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AN EXPLORATORY COMPARISON OF IEMT- VERSUS EMDR-DIRECTED EYE MOVEMENTS ON CHANGES IN EMOTIONALITY AND DISTRESS DURING RECALL OF NEGATIVE MEMORIES

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Abstract

Eye movement therapies have shown effectiveness in reducing distress pertaining to past traumatic events. In the clinical field, a variety of eye movement therapies exists, with the directions of eye movements and respective guidelines differentiating one from the other. Anecdotal work field evidence suggests Integral Eye Movement Therapy (IEMT) is as effective as Eye Movement Desensitization and Reprocessing (EMDR) and has less side effects; however, research is scarce at present.

Participants were recruited from the general population, and all received three conditions (IEMT, EMDR, control) in randomized order (N=33). Participants were asked to recall a pre-chosen negative memory. Questionnaires were answered pre-, post-intervention, and at one-week follow-up. These self-reports consisted of visual analogue scales measuring emotionality and distress, forming the main outcome of Subjective Units of Distress (SUD).

Blinded to condition, 60.6% preferred the IEMT condition to the EMDR- or the control condition. SUD-scores were significantly lower after both IEMT and EMDR conditions than after the control condition at post-intervention (p=.001; p<.001, respectively) and at follow-up (p=.014; p=.002,

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respectively). IEMT and EMDR conditions did not significantly differ at any time point.
This study was the first to compare IEMT and EMDR directed eye movements and found that each significantly lowered the experienced emotionality and distress related to a negative memory, as tested in randomized order in the general population.

Keywords: IEMT, EMDR, eye movement therapy, memory, treatment

Most individuals will experience potentially traumatic events. The lifetime prevalence of potential trauma has been estimated at 80.7% (De Vries & Olff, 2009), and 5.6% for those with Post-Traumatic Stress Disorder (PTSD) (Koenen et al., 2017). As such, trauma has a substantial economic impact: 600-900 million euros of annual societal costs were estimated for the loss of wellbeing due to symptoms of PTSD in The Netherlands (Dijk & Kiernan, 2023). The costs of potentially traumatic events could assumedly be estimated even higher as their prevalence is much higher than that of PTSD. Adverse childhood experiences (ACEs) alone were experienced once by 23.5% and multiple times by 18.7% of individuals, which has been estimated to cost US$581 billion in Europe (Bellis et al., 2019).

Given the impact of traumatic experiences on the individual, their environment and society in general, effective interventions that counteract the negative consequences of traumatic experiences are essential. Interventions are usually aimed at the reprocessing of emotional memories, based on the rationale that psychopathology occurs when a traumatic experience has not been processed healthily (Emotional Processing Theory; Foa & Kozak, 1986). One treatment avenue for emotional memory reprocessing has been found in the directing of eye movements. Directed eye movements are hypothesized to suppress the activity of the amygdala and strengthen extinction learning whilst reducing the vividness of a memory (de Voogd et al., 2018). The most well-known therapeutic approach involving eye movements is Eye Movement Desensitization and Reprocessing (EMDR; Shapiro, 1989), but other eye movement therapies exist such as Integral Eye Movement Therapy (IEMT), Eye Movement Integration (EMI, Beaulieu, 2003; van der Spuy & DuPlessis van Breda, 2019), and Visual Schema Displacement Therapy (Matthijssen et al., 2019). These interventions differ in the direction of eye movements on different axes and lengths (horizontally, diagonally, and circular) and have various guidelines. EMDR is a recognized treatment form in the mental health care standards of the Netherlands (GGZ Standaarden, 2020), with over 300 studies having examined its clinical application for PTSD (Landin-Romero et al., 2018). Increased evidence for the influence of life events, distress and trauma on the

development of psychopathology has also led to an effective use of EMDR in the treatment of anxiety disorders, mood disorders, psychotic disorders, pain management and dependency (Carletto et al., 2021; Landin-Romero et al., 2018; Lytle et al., 2002). However, more recently, it was stated that eye movements in any form might be effective for emotional reprocessing, provided that the working memory is sufficiently taxed (de Voogd et al., 2018). Indeed, a reduction of emotionality and vividness has been shown when reactivation of memory was paired with other working-memory tasks (e.g., Holmes et al., 2009; James et al., 2015). Specifically, retrieving a memory whilst making eye movements is hypothesized to compete for limited working memory resources, thereby attenuating the vividness and emotionality of a memory (Wadji et al., 2022). The present study is explicitly grounded in the working memory account of eye-movement-based interventions, which posits that the effectiveness of both EMDR and other eye-movement therapies can be explained by competition for limited working memory resources during simultaneous memory recall and eye movements.

