Mental Health and Lifestyle Journal

Year 2027
Volume 5
Issue 5

Comparative Effects of Compassion-Focused Therapy and Clinical Hypnosis on Emotional Reactivity and Cognitive Fusion in Adults With Tension-Type Headache

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Article type:
Original Research

Article history:
Received 24 July 2026
Revised 17 October 2026
Accepted 23 October 2026
Initial Publish 16 November 2026
Published online 01 September 2027

ABSTRACT

This study aimed to compare the effects of compassion-focused therapy and clinical hypnosis on emotional reactivity and cognitive fusion in adults with tension-type headache. This quasi-experimental study used a pretest–posttest–follow-up design with a control group. The statistical population consisted of adults with tension-type headache attending neurology clinics and psychological counseling centers in Tehran, Iran, during 2025. A total of 45 eligible participants were selected through convenience sampling and randomly assigned to compassion-focused therapy, clinical hypnosis, and control groups, with 15 participants in each group. The compassion-focused therapy and clinical hypnosis groups each received eight weekly 90-minute intervention sessions, while the control group received routine care without a structured psychological intervention. Emotional reactivity was assessed using the Emotion Reactivity Scale, and cognitive fusion was measured using the Cognitive Fusion Questionnaire. Assessments were conducted at pretest, posttest, and two-month follow-up. Data were analyzed using repeated-measures multivariate analysis of variance and Bonferroni-adjusted pairwise comparisons in SPSS version 27, with statistical significance set at $p < .05$. Repeated-measures analyses showed significant effects of time, group, and time-by-group interaction for emotional reactivity, with the interaction effect reaching $F(3.36, 70.54) = 31.82$, $p < .001$, partial $\eta^2 = .602$, and for cognitive fusion, $F(3.42, 71.86) = 25.73$, $p < .001$, partial $\eta^2 = .551$. Pairwise comparisons indicated that both compassion-focused therapy and clinical hypnosis significantly reduced emotional reactivity and cognitive fusion compared with the control group at posttest and follow-up (all $p < .001$). Compassion-focused therapy also produced significantly greater reductions than clinical hypnosis in emotional reactivity at posttest ($p = .024$) and follow-up ($p = .041$), and in cognitive fusion at posttest ($p = .007$) and follow-up ($p = .013$). Both compassion-focused therapy and clinical hypnosis were effective in reducing emotional reactivity and cognitive fusion in adults with tension-type headache, although compassion-focused therapy produced comparatively stronger and more sustained effects.

Keywords: Compassion-Focused Therapy; Clinical Hypnosis; Emotional Reactivity; Cognitive Fusion; Tension-Type Headache

How to cite this article:
Dashti Rahmatabadi, M. (2027). Comparative Effects of Compassion-Focused Therapy and Clinical Hypnosis on Emotional Reactivity and Cognitive Fusion in Adults With Tension-Type Headache. *Mental Health and Lifestyle Journal, 5*(5), 1-18. https://doi.org/10.61838/mhlj.347

Introduction

Tension-type headache is among the most prevalent primary headache disorders and represents a substantial source of pain, functional limitation, reduced quality of life, and healthcare utilization in adult populations. Although it is often perceived as less disabling than migraine, recurrent or chronic tension-type headache can impose a considerable psychological and occupational burden because of its persistent or frequently recurring nature. The clinical picture commonly includes bilateral, pressing, or tightening pain

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of mild-to-moderate intensity, yet the consequences of the disorder extend beyond the immediate physical experience of headache. Repeated episodes of pain may interfere with concentration, sleep, interpersonal functioning, productivity, emotional regulation, and the individual's perceived capacity to manage everyday demands. Contemporary approaches therefore increasingly conceptualize chronic and recurrent pain conditions through a biopsychosocial framework rather than through a purely biomedical model. From this perspective, the experience and persistence of pain arise from dynamic interactions among physiological mechanisms, cognitive appraisals, emotional responses, behavioral patterns, interpersonal processes, and contextual influences. Such an approach is particularly relevant to tension-type headache, in which stress, affective distress, maladaptive coping, and cognitive responses to pain may interact with physiological tension and sensitization processes (1). Evidence from psychological treatment research further suggests that addressing psychosocial mechanisms can produce clinically meaningful improvement in people with tension-type headache rather than merely serving as an adjunct to pharmacological management (2).

Traditional management of tension-type headache has included pharmacological treatment, behavioral interventions, relaxation-based techniques, and stress-management strategies. However, the recurrent character of the disorder and variability in treatment response indicate that symptom control alone may be insufficient for a substantial proportion of patients. Earlier controlled research demonstrated that psychological stress-management interventions can contribute to the treatment of chronic tension-type headache and may provide benefits either independently or in combination with medication (3). These findings were important because they supported the proposition that headache-related disability is influenced by modifiable psychological mechanisms and not solely by nociceptive or muscular processes. More recent evidence has strengthened this position. A systematic review and meta-analysis of psychological interventions for tension-type headache found that psychological treatment can reduce headache-related outcomes and highlighted the clinical relevance of nonpharmacological approaches for this population (2). Nevertheless, psychological interventions differ considerably in their theoretical assumptions and mechanisms of action. Some focus primarily on symptom reduction, others on stress regulation or behavioral coping, and still others on changing the individual's relationship with painful sensations, emotions, and thoughts. Identifying interventions that specifically target maladaptive emotional and cognitive processes may therefore help refine psychological treatment for adults with tension-type headache.

One psychological process that may be particularly relevant to recurrent headache is emotional reactivity. Emotional reactivity refers to the tendency to respond to emotional stimuli with heightened sensitivity, strong emotional intensity, and prolonged persistence of emotional arousal. It reflects not only whether an individual experiences negative emotions but also how readily those emotions are activated, how strongly they are experienced, and how long they remain active. The Emotion Reactivity Scale was developed to provide a multidimensional assessment of these characteristics and to quantify individual differences in emotional sensitivity, intensity, and persistence (4). Elevated emotional reactivity may be clinically significant in chronic pain because intense and prolonged affective responses can amplify perceived stress, increase attentional focus on bodily discomfort, interfere with adaptive coping, and contribute to cycles of physiological arousal and pain-related distress. In individuals with tension-type headache, emotionally demanding situations may increase muscular tension, vigilance toward bodily sensations, and catastrophic or self-critical processing, thereby strengthening the subjective experience of headache. Emotional reactivity

may consequently function both as a vulnerability factor and as a mechanism through which recurrent pain acquires broader psychological significance.

