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Verbal suggestions fail to modulate expectations about the effectiveness of a laboratory model of EMDR therapy: Results of two preregistered studies

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ABSTRACT

Background and objectives: For many psychotherapies, like Eye Movement and Desensitization Reprocessing (EMDR) therapy, there is an ongoing discussion about the role of specific versus non-specific mechanisms in their effectiveness However, experimental research directly examining the potential role of non-specific mechanisms is scarce. Here, we address the role of a non-specific factor that is often put forward for EMDR, namely treatment effectiveness expectations, within a laboratory model of EMDR therapy.

Methods: In a lab-based ($N = 96$) and an online experiment ($N = 173$), we gave participants verbal instructions to manipulate their treatment expectations. Instructions emphasized EMDR's effectiveness or ineffectiveness. Then, participants were asked to recollect an unpleasant autobiographical memory with or without making eye-movements.

Results: In line with previous studies, we found significant reductions of reported vividness and emotionality of negative autobiographical memories in the eye-movements condition. These reductions did not differ between the verbal suggestions conditions in both experiments, suggesting a limited effect of treatment effectiveness suggestions.

Limitations: Treatment effectiveness expectations were not successfully manipulated by the suggestions manipulation. This suggests that treatment expectations may be more difficult to influence than anticipated, thus limiting the interpretation of our findings.

Conclusions: These findings tentatively corroborate the results of two earlier reports, suggesting that the effects of verbal suggestions about treatment effectiveness in a laboratory model of EMDR therapy may be limited.

1. Introduction

Eye-Movement Desensitization and Reprocessing (EMDR) therapy (Shapiro, 2017) is a well researched and effective therapy for the treatment of Post-Traumatic Stress Disorder (PTSD) (Lewis et al., 2020). EMDR therapy comprises several interventions, but the main component is that the patient is asked to recall an aversive memory while simultaneously making horizontal eye-movements (Shapiro, 2017). Lab studies have shown that this component reduces the emotionality and vividness of emotional memories (Andrade et al., 1997; Engelhard et al., 2019).

Laboratory research suggests that a working mechanism of EMDR therapy involves taxing of working memory (WM) (Andrade et al., 1997; Gunter & Bodner, 2008; van den Hout & Engelhard, 2012). According to WM theories, WM is a limited capacity system used for the storage, manipulation and retrieval of mental images and memories (Baddeley, 2012). Making eye-movements taxes WM, which leaves less capacity for the retrieval of an emotional memory – a process that also requires WM capacity (Andrade et al., 1997). It has been hypothesized that the degraded emotional memory will be less emotionally intense, and will then either be restored (van den Hout & Engelhard, 2012) or reappraised (Engelhard et al., 2019; Gunter & Bodner, 2008), resulting in long-term decreases in memory vividness and emotionality and, in the context of EMDR therapy, a reduction of symptoms (Gunter & Bodner, 2008).

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As with many interventions, the question arises whether part of EMDR therapy's effectiveness can be ascribed to non-specific factors, such as expectation effects (e.g., Devilly, 2005; Lilienfeld, 1996). Outcome expectations can be defined as prognostic beliefs about the (beneficial) consequences of engaging in treatment (Constantino et al., 2011). Such expectations seem to contribute to the effectiveness of psychotherapies, such as cognitive-behavioral therapy, interpersonal therapy, and psychodynamic therapy (e.g., Arnkoff et al., 2002; Constantino et al., 2011; Greenberg et al., 2006). For example, in a meta-analysis of 46 studies, Constantino et al. (2011) found a weighted effect size of Cohen's $d = .24$ of psychotherapy outcome expectations on post treatment symptom reduction. Yet, patients' expectations are often neglected in psychotherapy research, despite the fact that adequately informing patients and managing expectations is indispensable in clinical practice (Arnkoff et al., 2002; Greenberg et al., 2006). Indeed, also in EMDR therapy, setting expectations is part of the treatment protocol (Shapiro, 2017).

To our knowledge, only Gosselin and Matthews (1995) and Littel et al. (2017; two studies) have investigated the effects of treatment expectations in a laboratory analogue of EMDR therapy. These studies found no or little evidence that treatment expectations about EMDR therapy moderate the effectiveness of the EMDR analogue intervention. However, several limitations of these studies should be taken into account. First, they used relatively small sample sizes (each approximately 20 participants per condition), which did not provide adequate statistical power to detect medium- and small-sized effects of expectation effects. Second, the first experiment in Littel et al. (2017) selected participants with prior knowledge, but did not provide information about the effectiveness of the eye-movements intervention in EMDR therapy. Moreover, in their second experiment, verbal suggestions focused on the hypothetical working mechanism rather than on EMDR's effectiveness per se. Similarly, Gosselin and Matthews (1995) merely informed participants in the low-expectation condition that little was known about the effectiveness EMDR. It could be argued that these manipulations provided limited information about effectiveness of EMDR therapy, which differs from clinical practice in which patients receive more explicit information either from their therapist or by looking up information themselves. Hence, it is important to gain insight into the effects of more explicit information about therapy effectiveness. Third, these earlier studies did not include a follow-up test, even though previous studies have shown that effectiveness of the laboratory eye-movement intervention tends to decrease over time (e.g., van Veen et al., 2020).