IEMT is a therapeutic model developed in 2006 by the British psychotherapist Andrew T. Austin (Austin, 2009, 2015), aimed at dealing with and reducing of intense negative emotional states. This model's origins can be traced back to Andreas's work regarding EMI Therapy (Andreas, 1993) and Shapiro's EMDR therapy (Shapiro, 1989; 2018).

In short, this IEMT model involves the recalling and maintaining of a negative memory regarding an event experienced by the client, which may present itself in the form of an image, sound, smell, feeling, taste, and/or bodily sensation. The client is invited to focus their attention on the memory, while the therapist instructs the client to move their eyes in different but specific directions by pointing them out with a pen, a telescope stick with a ball, or with their finger. The outcome of the therapeutic process is usually the client's loss of the recalled memory's negative emotional impact. The client experiences more distance from the memory and the memory's properties (e.g., its colors) become vaguer. Another important aspect of the IEMT model resides in the fact that the client is not required to disclose the memory's contents to the therapist.

The main hypothesis underlying the therapeutic approach of IEMT, differentiating it from EMDR, is based upon the assumption that eye movements in general can predict the client's recalled experience (Sharot et al., 2008) and that the specific set of eye movements used in the IEMT model is connected to brain areas that regulate memories and emotions, such as the hippocampus and the amygdala (Austin, 2009; Austin, 2015; Ten Brinke, 2023). IEMT therapists are trained to identify 'blinks', defined as tiny involuntary twitches of the eye pupil. The therapist is specifically attentive to these unconscious eye movements during the intervention. The rationale behind this is that, while thinking about the memory, the client may unconsciously try to sidestep or lapse away from particular areas in the visual field.

The blink then signals a changed mental representation within the client and the therapist will alter the course of the directed eye movements accordingly, until the client can follow the movements without disruptions (Austin, 2009; Austin, 2015; Ten Brinke, 2023). During the full IEMT protocol (Austin, 2009; Austin, 2015; Ten Brinke, 2023), the therapist will guide the client through emotionally associated memory traces compared to the focus on a single memory in the EMDR protocol, an attribute falling outside the scope of the current study. Two other main features distinguishing IEMT from EMDR are the length and direction of the eye movements. During EMDR, therapists tend to use narrow and horizontal movements (approximately 60 cm in width), while during IEMT the movements are broader (approximately 150 cm in width) and move horizontally, diagonally, and horizontal eight-shape, see Fig. 1 (Austin, 2009; Austin, 2015; Ten Brinke, 2023).

IEMT is being practiced prolifically in the Netherlands and the United Kingdom, among other countries. Anecdotal evidence from the clinical field suggests that IEMT is experienced by clients as more pleasant and more effective, with less negative side effects than its evidence-based predecessor EMDR. This claim about IEMT's effectiveness contains elements of pseudoscience, particularly its usefulness for a wide variety of mental complaints and the unclear theory about its working mechanism (Cuijpers & Cristea, 2016). More importantly, there is the lack of a solid scientific foundation for this form of treatment (but see Moore & Manea, 2018). Although IEMT currently lacks a strong empirical foundation, it can be conceptually understood within existing theoretical models of eye-movement-based interventions, particularly the working memory account. From this perspective, IEMT does not represent an unexpected or anomalous approach, but rather a variant of dual-attention procedures aimed at taxing working memory during memory retrieval.

Therefore, the authors decided to conduct a critical test to compare the differences in directed eye movement techniques. This study focused on a comparison between eye movement techniques based on IEMT, EMDR and a control condition on diminishing the emotional valence of negative memories, within an experimental laboratory setting. Because previous research demonstrates that a variety of working-memory taxing tasks (including but not limited to eye movements) can reduce emotionality and vividness of memories (e.g., Van de Voogd et al., 2028; Wadji et al., 2022), we hypothesized that IEMT and EMDR would produce comparable effects, as both rely on dual-attention eye-movement tasks during memory retrieval. Furthermore, we hypothesized that both IEMT and EMDR conditions would outperform the control condition.

