and immediately before the intervention. Individuals whose psychological symptom levels remained stable during this one-month period were included. The scores obtained from the second measurement for these individuals were considered as pre-test scores. Subsequently, it was confirmed that no significant difference existed in the average psychological symptom scores between the identified groups prior to the commencement of psychological counseling, as measured by the SCL-90 scale. The counseling sessions, incorporating emotion regulation techniques, were tailored to facilitate individuals' exploration of basic emotions and mitigate the adverse impact of traumatic memories through experiential learning. Additionally, neurofeedback therapy was exclusively utilized to support participants in the experimental group in transforming the neurological changes resulting from trauma exposure, as revealed by the research, into positive adaptations.

During the intervention phase, the experimental group underwent 10 sessions of neurofeedback-supported emotion regulation-based psychotherapy. Concurrently, the control group received emotion regulation-based psychotherapy without neurofeedback. The sole distinction in the emotion regulation sessions between both groups was that individuals in the experimental group had real-time visualization of the impact of their thoughts, feelings, and behaviors on brain waves using the neurofeedback method through a computer and connected screen.

Following the conclusion of the psychotherapy period, the SCL-90 was administered as a post-test to all participants within the week. Subsequently, participants were contacted again after one month to provide an update on their status. By maintaining records of participants' current contact information, the same individuals were reached two years later, and their psychological symptom levels were re-assessed using the SCL-90 as a follow-up test. A key element of this study is the extended duration of the follow-up test, conducted after a significant period of time (2 years), aimed at gaining deeper insights into the lasting effects of the applied methods on trauma-related symptoms.

Emotion Regulation-Based Psychotherapy

The Emotion Regulation-Based Psychotherapy program was developed based on the core framework of Emotion-Focused Therapy, with a specific focus on helping individuals recognize, identify, accept, and express their emotions, ultimately aiming to regulate them. The ten sessions of

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emotion regulation-based psychotherapy program given to the participants in both groups can be summarized as follows:

The first session is designed as an orientation session. During this session, clients are provided with details regarding the schedule, location, and guidelines to be adhered to throughout the program. A brief overview of the challenges they are facing is also presented. Furthermore, experimental group's participants obtain information about introduction of neurofeedback application and its intended benefits. The primary objectives of the first session include structuring the therapeutic process, fostering a therapeutic alliance, and establishing a foundation of trust between the clients and the therapist.

The second session focuses on the client's disclosure of their trauma, which they may have never shared with anyone before, at their own pace. During this session, the client is encouraged to assign an adjective (such as "hurt child," "innocent child," "beautiful child," etc.) to themselves during the occurrence of the traumatic event, and to narrate the experience from their perspective. Trauma often retains its impact over time, affecting the present as intensely as when it first occurred. Thus, the aim is for the client to articulate their traumatic experiences, recognizing the potency of memories influenced by trauma, and to approach the situation from the perspective of their younger self, rather than their current self. Through these exercises, the goal is to enable the client to assess their trauma within the context of their current abilities, awareness, and coping mechanisms. The second session aims to reveal primary dysfunctional emotions and show empathy for the client by identifying difficult experiences with the DOT's technique that aims to empathize with the clients and show compassion for themselves, asking if they can help the "hurt child" in them (Işık-Terzi and Ergüner-Tekinalp, 2013). Ultimately, the objective is to establish an empathetic therapeutic foundation that facilitates the process of regulating emotions.

The third session focuses on establishing goals with the client. Firstly, the overall purpose and its corresponding sub-objectives are identified. Then, with collaborative effort between the client and the therapist, specific targets are set to achieve each sub-objective. It was observed that both groups identified "forgetting" the traumatic event as their main goal. However, this desire to forget can indicate a tendency among some clients to suppress the memory and avoid confronting its contents (Conoley & Close-Conoley, 2009). Instead, the primary aim is to foster acceptance of the experienced situation in collaboration with the client. To achieve this overarching goal, four sub-goals are established. These sub-goals share a common theme across individuals to ensure consistency and prevent external factors from influencing the outcome of the neurofeedback intervention. In a sense, these goals serve as a control variable. The identified sub-objectives are as follows: understanding the underlying reasons behind the traumatic event, including the psychodynamics of the the actions of the perpetrator; accepting the occurrence of the event instead of denying it and wishing it had not happened; revising expectations and perceptions related to the event and offering forgiveness to the "traumatized self" for having the courage to share the experience with someone for the first time.

In the fourth session, tasks were assigned to work towards achieving these four sub-objectives, and homework assignments were provided for each task. Specifically, the session focused on identifying the predetermined goals and the thoughts associated with the traumatic event. Automatic thoughts, which often manifest as cognitive distortions, were pinpointed, along with their emotional and behavioral consequences.

In the fifth session, the emotions accompanying the event were determined. A detailed analysis was made about when and where these emotions occurred, and with whom they increased or decreased.

In the sixth session, the focus shifted to identifying the behaviors link to the traumatic event. It was emphasized that one of the outcomes of clients' thoughts and feelings related to the event is their behavior. Clients were encouraged to explore the reasons behind their long-standing thought patterns, fostering awareness of how their thoughts and behaviors are influenced by their beliefs about the past, present, and future shaped by the trauma experienced.

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In the seventh session, the bodily sensations accompanying the event of the clients were studied. In this session, the client's awareness that unexpressed emotions turn into bodily complaints and that the psychological pressure created in this way is expressed.