Taking these limitations into account, the current research addresses whether inducing either positive or negative expectations about the effectiveness of EMDR therapy influences the effectiveness of a laboratory analogue of the eye-movement component in EMDR therapy. In line with the effect of treatment effectiveness expectations in other psychotherapies (e.g., Constantino et al., 2011), we expected that inducing positive expectations through verbal suggestions would lead to increased effectiveness of the laboratory analogue of EMDR therapy (i.e., pre-post changes in memory ratings because of an eye-movement intervention) and that inducing negative expectations would lead to decreased effectiveness of this intervention.

2. Experiment 1

2.1. Pre-registration and deviations from the preregistration

The sample size determination, design, procedure, and data analyses steps were pre-registered on the Open Science Framework prior to the data collection (https://osf.io/m7crd/). In addition to what was pre-registered, we included a 24h follow-up test in the study. Furthermore, we also report Bayesian analyses for Experiment 1, even though this was not preregistered, in order to maintain consistency with Experiment 2.

2.2. Participants

In order to improve the statistical power of this study compared to the prior studies (Gosselin & Matthews, 1995; Littel et al., 2017), the sample size in each of the conditions of this experiment was increased with approximately 50% to 32 participants per condition (96 participants in total across the three conditions, see below). Power calculations using G-Power based on a simplified design for our study (i.e., a one-way ANOVA with three conditions) indicated a statistical power of .13, .57, and 0.94 to detect small ($f = .10$), medium ($f = .25$), and large ($f = .40$) effects, respectively (Faul et al., 2007). Participants were recruited via posters on the Utrecht University campus and Facebook groups. We selected participants according to their answers on a pre-screening questionnaire, which was completed by 202 persons. Eventually, 106 persons were excluded prior to participation based on the following criteria assessed by self-report: bad eyesight, neurological or medical conditions, psychological complaints, currently receiving psychological treatment, having experienced traumatic experiences, and/or having participated in studies comparable to our procedure. The remaining 96 persons participated in and completed the study (see Table 1). All participants provided written informed consent and received partial credit towards a course requirement or financial reimbursement (€8). Participants were randomly assigned to one of the three different conditions: positive information, negative information, or neutral information about EMDR therapy. The protocol of this study was approved by the local ethics committee (code: amendment to 15–080).

2.3. Materials and procedure

The experiment took place in a laboratory at Utrecht University. Upon arriving in the laboratory, participants were asked about their prior knowledge of three different therapies (Applied Relaxation, EMDR therapy, and Mindfulness) and to rate to what extent they thought that each of these is an effective therapy on a 10-point scale ranging from 1 (*not at all effective*) to 10 (*very effective*) and indicate the confidence they had in their answers (1 = not very sure; 10 = very sure). Afterwards, participants were provided with an information letter about the experiment, which the experimenter read aloud to them. Depending on the condition, they received information that was positive, negative, or neutral about the effectiveness of EMDR therapy. Participants in the positive information condition were told: "*The experiment you are about to take part in is based on a treatment that focuses on the processing of traumatic or unpleasant memories. This method is called Eye-Movement Desensitization Reprocessing (EMDR) therapy. With this method, it is assumed that carrying out eye-movements while retrieving the memory makes the unpleasant memory less vivid and emotional, so that patients suffer less from this memory. In the past decades, a lot of research has been done into this treatment and the results are very positive. EMDR therapy is a very effective method to reduce the emotionality and vividness of unpleasant memories. This makes it a popular method for the treatment of post-traumatic stress disorder and anxiety symptoms.*" Participants in the negative information condition received the same general introduction about EMDR therapy, but were then told: "*In the past decades, much research has been done into EMDR therapy, from which various results emerge. A small number of studies give moderately positive results, but most researchers*

Table 1
Descriptive statistics of the different conditions in Experiment 1.