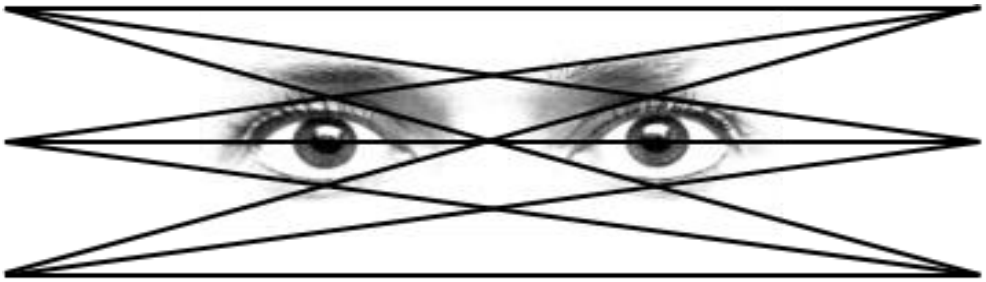

Figure 1. Directions of eye movements during IEMT condition

Methods

Participants

Participants were recruited from the general population through flyers, posters and online promotion. Upon expressed interest, participants received an e-mail with information regarding the exclusion criteria and a secure webpage containing the screening and pre-measurement questionnaire. Exclusion criteria were: (1) having an eye disease; (2) having a neurological disease; (3) having history of head trauma; (4) having to testify in legal procedures; and (5) receiving current treatment for a diagnosis according to the DSM-5. After screening, inclusion held for 33 participants aged 20-60 years (M=41.5, SD=12.1), of which 25 (75.8%) identified as female. Participants signed an informed consent containing information about study purposes, anonymity, and the potential discomfort in recalling negative memories. Participants were informed about their right to stop the experiment at any moment without repercussions.

Procedure

This prospective study followed a repeated measures design with questionnaires administered at baseline and pre-measurement, which were later averaged to one pre-measurement score, at post-measurement, and at one-week follow-up. After an information e-mail in which the participants chose a two-hour timeslot, the researchers sent an e-mail containing the baseline questionnaire five days before the chosen timeslot. The baseline measurement was administered through a secure online survey system termed Qualtrics. This measure was followed by the request to choose three aversive memories for recall in the experiment (i.e., negative memory). Participants entered a self-chosen keyword for each negative memory in order to remember the choice later and for the researchers to randomly allocate each memory to a condition (IEMT, EMDR, and the control condition).

Participants were blinded to which condition was offered at which time, receiving only a sequence of rooms to enter.

At the day of the experiment, the researchers again briefed the participants, who then signed the informed consent and answered the pre-measurement questionnaire. Following this, all participants experienced all three conditions, each lasting 20 minutes, with a 10-15 minutes resting time between conditions. The therapists set a timer to make sure each condition ended after 20 minutes. Participants had received physical documents that contained the pre- and post-measures directly related to the memories, for each condition, altogether taking maximally half an hour to fill out. At the end of all three conditions, the researchers interviewed the participants about their preferred condition and therapist, still blinded, and enquired about any further remarks.

The IEMT and EMDR conditions were recorded for fidelity. To ensure the procedures were conducted properly, fidelity checks were carried out by supervising video recordings. Recordings were securely saved on a server of Maastricht University. A week after the laboratory session, participants received the follow-up questionnaire via an e-mail in which their keywords were listed again to correctly fill out the questions pertaining to each memory. After completion, participants received the debriefing letter and a monetary reward for participating, a €10,- gift voucher.