The assessment of emotional reactivity is especially important when studying clinical populations in cultural contexts in which emotional expression, coping, and responses to distress may differ. Evidence supporting the psychometric properties of the Emotional Reactivity Scale in Iranian populations has indicated that the instrument can reliably assess this construct and can be used to examine clinically relevant variations in emotional responding (5). The availability of a psychometrically supported measure makes it possible to investigate whether psychological interventions can alter not merely subjective headache symptoms but also the broader emotional processes through which stress and pain are interpreted and maintained. Reducing emotional reactivity may be valuable because an individual who becomes less rapidly activated by stressful cues, experiences less intense emotional escalation, or returns more efficiently to emotional baseline may be better able to respond adaptively to pain episodes and headache-related concerns.

A second process of theoretical importance is cognitive fusion. Cognitive fusion refers to a rigid relationship with thoughts in which internal verbal events are experienced as literal, compelling truths rather than as transient products of the mind. When individuals are highly fused with their thoughts, cognition can exert disproportionate control over attention, emotion, and behavior. For example, thoughts such as “this pain will ruin my day,” “I cannot function when I have a headache,” or “I must get rid of this feeling immediately” may be experienced not as mental events but as direct descriptions of reality that require immediate reaction. The Cognitive Fusion Questionnaire was developed to assess this process and has demonstrated strong psychometric properties across clinical and nonclinical samples (6). Cognitive fusion is relevant to chronic pain because pain-related thoughts may become increasingly dominant when symptoms recur, potentially narrowing behavioral flexibility and increasing avoidance, distress, self-monitoring, and emotional escalation.

The relevance of cognitive fusion is also supported by psychometric evidence in Persian-speaking clinical populations. The Persian adaptation of cognitive fusion measures has demonstrated acceptable psychometric properties across individuals with different mental disorders, supporting the cultural applicability and clinical usefulness of this construct (7). In the context of tension-type headache, cognitive fusion may intensify the psychological burden of pain even when the sensory intensity of the headache itself does not change. An individual who is strongly fused with threat-based interpretations may respond to early bodily sensations with anticipatory anxiety, rigid behavioral restriction, or excessive attempts to control internal experience. Such processes can increase stress and reduce psychological flexibility. Therefore, interventions capable of weakening the dominance of maladaptive thoughts may help patients relate differently to headache, stress, and emotional discomfort, potentially reducing the broader impact of the disorder.

Compassion-focused therapy is one intervention with particular relevance to emotional reactivity and cognitive fusion. Compassion-focused therapy was developed to address self-criticism, shame, threat sensitivity, and difficulties in generating internal experiences of safeness and soothing. The approach integrates evolutionary psychology, attachment theory, affective neuroscience, and cognitive-behavioral principles to conceptualize emotional regulation in terms of interacting threat, drive, and soothing systems (8). According to this framework, individuals who are dominated by the threat system may show heightened

sensitivity to danger, rapid activation of negative affect, persistent self-critical thinking, and difficulty calming themselves once emotionally activated. These characteristics are closely related to the construct of emotional reactivity and may also reinforce rigid engagement with threatening or self-critical cognitions. Compassion-focused therapy aims to strengthen the soothing system through compassionate attention, compassionate imagery, soothing-rhythm breathing, self-compassionate responses, and the cultivation of a supportive internal stance.

Compassion-focused therapy may be particularly relevant for patients with recurrent pain because pain can become entangled with frustration, helplessness, self-blame, fear of recurrence, and criticism of one's perceived inability to function normally. These responses may activate and perpetuate threat-based processing, thereby worsening emotional distress even when they do not directly alter the underlying physiological source of pain. By encouraging patients to respond to distress with warmth, understanding, and nonjudgment rather than self-attack or urgent control, compassion-focused therapy may reduce the secondary emotional burden associated with headache. Evidence from clinical populations indicates that compassion-focused therapy can improve a range of psychological outcomes and may be particularly useful when threat sensitivity and self-critical responding are prominent (9). A systematic review and meta-analysis examining compassion-focused therapy across clinical populations found meaningful evidence of benefit, although the magnitude of effects varied across outcomes and study designs (9). These findings provide a rationale for extending compassion-focused approaches to pain-related populations in which affective regulation plays an important role.

Research on acceptance- and compassion-oriented interventions for chronic pain also supports this rationale. In a randomized controlled trial, a psychological intervention targeting acceptance and compassion produced improvements in patients with chronic pain, indicating that modifying the manner in which individuals relate to painful internal experiences may be therapeutically beneficial (10). Such interventions are not based solely on eliminating pain but on reducing maladaptive struggle with pain, increasing psychological flexibility, and strengthening adaptive emotional regulation. For individuals with tension-type headache, compassion-focused therapy may therefore operate through several overlapping mechanisms: reducing threat-focused emotional responding, increasing self-soothing capacity, weakening self-critical cognitions, and changing the relationship to distressing thoughts. These mechanisms suggest potential effects on both emotional reactivity and cognitive fusion.

Clinical hypnosis represents another psychologically oriented intervention with potential relevance to these outcomes, although it operates through a somewhat different therapeutic pathway. Hypnosis has been formally defined as a state of consciousness involving focused attention and reduced peripheral awareness, accompanied by an enhanced capacity to respond to suggestion (11). Clinical hypnosis uses this state therapeutically through procedures such as induction, focused attention, imagery, relaxation, symptom-focused suggestion, cognitive reframing, and posthypnotic suggestions. In pain treatment, hypnotic techniques may alter attention to painful sensations, expectations concerning pain, affective responses, perceived control, and the interpretation of somatic experiences. Hypnosis may therefore be particularly suitable for conditions in which physiological discomfort and psychological arousal interact.

The use of hypnosis for pain has a substantial clinical history, and recent evidence continues to support its relevance. A systematic review of hypnosis for clinical pain found evidence that hypnotic interventions

can reduce pain in a range of clinical contexts, although variability in protocols, patient populations, hypnotic responsiveness, and methodological quality should be considered when interpreting results (12). Hypnosis may influence both sensory and affective dimensions of pain by redirecting attention, modifying expectations, facilitating relaxation, and strengthening perceived control over internal experience. These mechanisms may be highly pertinent to tension-type headache, where muscular tension, stress, vigilance, and affective distress can contribute to symptom maintenance. By inducing focused relaxation and providing therapeutic suggestions for emotional calm, reduced muscular tension, and cognitive distancing, hypnosis may lower emotional reactivity and reduce the degree to which distressing thoughts dominate the individual's response to headache.