	Positive information (n = 32)	Negative information (n = 32)	Neutral information (n = 32)
Sex (men/women)	5/27	5/27	6/26
Mean age (SD)	20.97 (2.47)	20.97 (4.04)	21.47 (2.42)
Prior knowledge EMDR (% of the sample)	53.13%	53.13%	62.5%

conclude that EMDR therapy is not effective in making memories less vivid and emotional. Many researchers are therefore skeptical about the effectiveness of EMDR therapy, despite the popularity of the method." Finally, in the neutral information condition also received the same general introduction to EMDR therapy, but were told: "*Little research has been done into the effectiveness of this method.*" The information letter ended with the following instructions: "*In the current experiment, we will measure whether making eye-movements affects unpleasant memories that you have about moments from your own life.*" We decided to measure treatment expectations as a manipulation check at the end of the experiment (see below), and not immediately after the manipulation, because we did not want to elicit possible reactance processes that would otherwise not occur (e.g., Hauser et al., 2018). We assumed that if these treatment suggestions influence treatment expectations and effectivity, their effects should still be measurable at the end of the study.

After the instructions manipulation, participants continued with the eye-movements intervention phase. Following the procedure developed by van den Hout et al. (2001), and commonly used in similar studies (Gunter & Bodner, 2008; Littel et al., 2017; Mertens et al., 2018; van Veen et al., 2020), participants were first instructed to recall two unpleasant and vivid autobiographical memories and rate their unpleasantness on a scale from 0 to 100. Memories rated between 60 and 90 were selected and were then ranked in order of unpleasantness. Subsequently, the participant verbally recounted these memories. Randomization was used to decide which memory would be discussed first. In line with the Dutch EMDR therapy protocol (de Jongh & Ten Broeke, 2012), the participants were instructed to 'play' these memories in their minds as vividly as possible and tell the experimenter what they remembered. Then, they were asked to take a 'screenshot' in their mind of the most emotionally intense and unpleasant moment. Participants labelled each memory image with a keyword, which was used to refer to the image in the remainder of the experiment.

Participants were then subjected to the laboratory analogue of the eye-movement component in the EMDR therapy protocol. Participants were seated approximately 60 cm in front of a computer screen. They were instructed to recall one of their aversive memories. Meanwhile they had to make horizontal eye-movements (EM + Recall) induced by tracking a horizontally moving white dot (approximately 1 cm in diameter) on the screen (speed: 1 left-right-left cycle per second; see Engelhard et al., 2010; Littel et al., 2017), or to watch a black screen without a dot (Recall Only; this is a control condition). The order in which they performed these tasks was counterbalanced. Each intervention was completed in six blocks of 24 s separated by breaks of 10 s (Engelhard et al., 2012; van Schie et al., 2016). Before (pre-test) and after (post-test) each intervention participants recalled the aversive memory for 10 s and reported its emotionality and vividness ratings using Visual Analogue Scales (VASs) ranging from 0 (*not unpleasant/not vivid*) to 100 (*very unpleasant/very vivid*). After finishing both tasks, participants completed a questionnaire, inquiring about the effort participants invested into the EM + Recall (1 = "did not invest effort at all", 5 = "invested a lot of effort"), whether they believe EMDR therapy is an effective treatment (1 = "not at all effective", 10 = "very effective"), how much confidence they had in their answer regarding EMDR therapy effectiveness (1 = "not at all sure", 10 = "very sure"), and whether they thought this study attempted to influence this belief ("yes", "no", or "uncertain"). The experimental task was programmed using Inquisit (v4; www.millisecond.com).

After the computer task, participants were invited to participate in an online follow-up test approximately 24h later presented using Qualtrics (https://www.qualtrics.com). They were told that they would receive an additional €2 if they completed this questionnaire. Eighty-four (87.5%) participants did this. In the follow-up test, participants were instructed to recall the aversive memories for 10 s and report their emotionality and vividness ratings on VASs similar to the pre and post-test. Afterwards, participants were debriefed.

2.4. Data analysis

Participants' ratings regarding EMDR effectiveness were analyzed with a repeated measures ANOVA with factors Time (pre-versus post-experiment; within-subjects factor) and Condition (positive, negative, and neutral information; between-subjects factor). Similarly, participants' ratings regarding memory vividness and emotionality were analyzed with two repeated measures ANOVAs with factor Time (pre-rating, post-ratings; within-subjects factor), Task (EM + Recall, Recall Only; within-subjects factor) and Condition (positive, negative, and neutral information; between-subjects factor). For the follow-up test, ratings of memory' vividness and emotionality were analyzed with two repeated measures ANOVAs with factor Time (pre-rating, follow-up; within-subjects factor), Task (EM + Recall, Recall Only; within-subjects factor) and Condition (positive, negative, and neutral information; between-subjects factor). These analyses were executed in SPSS (version 26) and an alpha-level of 0.05 was used.