Interventions

Detailed study protocols for both the IEMT and EMDR conditions are listed in the appendix. In the IEMT condition, eye movement techniques were conducted according to the existing IEMT-protocols (Austin, 2009; ten Brinke, 2023). The IEMT condition was carried out by three licensed IEMT therapists (EG, CB & JR). After a short introduction with psychoeducation about eye movements, participants were asked to recall the distressing memory. After recalling the memory and rating characteristics on an 11-point Likert scale (Subjective Units of Distress (SUD-scores), see *Instruments*), a set of questions was asked pertaining to the representation and experience of the memory. Next, the IEMT-therapist instructed the participants to sit up straight and follow the IEMT-stick with their eyes without moving their head. Whilst doing this, participants had to recall the memory, continuing to do so whenever the recall became increasingly difficult. After each round of eye movements, lasting approximately 30 seconds, the emotional valence of the memory was scored between 0 and 10 points. Rounds of eye movements were performed until the memory was rated as neutral (score = 0) by the participant or until the end of the condition time.

Mostly (n=23), the condition was supplemented at the ending with a positive component for participants: horizontal eight-shaped eye movements, with the instruction to think about a highly positive memory. At the end of the condition, the

participant was asked to re-rate the memory characteristics on the 11-point Likert scale, which were a set of questions pertaining to the representation and experience of the memory.

The EMDR condition was carried out by two licensed EMDR therapists (AV & HD). The EMDR-therapists conducted the directed eye movements according to an abbreviated version of the Dutch standard EMDR-protocol (ten Broeke et al., 2023; De Jongh et al., 2012), see the appendix for details. They asked the participant to recall the memory connected to their selected keyword and to envision the most disturbing part of the memory as the target image. Participants were then asked to rate negative cognition and SUD-scores. Desensitization was performed until condition time ran out or until the SUD-score was rated zero. Depending on the participant process, this could result in either one, or multiple rounds of eye movements. In-between eye movements, the SUD-score was rated again. Some of the sessions ended with focusing on a positive cognition[*]. At the end of the condition, the participant was asked to re-rate the memory characteristics using the SUD-score.

In the control condition, the participant was asked to recall the memory that was randomly allocated to that room, and to fill out the pre-intervention VAS regarding the memory. Next, the participant was asked to do nothing whilst the researcher sat with them in silence. Participants were requested to think about any topic that came to mind, but to not practice meditation at this time. At eight- and fifteen- minutes' time, participants were asked to recall the memory and fill out the VAS.

Instruments

The *Depression Anxiety Stress Scale 21-R* (DASS-21-R; Henry & Crawford, 2005) is a short version of the original DASS containing 42 items (Lovibond & Lovibond, 1995). It contains 21 items in three subscales, which assess symptoms of depression (items 3, 5, 10, 13, 16, 17, 21; $\alpha = .90$), anxiety (items 2, 4, 7, 9, 15, 19, 20; $\alpha = .68$), and stress (items 1, 6, 8, 11, 12, 14, 18; $\alpha = .81$). The degree to which respondents endorsed the symptoms over the course of the last week is rated on a scale that ranges from 0 (did not apply to me at all) to 3 (applied to me very much or most of the time). Higher scores reflect higher levels of symptom endorsement (Henry & Crawford, 2005). In the present study, the overall reliability of the DASS-21 is rated as excellent ($\alpha = .90$ pre-intervention, $\alpha = .88$ post-intervention).

[*] Out of 66 video recordings, 14 were (partially) lost due to technical errors. Among the available recordings, 13 EMDR conditions were observed to end with a positive cognition. Based on these recordings, it may be assumed that the majority of EMDR conditions were also concluded with a positive cognition, as therapists were consistent in their methods. However, this cannot be verified for the missing recordings.

Subjective intensity of disturbance. Participants recalled perceived intensity of disturbance or distress of an image or an emotional memory. The score was indicated on an 11-point Likert scale, the Subjective Units of Disturbance (SUD) scale, ranging from 0 ('none at all') to 10 ('maximum distress'). The SUD scale was first introduced by Wolpe (1969) and it is incorporated in the IEMT protocol (ten Brinke, 2023; Austin, 2009), as well as in the EMDR protocol (Shapiro, 2018, Ten Broeke et al., 2023). In the present study, participants were requested to indicate the SUD-score verbally to the therapist during the session and in written form at the start and after each condition, as well as at one-week follow-up.