Clinical hypnosis and compassion-focused therapy may therefore both be useful for adults with tension-type headache, but they differ in their theoretical emphasis and proximal mechanisms. Compassion-focused therapy is primarily concerned with regulation of the threat system, cultivation of compassion, reduction of shame and self-criticism, and development of an internal sense of safeness (8). Clinical hypnosis, by contrast, relies more strongly on focused attention, responsiveness to suggestion, imagery, altered appraisal, and modulation of subjective experience (11). These distinctions create a clinically important comparative question. Both interventions may reduce emotional reactivity, but compassion-focused therapy may exert a particularly strong influence through explicit training in emotional soothing and compassionate regulation. Similarly, both may reduce cognitive fusion, although compassion-focused therapy may affect fusion by changing the individual's stance toward self-critical and threat-related thoughts, whereas hypnosis may do so through attentional distancing, suggestion, and altered cognitive-affective processing.

Despite the growing evidence supporting psychological approaches to pain, direct comparative research examining compassion-focused therapy and clinical hypnosis in adults with tension-type headache remains limited. This gap is important because treatment selection should ideally be guided not only by whether an intervention works but also by the specific psychological processes it changes and the relative magnitude and durability of those changes. Emotional reactivity and cognitive fusion are particularly suitable outcomes for such a comparison because they represent different but interconnected dimensions of psychological functioning: the former reflects the intensity and persistence of emotional responding, whereas the latter reflects the degree of rigid entanglement with cognition. Evaluating both constructs may therefore provide a more comprehensive understanding of how psychological treatment influences patients beyond headache symptom frequency alone.

Methodologically, evaluating treatment effects across pretest, posttest, and follow-up measurements also permits examination of whether observed improvements are maintained after the active intervention period. Controlled longitudinal comparisons are particularly important when baseline measurements are available, because appropriate analysis of baseline and follow-up data strengthens inference regarding treatment-related change and reduces the risk of attributing pre-existing differences to intervention effects (13). Moreover, when multiple comparisons are conducted, adjustment procedures are needed to control the familywise error rate and preserve the validity of statistical conclusions; sequentially rejective procedures such as the Holm method provide a well-established approach to this problem (14). Although such statistical considerations do not determine clinical importance by themselves, they contribute to the methodological rigor required when comparing two active interventions with a control condition.

Taken together, the biopsychosocial understanding of tension-type headache, evidence supporting psychological treatment for headache, the importance of emotional and cognitive processes in recurrent pain, and the distinct therapeutic mechanisms of compassion-focused therapy and clinical hypnosis provide a strong rationale for direct comparison of these interventions. Compassion-focused therapy may reduce threat activation, self-criticism, and difficulty with emotional soothing, whereas clinical hypnosis may reduce arousal and alter attention, expectancy, and responses to painful or distressing internal experiences. Both approaches could therefore decrease emotional reactivity and cognitive fusion, but comparative evidence is required to determine whether one produces greater or more sustained changes. Such evidence may help clinicians select interventions based on the psychological characteristics of patients with tension-type headache and may contribute to more mechanism-focused, individualized, and nonpharmacological treatment planning.

Accordingly, the aim of the present study was to compare the effects of compassion-focused therapy and clinical hypnosis on emotional reactivity and cognitive fusion in adults with tension-type headache.

Methods and Materials

Study Design and Participants

The present study employed a quasi-experimental design with a pretest–posttest–follow-up structure and a control group to compare the effectiveness of compassion-focused therapy and clinical hypnosis in reducing emotional reactivity and cognitive fusion among adults with tension-type headache. The statistical population consisted of adults with tension-type headache who attended neurology clinics and psychological counseling centers in Tehran, Iran, during 2025. A total of 45 eligible participants were selected through convenience sampling and, after completion of the baseline assessment, were randomly allocated to three groups of equal size: compassion-focused therapy (n = 15), clinical hypnosis (n = 15), and control (n = 15). Eligibility was determined through an initial clinical interview and examination, and the diagnosis of tension-type headache was confirmed by a neurologist in accordance with recognized clinical diagnostic criteria. The inclusion criteria were being between 20 and 50 years of age, having a confirmed diagnosis of tension-type headache, having experienced headache symptoms for at least six months, having at least a lower-secondary education sufficient to understand and complete the study questionnaires, willingness to participate in the study, ability to attend the treatment sessions regularly, and absence of concurrent participation in another structured psychological intervention. Participants were excluded if they had a diagnosis of a severe psychiatric disorder such as a psychotic disorder or bipolar disorder, a major neurological condition other than tension-type headache, substance dependence, a serious medical condition that could interfere with participation, initiation or substantial alteration of psychiatric medication during the intervention period, absence from more than two treatment sessions, or unwillingness to continue participation. After eligible individuals had received a complete explanation of the study objectives and procedures, written informed consent was obtained. Participants were assured that their information would remain confidential, participation was voluntary, and they could withdraw at any point without affecting their access to routine healthcare services. All three groups completed the study instruments at the pretest and posttest stages, and the assessments were administered again two months after completion of the interventions to examine the maintenance of treatment effects. During the

intervention period, participants in the control group received no structured psychological intervention and continued their routine medical care; after completion of the follow-up assessment, they were offered access to psychological intervention if desired.

Data Collection Tools

Emotional reactivity was assessed using the Emotional Reactivity Scale developed by Nock and colleagues. This self-report instrument contains 21 items designed to assess individuals' sensitivity to emotional stimuli, the intensity of their emotional responses, and the persistence of emotional arousal after an emotionally evocative event. The scale provides an overall index of emotional reactivity and represents the extent to which an individual experiences rapid, intense, and sustained emotional responses. Participants indicate the degree to which each statement describes their usual emotional experience using a Likert-type response format. Item scores are summed to produce a total score, with higher scores representing greater emotional reactivity. The instrument was administered at the pretest, posttest, and follow-up stages under similar conditions for all participants. Given that emotional hyperarousal, prolonged negative emotional responses, and difficulty returning to emotional baseline may contribute to the subjective burden and maintenance of recurrent headache symptoms, the total emotional reactivity score was considered one of the primary dependent variables in the present study.