The fourth session focuses on identifying the cognitive and behavioral components that contribute to the emotional schemas hindering the attainment of established goals. Emotional schemas, comprising emotions, goals, memories, thoughts, and behavioral tendencies acquired during early life stages, play a crucial role in shaping individual experiences (Işık-Terzi & Ergüner-Tekinalp, 2013). Analyzing feelings, thoughts, behaviors, and bodily sensations in detail over the following sessions aims to enhance client awareness. Healing through verbal expression involves stimulating Broca's area, linking words and emotions to the fragmented neural networks storing trauma-related information, and reshaping perceptions (Cozolino, 2018). Greenberg (2014) suggests that each time a memory is recalled, it undergoes rewriting, influenced by recent events. This insight offers hope that experiential sessions can lead to memory modifications. Thus, dysfunctional feelings stemming from early loss and trauma are explored during therapy sessions, with the aim of memory reconstruction (Işık-Terzi & Ergüner-Tekinalp, 2013). Consequently, the eighth and ninth sessions are dedicated to reconstructing memories within the therapeutic setting.

During the eighth and ninth sessions, clients focus solely on expressing emotions related to trauma that they were previously unable to articulate. Initially, distorted thoughts accompanying the trauma are identified, and alternative explanations are devised to restructure cognition. Following this cognitive restructuring, clients engage in practice activities during and after the session, facilitating the expression of their feelings about the event in a more accessible and functional manner. Clients not only begin to voice repressed emotions regarding the event but also articulate both positive and negative feelings they experience in their current interactions (with family members, spouses, etc.) as a result of the event, yet struggle to express them appropriately. This transition marks a significant indicator of psychological well-being. Up to this point, clients have demonstrated comprehension of the psychodynamics underlying their experience, acceptance of the event based on this understanding, and adjustment of expectations accordingly.

In the tenth session, clients engage in activities aimed at replacing dysfunctional emotions with functional ones, such as bidding farewell to avoided emotions and writing letters to evoke functional emotions (Işık-Terzi and Ergüner-Tekinalp, 2013). During this session, clients are tasked with composing a letter addressed to themselves, specifically forgiving their past selves characterized as small, innocent, blameless, fearful, etc. (reflecting their state at the time of the trauma). The letter is typed up during the session, and clients complete the writing process while discussing the thoughts and emotions accompanying this experience. They are encouraged to read the letter at their own pace, after which their subsequent thoughts and emotions are explored.

Some of the changes reported during follow-up sessions with each client two years later included decreased bodily complaints, reduced fatigue in interpersonal relationships, diminished doubts, earlier sleep onset, increased morning vitality, reduced fear of recalling the traumatic event, and cessation of avoidance behaviors triggered by reminders of the event. Clients also noted that these changes were noticed by their relatives, whose positive reactions made them feel happier and stronger. By acknowledging, recognizing, and expressing their feelings, clients felt they had completed a perpetual task for themselves, empowering them to lead a more complete and purposeful life across the past, present, and future.

Neuofeedback App

While the sessions were designed similarly for both groups as outlined above, individuals in the experimental group had the unique opportunity to immediately monitor their brain waves' positive and negative changes in response to their thoughts, emotions, behaviors, and bodily reactions throughout ten sessions. Alongside the emotion regulation studies, the neurofeedback application included the following steps:

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Each client was initially briefed on the Neurofeedback application, its applications in various disorders, its usage, and assured of its lack of side effects. In this study, Alpha/Theta training was employed. While the theta wave relates to the inner world, facilitating free-flowing mental imagery, the alpha wave facilitates connection with the external world, acting as a bridge between internal and external realms. Alpha/theta training alternately reinforces these waves, enhancing their connection and aiding individuals in staying grounded in reality (Van der Kolk, 2018). Each client underwent a trial application where they learned to observe changes in brain waves associated with their thoughts, feelings, and physiological responses. They were guided on interpreting increases and decreases in these waves. Following this trial, individual interviews were conducted to gather feedback. Clients expressed positive evaluations, noting that witnessing concrete reflections of their mental and physiological changes bolstered their confidence in their recovery.

The application involved sensors attached to the right and left earlobes and the frontal lobe region, allowing clients to observe brain wave movements on a computer screen. During neurofeedback sessions, clients observed concrete differentiation in the expression of emotions through brain waves. This tangible differentiation, perceived by the clients, likely contributed to more rapid and lasting recovery. For instance, anger was associated with increased Theta and Delta waves, while feelings of peace, relaxation, and forgiveness correlated with increased Alpha waves and decreased Beta waves. Clients reported enhanced ease in expressing and regulating their emotions in social settings, thanks to the skills gained from this practice. For example, during this process, clients said that they were thinking "which wave am I raising right now" or that they were making humorous expressions such as "please do not raise my theta wave" to the other person.

Analysis of Data

In the data analysis, a Mixed Inter-Group Intra-Variance Analysis (Mixed Design ANOVA) was conducted using the SPSS 27 package. This analysis enabled the simultaneous examination of differences across pre-test, post-test, and follow-up test scores, representing the main effects of time, as well as the main effects and interaction effect for the experimental and control groups. By integrating these factors into a single analysis, the error rate was significantly reduced. Prior to the analyses, the distribution of scores at the pre-intervention, post-intervention, and follow-up stages for both groups was assessed using the Shapiro-Wilk Test, revealing that all scores were normally distributed. Additionally, effect sizes were reported to enhance the assessment of the clinical significance of statistically significant findings (Özsoy & Özsoy, 2013).

Results

In this study, the effect of neurofeedback-assisted emotion regulation-based psychotherapy on psychological symptoms was examined. Within the scope of psychological symptoms, SCL90-R was used as pre-test, post-test and follow-up test in both groups and all sub-dimensions were measured. The research findings do not include Alpha Beta values. The analyses are limited to psychological symptoms identified through the SCL90-R scale. The scores of both groups over three time periods are presented in Table 2.