We also analyzed the data using Bayesian Hypothesis Testing (BHT) to quantify evidence in favor of the null (Dienes, 2014), JASP software (JASP Team, 2020). JASP determines a Bayes Factor (BF) per requested test, which expresses the relative likelihood of the data under H_1 and the H_0. Because of this relativity, data are expressed as being in favor of the H_1 (relative to H_0, expressed as BF_{10}) or H_0 (relative to H_1, expressed as BF_{01}). For instance, $BF_{01} = 10$ means that the data are 10 times more probable under H_0 than under H_1. In all analyses, we used JASP's standard prior: a Cauchy distribution with scale r = 0.707 (i.e., medium prior).

2.5. Results

2.5.1. Expectations regarding EMDR effectiveness

EMDR effectiveness ratings revealed a significant effect for Time, $F(1, 91) = 11.59$, $p = .001$, $\eta^2_p = .11$, $BF_{10} = 24.94$, showing an overall decrease in effectiveness ratings (see Table 2). There were no effects for Condition, $F(1, 91) = 2.27$, $p = .109$, $\eta^2_p = .05$, $BF_{01} = 1.40$, or for Time × Condition, $F(1, 91) = 1.50$, $p = .228$, $\eta^2_p = .03$, $BF_{01} = 3.09$.

2.5.2. Vividness and emotionality of the autobiographical memories

Pre-test versus post-test comparison. For vividness, a main effect of Time, $F(1, 93) = 13.64$, $p < .001$, $\eta^2_p = .13$, $BF_{10} = 24.98$, and Task, $F(1, 93) = 7.10$, $p = .009$, $\eta^2_p = .07$, $BF_{10} = 18.38$, as well as a two-way interaction between these two factors, $F(1, 93) = 13.30$, $p < .001$, $\eta^2_p = .13$, $BF_{10} = 6.67$, were found. This interaction reflects a greater decrease from the pre-test to post-test in the EM + Recall compared to Recall Only condition (see Table 3). However, crucially, no main effect or interaction effects were found with Condition, $Fs < 2.71$, $ps > .07$, $\eta^2_p < .06$, $BF_{01} > 9.7$.

Analysis of the emotionality ratings likewise showed a main effect of Time, $F(1, 93) = 41.64$, $p < .001$, $\eta^2_p = .31$, $BF_{10} = 1.42 \times 10^6$, and an interaction between Time and Task, $F(1, 93) = 13.33$, $p < .001$, $\eta^2_p = .13$, $BF_{10} = 4.18$, also reflecting a greater decrease from the pre to post-test in the EM + Recall compared to Recall Only condition (see Table 3). However, crucially, also for emotionality ratings, no main effect or interaction effects were found with Condition, all $F's < 1.31$, all $p's > 0.27$, $\eta^2_p < .03$, $BF_{01} > 5$.

Table 2
Mean (standard deviation) EMDR therapy effectiveness ratings (1–10) before (pre-rating) and after (post-rating) the study was completed.

	Positive information condition	Negative information condition	Neutral information condition
Pre-rating	7.16 (1.49)	6.87 (1.23)	7.25 (1.50)
Post-rating	6.90 (1.30)	6.03 (1.49)	6.88 (1.66)

Table 3
Mean (SD) of vividness and emotionality ratings in the different conditions of Experiment 1.

	Positive information condition		Negative information condition		Neutral information condition	
	EM + Recall	Recall Only	EM + Recall	Recall Only	EM + Recall	Recall Only
Vividness						
Pre-ratings	75.90 (9.88)	77.21 (11.15)	74.73 (16.50)	72.62 (16.98)	80.52 (12.40)	81.69 (10.43)
Post-ratings	66.17 (20.87)	74.69 (15.87)	66.35 (21.56)	74.12 (15.74)	73.76 (19.75)	79.07 (14.16)
Follow-up	64.03 (13.80)	62.90 (15.06)	62.08 (16.98)	58.15 (19.01)	65.28 (19.23)	62.83 (20.38)
Emotionality						
Pre-ratings	70.24 (12.49)	70.00 (11.03)	73.04 (16.98)	71.81 (13.25)	75.10 (14.10)	72.38 (10.38)
Post-ratings	61.10 (17.91)	63.79 (17.81)	66.19 (19.23)	70.42 (14.57)	63.69 (15.99)	69.34 (13.08)
Follow-up	57.45 (20.37)	60.62 (13.33)	62.81 (15.78)	58.31 (14.44)	58.48 (18.10)	60.97 (16.60)

Pre-test versus follow-up comparison. For vividness ratings, only a main effect of Time was found, $F(1, 81) = 80.94$, $p < .001$, $\eta^2_p = .50$, $BF_{10} = 6.71 \times 10^{19}$, indicating a large reduction in rated vividness from pre-test to follow-up test (see Table 3). All other main or interaction effects were not statistically significant, all $Fs < 2.53$, all $ps > .11$, $\eta^2_p < .04$, $BFs_{01} > 2.6$.