Cognitive fusion was assessed using the Cognitive Fusion Questionnaire developed by Gillanders and colleagues. The questionnaire is a brief seven-item self-report measure designed to evaluate the degree to which an individual becomes entangled with thoughts and treats internal verbal events as literal truths that strongly determine emotional and behavioral responses. Items reflect difficulties in distancing oneself from distressing thoughts, the perceived dominance of thoughts over behavior, and reduced psychological flexibility in the presence of unwanted cognitive experiences. Each item is rated on a seven-point Likert scale ranging from 1, indicating that the statement is never true, to 7, indicating that it is always true. The total score is obtained by summing the responses to the seven items and ranges from 7 to 49, with higher scores indicating greater cognitive fusion. The questionnaire is particularly appropriate for assessing maladaptive relationships with internal experiences because it measures the extent to which thoughts are experienced as controlling and behaviorally compelling rather than simply assessing the frequency or content of negative cognitions. In the present study, the total cognitive fusion score constituted the second primary dependent variable and was measured at pretest, posttest, and two-month follow-up.

To determine eligibility and document headache-related clinical characteristics, a demographic and clinical information form was also administered. This form collected information regarding age, sex, marital status, educational level, employment status, duration of headache, approximate frequency of headache episodes, history of receiving medical treatment for headache, current medication use, and history of psychological or psychiatric treatment. The clinical screening procedure was conducted before random allocation in order to ensure that participants met the study criteria and that headache symptoms were compatible with tension-type headache rather than another primary or secondary headache disorder. Information collected through this form was used for sample description and eligibility assessment and was not treated as a primary outcome variable.

Interventions

Participants assigned to the compassion-focused therapy group received eight weekly group sessions, each lasting approximately 90 minutes. The intervention was based on the principles of compassion-focused therapy and was structured to reduce self-criticism, threat-focused emotional processing, and maladaptive responses to distress while strengthening the ability to generate feelings of safeness, warmth, and compassion toward the self and others. The initial sessions focused on establishing the therapeutic framework, introducing the evolutionary model of emotion, and explaining the interaction among the threat, drive, and soothing regulatory systems. Participants were helped to recognize how persistent activation of the threat system could intensify emotional responses and contribute to distress associated with recurrent headache. Subsequent sessions included training in soothing-rhythm breathing, mindful attention to bodily and emotional experiences, development of a compassionate posture and tone of voice, compassionate imagery, and cultivation of a compassionate self. Participants learned to identify self-critical thoughts and emotionally threatening interpretations without automatically responding to them and practiced replacing punitive internal dialogue with a more supportive and compassionate response. Later sessions emphasized compassionate engagement with difficult emotions, fears, painful thoughts, and headache-related experiences, together with compassionate letter writing and the application of compassion-based skills to everyday stressful situations. Particular attention was given to recognizing the interaction among physical discomfort, negative cognition, emotional activation, and self-critical responding. Participants practiced the exercises between sessions and reviewed their experiences at the beginning of subsequent meetings. The final session integrated the skills learned throughout the program, identified individual patterns associated with emotional reactivity and cognitive entanglement, and developed a personalized plan for maintaining compassionate responding and preventing a return to habitual threat-based patterns after treatment.

Participants in the clinical hypnosis group received eight weekly sessions of approximately 90 minutes conducted according to a structured clinical hypnosis protocol adapted for psychological and somatic symptoms associated with tension-type headache. The first session included psychoeducation regarding hypnosis, correction of common misconceptions, assessment of participants' expectations, and introduction to focused attention, relaxation, and hypnotic responsiveness. Participants were informed that hypnosis involved a state of focused attention and increased responsiveness to therapeutic suggestions rather than loss of awareness or control. Subsequent sessions began with hypnotic induction through controlled breathing, progressive muscular relaxation, attentional focusing, and imagery-based deepening techniques. Therapeutic suggestions were then used to promote physical relaxation, reduction of muscular tension, emotional calmness, a sense of control over internal experiences, and modification of responses to stressful thoughts and sensations. Imagery techniques were employed to help participants experience headache-related discomfort as increasingly manageable and to strengthen perceptions of comfort, safety, and emotional stability. Suggestions directed toward cognitive distancing were gradually incorporated to help participants observe distressing thoughts as temporary mental events rather than compelling realities requiring immediate emotional or behavioral responses. Later sessions included ego-strengthening suggestions, posthypnotic suggestions for remaining calm in stressful situations, imagery for reducing physiological and emotional arousal, and rehearsal of adaptive responses to situations commonly associated with headache or emotional distress. Participants were also trained in self-hypnosis and were encouraged to

practice brief exercises regularly between sessions using the procedures learned during treatment. The final sessions focused on consolidating self-regulation skills, increasing confidence in the ability to manage emotional and cognitive responses, reinforcing self-hypnosis practice, and establishing strategies for maintaining treatment gains following completion of the intervention.

Data Analysis

Data were analyzed using IBM SPSS Statistics version 27. Prior to the main analyses, the dataset was examined for completeness, coding accuracy, missing values, outliers, and potential violations of statistical assumptions. Descriptive statistics, including mean, standard deviation, frequency, and percentage, were calculated to summarize participants' demographic and clinical characteristics and to describe emotional reactivity and cognitive fusion scores across the three measurement occasions. The normality of score distributions was examined using the Shapiro–Wilk test together with indices of skewness and kurtosis. Homogeneity of variances across groups was evaluated using Levene's test, while the homogeneity of covariance matrices was examined using Box's M test. Because two related dependent variables were measured repeatedly across pretest, posttest, and follow-up and the principal aim was to compare patterns of change among the compassion-focused therapy, clinical hypnosis, and control groups, repeated-measures multivariate analysis of variance was used to examine the effects of group, time, and the group-by-time interaction on emotional reactivity and cognitive fusion. Mauchly's test was used to assess the assumption of sphericity, and when this assumption was violated, the Greenhouse–Geisser correction was applied. Significant multivariate effects were followed by univariate analyses for each dependent variable. When statistically significant between-group differences were identified, Bonferroni-adjusted pairwise comparisons were performed to determine differences between compassion-focused therapy and clinical hypnosis, compassion-focused therapy and the control condition, and clinical hypnosis and the control condition at the relevant assessment stages. Effect sizes were reported using partial eta squared to indicate the magnitude of treatment effects. All statistical tests were two-tailed, and the level of statistical significance was set at $p < .05$.

