

The effect of manipulated outcome expectancy on the effectivity of an online analogue of EMDR
therapy

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Abstract

Eye movement desensitization and reprocessing (EMDR) is a psychotherapy that has been researched thoroughly over the last decades. Proposed specific working mechanisms of EMDR therapy, like the working memory theory, remain a topic of debate within the scientific community. It is therefore pressing to investigate possible common or non-specific factors influencing EMDR therapy. Above all since research into this topic is limited. Our study tried to experimentally manipulate the outcome expectancy of participants ($N= 133$) while using an online analogue of EMDR therapy, since e-health interventions are on the rise and proven effective for other forms of psychopathology and research into this subject is, to our knowledge, non-existent. Preliminary evidence for the effectivity of an online analogue of EMDR therapy was found. Clinical application of an online version of EMDR could be innovative. The effects of outcome expectations proved difficult to examine since experimental manipulation did not provide significant results, but results were in line with previous studies. Future studies should focus on finding an effective way of inducing outcome expectations. Limitations of the current study are discussed.

Keywords: *Eye Movement Desensitization and Reprocessing; EMDR; Common Factors; Online; Outcome Expectancy; Manipulation*

Introduction

Eye movement desensitization and reprocessing (EMDR) therapy is a psychotherapy with a comprehensive research base. Several systematic reviews and meta-analyses have shown EMDR therapy to be effective in reducing symptoms of post-traumatic stress disorder (Bisson et al., 2013; Chen et al., 2014; Lee & Cuijpers, 2013) and it is a recommended treatment for this disorder in several mental healthcare guidelines (e.g. National Institute for Health and Care Excellence, 2018).

The core component of EMDR therapy consists of retrieving an aversive or traumatic memory accompanied with associated thoughts and emotions while making bilateral eye movements (EM; van den Hout & Engelhard, 2012). This leads to a reduction in emotionality and vividness of the distressing memory (van den Hout et al., 2011; van Veen et al., 2016). A meta-analysis of Lee & Cuijpers (2013) suggests that adding EM while recalling aversive memories has a considerable advantage over solely recollecting the memory in both clinical and student populations. A more recent systematic review and meta-analysis of Cuijpers, van Veen, Yoder & Cristea (2020) put forth evidence however that most randomized trials researching EMDR as a treatment for PTSD are at high risk of bias and that the therapy might not have advantages over other therapies in the long term, despite the fact heterogeneity in these studies regarding EMDR is high.

A prominent explanation as to why EM reduces emotionality and vividness is the working memory (WM) theory (Andrade et al., 1997; van den Hout & Engelhard, 2012). WM can be defined as “[...]a system that has evolved for the short-term maintenance and manipulation of information necessary for the performance of such complex tasks as learning, comprehension and reasoning” (Baddeley, 1998, p. 1). The WM theory of EMDR therapy is based upon the limited resources of the WM (Baddeley, 1998). During recall, the memory and the EM are both contending a claim on the limited resources of the WM. This will lead to overcapacity of the WM which causes the memory, which is amenable to change during recall, to be reconsolidated with reduced emotionality and vividness (van den Hout et al., 2011; van den Hout & Engelhard, 2012).

An alternative to researching specific factors in psychotherapy is the search for common factors (also called non-specific factors; Cuijpers, Reijnders, & Huibers, 2019). Common factors can be seen as those pathways of therapy that are beneficial within all forms of psychotherapy as

long as they are designed as bona fide treatments (Ahn & Wampold, 2001). Cuijpers, Reijnders, & Huibers (2019) refer to the striking work of Lambert (1992) in which the latter claimed that 15% of treatment outcome was determined by common factors. Cuijpers et al. (2019) note that this number has no solid empirical basis and that it is an extremely complicated assignment to determine exactly what part of treatment outcome is attributable to common factors. The authors duly add however that the same is true for specific factors and that empirical research should focus on both possibilities. One of the most comprehensive models for explaining therapy effects through common factors is the contextual model (Ahn & Wampold, 2001; Wampold, 2015) in which outcome expectations are part of one of the three active pathways besides the *real relationship between therapist and client* and *the enactment of health promoting actions*.