For emotionality ratings, only a main effect of Time was found, $F(1, 81) = 63.16$, $p < .001$, $\eta^2_p = .44$, $BF_{10} = 1.61 \times 10^{16}$, similarly indicating a large reduction in rated emotionality from pre-test to follow-up test (see Table 3). All other main or interaction effects were not statistically significant, all $Fs < 2.81$, all $ps > .06$, $\eta^2_p < .07$, $BFs_{01} > 4.2$.

2.5.3. Correlation analyses

Because our manipulation of EMDR effectiveness ratings did not differ per condition, we additionally used a different approach to investigate whether EMDR's effectiveness expectations were related to the effectiveness of the eye-movement intervention (see the preregistration). Therefore, we correlated effectiveness ratings before the experiment with the pre-to-posttest and pre-to-follow-up test differences between the EM + Recall condition and the Recall Only condition. These correlations were not significant for the pre-to-posttest difference (vividness: $r = .059$, $p = .570$, $BF_{01} = 6.62$; emotionality: $r = -0.048$, $p = .644$, $BF_{01} = 6.98$) and for the pre-to-follow-up test difference (vividness: $r = .031$, $p = .780$, $BF_{01} = 6.97$; emotionality: $r = -0.101$, $p = .635$, $BF_{01} = 4.85$).

2.6. Discussion

There was no evidence that a laboratory analogue of EMDR therapy is influenced by participants' treatment effectiveness suggestions. However, one important limitation was the unsuccessful manipulation of participants' expectations. It may be difficult to change expectations for an existing and (in the Netherlands) well-known therapy using simple verbal suggestions. Therefore, we decided to conduct a second study using a novel task that capitalizes on the same working mechanisms as the eye-movements component in EMDR, but did not overtly resemble EMDR therapy and was therefore likely unknown to participants.

3. Experiment 2

We made several changes compared to Experiment 1. First, we used a different intervention to induce eye-movements dubbed the "Working Memory-Symbol Recognition Task (WM-SRT)" to mask any connection with EMDR therapy. In this task, participants see distractor letters (e.g., "m") that appear alternatingly on the left and right side of the computer screen. Participants are instructed to press the spacebar whenever they see a target letter (e.g., "n"). Participants are also instructed to keep their head still and only move their eyes. Hence, this task induces left-right eye-movements (Homer et al., 2016). Second, the study was conducted online to facilitate testing a larger sample. The third change was a more extensive assessment of participants' expectations using the Expectations/Credibility Questionnaire (CEQ; Devilly & Borkovec, 2000) at the end of the experiment. Finally, we removed the neutral information condition and only focused on the two most extreme conditions (i.e., positive information vs. negative information).

3.1. Pre-registration and deviations from the preregistration

The sample size determination, design, procedure, and data analyses steps were pre-registered on the Open Science Framework prior to the data collection (https://osf.io/mu3ca/). There were no deviations from the preregistration, except that slightly more participants than planned were tested (N = 173 instead of the planned N = 160).

3.2. Participants

Based on an a priori power analysis, we aimed to test at least 80 participants in each condition (160 in total). This provides adequate statistical power (>0.80) to detect small-to-medium sized differences (Cohen's $d = .4$) between the two groups ($\alpha = .05$). Participants were recruited through posters at Utrecht University and Erasmus University Rotterdam campus and online advertisement. Two-hundred and thirty-eight participants clicked on the participation link. Based on our exclusion criteria (currently being under treatment by a psychologist/psychiatrist or reporting complaints regarding unpleasant and/or intrusive memories), 49 participants were automatically excluded based on an initial screening. The remaining 189 participants provided informed consent to participate in the study, and 178 completed the experiment and answered the post-rating assessment. Finally, 5 participants were removed because they failed to select a sufficiently unpleasant memory (rated less than 5 on a 1–10 scale; $n = 3$), indicated that they did not pay sufficient attention during the experiment (rated less than 5 on a 1–10 scale; $n = 1$), or completed the experiment twice ($n = 1$). The final sample size for analyses comprised 173 participants. They had been randomly assigned to one of the conditions: positive information ($n = 83$; mean age = 22.76, SD = 5.79; 67 women, 16 men) or negative information ($n = 90$; mean age = 22.26, SD = 6.84; 72 women, 16 men, 2 preferred not to say). They were given course credit or the chance to win a coupon (€10). This study was approved by the ethics committee of the Faculty of Social and Behavioral Sciences of Utrecht University (code: 19–122).