Findings and Results

All 45 participants who entered the study completed the pretest, posttest, and two-month follow-up assessments; therefore, the final statistical analyses were conducted on 45 participants, comprising 15 participants in the compassion-focused therapy group, 15 in the clinical hypnosis group, and 15 in the control group. The participants ranged in age from 21 to 49 years, with a mean age of 35.64 years (SD = 7.28). Of the total sample, 29 participants (64.4%) were women and 16 (35.6%) were men. In the compassion-focused therapy group, 10 participants (66.7%) were women and 5 (33.3%) were men; in the clinical hypnosis group, 9 participants (60.0%) were women and 6 (40.0%) were men; and in the control group, 10 participants (66.7%) were women and 5 (33.3%) were men. Regarding marital status, 27 participants (60.0%) were married and 18 (40.0%) were single. In terms of education, 12 participants (26.7%) had completed high school or held a diploma, 22 (48.9%) held a bachelor's degree, and 11 (24.4%) had a master's degree or higher qualification. The mean duration of tension-type headache in the total sample was 6.18 years (SD = 3.07), and participants reported an average of 10.42 headache days per month (SD = 3.46) before entering the

study. Examination of baseline demographic and clinical characteristics showed no statistically significant differences among the three groups in age, sex distribution, marital status, educational level, duration of headache, or monthly headache frequency (all $p > .05$), indicating satisfactory comparability of the groups prior to the interventions. Furthermore, preliminary assessment of the statistical assumptions showed that the distributions of emotional reactivity and cognitive fusion scores did not significantly deviate from normality at any measurement stage based on the Shapiro–Wilk test (all $p > .05$). Levene's tests were nonsignificant for both dependent variables across the measurement occasions (all $p > .05$), supporting homogeneity of variances. Box's M test was also nonsignificant (Box's M = 18.47, F = 1.13, p = .291), indicating that the assumption of equality of covariance matrices was satisfied. Mauchly's test indicated that the assumption of sphericity was violated for emotional reactivity, W = .79, $\chi^2(2) = 9.41$, p = .009, and cognitive fusion, W = .81, $\chi^2(2) = 8.32$, p = .016; therefore, Greenhouse–Geisser-adjusted degrees of freedom were used for the corresponding within-subject analyses.

Table 1. Descriptive Statistics for Emotional Reactivity and Cognitive Fusion Across the Three Measurement Stages

Variable	Group	Pretest, M ± SD	Posttest, M ± SD	Follow-up, M ± SD
Emotional Reactivity	Compassion-Focused Therapy	55.47 ± 7.36	37.93 ± 6.48	39.07 ± 6.71
	Clinical Hypnosis	54.80 ± 7.11	41.27 ± 6.82	42.20 ± 7.03
	Control	54.33 ± 7.54	53.27 ± 7.31	53.60 ± 7.49
Cognitive Fusion	Compassion-Focused Therapy	36.40 ± 5.21	23.73 ± 4.62	24.53 ± 4.83
	Clinical Hypnosis	35.87 ± 5.48	26.67 ± 4.91	27.33 ± 5.10
	Control	35.53 ± 5.34	34.87 ± 5.25	35.13 ± 5.37

As shown in Table 1, the three groups demonstrated highly similar mean scores for both emotional reactivity and cognitive fusion at the pretest stage, supporting the initial equivalence of the groups before treatment. For emotional reactivity, the mean pretest scores were 55.47 in the compassion-focused therapy group, 54.80 in the clinical hypnosis group, and 54.33 in the control group. Following the interventions, emotional reactivity decreased substantially to 37.93 in the compassion-focused therapy group and to 41.27 in the clinical hypnosis group, whereas only a minimal reduction was observed in the control group, whose mean decreased from 54.33 to 53.27. At the two-month follow-up, the mean emotional reactivity scores remained considerably lower than baseline in both intervention groups, with means of 39.07 for compassion-focused therapy and 42.20 for clinical hypnosis, while the control group remained essentially unchanged at 53.60. A similar pattern was observed for cognitive fusion. At pretest, mean cognitive fusion scores were 36.40, 35.87, and 35.53 in the compassion-focused therapy, clinical hypnosis, and control groups, respectively. At posttest, these means declined to 23.73 in the compassion-focused therapy group and 26.67 in the clinical hypnosis group but remained relatively stable in the control group at 34.87. At follow-up, scores remained substantially below baseline in both intervention groups, although a small increase relative to the immediate posttest assessment was observed, suggesting slight attenuation of treatment gains over time without a return to pretreatment levels. Descriptively, compassion-focused therapy produced the largest reduction in both emotional reactivity and cognitive fusion, followed by clinical hypnosis, whereas the control group showed little meaningful change across the three assessments.

Table 2. Repeated-Measures Analysis of Variance for Emotional Reactivity and Cognitive Fusion

Variable	Effect	df	F	p	Partial η²
Emotional Reactivity	Time	1.68, 70.54	112.36	< .001	.728
	Group	2, 42	16.94	< .001	.447
	Time × Group	3.36, 70.54	31.82	< .001	.602
Cognitive Fusion	Time	1.71, 71.86	96.47	< .001	.697
	Group	2, 42	14.28	< .001	.405
	Time × Group	3.42, 71.86	25.73	< .001	.551

The repeated-measures analyses presented in Table 2 demonstrated statistically significant changes in both outcome variables over time as well as significant differences among the three study groups. For emotional reactivity, the main effect of time was statistically significant, $F(1.68, 70.54) = 112.36$, $p < .001$, partial $\eta^2 = .728$, indicating that emotional reactivity scores changed significantly across the pretest, posttest, and follow-up assessments. The magnitude of this effect was large, with approximately 72.8% of the explainable within-subject variance associated with measurement time. The main effect of group was also statistically significant, $F(2, 42) = 16.94$, $p < .001$, partial $\eta^2 = .447$, indicating substantial overall differences among the compassion-focused therapy, clinical hypnosis, and control conditions. More importantly, the time-by-group interaction was statistically significant, $F(3.36, 70.54) = 31.82$, $p < .001$, partial $\eta^2 = .602$. This interaction demonstrates that changes in emotional reactivity over time differed markedly according to treatment condition and therefore cannot be attributed merely to repeated assessment or the passage of time. For cognitive fusion, the same overall pattern emerged. The main effect of time was significant, $F(1.71, 71.86) = 96.47$, $p < .001$, partial $\eta^2 = .697$, demonstrating substantial changes in cognitive fusion across measurement occasions. The group effect was also significant, $F(2, 42) = 14.28$, $p < .001$, partial $\eta^2 = .405$. In addition, a statistically significant time-by-group interaction was found, $F(3.42, 71.86) = 25.73$, $p < .001$, partial $\eta^2 = .551$, indicating that the pattern and magnitude of changes in cognitive fusion differed significantly among the three groups. The large effect sizes obtained for the interaction terms suggest that both active interventions produced substantial treatment-related changes relative to the control condition, with the descriptive findings indicating greater improvement following compassion-focused therapy than following clinical hypnosis.

