

Fifteen to Twenty Seconds of Eye Movements Have No Effect on Believability of Positive Personal Verbal Statements: Results From a Working Memory Study

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According to working memory theory, a task that taxes working memory during simultaneous focus on a memory will tend to reduce memory vividness and emotional intensity. Results have been found for both negative and positive memories. Some studies have shown the necessity of modality-specific tasks, with visual tasks producing greater deterioration of a visual memory, and auditory tasks reducing the quality of an auditory or verbal memory; other studies have reported cross-modality effects. Research has confirmed that eye movements similar to those in eye movement desensitization and reprocessing (EMDR) therapy produce these effects on visual imagery. However, the effects of eye movements on positive verbal imagery remain unclear. This study tested the effects of eye movements on positive verbal statements. In two experiments, undergraduates performed 15–20 seconds of eye movements or 15–20 seconds of keeping eyes stationary while focusing on a statement of a positive relevant personality trait (e.g., “I’m persistent”). Results showed that 15–20 seconds of eye movements did not enhance or diminish participant’s belief in possessing the trait. Discussion focuses on methodological factors and calls for future research on the effect of eye movements on verbal material.

Keywords: positive verbal material; verbal imagery; positive closure; working memory; modality-specific taxing; eye movements

With more than 25 randomized clinical trials, eye movement desensitization and reprocessing (EMDR) therapy has been established as an evidence-based intervention for posttraumatic stress disorder (PTSD) and proven equally effective as trauma-focused cognitive behavioral therapy (Bisson et al., 2007). Preliminary studies indicate that it may also be effective for a broad variety of other disorders and psychological conditions where EMDR is used to resolve negative memories thought to underlie the symptoms (see Shapiro, 2014, for summary).

EMDR Therapy

The core feature of EMDR therapy is the client holding an emotionally disturbing negative memory in mind while simultaneously engaging in sets of eye movements or other bilateral stimuli, such as taps or tones (Shapiro, 2001). EMDR uses a standardized

eight-phased procedure to address past, present, and future aspects of the distressing event. Two of the eight phases are (a) “desensitization” of the memory, which continues until the client reports no related negative emotional disturbance; followed by (b) “installation” of a related positive self-referring cognition. The installation phase continues until the client reports that the previously unbelievable positive statement now has high validity.

Positive Closure

Sometimes, a client is able to completely resolve a targeted memory in one session; at other times, more than one session is required. Various strategies have been developed for therapists to provide positive closure for incomplete sessions (e.g., Leeds, 2009; Shapiro, 2001). Of relevance for the experiments described in this article is the “positive closure” procedure in the Dutch

version of the standard EMDR protocol. It is standard protocol in the Netherlands for this procedure to be used at the end of both complete and incomplete sessions. The client is asked, "What is the most positive or valuable thing you have learned about yourself during this last hour/this last session, with regard to this theme or this event?" The client identifies a trait or a positive self-affirmation, such as "I am strong" or "I am a fighter." After this, the therapist conducts a set of 20–25 eye movements while the client focuses on the statement. Additional sets of eye movements are conducted if the client reports that other positive thoughts were elicited. The procedure continues until no further positive change is reported. Although no research has been conducted on this specific procedure, it was added to the Dutch protocol, with the expectation that it might reinforce any positive changes that had occurred during trauma reprocessing, stimulate positive responses, and "anchor" identified changes (de Jongh & ten Broeke, 2003, pp. 124–129).

Research on EMDR's Eye Movements

A large number of studies have investigated the eye movement component in EMDR. In a meta-analysis by Lee and Cuijpers (2013), results showed that eye movements contribute to EMDR's successful treatment outcome. Various theories have proposed different mechanisms of action by which eye movements may achieve this effect, and numerous studies have sought to determine this mechanism. Currently, many researchers and theorists (e.g., Bergmann, 2010; Keller, Stevens, Lui, Murray, & Yaggie, 2014) argue that eye movements have more than one effect in EMDR and are related to more than one mechanism. The various theories and their level of research support are well summarized by Yaggie et al. (2015).