Table 2. *Pretest, Posttest and Follow-up Test Scores of Experimental and Control Groups*

Psychological Symptoms	Application	Experimental Group			Control Group		
		n	$\bar{x}$	*ss*	*n*	$\bar{x}$	*ss*
Somatization	Pretest	5	1.82	.12	5	1.80	.15
	Posttest	5	.754	.12	5	.95	.03
	Follow-up	5	.50	.32	5	.69	.16
Obsessive Compulsive Symptoms	Pretest	5	2.47	.22	5	2.43	.22
	Posttest	5	.59	.21	5	.67	.21
	Follow-up	5	.82	.37	5	.94	.40

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Interpersonal Sensitivity	Pretest	5	1.65	.28	5	1.61	.27
	Posttest	5	.63	.19	5	.79	.15
	Follow-up	5	.55	.29	5	.56	.29
Depression	Pretest	5	2.53	.31	5	2.50	.30
	Posttest	5	.45	.08	5	.89	.03
	Follow-up	5	.56	.20	5	1.08	.49
Anxiety	Pretest	5	1.87	.18	5	1.84	.18
	Posttest	5	.62	.05	5	.87	.05
	Follow-up	5	.26	.17	5	.60	.35
Hostility	Pretest	5	1.81	.28	5	1.78	.27
	Posttest	5	.61	.14	5	.91	.04
	Follow-up	5	.40	.22	5	1.00	.44
Phobic Anxiety	Pretest	5	3.31	.36	5	2.30	.36
	Posttest	5	.63	.09	5	.76	.13
	Follow-up	5	.11	.19	5	.28	.39
Paranoid Thinking	Pretest	5	2.55	.23	5	2.52	.23
	Posttest	5	.69	.04	5	.87	.08
	Follow-up	5	.30	.27	5	.87	.70
Psychoticism	Pretest	5	2.13	.54	5	2.13	.54
	Posttest	5	.50	.08	5	.77	.08
	Follow-up	5	.16	.13	5	.44	.27

When Table 2 is examined, the psychological symptoms of both the experimental group and the control group change in three time periods. Mixed Inter-Group Variance Analysis was performed to determine both the change over time and the change between the groups at the same time. Before examining the main effects for the time and group, the interaction effect was first checked to determine whether the same change occurred in the scores of both groups over time.

According to the findings, there was no significant interaction between the group and time for somatization scores from psychological symptoms Pillai's Trace = .33, $F_{(2-7)}$ = 1.72, p =. 246, partial eta square = .33.

There is a major impact for time Pillai's Trace = .97, $F_{(2-7)}$ = 118.62, p=.000, partial eta squared = .97. The effect size results show that the therapies applied to the groups correspond to the great potency. There was a large decrease in the somatization scores of both groups between pretest, posttest and follow-up tests, as seen in Table 2.

The main effect comparing the two types of applications was not significant $F_{(1-8)}$ = 4.91, p = .058, partial eta squared = .38. The findings show that the procedure applied to both groups was effective and the results were quite close to each other. The change between the scores of the somatization pretest, posttest and follow-up test of both groups is shown in Figure 2.

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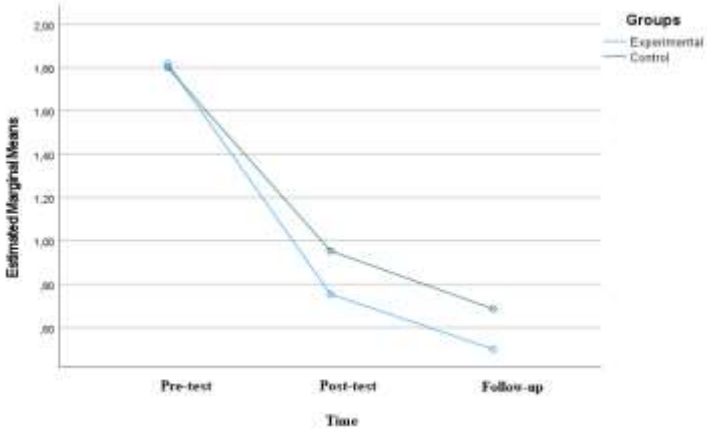
Figure 2 *Somatization Scores for the Experimental and Control Groups Across Three Time Periods*



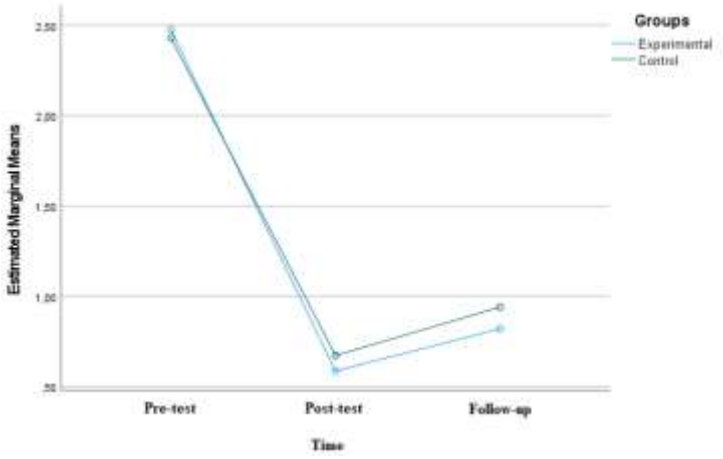
As shown in Figure 2, neurofeedback-assisted emotion regulation-based psychotherapy applied to the experimental group provided a greater reduction in somatization symptoms than emotion regulation-based psychotherapy alone applied to the control group, however the difference was not statistically significant.