3.3. Materials and procedure

The task was programmed in Inquisit v4 (https://www.millisecond.com/) and administered online through the Inquisit Web servers. Participants were asked to execute the task from home in a quiet surrounding using their laptop or personal computer. The task started with a pre-screening assessment, an information letter, and an informed consent form. The information letter was manipulated to be either very positive or very negative about a novel treatment called "Working Memory-Symbol Recognition Task". Particularly, participants in the positive information condition were told that: "*The experiment in which you are about to participate investigates a treatment that focuses on the processing of unpleasant or traumatic memories. This relatively new*

treatment is based on focusing the attention to symbols while thinking back of the memory. This treatment is called the Working Memory Symbol recognition Task (WM-SRT). In this treatment, it is presupposed that loading the working memory while recollection a memory will make this memory less vivid and emotional, thereby reducing the distress of the memory for patients. In the past decennia, much research has been conducted on WM-SRT, and most studies have concluded that WM-SRT is very effective to make memories less vivid and emotional. Many researchers and clinicians are therefore extremely enthusiastic about the effectiveness of WM-SRT." Participants in the negative information condition were given the same general introduction about WM-SRT, but were additionally informed that: "*In the past decennia, much research has been conducted on WM-SRT, in which different results have been found. A small number of studies indicated moderate positive results, but the majority of studies have concluded that WM-SRT is not an effective treatment to make memories less vivid and emotional. Many researchers and clinicians are therefore skeptical about the effectiveness of WM-SRT.*" The information letter ended with the following information: "*In this study we will measure whether loading working memory has an effect on unpleasant memories you have about certain moments in your life.*" Following this manipulation, participants were asked to select one unpleasant memory about a situation in the past (>1 week ago) that, when recalled, would still made them feel emotional. They were asked to provide one keyword that would trigger them to think about the memory.

After the expectancy manipulation and memory selection, participants rated memory vividness and emotionality following the same procedure as Experiment 1, with the addition that they also scored their memory accessibility on a 0–100 VAS ("How easily could you recollect the memory?"; 0 = not at all easily, 100 = very easily). Next, they completed four blocks of 24s of the task developed by Homer et al. (2016). Before each block, participants were asked to think back to the selected memory (using the keyword they selected) and to keep it in mind while executing the task. Furthermore, they were told what the target letter was (i.e., 'n', 'p', 'v', or 'e') and they were instructed to press the space bar whenever they saw this target letter appear. The task consisted of 300 ms presentations of letters on the left and right sides of the computer screen (with a 450 ms inter-trial interval). Each block consisted of 30 distractor letter presentations (i.e., 'm', 'd', 'w', or 'c') and two target letter presentations. A different target and distractor letter was used in each block. In the background, alternating black and white stripes were presented to increase the visual load of the task (see Homer et al., 2016). A prior study from our lab showed that this task was comparably effective to a dot-tracking task to reduce the reported emotionality and vividness of negative autobiographical memories (Mertens et al., 2018). After completing the task, participants provided post-ratings of their selected memory in the same way as in the pre-test.

At the end of the experiment, participants completed an adjusted version of the Credibility/Expectancy Questionnaire (CEQ; Devilly & Borkovec, 2000). This adjusted CEQ included only the first four questions of this questionnaire and questions were rephrased to refer specifically to the WM-SRT therapy.[1] Finally, participants were asked to indicate to what extent they payed attention to the task (0–10 scale; 0 = "not at all attentive", 5 = "somewhat attentive", 10 = "very attentive") with the explicit instruction that their answer to this question would not impact their compensation for their participation. The experiment took approximately 20 min.

[1] This was decided because the CEQ was developed to be administered before (four questions) and after (two questions) psychotherapy. Therefore, the original questions in the CEQ do not refer to a specific therapy, but only to 'the therapy'. For use in our study, we decided to reword the questions to more clearly refer to the 'WM-SRT' intervention and only use the first four question since we only had one measurement time point.

3.4. Data analysis

First, the psychometric properties of the CEQ were evaluated. A principle components analysis confirmed that all questions loaded acceptably onto one common latent factor (63.45% explained variance), and that internal consistency was good (Cronbach's alpha = 0.80). Therefore, a weighted sum score of the scale was calculated and analyzed using a one-way ANOVA with Condition (positive information, negative information) as a between-subjects factor.

For the memory vividness, emotionality and accessibility ratings a repeated measure ANOVA with factor Time (pre-ratings, post-ratings; within-subjects) and Condition (positive information, negative information; between-subjects) was used. To account for multiple testing across three different dependent variables that tested the same hypothesis, the alpha-level was corrected to 0.05/3 = .017. Furthermore, as in Experiment 1, the same analyses were also conducted using BHT in JASP (JASP Team, 2020).