The Working Memory Account for Eye Movement Effects in EMDR

Working Memory

With numerous studies (e.g., Engelhard, van Uijen, & van den Hout, 2010; Gunter & Bodner, 2008; Maxfield, Melnyk, & Hayman, 2008; van den Hout et al., 2010; van den Hout et al., 2011), working memory is one of the most thoroughly researched mechanisms of action in EMDR therapy. Working memory research has found that engaging in a dual task which taxes working memory while focusing on a recalled mental image will reduce the vividness and emotional intensity of the mental image. Both tasks (keeping the image in mind and the other taxing task) compete for working

memory space, which is limited. With less working memory capacity available for keeping the recalled image in mind, the mental image becomes less vivid and less emotional, and the recalled memory is reconsolidated in this way (van den Hout & Engelhard, 2012). Eye movements, such as those used in EMDR therapy, have been found effective in reducing the vividness and emotionality of emotionally charged visual and/or auditory images. Other tasks having these effects include calculating out loud (Kemps & Tiggemann, 2007), auditory shadowing (Gunter & Bodner, 2008), copying a complex figure (Gunter & Bodner, 2008), playing the computer game Tetris (Engelhard et al., 2010), mental arithmetic (Engelhard, van den Hout, & Smeets, 2011; van den Hout et al., 2010), and mindful breathing (van den Hout et al., 2011).

Research on Eye Movement as a Dual Attention Task

Various studies have investigated the effects of eye movements as the dual task during memory recall. Although results varied somewhat from study to study, overall, the effects are robust. Most studies have evaluated the effects of eye movements on the vividness and emotionality of a memory image, finding a reduction in these variables (e.g., de Jongh, Ernst, Marques, & Hornsveld, 2013; Gunter & Bodner, 2008; van den Hout, Muris, Salemink, & Kindt, 2001).

Cross-Modality Effects

Cross modality is a term that describes the pairing of a dual attention task with a primary task that is of a different modality. For example, eye movements (a visual task) can be paired with focusing on a verbal statement (an auditory task). Research has shown variability in the cross-modality effects of eye movements. Kemps and Tiggeman (2007) compared eye movements with a verbal task for auditory and visual images and reported modality-specific outcomes, with eye movements producing greater deterioration of visual images and the verbal task producing greater deterioration in auditory images. On the other hand, Maxfield et al. (2008) found non-modality-specific results. They investigated the effects of eye movements on the clarity of thoughts related to the targeted autobiographical memory and found a significant reduction in thought clarity. This effect occurred even when participants focused only on the memory image during the eye movement dual attention task. Maxfield et al. concluded that the memory components appeared to be linked because there was an effect on different nontargeted memory components.

Baddeley and Andrade (2000) conducted seven studies in which vividness of visual and auditory images was rated while performing various tasks that disrupted working memory. In particular, they found that modality-specific tasks had larger effects on generic nonautobiographical memory targets (i.e., a visual task disrupted generic visual memories but not generic auditory memories). However, for autobiographical memories, there was less disruption of image vividness when memories were “meaningful” or “familiar.” They attributed the maintenance of image clarity to long-term memory effects in spite of reduced working memory capacity.

Working Memory Effects of Eye Movement Tasks on Positive Material

Positive memories and images tend to become less vivid and less positive when they are retrieved with simultaneous eye movements (Barrowcliff, Gray, Freeman, & MacCulloch, 2004; Engelhard et al., 2010; van den Hout et al., 2001). Hornsveld et al. (2011) used a stripped down version of the EMDR Resource Development and Installation (RDI) protocol (Korn & Leeds, 2002) to evaluate the effects of eye movements on positive memories similar to those used in the RDI protocol. They measured the vividness, pleasantness, and the experienced strength of three positive memories (representing pride, perseverance, and self-confidence). Rather than enhancing the quality of the positive memories, the eye movement task reduced the vividness, pleasantness, and subjectively experienced strength of the resource. Hornsveld, de Jongh, and ten Broeke (2012) concluded that eye movements were counterproductive in RDI applications and should not be used. However, RDI developers, Leeds and Korn (2012) disagreed. They commented that Hornsveld et al. did not use important elements of the RDI procedure and that the design “disqualifies the authors from making any claims about the relevance of their findings to the clinical usage of EMs [eye movements] in EMDR and, more specifically, in RDI” (Leeds & Korn, 2012, p. 170).