Data analyses

Statistical analyses were performed using SPSS 27.0. After running descriptive analyses for age, gender, highest finished education and preferred condition, repeated measures analysis of variance (ANOVA) was conducted with SUD-scores as outcome measure. Effects of time (pre-intervention, post-intervention, and follow-up), condition (IEMT, EMDR and control) and their interaction were inspected. In case of significant effects, follow-up multiple comparisons were conducted using separate Bonferroni-corrected ANOVAs split per time and condition. Additionally, exploratory t-tests were run to test differences from pre- to post-intervention in the subscales of depression, anxiety and stress, as measured by the DASS-21-R. All analyses were conducted at a=.05. Effect sizes for within-subject changes were calculated using Cohen's *dz*, while partial eta squared values were calculated for the ANOVA effects.

Results

Participant characteristics

Of the 33 participants, 25 (75.8%) were female. The mean age was 41.45 years (SD=2.11) and ranged from 20 to 60 years. For the majority of the participants, the highest finished education was higher professional education (n =11, 33.3%), a university bachelor's education (n=9, 27.3%) or university master's education (n =7, 21.2%). For others, the highest finished education was a vocational education (n =1, 3%), secondary higher-level education (n =1, 3%), secondary vocational education (n =3, 9.1%) or a PhD (n =1, 3%). Based on established DASS-21 severity cut-offs (Lovibond & Lovibond, 1995), the participants scored within the lower end 'normal' range for depression (M = 5.64, SD = 6.51), anxiety (M = 4.73, SD = 4.87), and stress (M = 10.85, SD = 6.10) at baseline, confirming that this was a predominantly non-clinical sample.

Regarding preference for condition (blinded), 20 (60.6%) participants reported to prefer IEMT and nine (27.3%) reported to prefer EMDR. Four participants (12.1%) reported no preference. Reasons for preferring IEMT over EMDR entailed the following: eye movements were more pleasant (*n*=5); IEMT was calmer, softer, and took an emotional perspective (*n*=10); IEMT was more intense but felt more effective (*n*=4); no need to talk during IEMT (*n*=4); having felt changes on a physical level (*n*=3); more in-depth questions during IEMT (*n*=1); feeling of being seen and heard more during IEMT (*n*=1); IEMT brought greater insight, meaning, depth, synthesis, due to its all-encompassing character (*n*=10); and tension in the head, headache and tired eyes during EMDR (*n*=4). Reasons for preferring EMDR over IEMT were: talking during the session helped to find the memory (*n*=2); clear communication and guidance (*n*=2); having to work harder during EMDR (*n*=4); EMDR felt more forceful and therefore effective (*n*=1); EMDR had a stronger effect (*n*=3); and EMDR took a cognitive perspective (*n*=1).

Main outcomes

Repeated measures ANOVA yielded significant main effects of condition (F[1.619, 50.196] = 24.410, p<.001, η^2p = .441) and time (F[1.708, 52.951] = 78.992, p<.001, η^2p = .718). A significant interaction effect was found for condition and time (F[2.551, 79.077] = 9.868, p<.001, η^2p = .241). The profile plot suggested a steeper decrease in SUD-scores for IEMT and EMDR conditions than for the control condition, see Fig 2. This decline held from pre- to post-intervention measurement and was maintained at follow-up. The Bonferroni-corrected 95% CI showed that participants had reliably lower SUD-scores post-IEMT and post-EMDR than after the control condition, as shown in Table 1.

Table 1. SUD-score means, S.E.s and Bonferroni-adjusted 95% CI of ANOVA interaction effect

Condition	Time								
	Pre-intervention			Post-intervention			Follow-up		
	Mean	S.E.	95% CI	Mean	S.E.	95% CI	Mean	S.E.	95% CI
EMDR	61.36	3.02	55.20; 67.52	17.08	3.17	10.62; 23.54	20.80	3.20	14.28; 27.32
IEMT	66.85	2.72	61.31; 72.39	24.16	3.79	16.44; 31.88	23.58	3.69	16.04; 31.11
CONTROL	64.88	2.69	59.39; 70.36	45.59	4.07	37.29; 53.90	35.11	4.53	25.87; 44.35