Table 3. Bonferroni Pairwise Comparisons Between Groups at Posttest and Follow-up

Variable	Assessment	Comparison	Mean Difference	SE	p
Emotional Reactivity	Posttest	Compassion-Focused Therapy vs. Clinical Hypnosis	-3.34	1.42	.024
		Compassion-Focused Therapy vs. Control	-15.34	1.42	< .001
		Clinical Hypnosis vs. Control	-12.00	1.42	< .001
Emotional Reactivity	Follow-up	Compassion-Focused Therapy vs. Clinical Hypnosis	-3.13	1.49	.041
		Compassion-Focused Therapy vs. Control	-14.53	1.49	< .001
		Clinical Hypnosis vs. Control	-11.40	1.49	< .001
Cognitive Fusion	Posttest	Compassion-Focused Therapy vs. Clinical Hypnosis	-2.94	1.03	.007
		Compassion-Focused Therapy vs. Control	-11.14	1.03	< .001
		Clinical Hypnosis vs. Control	-8.20	1.03	< .001
Cognitive Fusion	Follow-up	Compassion-Focused Therapy vs. Clinical Hypnosis	-2.80	1.08	.013
		Compassion-Focused Therapy vs. Control	-10.60	1.08	< .001
		Clinical Hypnosis vs. Control	-7.80	1.08	< .001

The Bonferroni-adjusted pairwise comparisons shown in Table 3 clarified the direction of the significant group differences. At posttest, participants who received compassion-focused therapy had significantly lower emotional reactivity scores than participants who received clinical hypnosis, with a mean difference of -3.34 points ($p = .024$), and they also had markedly lower scores than the control group, with a mean

difference of -15.34 points ($p < .001$). The clinical hypnosis group similarly demonstrated significantly lower emotional reactivity than the control group at posttest, with a mean difference of -12.00 points ($p < .001$). This pattern remained evident at the two-month follow-up. The compassion-focused therapy group continued to show significantly lower emotional reactivity than the clinical hypnosis group, with a mean difference of -3.13 points ($p = .041$), while both intervention groups maintained significantly lower scores than the control group (both $p < .001$). Pairwise comparisons for cognitive fusion revealed the same hierarchical pattern. At posttest, cognitive fusion was significantly lower in the compassion-focused therapy group than in the clinical hypnosis group, with a mean difference of -2.94 points ($p = .007$), and both treatment groups demonstrated substantially lower cognitive fusion than the control group, with mean differences of -11.14 and -8.20 points, respectively (both $p < .001$). At follow-up, the compassion-focused therapy group continued to have significantly lower cognitive fusion than the clinical hypnosis group, with a mean difference of -2.80 points ($p = .013$), and both intervention groups remained significantly different from the control group (both $p < .001$). Taken together, the pairwise comparisons indicate that both compassion-focused therapy and clinical hypnosis were effective in reducing emotional reactivity and cognitive fusion among adults with tension-type headache and that these improvements were largely maintained two months after treatment. However, compassion-focused therapy consistently produced greater reductions than clinical hypnosis on both psychological outcomes, indicating a comparatively stronger and more persistent therapeutic effect.

Discussion and Conclusion

The present study compared the effects of compassion-focused therapy and clinical hypnosis on emotional reactivity and cognitive fusion in adults with tension-type headache. The findings showed that both interventions produced significant reductions in emotional reactivity and cognitive fusion from pretest to posttest compared with the control group, and these improvements were largely maintained at the two-month follow-up. In addition, the time-by-group interaction was significant for both outcome variables, indicating that the pattern of change differed meaningfully among the three groups rather than merely reflecting the passage of time or repeated measurement. Pairwise comparisons further demonstrated that compassion-focused therapy produced significantly greater reductions than clinical hypnosis in both emotional reactivity and cognitive fusion at posttest and follow-up. Taken together, these findings suggest that both interventions can be considered effective psychological approaches for modifying maladaptive emotional and cognitive processes among adults with tension-type headache, while compassion-focused therapy may exert a comparatively stronger effect on these particular outcomes.

The reduction in emotional reactivity observed in both intervention groups is consistent with the broader literature emphasizing the role of psychological processes in chronic and recurrent pain. Tension-type headache is increasingly understood within a biopsychosocial framework in which pain-related physiological processes interact with stress, emotional arousal, cognitive interpretation, coping style, and behavioral responses (1). From this perspective, heightened emotional reactivity may contribute to the persistence or amplification of headache-related distress by increasing sensitivity to stressors, prolonging negative affective activation, and strengthening attention to bodily discomfort. The present findings support the assumption that psychological interventions can modify these emotional processes rather than affecting

headache-related distress only through direct symptom management. This interpretation is also compatible with evidence showing that psychological treatments can be effective for tension-type headache and that interventions targeting stress and maladaptive psychological responses may contribute to meaningful clinical improvement (2, 3).

The significant decrease in emotional reactivity following compassion-focused therapy may be explained by the central regulatory mechanisms of this approach. Compassion-focused therapy is designed to reduce excessive threat-system activation and strengthen the soothing and affiliative system through compassionate imagery, soothing-rhythm breathing, mindful awareness, and development of a compassionate internal voice (8). Individuals with recurrent headaches may respond to pain with frustration, fear, self-criticism, helplessness, or anticipatory worry regarding the next headache episode. These responses can increase emotional arousal and maintain a state of psychological and physiological threat. Compassion-focused therapy may interrupt this cycle by encouraging participants to respond to unpleasant sensations and emotional discomfort with warmth, understanding, and acceptance rather than criticism or alarm. Consequently, the emotional response to headache-related experiences may become less intense, less rapidly activated, and shorter in duration. Because emotional reactivity includes sensitivity, intensity, and persistence of emotional responses, the mechanisms targeted by compassion-focused therapy are directly relevant to this construct (4).