3.5. Results

3.5.1. Expectations regarding EMDR effectiveness (credibility/expectations questionnaire)

Although the results were in the expected direction, no statistically significant difference was found between the positive and negative verbal suggestions condition for the CEQ ($F(1, 168) = 2.52$, $p = .114$, Cohen's $d = 0.24$, $BF_{10} = 1.16$; see Table 4).

3.5.2. Vividness, emotionality, and accessibility of the autobiographical memories

For all outcome measures (vividness, emotionality, and accessibility) there was a clear effect of Time: vividness, $F(1, 171) = 42.23$, $p < .001$, $\eta^2_p = .20$, $BF_{10} = 4.54 \times 10^5$, emotionality, $F(1, 171) = 49.98$, $p < .001$, $\eta^2_p = .23$, $BF_{10} = 2.54 \times 10^8$; and accessibility, $F(1, 171) = 64.00$, $p < .001$, $\eta^2_p = .27$, $BF_{10} = 3.57 \times 10^{10}$. This indicates that the intervention reduced the memory ratings across these three dimensions (see Table 5). However, no interaction with factor Condition was found for any of the outcomes measures: vividness: F-values < 1, p-values > .43, η^2_p's < 0.01, $BFs_{01} > 4.3$. This indicates that our manipulation did not modulate the effect of the intervention.

3.6. Discussion

Experiment 2 was an online study, in which we attempted to manipulate participants' expectations regarding a non-existing treatment capitalizing on the same mechanisms as EMDR (i.e., WM-SRT therapy). Despite a well-powered study ($N = 173$), we were unable to find a significant impact of our treatment effectiveness suggestions on participants' expectations of the treatment as measured with the CEQ

Table 4
Credibility/expectancy questionnaire results for the two suggestion conditions in Experiment 2.

CEQ items	Mean (*SD*) positive condition	Mean (*SD*) negative condition
1. How logical did you find the WM-SRT therapy? (1–9)	5.72 (2.08)	5.22 (1.87)
2. How successful do you think the WM-SRT was to reduce the intensity of your memories? (1–9)	5.13 (1.78)	4.82 (1.87)
3. How much confidence would you have to recommend this therapy to a friend? (1–9)	5.16 (2.02)	4.61 (1.78)
4. At the end of the task, how strongly did you think the WM-SRT reduced the intensity of your memory? (0–100%)	28.90% (17.99%)	28.07% (21.38%)
Weighted mean	18.61 (5.79)	17.17 (6.01)

Table 5
Mean (SD) memory vividness, emotionality and accessibility rating across the different conditions of Experiment 2.

	Positive information condition (n = 83)	Negative information condition (n = 90)
Vividness		
Pre-test	72.17 (21.79)	70.78 (22.29)
Post-test	60.46 (21.94)	61.57 (21.90)
Emotionality		
Pre-test	69.52 (15.71)	68.48 (16.59)
Post-test	62.60 (18.34)	59.82 (17.44)
Accessibility		
Pre-test	76.49 (20.78)	75.31 (19.99)
Post-test	63.25 (22.00)	63.24 (23.31)

(Devilly & Borkovec, 2000). Furthermore, we found a clear reduction in memory ratings due to the intervention, but no interaction with our manipulation.

4. General discussion

Despite debate about the role of non-specific factors in psychotherapy in general (Cuijpers et al., 2019) and EMDR therapy in particular (Devilly, 2005; Lilienfeld, 1996), there is a lack of experimental research directly addressing the role of such factors. In two pre-registered experiments ($N = 96$ and $N = 173$), we investigated the role of treatment effectiveness suggestions in a laboratory model of EMDR therapy. We found no evidence that verbal suggestions about treatment expectations impacted the effectiveness of our laboratory models of EMDR therapy. These results corroborate the only two other available reports on this topic (Gosselin & Matthews, 1995; Littel et al., 2017) and suggest that treatment effectiveness suggestions do not modulate the effectiveness of a laboratory analogue of EMDR therapy. However, importantly, expectations about the effectiveness of the interventions did not significantly differ between the groups receiving different suggestions about EMDR's effectivity in both studies. Hence the absence of effects of the suggestions manipulation on the outcome measures (i.e., memory vividness, emotionality and accessibility) is difficult to interpret due to the absence of a successful manipulation of expectations.