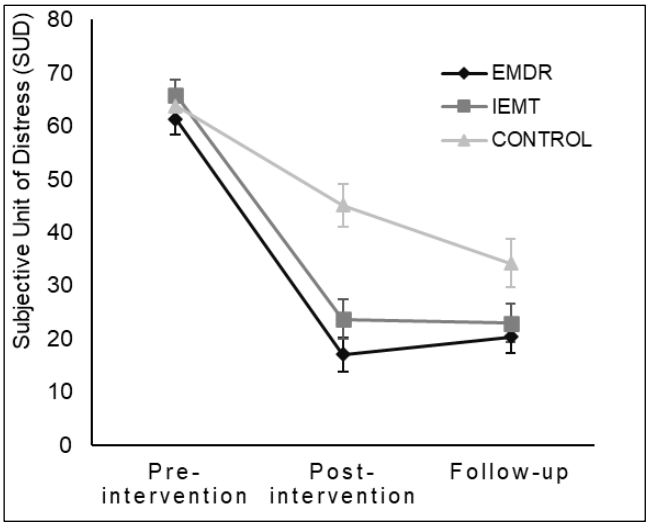

Figure 2. Profile plot SUDs with S.E. error bars, across time and condition

Both univariate and multivariate methods showed significant interactions between condition and time, necessitating follow-up analyses. No pre-intervention differences were found in SUD-scores between the conditions (p=.113 – p=1.000). SUD-scores were significantly lower in the IEMT condition than in the control condition post-intervention (p=.001) and at follow-up (p=.014). Likewise, SUD-scores were significantly lower in the EMDR condition than in the control condition at post-intervention (p<.001) and at follow-up (p=.002). IEMT and EMDR did not significantly differ at post-intervention or at follow-up, as detailed in Table 2.

Pre- to post-EMDR, the SUD-score significantly decreased by 44.28 points (S.E. = 4.15, [95% CI -54.78; -33.79], p<.001, Cohen's dz = 1.86). From the post-EMDR condition to EMDR follow-up, the SUD-score increased non-significantly by 3.72 points (S.E. = 3.00, [95% CI -3.88, 11.32], p=.675, Cohen's dz = 0.22). For the IEMT condition, the SUD-score lowered from pre- to post-measurement by 42.70 points (S.E. = 4.08, [95% CI -53.03; -32.36], p<.001, Cohen's dz = 1.82), which was maintained at follow-up with a non-significant further decline of .58 points (S.E. = 3.30, [95% CI -8.92; 7.76], p=1.000, Cohen's dz = 0.03). Pre- to post-control, the SUD-score significantly decreased by 19.28 points (S.E. = 4.65, [95% CI 7.52; 31.04], p<.001, Cohen's dz = 0.72). From the post-control condition to control follow-up, the SUD-score decreased non-significantly by 10.48 points (S.E. = 5.25, [95% CI -2.80, 23.77], p=.164, Cohen's dz = 0.35).

Overall, the reduction in SUD scores from pre- to post-intervention in all conditions was large to very large based on the effect sizes, and small for the non-significant reductions from post-intervention to follow-up.

Table 2. Multiple comparisons of the conditions at each time point

Time	Condition comparison	Mean difference	S.E.	p^a	95% CI[a]
Pre-intervention	EMDR-IEMT	-5.49	2.53	.113	(-11.90, .91)
	Control-IEMT	-1.98	2.21	1.000	(-7.57, 3.62)
	Control-EMDR	3.52	2.14	.334	(-1.91, 8.94)
Post- intervention	EMDR-IEMT	-7.08	3.23	.109	(-15.26, 1.10)
	Control-IEMT	21.44	5.42	.001	(7.71, 35.16)
	Control-EMDR	28.52	3.89	.000	(18.67, 38.36)
Follow-up	EMDR-IEMT	-2.59	2.55	.954	(-9.04, 3.86)
	Control-IEMT	11.26	3.71	.014	(1.88, 20.63)
	Control-EMDR	13.85	3.67	.002	(4.57, 23.13)