There was no significant interaction between the group and time for obsessive-compulsive symptom scores, another psychological symptom examined within the scope of the research Pillai's Trace = .09, $F_{(2\text{-}7)}$ = .33, p = .727, partial eta square = .09.

The major main effects for time are Pillai's Trace = .99, $F_{(2\text{-}7)}$ = 253.28, p = .000, partial eta square = .99. The effect size results show that the therapy applications applied to the groups correspond to the great potency. As seen in Table 2, the obsessive-compulsive symptom scores of both groups decreased over three time periods.

The main effect comparing the two types of applications was not significant $F_{(1\text{-}8)}$ = .25, p = .634, partial eta square = .03. The findings show that the procedure applied to both groups was effective and the results were quite close to each other. The change between the scores of both group's obsessive-compulsive symptoms, pretest, posttest, and follow-up is shown in Figure 3.

Figure 3. *Obsessive Compulsive Symptoms Scores for the Experimental and Control Groups Across Three Time*



Periods

As shown in Figure 3, neurofeedback-assisted emotion regulation-based psychotherapy applied to the experimental group provided a greater reduction in obsessive-compulsive symptoms

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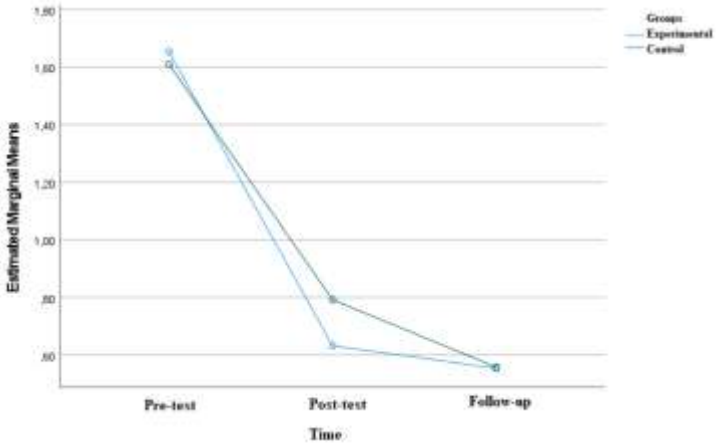
than emotion regulation-based psychotherapy alone applied to the control group, however the difference was not statistically significant.

There was no significant interaction between the group and time in interpersonal sensitivity scores, another psychological symptom Pillai's Trace = .31, $F_{(2-7)}$ = 1.55, p = .277, partial eta square = .31.

There is a great main influence for time. Pillai's Trace = .96, $F_{(2-7)}$ = 88.92, p = .000, partial eta square = .96. The effect size results show that the therapy applications applied to the groups correspond to the great potency. As seen in Table 2, the interpersonal sensitivity scores of both groups decreased over three time periods.

The main effect comparing the two types of applications was not significant $F_{(1-8)}$ = .13, p = .731, partial eta square = .02. The findings show that the procedure applied to both groups was effective and the results were quite close to each other. The change between the interpersonal sensitivity pretest, posttest and follow-up scores of both groups is shown in Figure 4.

Figure 4. *Interpersonal Sensibility Scores for the Experimental and Control Groups Across Three Time Periods*



As seen in Figure 4, neurofeedback-assisted emotion regulation-based psychotherapy applied to the experimental group provided a greater reduction in interpersonal sensitivity symptoms than emotion regulation-based psychotherapy alone applied to the control group, however the difference was not statistically significant.

There was a significant interaction between the group and time for depression scores Pillai's Trace = .44, $F_{(2-7)}$ = 2.70, p = .135, partial eta square = .44.

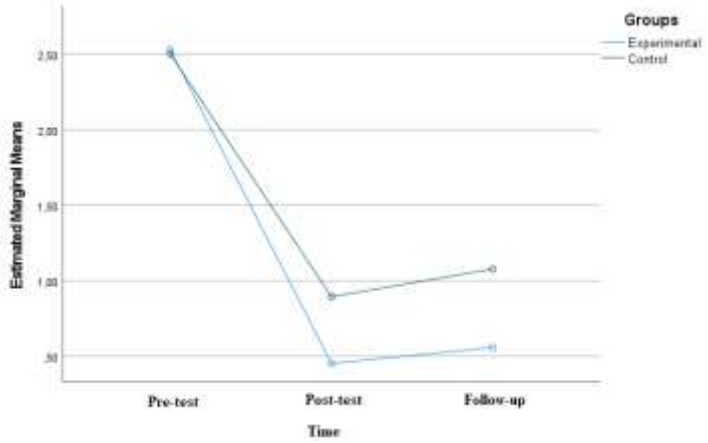
There is a great main influence for time. Pillai's Trace = .98, $F_{(2-7)}$ = 159.86, p = .000, partial eta squared = .98. The effect size results show that the therapy applications applied to the groups correspond to the great potency. As seen in Table 2, depression scores of both groups decreased over three time periods.

The main effect comparing the two types of applications was significant $F_{(1-8)}$= 7.48, p=.026, partial eta square= .48. According to this finding, neurofeedback-assisted emotion regulation-based psychotherapy applied to the experimental group made a statistically significant difference compared to emotion regulation-based psychotherapy applied to the control group, which corresponds to its great effective power in the treatment of depression.

The change between the depression pretest, posttest and follow-up scores of the both groups is shown in Figure 5.

