



## The impact of eye movements and tones on disturbing memories involving PTSD and other mental disorders



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### ABSTRACT

**Background:** A wide array of experimental studies are supportive of a working memory explanation for the effects of eye movements in EMDR therapy. The working memory account predicts that, as a consequence of competition in working memory, traumatic memories lose their emotional charge.

**Method:** This study was aimed at investigating (1) the effects of taxing the working memory, as applied in EMDR, during recall of negative memories in 32 patients with posttraumatic stress disorder (PTSD), and 32 patients with other mental disorders, and (2) whether the results would differ between both groups. In a therapeutic session patients were asked to recollect a crucial upsetting memory while, in counterbalanced order (a) performing eye movements, (b) listening to tones and (c) watching a blank wall ('recall only'), each episode lasting 6 min.

**Results:** Eye movements were found to be more effective in diminishing the emotionality of the memory than 'recall only'. There was a trend showing that tones were less effective than eye movements, but more effective than 'recall only'. The majority of patients (64%) preferred tones to continue with. The effects of taxing working memory on disturbing memories did not differ between PTSD patients and those diagnosed with other conditions.

**Conclusions:** The findings provide further evidence for the value of employing eye movements in EMDR treatments. The results also support the notion that EMDR is a suitable option for resolving disturbing memories underlying a broader range of mental health problems than PTSD alone.

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### 1. Introduction

Posttraumatic stress disorder (PTSD) is an anxiety disorder that is rooted in the experience of events involving actual or threatened death or serious injury, or the threat to the physical integrity of oneself or others (American Psychiatric Association, 2000). Individuals with PTSD repeatedly experience their traumatic event in the form of aversive and disturbing memories, nightmares, distressing dreams, hallucinations, and flashbacks. One of the most effective therapies for the treatment of such unpleasant memories

is eye movement desensitization and reprocessing (EMDR). Clinical trials and meta-analyses demonstrate that EMDR is an evidence based treatment for PTSD, and equally effective as trauma-focused cognitive behavioral therapy (Bisson et al., 2007; Seidler & Wagner, 2006).

A core feature of EMDR therapy is that the patient is asked to hold a disturbing memory in mind while engaging in sets of eye movements or other bilateral stimuli, such as taps or tones (Lee & Cuijpers, 2013; Shapiro, 2001). In the original description of EMDR it was assumed that the bilaterality of the presented stimulus was a necessary factor to stimulate trauma recovery. However, evidence is mounting to support an explanation based upon a working memory model. The theory underpinning this model states that recalling an episode uses working memory capacity, which in itself is limited (Baddeley, 2012). Since a traumatic memory is inherently intense, vivid and emotionally charged, it

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taxes working memory resources when it is recalled. If at the same time another task (i.e. client's eyes following the therapist's hand back and forth) is executed during recall, fewer resources would be available for the memory (Baddeley, 2012). This competition within the working memory results in less memory resources for the vividness and the disturbance or emotionality of the memory (e.g. Andrade, Kavanagh, & Baddeley, 1997; Gunter & Bodner, 2008; Hornsveld et al., 2010). Consistent with hypotheses from a working memory theory, memories have been found to not only becoming less disturbing, and less vivid, during execution of an eye-movement task (e.g. Gunter & Bodner, 2008), but also during a range of other working memory taxing tasks (for an overview see van den Hout et al., 2012).

Two studies have investigated the effects of taxing working memory with trauma images using a clinical population with a PTSD diagnosis. Lilley and his colleagues used a within-subjects design in which 18 patients completed an imagery task under three concurrent task conditions: eye movements (following a letter flashing up on alternate sides of computer screen), counting, and exposure only (without a concurrent task) (Lilley, Andrade, Turpin, Sabin-Farell, & Holmes, 2009). The participants selected three distressing images each. Each image was assigned to a condition that comprised eight trials in which the participants were asked to recollect the image for 8 s while performing one of the three tasks. Vividness and emotionality of each of the images was assessed before and after the intervention. The eye-movement task reduced vividness and emotionality of the distressing images relative to the counting task and exposure only. In the other study (van den Hout et al., 2012) 12 PTSD patients were asked to recall the traumatic event while performing three tasks in counterbalanced order: eye movements (visually tracking the therapist's fingers), listening to tones, and just recalling the event. The results showed that eye movements were superior to tones in reducing emotionality and vividness of the trauma memories, whereas tones and 'recall only' had both similar, negligible effects. Interestingly, despite the fact that the application of eye movements was (far) more effective than auditory tones in almost all patients, eight out of 12 patients preferred the tones, while only three preferred the eye movements.