[a] *Bonferroni-adjusted*

Sensitivity analyses

Using multivariate methods, no significant differences in SUD-scores were found between therapists within the IEMT condition (n=19 for therapist A, n=8 for therapist B and n=6 for therapist C) at post-measurement (A-B = -6.62, S.E. = 8.93, [95% CI -29.27; 16.04], p=1.000; B-C = -7.08, S.E. = 11.45, [95% CI -36.11; 21.95], p=1.000; A-C = -13.70, S.E. = 9.93, [95% CI -38.87; 11.47], p=.533). The same held at follow-up (A-B = -11.67, S.E. =8.38, [95% CI -32.91; 9.57], p=.521; B-C = -8.00, S.E. = 10.74, [95% CI -35.22; 19.22], p=1.000; A-C = -19.67, S.E. = 9.31, [95% CI -43.28; 3.93], p=.129). Likewise, no significant differences were found between therapists within the EMDR condition (n=23 for therapist D vs. n=9 for therapist E) at post-measurement (D-E = -9.94, S.E. = 6.93, [95% CI -24.10; 4.22], p=.162) or follow-up (D-E = -5.00, S.E. = 7.17, [95% CI -19.65; 9.65], p=.491).

Exploratory analyses DASS-21-R

After experiencing all three conditions, participants scored on average significantly lower on the DASS-21-R subscale *stress* by 2.06 points, as measured at follow-up (M=8.78, SD=6.44), compared to before the experiment (M=10.85, SD=6.10), t(32) = 2.07, p=.047. Furthermore, participants scored 2.97 points lower on the DASS-21-R subscale *depression* at follow-up (M=2.67, SD=3.56) than at pre-intervention (M=5.64, SD=6.51), t(32)=3.91, p<.001). The decrease in DASS-21-R subscale *anxiety* did not significantly deviate from zero, t(32)=1.64, p=.111, from pre-intervention (M=4.72, SD=4.02) to post-intervention (M=3.33 SD=4.02). Both the pre- and post-intervention DASS-21 scores fall within the lower end of the established cut-off ranges and are classified as 'normal'. Specifically, the normal

range is defined as 0–14 points for the *stress* subscale, 0–9 points for the *depression* subscale, and 0–7 points for the *anxiety* subscale.

Discussion

The present study demonstrated significant reductions in experienced emotionality and distress related to a negative memory through directed eye movements either with an IEMT or an EMDR approach, with no significant differences among these two eye movement techniques. Participants scored significantly better at both post-intervention and follow-up after receiving either eye movements technique than after the control condition. As displayed by the DASS-21-R results, participants experienced less stress and depressive symptoms at follow-up.

The first hypothesis that both IEMT and EMDR conditions would outperform the control condition could thus be confirmed by the present findings. The second hypothesis, that IEMT directed eye movements would perform equally compared with EMDR directed eye movements, could be confirmed as well. This is in line with literature suggesting that the specific shape or form of the eye movements, horizontally or diagonally, may not be as crucial as previously suspected (Van de Voogd et al., 2018). Given the relatively small sample size and experimental nature of the design, findings should be interpreted as exploratory and preliminary.

Interestingly, nearly two thirds of participants preferred the IEMT condition over the EMDR condition despite reductions in SUD-scores being comparable. Those who preferred the IEMT condition most often mentioned that IEMT took a calmer, softer, and more emotional perspective and that it brought greater insight, depth and synthesis, due to its all-encompassing character. Interestingly, obtaining meaningful insights while not having to speak may warrant some reconsiderations regarding the necessity of talking therapies. Experiencing more tension in the head, headaches, and tired eyes during the EMDR condition were also mentioned as reasons for preferring the IEMT condition, reminding us of anecdotal evidence from the clinical field. Participants who preferred the EMDR condition appreciated the cognitive perspective and clear communication, felt that talking during the session helped them to recall the memory, and believed that having to work harder felt more forceful and therefore effective. Potentially, individual differences exist that might explain why certain participants prefer one condition over the other.

The majority of sessions in both experimental conditions ended on a positive note. In the EMDR condition, one focused on a positive cognition, while in the IEMT condition one focused on a positive memory or emotion while following horizontal eight-shaped directed eye movements. In the field of imagery rescripting (ImRs), scientific studies have been conducted to investigate to what degree clinicians use a

positive ending to a session and to what effect, as this varies across protocols and clinicians (Hackmann, 2011). Some explicitly instruct patients to conclude an ImRs session with a positive ending (Van der Wijngaart, 2021), while others do not (e.g., Arntz & Weertman, 1999). While positive emotions can be heightened through a positive component within ImRs, it is as of yet unclear whether this positive component significantly enhances the effectiveness of treatment (Geschwind et al., 2024). The Broaden and Build theory (Fredrickson, 2001) and the undoing hypothesis (Fredrickson et al., 2000) posit that positive emotions may help individuals undo the adverse effects of trauma and build durable biopsychosocial resources. Likewise, for IEMT and EMDR positive endings may enhance treatment effectiveness, as should be investigated in future research.