Koç, M., Çolak Turan, T. S., Sapancı, A., Kelek, Ş., & Koç, G. (2024). The effect of neurofeedback-assisted emotion regulation-based psychotherapy on psychological symptoms in individuals with trauma experiences. *Journal of Human Sciences*, *21*(4), 454-476. doi:10.14687/jhs.v21i4.6499

Figure 5. *Depression Scores for the Experimental and Control Groups Across Three Time Periods*



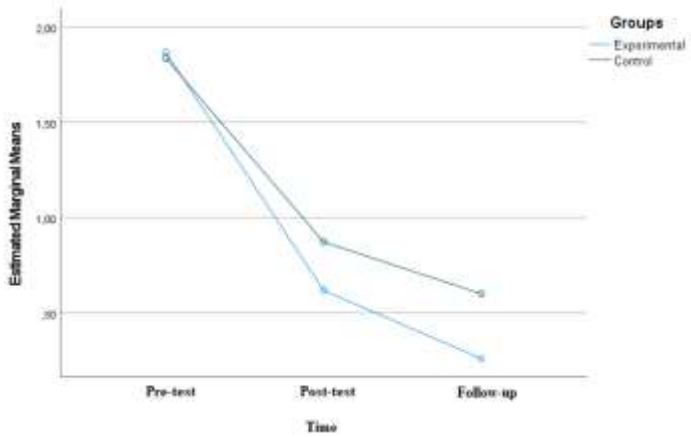
As can be seen in Figure 5, it is seen that neurofeedback-supported emotion regulation-based psychotherapy applied to the experimental group provides both statistically significant reduction in depression symptoms and that the gains are permanent compared to emotion regulation-based psychotherapy alone applied to the control group.

There was no significant interaction between the group and time for anxiety scores Pillai's Trace =.55, $F_{(2\text{-}7)}$=4.30, p=.061, partial eta squared = .55.

There are a major effects for time in Pillai's Trace =.99, $F_{(2\text{-}7)}$ = 257.76, p=.000, partial eta squared = .99. The effect size results show that the therapy applications applied to the groups correspond to the great potency. As seen in Table 2, the anxiety scores of both groups showed a large reduction over three time periods.

The main effect comparing the two types of applications was not significant $F_{(1\text{-}8)}$ = 4.63, p = .064, partial eta square = .37. The findings show that the procedure applied to both groups was effective and the results were quite close to each other. The change between the anxiety pretest, posttest and follow-up scores of both groups is shown in Figure 6.

Figure 6. *Anxiety Scores for the Experimental and Control Groups Across Three Time Periods*



As shown in Figure 6, neurofeedback-assisted emotion regulation-based psychotherapy applied to the experimental group provided a greater reduction in anxiety symptoms than emotion regulation-based psychotherapy alone applied to the control group, however the difference was not statistically significant.

There was no significant interaction between group and time for hostility scores Pillai's Trace = .49, $F_{(2\text{-}7)}$ = 3.32, p = .097, partial eta square = .49.

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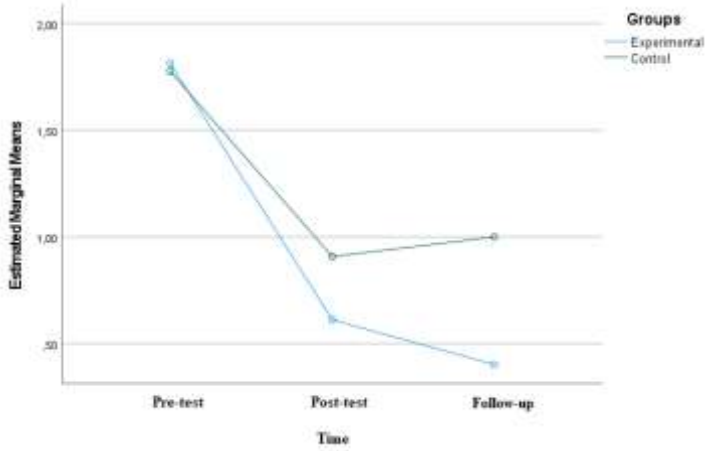
The major main effects for time are Pillai's Trace = .95, $F_{(2-7)}$ = 69.57, p = .000, partial eta square = .95. The effect size results show that the therapy applications applied to the groups correspond to the great potency. As seen in Table 2, the hostility scores of both groups showed a large reduction over three time periods.

The main effect comparing the two types of applications was significant $F_{(1-8)}$ = 8.11, p = .022, partial eta square = .50. According to this finding, neurofeedback-assisted emotion regulation-based psychotherapy applied to the experimental group made a statistically significant difference corresponding to the great effect power in the treatment of hostility compared to emotion regulation-based psychotherapy alone applied to the control group. The change between the hostility pretest, posttest and follow-up scores of both groups is shown in Figure 7.

Figure 7. *Hostility Scores for the Experimental and Control Groups Across Three Time Periods*



As shown in Figure 7, neurofeedback-assisted emotion regulation-based psychotherapy applied to the experimental group provided a statistically significantly greater reduction in hostility symptoms than emotion regulation-based psychotherapy alone applied to the control group.

There was no significant interaction between group and time for phobic anxiety scores Pillai's Trace = .11, $F_{(2-7)}$ = .43, p = .668, partial eta square = .11.

There are major main influences for time Pillai's Trace = .99, $F_{(2-7)}$ = 232.13, p=.000, partial eta squared = .99. The effect size results show that the therapy applications applied to the groups correspond to the great potency. As seen in Table 2, the phobic anxiety scores of both groups decreased over three time periods.