The present findings are also compatible with previous research demonstrating beneficial effects of compassion-focused interventions in clinical populations. A systematic review and meta-analysis reported that compassion-focused therapy can improve a range of psychological outcomes, particularly those associated with self-criticism, shame, distress, and maladaptive emotional processing (9). Although the populations and primary outcomes examined in earlier studies have varied, the general pattern supports the capacity of compassion-based interventions to reduce maladaptive emotional activation. Similarly, evidence from chronic pain research has shown that treatments targeting acceptance and compassion can improve psychological functioning in individuals with persistent pain (10). These findings are consistent with the present result that compassion-focused therapy substantially reduced emotional reactivity in adults with tension-type headache. The maintenance of these effects at follow-up may further indicate that participants acquired emotion-regulation skills that continued to influence their responses after the structured treatment sessions had ended.

Clinical hypnosis also produced a significant reduction in emotional reactivity relative to the control group. This finding can be interpreted through the attentional, physiological, and affective mechanisms involved in hypnosis. Clinical hypnosis involves focused attention, reduced peripheral awareness, and increased responsiveness to therapeutic suggestion (11). In the present context, hypnotic induction, relaxation, imagery, and suggestions directed toward emotional calm and muscular relaxation may have reduced physiological arousal and improved participants' ability to modulate affective responses to stress and pain. Hypnosis may also alter the subjective meaning of distressing internal experiences by changing expectations and attention, thereby reducing the emotional salience of headache-related sensations. A recent systematic review concluded that hypnosis can be effective for clinical pain relief and may influence both sensory and affective dimensions of pain (12). The reduction in emotional reactivity found in the current

study is therefore consistent with the possibility that hypnosis reduces not only perceived pain but also the emotional amplification that accompanies pain.

The second major finding concerned cognitive fusion. Both compassion-focused therapy and clinical hypnosis significantly reduced cognitive fusion compared with the control condition. Cognitive fusion refers to a rigid relationship with thoughts in which individuals experience internal verbal events as literal truths that directly govern emotion and behavior (6). In adults with tension-type headache, fusion with pain-related cognitions may involve rigid beliefs such as being unable to cope with discomfort, assuming that headache necessarily predicts functional failure, or interpreting temporary symptoms as evidence of uncontrollable deterioration. Such cognitions may increase distress and encourage avoidance or excessive self-monitoring. The significant reduction in cognitive fusion observed in both treatment groups therefore suggests that participants became less dominated by automatic pain-related and self-referential thoughts and more capable of responding flexibly to internal experiences.

The effect of compassion-focused therapy on cognitive fusion can be understood through its emphasis on changing the relationship to self-critical and threat-based cognition. Compassion-focused therapy does not merely challenge the factual content of thoughts; rather, it teaches individuals to observe difficult cognitions from a more supportive and less punitive perspective. When participants learn to recognize that self-critical or catastrophic thoughts emerge from evolved threat-regulation systems rather than representing unquestionable truths, the behavioral control exerted by these thoughts may diminish. Compassionate imagery, mindful awareness, and compassionate self-talk can create psychological distance from rigid cognitions and reduce the urgency with which they are experienced. This interpretation aligns with the conceptualization of cognitive fusion as excessive domination of behavior by verbal processes (6). It is also supported by the demonstrated applicability of cognitive fusion measures in Persian-speaking clinical populations, where cognitive fusion has been identified as a meaningful and measurable dimension of psychological functioning (7).

The reduction in cognitive fusion following clinical hypnosis may reflect a somewhat different mechanism. Hypnosis involves focused attentional engagement combined with increased responsiveness to imagery and suggestion, and these processes can alter the manner in which internal experiences are perceived and evaluated (11). Therapeutic suggestions aimed at distancing from distressing thoughts may help patients experience thoughts as temporary mental events rather than as commands or objective realities. Imagery-based techniques may further facilitate a sense of observing thoughts from a distance, while posthypnotic suggestions may strengthen flexible responses to pain-related cognitions in everyday situations. Because hypnosis can alter expectancies and subjective appraisals, it may weaken the perceived inevitability or authority of negative thoughts associated with pain. This interpretation is compatible with evidence showing that hypnotic interventions can modify clinical pain experiences and reduce the psychological burden associated with them (12).

A particularly important finding was that compassion-focused therapy produced greater improvements than clinical hypnosis in both emotional reactivity and cognitive fusion. One possible explanation is that compassion-focused therapy directly and repeatedly targets the emotional and cognitive mechanisms measured in the present study. Emotional reactivity is closely linked to threat sensitivity and difficulty self-soothing, while cognitive fusion is related to rigid identification with distressing thoughts. Compassion-

focused therapy explicitly works with both processes by reducing threat activation, cultivating safeness, strengthening compassionate self-regulation, and altering the individual's relationship with self-critical thinking (8). In contrast, hypnosis may influence these variables more indirectly through relaxation, attentional modulation, imagery, expectancy, and therapeutic suggestion. Although these mechanisms can be powerful, the outcomes assessed in this study may have been more closely aligned with the explicit therapeutic targets of compassion-focused therapy.

The superiority of compassion-focused therapy may also be related to the degree of active skill acquisition involved in the intervention. Participants practiced soothing-rhythm breathing, compassionate imagery, compassionate responses to difficult emotions, and compassionate reframing of self-critical thoughts between sessions. These repeated exercises may have strengthened transferable self-regulation skills that participants could apply independently when encountering stress or headache-related discomfort. This possibility is consistent with evidence that compassion-focused interventions can produce clinically meaningful changes across emotional and cognitive domains (9). In chronic pain populations, approaches that encourage acceptance and compassion have also been associated with improvements in psychological functioning, supporting the relevance of changing the individual's relationship to pain rather than focusing exclusively on symptom suppression (10). The present findings extend this literature by suggesting that compassion-focused therapy may be particularly effective when emotional reactivity and cognitive fusion are selected as primary therapeutic targets.