Key to the working memory explanation of EMDR therapy is the question of whether the findings observed translate to other memories than those involving PTSD *per se*. To this end, EMDR is increasingly applied as a treatment for other (anxiety) disorders (De Jongh & Ten Broeke, 2009a, 2009b), such as driving phobias (De Jongh, Holmshaw, Carswell, & van Wijk, 2011), and other conditions and symptoms that developed following an adverse event (see for instance De Jongh & Ten Broeke, 2009b; Maxfield & Melnyk, 2000). If the working memory model is a valid explanation for what occurs during EMDR, it would mean that taxing working memory is effective in resolving negative memories that play a role in, or underlie, a broad variety of psychological symptoms and conditions.

The purpose of the present study is two-fold. First, it was aimed at replicating previous clinical studies that tested the working memory explanation of EMDR, using a larger sample size to increase statistical power, thereby lending more credibility to the conclusions. As eye movements have been found to tax working memory more than tones, and tones more than 'recall only' (van den Hout et al., 2011), it was predicted that eye movements would outperform tones, whereas tones would outperform 'recall only' in diminishing emotionality and vividness of patients' crucial upsetting memories. As van den Hout et al. (2012) found that treatment efficacy did not coincide with preference of the patients, patients were not only asked for preferences, but also for the reason a particular task was evaluated as most effective. The second main aim of the study was to investigate whether results found in PTSD

**Table 1**

Summary of the DSM-IV-TR classifications for which the patient was treated with EMDR ( $N = 64$ ).

Psychiatric diagnosis	<i>N</i>	Percentage (%)	Examples of target images
PTSD	32	50.0	Robbery, rape, hit by ex.
Other anxiety disorder	9	14.0	Dental operation; social rejection
Mood disorder	6	9.4	Suicide of brother; bullied; rejection
Adjustment disorder	9	14.0	Divorce; reanimation: loss of job
Somatiform disorder	2	3.1	Humiliation, memory of pain
Other diagnoses	3	4.7	Death of father
Personality disorder	3	4.7	Being bullied

patients could be extrapolated to patients with other mental health conditions. It was hypothesized that the experimental tasks would have similar effects on memories of patients with other diagnoses than PTSD.

## 2. Method

### 2.1. Participants

Inclusion criteria for patients were at least 18 years old, indicated by their therapist for EMDR, but never having received EMDR treatment before, good command of the Dutch language and any valid clinical diagnoses based on the DSM-IV-TR (American Psychiatric Association, 2000) as determined by their therapist. The final sample consisted of 64 patients (50 females; mean age = 35.6 yrs,  $SD = 11.2$ ; range = 19–61 yrs; education levels: 9.4% low, 48.4% middle, 39.1% high, and 3.1% unknown). It appeared that 32 patients met all DSM-IV-TR criteria for PTSD, and 32 remaining patients met other DSM-IV-TR diagnoses. Table 1 summarizes the DSM-IV-TR classifications for which the patient was treated with EMDR and gives, for each category, examples of the images targeted by EMDR. The Impact of Event Scale (see Measures) was administered to investigate the severity of symptoms relative to the identified traumatic event. PTSD patients had significantly higher IES scores ( $M = 2.19$ ,  $SD = 0.66$ ) than non-PTSD patients ( $M = 1.60$ ,  $SD = 0.64$ ;  $t(54) = -3.43$ ,  $p = .001$ ). Subscale differences were found for 'intrusions' (PTSD  $M = 2.52$ ,  $SD = 0.91$ ; non-PTSD  $M = 1.70$ ,  $SD = 0.66$ ;  $t(60) = -4.01$ ,  $p < .001$ ), and 'hyperarousal' (PTSD  $M = 2.48$ ,  $SD = 0.89$ ; non-PTSD  $M = 1.63$ ,  $SD = 0.89$ ;  $t(59) = -3.75$ ,  $p < .001$ ), but not for 'avoidance' (PTSD  $M = 1.93$ ,  $SD = 0.91$ ; non-PTSD  $M = 1.50$ ,  $SD = 0.82$ ;  $t(57) = -1.90$ ,  $p = .062$ ).

### 2.2. Procedure

Using the database of the Dutch EMDR Association, 828 qualified therapists who had completed advanced EMDR therapy (Level II) training, and had been extensively supervised in the application of EMDR, were approached by email and asked to participate in the study. If a therapist agreed to participate he or she received detailed instructions, including a step-by-step video demonstration of the research protocol<sup>1</sup>. In total, 226 therapists responded, of which 119 agreed to participate. Eventually, 35 therapists actually participated of whom 18 treated multiple patients (range: 2–5). Reasons for not participating were: no eligible patients, the patient was not willing to participate or the therapist found the procedures and the preparations – on second thoughts – too time consuming.

No patient had received previous EMDR therapy. The study took place during the very first part of the first EMDR session. Patients

<sup>1</sup> <http://www.youtube.com/watch?v=BUmH1qvagkg>.

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