The main effect comparing the two types of applications was not significant $F_{(1-8)}$ = .44, p = .525, partial eta square = .05. The findings show that the procedure applied to both groups was effective and the results were quite close to each other. The change between the phobic anxiety pretest, posttest and follow-up scores of both groups is shown in Figure 8.

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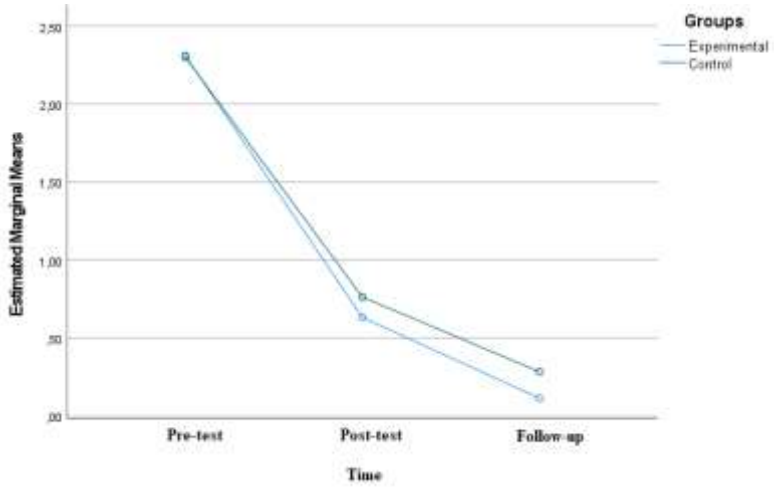
Figure 8. *Phobic Anxiety Scores for the Experimental and Control Groups Across Three Time Periods*



As seen in Figure 8, neurofeedback-assisted emotion regulation-based psychotherapy applied to the experimental group provided a greater reduction in phobic anxiety symptoms than emotion regulation-based psychotherapy alone applied to the control group, however the difference was not statistically significant.

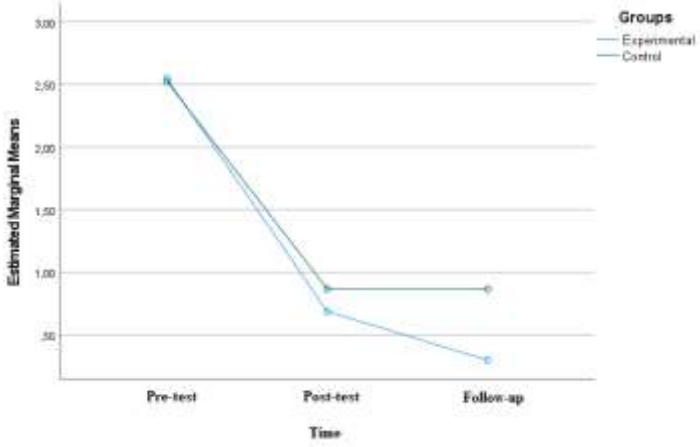
There was no significant interaction between group and time for paranoid thought scores Pillai's Trace = .49, $F_{(2\text{-}7)}$ = 3.40, p = .093, partial eta square = .49.

The major main effects for time are Pillai's Trace = .99, $F_{(2\text{-}7)}$ = 376.98, p = .000, partial eta square = .99. The effect size results show that the therapy applications applied to the groups correspond to the great potency. As seen in Table 2, the paranoid thought scores of both groups decreased over three time periods.

The main effect comparing the two types of applications was not significant $F_{(1\text{-}8)}$ = 2.81, p = .133, partial eta square = .26. The findings show that the procedure applied to both groups was effective and the results were quite close to each other. The change between the pretest, posttest and follow-up test scores of both groups is shown in Figure 9.

Figure 9

Paranoid Ideation Scores for the Experimental and Control Groups Across Three Time Periods



As seen in Figure 9, neurofeedback-assisted emotion regulation-based psychotherapy applied to the experimental group provided a greater reduction in paranoid thought symptoms than emotion regulation-based psychotherapy alone applied to the control group, however the difference was not statistically significant.

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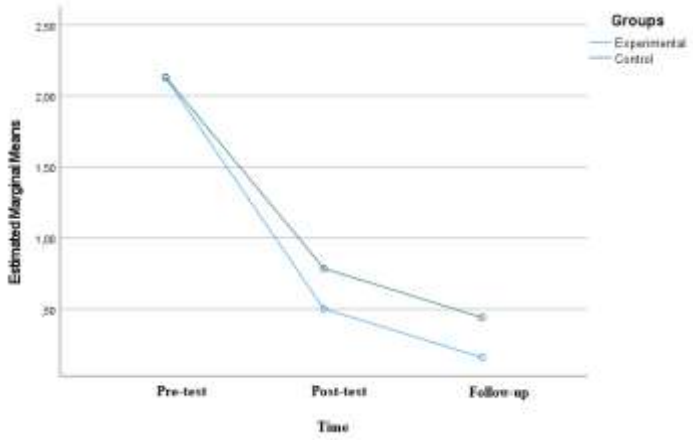
There was no significant interaction between group and time for psychoticism scores Pillai's Trace = .10, $F_{(2-7)}$ = .41, p = .681, partial eta square = .10.

There are a major influence for time Pillai's Trace = .97, $F_{(2-7)}$ = 95.21, p = .000, partial eta square = .97. The effect size results show that the therapy applications applied to the groups correspond to the great potency. As seen in Table 2, the psychoticism thought scores of both groups decreased over three time periods.