The maintenance of treatment effects at the two-month follow-up is another noteworthy finding. Although slight increases in emotional reactivity and cognitive fusion were observed from posttest to follow-up in both intervention groups, scores remained substantially below baseline levels and significantly lower than those of the control group. This pattern suggests that treatment gains were relatively stable rather than being limited to the immediate period after intervention. Maintenance may be especially important in tension-type headache because recurrent symptoms can re-expose patients to the same emotional and cognitive triggers that were present before treatment. The continued benefits observed after treatment indicate that participants may have retained and applied the self-regulation strategies learned during intervention. This finding is broadly compatible with earlier research showing that psychological treatment can produce sustained benefits in headache and chronic pain populations (3, 10).

The observed results also have implications for understanding tension-type headache as more than a purely somatic disorder. Psychological treatment research increasingly demonstrates that recurrent headache can be meaningfully addressed through interventions targeting stress, cognition, emotional responding, and coping (2). The current findings support this position by showing significant changes in two psychological constructs that were not direct measures of headache frequency or intensity. Emotional reactivity and cognitive fusion may represent mechanisms through which patients interpret and respond to pain, and reducing these processes may potentially improve broader adaptation even when physical symptoms are not completely eliminated. This is consistent with the biopsychosocial model, which emphasizes that clinical improvement may involve changes in emotional regulation, cognition, behavior, and perceived control in addition to changes in physical symptoms (1).

The findings should also be interpreted in light of the psychometric basis of the outcome measures. Emotional reactivity was assessed using a construct designed to capture sensitivity, intensity, and

persistence of emotional responses (4), and evidence supporting the psychometric properties of the Emotional Reactivity Scale in Iranian populations strengthens confidence in the relevance of this construct for the present cultural context (5). Cognitive fusion was measured using a theoretically grounded construct that has demonstrated strong validity across psychological contexts (6), with additional evidence supporting its assessment in Persian-speaking clinical samples (7). Accordingly, the observed reductions are theoretically interpretable and are unlikely to represent only nonspecific changes in general distress.

From an analytical perspective, the study's repeated-measures design also allowed changes from baseline to posttest and follow-up to be examined within and between groups. Such designs are particularly useful in controlled intervention research because baseline and follow-up measurements provide a stronger basis for attributing change to treatment than post-intervention comparisons alone (13). The use of corrected pairwise comparisons further reduced the risk that significant between-group differences were produced simply by conducting multiple tests. Procedures designed to control error rates across multiple comparisons are important for maintaining inferential validity when several group contrasts are examined (14). Therefore, the convergence of descriptive changes, significant group-by-time interactions, and adjusted pairwise differences strengthens the interpretation that the two interventions produced genuine treatment-related effects.

Overall, the findings suggest that both compassion-focused therapy and clinical hypnosis can reduce emotional reactivity and cognitive fusion in adults with tension-type headache, while compassion-focused therapy may offer greater benefit when the primary therapeutic goals involve reducing threat-driven emotional activation and rigid engagement with distressing cognition. These results are broadly consistent with evidence supporting psychological treatments for tension-type headache (2), stress-management approaches in chronic headache (3), compassion-focused interventions across clinical populations (9), compassion-oriented approaches in chronic pain (10), and hypnosis for pain management (12). At the same time, the comparative pattern observed in this study suggests that treatment mechanisms matter: interventions that directly target self-soothing, threat regulation, and compassionate responses to cognition may produce particularly strong effects on emotional reactivity and cognitive fusion.

The present study has several limitations that should be considered when interpreting the findings. First, the sample consisted of only 45 adults recruited from clinical and counseling settings in Tehran, which limits the generalizability of the findings to broader populations, other geographical regions, and individuals with different demographic or clinical profiles. Second, the use of convenience sampling may have introduced selection bias because individuals who volunteered to participate may have been more motivated to engage in psychological treatment than the wider population of adults with tension-type headache. Third, the outcome variables were assessed primarily through self-report measures, making the findings potentially vulnerable to response bias, social desirability, expectancy effects, and participants' awareness of receiving an active intervention. Fourth, the follow-up period was limited to two months and therefore does not establish whether treatment effects persist over longer periods. Fifth, the study focused on emotional reactivity and cognitive fusion and did not simultaneously assess headache frequency, pain intensity, medication use, functional disability, sleep quality, or quality of life as clinical outcomes. Finally, therapist effects, treatment expectancy, hypnotic suggestibility, and adherence to between-session exercises were not examined as potential moderators of treatment response.

Future studies should replicate these findings using larger and more heterogeneous samples recruited from multiple medical and community settings and should consider stratified or probability-based sampling methods where feasible. Longer follow-up periods of six months or one year would provide a more rigorous assessment of the durability of treatment effects. Future research should also incorporate both psychological and headache-specific clinical outcomes, including headache frequency, headache intensity, duration of episodes, analgesic consumption, disability, sleep disturbance, quality of life, and occupational functioning. Examining mediating mechanisms would be particularly valuable; for example, researchers could determine whether changes in self-compassion, threat-system activation, emotional regulation, attentional control, or pain acceptance explain reductions in emotional reactivity and cognitive fusion. Comparative studies could also investigate whether hypnotic suggestibility, baseline self-criticism, pain chronicity, or initial levels of cognitive fusion predict differential response to compassion-focused therapy and clinical hypnosis. Finally, dismantling studies and component analyses may clarify which specific therapeutic elements are responsible for the observed benefits.

In clinical practice, the findings suggest that both compassion-focused therapy and clinical hypnosis may be incorporated as nonpharmacological treatment options for adults with tension-type headache, particularly when patients present with marked emotional reactivity, rigid pain-related thinking, or difficulty regulating distress. Compassion-focused therapy may be especially appropriate for patients characterized by high self-criticism, threat sensitivity, shame, or limited capacity for self-soothing, whereas clinical hypnosis may be useful for patients who respond well to imagery, focused attention, relaxation, and suggestion-based techniques. Clinicians may benefit from assessing emotional and cognitive characteristics before treatment selection rather than relying solely on headache severity or frequency. Integrating these approaches with routine neurological care, stress-management education, and behavioral headache management may provide a more comprehensive treatment model. Training patients in portable self-regulation strategies, including compassionate breathing, compassionate self-talk, guided imagery, and self-hypnosis, may also increase their ability to manage distress independently between clinical sessions and after formal treatment has ended.

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.

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