The effect of eye movements on positive personal memories was also studied by Keller et al. (2014). Their results indicated an increase in memory strength and vividness, which seemed to contradict earlier research on positive memories. They pointed out that the ratings in their study were conducted after 1-minute processing periods, whereas other studies did not include these processing periods. This is why in their discussion they suggest a “two-stage process,” where working memory first blurs and desensitizes the

image and a second stage of reprocessing produces increased memory vividness and a more constructive reframe of the original memory (Keller et al., 2014). This is in line with suggestions made by Maxfield et al. (2008) that once the salience of negative material is diminished by working memory effects, other material will become more accessible.

Experiment 1

The objective of these studies was to test the additional value of eye movements on the positive verbal material, such as used in the procedure positive closure. It was hypothesized that eye movements would have a working memory effect and reduce the believability of possessing the positive relevant personality trait. We compared two conditions: (a) recall with 15–20 seconds of horizontal eye movements and (b) recall only (15 seconds of “eyes stationary” control condition). To obtain sufficient statistical power (0.8, with a confidence interval of 95% and an expected medium effect size, $F = 0.26$), 30 participants were needed.

Experiment 1: Method

Participants. The participants in the experiment were 30 undergraduates (22 females) of Utrecht University and the Higher Vocational Education of Utrecht. They had a mean age of 21.3 years ($SD = 3.03$) and participated in exchange for financial compensation. Exclusion criteria were uncorrected visual impairments, hearing impairments, and use of medication that might influence attention or memory and current psychiatric complaints. Information regarding these items was collected on a checklist. Potential participants filled out a form to describe a short description of a vivid negative memory. Inclusion criterion was that the described memory was determined by the therapist to be suitable for EMDR processing. No participants were excluded.

Procedure. Each participant received a 20-minute EMDR therapy session on the selected negative memory, using the standard Dutch EMDR protocol (de Jongh & ten Broeke, 2003, 2012). Following this, a modified version of the positive closure procedure was given. Participants were asked, “What are the two most valuable things that you have learned about yourself during this last hour/this last session, with regard to this theme or this event?” Participants could choose from a list of relevant personality traits or indicate any other characteristic. The list of 18 relevant personality traits was based on the “Big Five” personality traits (van Eijck & de Graaf, 2001). The trait

“emotionally stable” was replaced by “energetic” and “positive attitude.”

Participants were randomly assigned to one of four conditions. The trait with the highest/lowest score, and the order of the two conditions (eye movements and eyes stationary), was counterbalanced. This resulted in four separate order conditions: trait with highest score first versus lowest score first and eye movements first versus eyes stationary first.

The positive closure procedure was administered for each personality trait, once with eye movements and once with eyes stationary. In the eye movement condition, participants performed 20–25 horizontal left-right-left eye movements which were evoked by following the top of the researcher’s fingers. The eye movement velocity was as fast as the participant could follow the researcher’s fingers. The eyes stationary task was to look at the top of the researcher’s fingers for a duration of 15 seconds, which was approximately the same amount of time as the eye movement condition. The dependent variable “belief in possessing the relevant personality trait” was assessed before and after each condition by participants, putting a mark on the Belief in Personality Trait Visual Analogue Scale (VAS). After completing the postcondition rating for the second personality trait, participants completed the Perception Checklist.