The main effect comparing the two types of applications was not significant $F_{(1-8)}$ = 1.80, p = .216, partial eta square = .18. The findings show that the procedure applied to both groups was effective and the results were quite close to each other. The change between the scores of both groups on the psychoticism pretest, posttest and follow-up test is shown in Figure 10.

Figure 10. *Psychoticism Scores for the Experimental and Control Groups Across Three Time Periods*



As shown in Figure 10, neurofeedback-assisted emotion regulation-based psychotherapy applied to the experimental group provided a greater reduction in psychoticism symptoms than emotion regulation-based psychotherapy alone applied to the control group, however the difference was not statistically significant.

Discussion

Emotions hold a crucial role in facilitating change. When individuals encounter significant events, their cognitive flexibility may diminish, leading to intensified emotional experiences and rapid reactions. Traumatic experiences often halt cognitive information processing, resulting in intense activation of the amygdala and the storage of negative emotions in fragmented neural networks (Cozolino, 2015). Childhood trauma is strongly linked to various developmental, psychosocial, and medical issues across the lifespan, with emotion dysregulation serving as a key explanatory factor (Dvir et al., 2014). This study focused on clients with profound traumatic histories. Emotion regulation-based interventions, tailored for traumatized individuals and emphasizing present emotions, were implemented in sessions, drawing from techniques and stages of EFT (Işık-Terzi & Ergüner-Tekinalp, 2013). Additionally, the experimental group received support through Neurofeedback therapy, a behavioral technique embraced within eclectic therapeutic approaches (Corsini & Wedding, 2005; Prochaska & Norcross, 2010).

We assessed both the impact of emotion regulation-based psychotherapy and the combination of emotion regulation-based psychotherapy with Neurofeedback on trauma-related psychological symptoms. Results indicated significant reductions in trauma-related psychological symptoms for both intervention approaches. According to Greenberg (2014), emotions are fundamental to social connection, and memories evolve with new experiences. Exploring and experiencing emotions are pivotal steps in assisting clients in understanding their emotions. and transform them into more

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adaptive ones (Greenberg, 2016). Across the ten-session process, our aim was to enhance clients' emotional awareness, uncover their patterns, and reshape their personal narratives through inter-session experiences. Post-experiment assessments revealed the efficacy of emotion regulation-based psychotherapy in alleviating psychological symptoms, with lasting effects observed in follow-up tests conducted after 2 years.

The study demonstrated that Neurofeedback-assisted emotion regulation-based psychotherapy was more effective in alleviating trauma-related psychological symptoms compared to emotion regulation-based psychotherapy alone. While both groups showed decreased mean symptom levels across all sub-dimensions, significant differences between both groups were observed specifically for "depression" and "hostility". Notably, these differences were clinically significant ($p < .05$ and partial eta squared $> .14$). In summary, while emotion regulation-based psychotherapy alone proved effective in symptom reduction, augmenting such studies with Neurofeedback enhanced treatment efficacy.

Upon closer examination of the research findings concerning the time effect, it's evident that the main effect of time across all sub-dimensions for both groups is significant, with a large effect size. This indicates that both interventions effectively reduced individuals' trauma-based psychological symptoms. In particular, post-test averages across all sub-dimensions were significantly lower than the pre-test averages. Additionally, during the follow-up assessment conducted two years later, symptom scores for somatization, interpersonal sensitivity, anxiety, phobic anxiety, and psychoticism further declined in both groups compared to their post-test results. However, for the paranoid thoughts sub-dimension, while the experimental group experienced a reduction in follow-up scores, no change was observed in the control group. Furthermore, both groups exhibited increases in obsessive-compulsive symptoms and depression throughout the follow-up period compared to the post-test, though these scores remained notably lower than their pre-test levels. Regarding the hostility subscale, the follow-up scores decreased in the experimental group but increased in the control group, with the control group's scores still lower than pre-test values. These results highlight the enduring impact of the interventions. Almost all disorders outlined in the DSM-V diagnostic manual feature at least one non-functional symptom related to emotion (Sloan & Kring, 2010), highlighting the importance of processing and regulating emotions in psychological symptoms and disorders (Leahy et al., 2011). In Koç et al. study (2019), it was noted that the ability to express emotions, a key step in emotion regulation and a fundamental practice in this study's sessions, serves as a crucial predictor of psychological symptoms. They found that as individuals' capacity to express emotions increases, psychological symptoms tend to decrease. Similarly, Katz & Campbell (1994) identified a significant relationship between emotional expression and depression, while King & Emmons (1990) linked it to obsessive-compulsive tendencies, depression, paranoid thoughts, and anxiety. These findings align with existing literature. However, there are variations across studies concerning different sub-dimensions. Additionally, during the follow-up session of this study, apart from SCL-90 measurements, clients reported decreased physical complaints, reduced strain in interpersonal relationships, diminished doubts, earlier bedtime, increased morning vigor, reduced fear associated with reflecting on the traumatic event, and stopped engaging in escape behaviors triggered by cues related to the event.

When examining the research findings regarding the impact of the implemented program, a notable difference in trauma-based symptoms across all sub-dimensions was observed within the control group, which received emotion regulation-based psychotherapy alone. Similarly, a significant reduction in symptoms was noted within the experimental group, which received neurofeedback-supported emotion regulation-based psychotherapy. A more detailed analysis revealed that the symptom scores of the experimental group were consistently lower than those of the control group in both the post-test and follow-up assessments across all sub-dimensions. Although there was an increase in obsessive symptoms and depression scores between the post-test and follow-up test, this increase was less pronounced in the experimental group compared to the control group.