Interestingly, our findings also showed a significant reduction in experienced emotionality and distress related to a negative memory within the control condition. This reduction of the memory's negative emotional valence might be explained by the requests to think of the negative memory in the presence of a supporting professional, i.e. one of the researchers, and to repeatedly score VAS scales, actions which may lead participants to expect change. The control condition may have also unintentionally functioned as a wakeful rest condition, which has been shown to reduce negative thoughts (Hørlyck et al., 2019). These results reminded us of the potential effects of social buffering (Bratec et al., 2020), expectancy effects and other common factors (Constantino et al., 2018), and the Hawthorne Effect (McCarney et al., 2007), stipulating the necessity and importance of incorporating an active control condition in experimental designs.

Whilst the present study showed equal outcomes for the IEMT and EMDR conditions, it is yet unknown how IEMT might achieve such results. However, IEMT's effectiveness is hypothesized on the assumption that eye movements, and more specifically purposeful movement along the line of the 'blink', may facilitate change. The blinks are hypothesized to be connected to areas of the brain that are in charge of memories and emotions, such as the hippocampus and the amygdala (Austin, 2009). In the current study, this hypothesis could not be tested. Future studies should entail EEG (electroencephalogram) or MRI (magnetic resonance imaging) techniques to establish changes in specific brain areas before, during, and after IEMT. If underlying processes are established and results are replicated, IEMT may prove a promising avenue in treatment by addressing traumatic experiences.

Strengths and limitations

Notable strengths of this study included the randomization of conditions, the use of a control group, the experimentally controlled setting and the novel insights that were obtained from the data. Participants had to prepare three negative

memories, which were randomized over conditions to avoid participants choosing which memory to work on themselves. Participants were furthermore blind to the conditions.

Several limitations must be noted. First, the sample size of this first exploration was relatively small, and must be expanded upon in future evaluations. Second, while EMDR and IEMT should be beneficial to all persons who experienced adversity, generalizability to clinical groups is presently unclear due to the use of a non-clinical sample. Another important limitation was the restricted timeframe we allowed per session, a maximum of 20 minutes per condition. This meant that therapists in both experimental conditions could not conduct the full protocol of either IEMT or EMDR. The full potential of both therapy conditions could therefore not be established and thoroughly compared through this study, but rather the focus was on the specific eye movement technique. Therefore, conclusions on the forms of therapy should be made with caution as both interventions involve additional and varying components within their protocols. Future studies should therefore employ longitudinal designs with longer follow-ups and more extensive time frames, using the full protocol, for a stronger comparison and to establish the true effectiveness of each therapy condition.

Furthermore, the design of the study meant that participants went from one condition to the other with a short break in between. As such, one may speculate that treatment effects could have therefore crossed over from one session to the next. However, the applied randomization of conditions should control for this potential risk.

A final limitation is the absence of an active working-memory control task (e.g., Tetris; Holmes et al., 2009). Future studies should include such conditions to more directly test whether observed effects are attributable specifically to eye movements or to working-memory taxation more broadly.

Conclusion

This study is, to the best of our knowledge, the first to compare IEMT directed eye movements with EMDR directed eye movements. Results showed that participants experienced a similar decrease in emotionality and distress related to a negative memory in both conditions. This leads to the cautious conclusion that directed eye movements in general, regardless of their specific directions or axes, may be responsible for the decrease in distress via taxation of the limited working memory capacity. The majority of participants preferred IEMT as a treatment condition, however, it remains unclear how IEMT yields its positive effects. Replication of these results is warranted, both in non-clinical and clinical samples.

Authors' note

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The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. DH, AtB and NT designed the study and collected data; AB and DH analyzed the data. All authors contributed to writing the article.

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