Measures

Belief in Personality Trait. Pretest and posttest ratings were obtained by using four 10-cm VAS to measure belief in the relevant personality trait. This “belief” measure is conceptually similar to EMDR’s Validity of Cognition Scale, which measures to what extent the client is convinced of the positive cognition. The extreme left side of the VAS scale represented 0 (*no belief in possession of the trait at all*) and the extreme right side of the scale represented 10 (*convinced of possessing the trait*). The numerical values 0 and 10 were visible on the actual scales themselves. During the posttest rating, participants were not able to see their previous scoring of the belief.

Perception Checklist. A checklist was given at the end of the study to see whether or not the participants thought about the characteristic during the conditions; if they experienced inconvenience; if they had knowledge about EMDR prior to the experiment; and if they evaluated the eye movements or eyes stationary condition to be equally beneficial or detrimental, or if one was superior.

Data Processing and Statistical Analyses. The data for this study was processed using SPSS (Version 21). A 2 (pretest, posttest) \times 2 (eye movement [EM], eyes

stationary [ES]) repeated measures analysis of variances (ANOVAs) were conducted using the level belief of the relevant personality trait as the dependent variable to detect any significant main or interaction effects. Also, a secondary analysis, a 2 (pretest, posttest) \times 2 (EM, ES) \times 2 (Knowledge of EMDR) was conducted, using Time and Condition as within-subject variables and Knowledge of EMDR as a between subject variable.

Experiment 1: Results

No participants were excluded. One participant was diagnosed with PTSD by the researcher. The participant was unaware of this before starting the experiment. Proper treatment was provided for the participant afterwards. Of the negative memories, 7% of the participants described relational problems (e.g., being cheated on), 23% described problems in social interaction (e.g., having an argument), 47% described a loss event (e.g., loss of a loved one), and 23% described an illness of themselves or a loved one.

For the first personality trait (this was the first selected trait), 30% of the participants chose “someone who persists,” 26.7% “open,” 10% “self-assured,” 6.7% “positive attitude,” 6.7% “helpful,” 3.3% “other traits,” and 6.7% identified a trait not on the list. For the second relevant personality trait, 23.3% chose “positive attitude,” 10% “someone who persists,” 10% “open,” 10% “self-assured,” 3.3% “other traits,” and 20% of the participants identified a trait not on the list.

The mean pre- and posttest values of the belief are presented in Table 1 and suggest that there was no change after either the eye movements or the eyes stationary condition in belief of the relevant personality trait.

The data was analyzed with a 2 (Time; pretest vs. posttest) \times 2 (Condition; EM vs. ES) repeated measures ANOVA. There were no significant main effects of time, $F(1, 29) = .351, p = .558$, and condition, $F(1, 29) = .061, p = .806$, and no significant interaction effect between Time \times Condition, $F(1, 29) = .004, p = .951$. To test if prior knowledge of EMDR would have an effect, a secondary analysis (a 2 \times 2 \times 2 ANOVA)

TABLE 1. Means and Standard Deviations of Belief Before and After Horizontal Eye Movement (EM) and Eyes Stationary (ES) Condition

	EM (SD)	ES (SD)
Pretest	7.74 (15.05)	7.54 (1.37)
Posttest	7.76 (16.03)	7.58 (1.48)

was conducted with a Time (pretest vs. posttest) and Condition (EM vs. ES) as within group factors and Knowledge about EMDR (Yes/No) as a between group factor. Neither the main effects nor the interactions were significant ($F_s < 1.83$; $p_s > .186$).

Results of the Perception Checklist. Of the participants, 4 rated both conditions as not useful; 3 as both equally beneficial; 8 rated the eye movements conditions as more beneficial, and 15 eyes stationary condition as more beneficial.

Experiment 1: Discussion

To the best of our knowledge, this was the first study on the effects of eye movements on positive personal *verbal* statements, which were not grounded in personal memories or autobiographical context. The Dutch version of the standard EMDR protocol was used with a modification in the procedure positive closure. Eye movements are part of that procedure, and this study tested the working memory hypothesis that eye movements would decrease the level of belief in the relevant personality trait, rather than increasing the belief.

Results were clear: Eye movements did not decrease or enhance the belief of the positive relevant personality trait. There were no differences between the eye movement and the eyes stationary control condition.