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Furthermore, while hostility scores continued to decrease in the experimental group after the post-test, they showed a partial increase in the control group. These findings indicate that incorporating neurofeedback therapy into emotional expression improves the overall effectiveness of the intervention. Particularly noteworthy is the statistically significant difference observed, with a high clinical impact value, in the sub-dimensions of depression and hostility. Neurofeedback application has the potential to influence neurotransmitter production, as evidenced by research (Sulzer et al., 2013). For example, individuals with PTSD frequently show heightened levels of norepinephrine, triggering the fight or flight response, alongside decreased serotonin levels, leading to avoidance of attachment, trust, and well-being. This neurochemical imbalance can contribute to symptoms like anger, depression, and an increased risk of suicide (Cozolino, 2015). Therefore, the observed differences in the depression and hostility sub-dimensions between the groups are comprehensible in this context.

The mean differences between both groups, whether statistically significant or not, are believed to stem from the regulation of brain waves within the neurological processes of individuals exposed to trauma, influenced by the Neurofeedback-assisted program. Concurrently, research on trauma suggests a correlation between the emotional expression of traumatic experiences, cognitive restructuring, behavioral changes, and the alleviation of physical symptoms (Conoley & Close-Conoley, 2009). Following the intervention, neurofeedback-supported group's participants exhibited a decrease in beta wave propagation rates, facilitating processes like thinking, remembering, problem-solving and associating. Their alpha waves also became calmer, fostering relaxation and flexibility. These changes in wave activations in the anterior frontal region of the brain mitigated trauma's impact on daily functioning. Comparable studies support these results; for example, research showed that four weeks of amygdala-focused neurofeedback sessions resulted in a significant reduction in amygdala activity compared to the control group, while also improving connection between the amygdala and regions like prefrontal cortex, hippocampus, and the anterior cingulate cortex (Herwig et al., 2019). Indeed, research has elucidated the impact of neurofeedback on various cognitive processes such as fear conditioning, visual perception, and confidence judgment (Oblak et al., 2019). Therefore, it was anticipated that neurofeedback would yield greater reductions in psychological symptom scores among traumatized individuals, considering its influence on these cognitive domains.

The application of Alpha/Theta training in each session empowered individuals to perceive their control over their brain waves through monitoring. Biofeedback studies have shown that individuals can exert control over their autonomic systems when provided with biofeedback, which heightens their awareness of internal factors influencing their conditions, facilitating self-regulation (Senemoğlu, 2013). Following trauma, individuals often develop entrenched neural models that require modification. By inducing relaxation in brain models associated with emotions like fear, neurofeedback therapy reduces sensitivity to stress responses and enhances receptivity to everyday events (van der Kolk, 2014). Unlike pharmacological interventions, which may not sustain metabolic changes induced by talk therapy, neurofeedback therapy offers sustained benefits by providing clients with feedback on their unconscious neuronal activities through graphical or auditory cues, fostering self-awareness and regulation skills, fortifying neural pathways, and enhancing mental resilience and flexibility (Demos, 2005). In the study, as clients recognized their ability to control brain waves, particularly in the right anterior temporal region governing emotions and fear responses, their self-regulation and emotion regulation skills improved. During sessions, clients demonstrated their understanding by identifying active waves corresponding to their emotions and offering real-life examples of their newly acquired skills.

A similar study could explore the simultaneous measurement of brain activity across all brain regions using advanced apparatus. Brain wave asymmetry has been linked to several psychological disorders. Elevated activity in the left frontal region is associated with positive emotions and approach-related behaviors, while increased activity in the right frontal region corresponds to

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negative emotions, such as fear, sadness, and avoidance (Davidson, 1998). Investigating how expressing emotions influences brain wave dynamics in different brain regions, including instances where waves accelerate when they should decelerate or vice versa, and the interplay between desired and undesired changes in brain waves, could enhance therapeutic processes. This study facilitated clients' understanding of how emotions impact brain waves, how brain waves affect psychology, and the effects of verbalizing emotions versus suppressing them. Moreover, it shed light on the impact of reliving experiences without fear or shame on brain waves and the consequent psychological well-being. Specifically, Neurofeedback-assisted psychotherapy provided tangible evidence of how emotional expression induces changes in brain waves. Clients had the opportunity to observe changes in Alpha, Theta, and Delta waves on a TV screen in response to their emotional experiences and verbal expressions, enriching their therapeutic journey. Hence, clinicians may benefit from incorporating Neurofeedback and similar techniques more frequently in their clinical endeavors.

Conclusion, limitations and future suggestions

This study underscores the efficacy of emotion regulation-based psychotherapy, both with and without neurofeedback support, in reducing trauma-related psychological symptoms. The findings revealed that while both intervention approaches significantly decreased symptom levels across all sub-dimensions, neurofeedback-assisted therapy demonstrated superior effectiveness, particularly in the sub-dimensions of depression and hostility. The enduring impact of these interventions was evident in the follow-up assessments conducted two years post-intervention.

It is recommended to incorporate neurofeedback applications in the therapy of individuals experiencing PTSD and other psychological issues. Clinical experts should consider integrating neurofeedback techniques into standard emotion regulation-based psychotherapy protocols for trauma survivors. This approach can enhance treatment efficacy and facilitate a faster and more enduring reduction of symptoms. New research can be conducted on the effectiveness of neurofeedback-assisted therapy for various psychological disorders. Based on the findings from these studies, therapy methods can be diversified. Additionally, experimental research with more intensive neurofeedback applications can be designed. By addressing these recommendations, mental health practitioners can enhance the effectiveness of interventions for trauma-related and other psychological symptoms, contributing to better long-term outcomes for clients.

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