The fact that effectiveness expectations were difficult to change using verbal suggestions was unexpected and deserves further consideration. In other areas, such as research on the placebo and nocebo effect, verbal suggestions are typically quite effective to change expectations (e.g., Peerdeman et al., 2016). In the current study, there was Bayesian evidence for the absence of an effect of verbal suggestions (Experiment 1) or inconclusive evidence (Experiment 2). This was both the case for EMDR therapy (for which many of our participants had pre-existing knowledge), but also for a non-existing therapy (WM-SRT) for which participants could not have had prior knowledge. These results suggest that verbal suggestions may be a relatively weak route to change expectations about these treatments. However, some nuance is in place here. First, in the first experiment the information letter and thus also the manipulation were read aloud to the participants, but in the second experiment, the manipulation was only delivered via the informed consent letter. Although participants were asked to carefully read this letter, there is evidence that participants in psychology studies often do not carefully attend to information provided in informed consent letters (e.g., Douglas et al., 2020). This may have limited the effectiveness of our manipulation, particularly in Experiment 2. Second, treatment expectations were only measured at the end of the experiments rather than directly after the suggestions manipulation. This may have obscured the effect of the suggestions, because the intervention may have also influenced participants' expectations about the intervention. Future studies could measure expectations immediately after the suggestions manipulation, although a potential drawback is that this may draw attention to the manipulation (Hauser et al., 2018). Third, the suggestions were given within the setting of experimental research in university students. It is likely that students are skeptical and critical about information provided to them within this setting (e.g., Fransen et al., 2015). Hence, verbal suggestions may be more effective to change expectations regarding therapy efficacy through other mediums (e.g., direct instructions instead of via the informed consent letter), in different settings (e.g., in a clinic) and in other populations (e.g., patients; general population; see Testa & Rossettini, 2016). Future studies may want to make use of such "contextual factors" to maximize the effectiveness of verbal suggestions to change expectations (see Olson et al., 2020).

For clinical purposes, our results may be taken as encouraging from the perspective of EMDR practitioners, because they suggest that a laboratory analogue of the eye-movement component of EMDR therapy seems to work, regardless of verbal suggestions about its effectiveness (i.e., reductions in memory ratings were seen even in the negative suggestions conditions in both studies). Hence, the eye-movement intervention reduced memory ratings, regardless of positive or negative suggestions regarding its effectiveness. This is encouraging for the continued development of EMDR protocols according to mechanistic theories about human memory and psychopathology, and for the training of aspiring psychotherapists in using these protocols. However, given the scarcity of studies, more research about the role of verbal suggestions and its interaction with contextual factors for EMDR and other psychological therapies is needed.

Another aspect of our results that deserves highlighting is that the interventions were quite effective in changing the self-reported emotionality and vividness of autobiographical memories, even in an online-based implementation of our task. The observed reductions observed in both studies (approximately 10 points on a 100 scale for all outcome measures) are comparable to the average reduction found in similar previous studies (e.g., Homer et al., 2016; van Schie et al., 2016; van Veen et al., 2020). Hence, an online implementation of the EMDR-analogue paradigm appears feasible, which opens up opportunities for future research. A note of caution is that the online version of the EMDR-analogue did not have a control condition, which leaves open the option that the observed effects on memory ratings were not specifically due to the intervention. Nonetheless, the control condition of EMDR lab analogues typically have negligible effects on memory ratings in the short term (Mertens et al., 2020), so it seems unlikely that in the current study the observed effects are explained by non-specific time effects.

Finally, a number of limitations of these studies can be noted. First, our research was conducted with a student sample in a non-clinical setting. This limits the extent to which our results can be generalized to other populations and different settings. Nonetheless, inducing negative expectations about treatment in patients may adversely impact their treatment willingness and treatment success. Hence, though research within clinical contexts is optimal, fundamental research is needed to investigate the impact of treatment effectiveness expectations in a safe and well-controlled environment. Still, generalizations to clinical populations and psychotherapy should be done carefully. Another limitation is that the sample sizes of our experiments were too small to detect smaller effect sizes (i.e., Cohen's $d \leq 0.4$). Nonetheless, we believe that these two relative large experiments provide an important addition to the literature regarding the role of treatment expectation suggestions in EMDR therapy.

Author statement

Gaëtan Mertens: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Project administration; Software; Supervision; Roles/Writing - original draft. **Kevin van Schie:** Formal analysis; Investigation; Writing - review & editing. **Sophie Lammertink:**

Investigation; Project administration; Writing - review & editing. **Marianne Littel:** Investigation; Writing - review & editing. **Iris M. Engelhard:** Funding acquisition; Resources; Software; Supervision; Writing - review & editing.

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Data and materials availability statement

The data and materials of the experiments reported in this article are available at https://osf.io/mu3ca/and https://osf.io/m7crd/.

Declaration of competing interest

The authors declare no conflict of interest regarding the research reported in this article.

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