We considered several explanations for the null results and identified two possible methodological explanations for the lack of working memory effects on decreasing the positive belief. The first was that the effect may have been diminished if participants had developed a positive bias toward eye movements; this may have been created by the beneficial experience of EMDR therapy in the first 20 minutes of the session. A testable implication was that, if participants had no prior positive experiences with eye movements, the working memory effect would be found and eye movements would have a detrimental effect on the belief.

The second explanation relates to the emotionality of the material. Van den Hout, Eidhof, Verboom, Littel, and Engelhard (2014) showed that taxing of working memory with eye movements did not reduce the vividness of nonemotional memories (cf., Baddeley & Andrade, 2000). In Experiment 1, the emotionality of the positive personality trait statements was not assessed. A testable implication was that eye movements would have a detrimental effect on the belief if the belief was experienced with strong emotion.

Experiment 2

Experiment 2 was designed to rule out these explanations. To rule out the possibility that provision of EMDR therapy created a positive bias to eye movements and interfered with working memory effects, participants were not exposed to EMDR and an alternative pre-positive closure activity was provided. To rule out the possibility that the lack of working memory effects was related to low emotionality, emotionality was assessed in Experiment 2. To stay as close as possible to Experiment 1, the experiment was repeated without the preparatory EMDR session and emotionality ratings were added. With a power of 0.9 (with a confidence interval of 95% and an expected medium effect size, $F = 0.25$), 46 participants were needed.

Experiment 2: Method

Participants. Participants were 46 undergraduates (33 females) of Utrecht University and the Higher Vocational Education of Utrecht. They had a mean age of 22.0 years ($SD = 2.2$) and participated in exchange for financial compensation. Exclusion criteria were uncorrected visual impairment, hearing impairment, use of medication that might influence attention or memory, and current psychiatric complaints.

Procedure. The procedure for Experiment 2 was identical to that of Experiment 1 except (a) a suitable negative memory was not an inclusion criterion, (b) EMDR processing of the negative memory was replaced by participants working on a Sudoku puzzle for 10 minutes, (c) the VAS measure “Emotionality” was added, and (d) the eyes stationary control condition was 20 seconds.

Measures

Belief in Personality Trait. See description in Experiment 1 “Measures” section.

Perception Checklist. See description in Experiment 1 “Measures” section.

Emotionality. Pretest and posttest ratings of Emotionality scale were obtained by means of four 10-cm VAS. Scores ranged from 0 (*not pleasant at all*) to 10 (*very pleasant*). The numerical values 0 and 10 were visible on the actual scales. At posttest rating, participants were not able to see their previous scorings.

Data Processing and Statistical Analyses. The data for this study were processed using the same statistical package and the same analyses as in Experiment 1. The analyses were repeated for the second variable (Emotionality) which was added in Experiment 2.

Experiment 2: Results

Before the actual study started, a pilot study was performed on 16 participants to see if participants could come up with the positive things they learned about themselves during solving the puzzle and to see if they understood the question of “how pleasant” the trait was for them. It appeared that participants could all select positive personality traits and could rate how pleasant they were for them. No changes were made in the procedure as a result of the pilot study.

No participants were excluded. For the first personality trait (this was the first selected trait), 60.9% of the participants selected “someone who persists,” 10.9% “creative,” 8.7% “investigating,” 8.7% “accurate,” and 6.5% “emotionally stable.” For the second trait, 37% chose “investigating,” 23.9% “accurate,” 10.9% “self-assured,” and 6.5% chose both “precise” and “open.” Less than 2.5% selected “other characteristics.”

The mean pre- and posttest values of Belief and Emotionality are presented in Table 2 and suggest that there was no change after either the EM or the ES condition on the level of belief or the emotionality of the relevant personality trait.

Data were analyzed with a 2 (Time; pretest vs. post-test) \times 2 (Condition; EM vs. ES) repeated measures ANOVA. There was no significant main effect of Time, $F(1, 45) = 1.416$, $p = .240$, Condition, $F(1, 45) = 3.834$, and no significant interaction effect between Time \times Condition, $F(1, 45) = 1.812$, $p = .185$, was found. With the exclusion of two outliers, the same analysis still failed to reach any significance. However, a closer look at the data showed a large variance. The differences in VAS scores were also tested nonparametrically and the conclusions agree with the parametrical tests and fail to reach any significance (all p values $> .15$).

For emotionality, data were analyzed also with a 2 (Time; pretest vs. posttest) \times 2 (Condition; EM vs. ES) repeated measures ANOVA. There was no significant main effect of Time, $F(1, 45) = 2.771$, $p = .103$, and Condition, $F(1, 45) = 2.556$, $p = .117$, and

no significant interaction effect between Time \times Condition, $F(1, 45) = 0.105$, $p = .748$.

Results of the Perception Checklist. In the eye movement condition, none of the participants stated that they were aware of keeping the trait in mind while performing the eye movements, and in the eyes stationary condition, four participants were aware of keeping the trait in mind. If being aware of keeping the trait in mind caused a decrease in the belief (or emotionality) could not be tested because the subgroup was nonexistent (EM condition) and too small (ES condition) for analysis. Of the participants, 16 rated both conditions as “not useful,” 16 rated as both “equally beneficial,” 7 rated the eye movements conditions as “more beneficial,” and 7 rated the eyes stationary condition as “more beneficial.” Groups were too small for analysis.

Experiment 2: Discussion

The second study examined the effect of 15–20 seconds of eye movements versus 20 seconds of an eyes stationary task on a positive verbal statement. The statement was a belief related to the positive relevant personality trait. It was identified after participants solved a Sudoku puzzle. Participants focused on the positive relevant statement while engaging in the two conditions. The eye movement condition was a modified version of the positive closure procedure of the Dutch version of the standard EMDR protocol. The experimental task provided only one set of eye movements, and therapists did not elicit associative material.

Results were as clear as in the first experiment: Brief eye movements did not diminish or enhance the belief of the positive relevant personality trait. There were no differences between the eye movement and the eyes stationary conditions.

Experiment 2 was designed to rule out two possible explanations for the lack of working memory effects in Experiment 1. We determined that the null

TABLE 2. Means and Standard Deviations of Level of Belief and Emotionality Before and After Horizontal Eye Movement (EM) and Eyes Stationary (ES) Condition

	EM		ES	
	Belief (SD)	Emotionality (SD)	Belief (SD)	Emotionality (SD)
Pretest	6.90 (1.15)	7.35 (1.44)	7.11 (1.28)	7.73 (1.52)
Posttest	6.50 (.186)	7.05(.171)	7.14 (1.42)	7.52 (1.41)

results could not be explained by a possible positive response bias in participants who had experienced beneficial effects of EMDR therapy. The same null results were found when participants played Sudoku instead of receiving EMDR therapy and had no positive response bias toward eye movements. We also determined that the lack of working memory effects in Experiment 1 was not related to low emotion in the positive belief. In Experiment 2, participants' mean scores were between 7.35 and 7.73 (out of 10), which indicates that the material was emotionally charged.

Discussion

We tested whether applying 15–20 seconds eye movements while focusing on positive personal verbal material would decrease the believability or the pleasantness of the positive statement. In Experiment 1, healthy participants selected two positive personality traits which they recalled while performing brief eye movements or holding eyes stationary, after receiving an analogue EMDR session. There was no discussion of whether the traits were grounded in personal memories or autobiographical context. There was no enhancement or deterioration of the belief in possessing the personal trait for either condition. In Experiment 2, we used the same procedure on healthy participants, but it was not preceded by an EMDR session, and we also assessed emotionality of the positive statements. Again, we observed no enhancement or deterioration for either condition.

One of the purposes of this research was to evaluate the positive closure procedure to determine if the eye movement component resulted in any decrease in the believability of the positive statement. The study used a truncated version of the procedure, with only one set of eye movements and no elicitation of associated material. Results were clear. No effect was found in the eye movements. This raises questions about the usefulness of eye movements in the positive closure procedure, but no conclusions thus far can be drawn.

In clinical EMDR and laboratory studies, EM have been found to affect the emotionality and vividness of retrieved negative memories (Lee & Cuijpers, 2013). Laboratory studies have also provided evidence that eye movements tend to decrease the emotionality and vividness of positive memories (Barrowcliff et al., 2004; Engelhard et al., 2010; van den Hout et al., 2001; cf., Keller et al., 2014). Why were such effects absent in this study? Perhaps the reason for our null findings was related to the limitations in our methodology—or perhaps there was no effect to be found.

Limitations

Speed and Number of Eye Movements. The foremost explanation for the lack of results could be that the manipulation was not strong enough. Only 15–20 seconds of eye movements were conducted (20–25 left-right-left movements), which is a very brief manipulation. Previous working memory research has typically used multiple manipulations of 24 seconds (Keller et al., 2014; van den Hout et al., 2001) or 30 seconds (de Jongh et al., 2013); the brief intervention may have provided insufficient dosage. The speed of eye movements in this study was fast: 20–25 eye movements in about 15–20 seconds, at a rate of 0.6–1 second for each left-right-left movement. Most working memory studies used a rate of about 1 second for each left-right-left movement (de Jongh et al., 2013; Keller et al., 2014; Nieuwenhuis et al., 2013; van den Hout et al., 2011). Faster eye movements used in this study may have made it difficult for participants to simultaneously engage in the task of focusing on the verbal statement. On the other hand, the speed was adjusted to the potential of the participants, in the same way the EMDR therapist does this with his patients.

Modality-Specific Taxing. Modality-specific taxing—taxing in the same modality—was not used. Some working memory studies (Baddeley & Andrade, 2000; Kemps & Tiggeman, 2007) showed a (small) beneficial effect for modality-specific taxing; other studies showed cross-modality effects (Gunter & Bodner, 2008; Maxfield et al., 2008). In both experiments reported here, cross-modality taxation was used, with a visual taxation (eye movements) on an auditory recollection (verbal statement).

Modality-specific taxing was not added because the researchers wanted to stay as close as possible to the original positive closure procedure. In the positive closure procedure, verbal material is activated while a visual spatial load is presented (eye movements). Further research could examine in more detail the effect of modality-specific taxing or taxing in cross-modality in this procedure.

Outcome Measure. The primary outcome measure used in this study was belief in a possession of a positive personality trait, based on the Big Five personality traits (van Eijck & de Graaf, 2001). Although participants did not discuss related autobiographical material, it is likely that the endorsed trait was meaningful to participants and embedded in their identity. Because the Big Five personality traits are known to have high test–retest reliability, and to be fairly immutable, it is likely that endorsement of the trait

will not easily change over time—especially after a 15–20 seconds intervention. A question then arises about whether endorsed traits are less responsive to working memory effects. Future research could examine the types of self-statements that are more amenable to change and those which are more resistant.

Recommendations for Future Research

Many studies have determined that working memory effects of eye movements result in desensitization of memories, with decreased vividness and emotionality. The implications for the use of eye movements in EMDR therapy are evident, and many agree that working memory effects may be a credible mechanism of action in EMDR and that they may account for some or most of the desensitization effect in EMDR therapy (Keller et al., 2014; Maxfield et al., 2008).

Future research needs to examine these effects with patients in actual treatment sessions to determine the extent and prevalence of these effects. The limitations and boundaries of the working memory effects need to be more carefully examined. For example, in this study, we found no change in endorsed beliefs about personality traits. A question then arises if the manipulation was not strong enough or whether endorsed traits are less responsive to working memory effects, and if so, to determine how to use such knowledge to improve individual treatment.

In EMDR therapy, memories are not only desensitized but they are also transformed. Can the desensitization effects of working memory account for this transformative outcome, or is there another process involved? To what extent, if any, is desensitization modified by EMDR's elicitation of associations and facilitation of processing?

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