Outcome expectations can be defined as “the patients’ prognostic beliefs about the consequences of engaging in treatment” (Constantino et al., 2011). They have said to be the “ignored common factor” (Constantino, 2012). This is striking, since meta-analyses show a positive association between patient outcome expectancy and treatment effect (Constantino et al., 2011, 2018). This makes experimental research into patient expectations a crucial part of the investigation into common factors explaining psychotherapy success. If outcome expectancy is indeed an influencing factor on the outcome of EMDR therapy, clinicians should consider monitoring or even influencing the expectations of patients in the form of remoralization, which can be defined as a restored sense of hope and self-esteem (Wampold, 2015).

So far, only two experimental laboratory studies (Gosselin & Matthews, 1995; Littel et al., 2017) have been conducted to investigate the effects of expectations on the treatment outcome of EMDR. Gosselin & Matthews (1995) tried to induce positive and negative expectations about EMDR in participants. The manipulation did not lead to significant differences in treatment expectations and no effect of expectation on treatment outcome was seen. Littel et al. (2017, experiment 2) tested whether prior knowledge about the working mechanisms of EMDR therapy had an effect on treatment outcome. Participants without prior knowledge of EMDR therapy were given correct or incorrect information about the working mechanism of EMDR. It was concluded that EMDR seems robust against prior knowledge about the working mechanisms of the therapy.

Some limitations should be taken into account regarding this prior research. Firstly the manipulation in the study of Littel et al. (2017) did not directly aim at inducing positive or

negative expectations, but rather informed participants about the supposed working mechanism of EMDR therapy. Secondly, both studies used a minimum amount of participants for statistical analysis with enough power (Gravetter & Forzano, 2013). Finally, the use of a student population can be seen as a potential limitation in earlier research. Even though the use of student samples does not need to cause problems in itself, it can lead to a reduction of internal validity when the person variables (i.e. prior knowledge of EMDR), are bound to interact with the independent variable and therefore clashes with experimental manipulation (Stevens, 2011). And since these previous studies used a relatively large sample of psychology students who might have more knowledge of EMDR therapy than the general population, this could have made the manipulation of outcome expectancy more difficult. Taking into account that a commonly used laboratory analogue of EMDR (Gunter & Bodner, 2008) consists of a horizontally moving dot on a computer screen, which is a well-known feature of EMDR therapy.

The present study will try to circumvent the abovementioned problems in several ways. First of all our study will use a “mock name” and will be presented as a new treatment without mentioning EMDR therapy while using the WM task as designed by Homer et al. (2016). This task similarly induces horizontal EM, but does so by making letters (e.g., ‘b’) alternately appearing on both sides of the screen and having participants react whenever they see a target letter (e.g., ‘p’; see *methods* section for details). A recent study by Mertens et al. (2018) found no significant difference between this task and the commonly used one by Gunter & Bodner (2008) in the ability to reduce emotionality and vividness of aversive autobiographical memories relative to a control task and the authors discovered that this task causes a higher WM-taxation relative to other WM-tasks. Furthermore, this task will be unfamiliar for all participants and is therefore more suitable to induce EM while recalling a memory without revealing the true intention. Finally, we expect that it will be more easy to induce positive or negative outcome expectations about this task, given that participants have no prior knowledge about it. To further amplify the induction of positive and negative outcome expectancy we will implement more convincing language within the letter of informed consent, which will be used as manipulation, since earlier research that used a similar manipulation (Gosselin & Matthews, 1995) did not seem to produce strong enough results.

For reasons of efficiency and to increase statistical power by means of a larger sample (Gravetter & Forzano, 2013), an online adaptation of the WM task (Homer, Deeproose &

Andrade, 2016) will be used. To the author's knowledge, there is no known research that has explored online experimentation with EMDR therapy. This is remarkable since e-health interventions are on the rise and have been proven effective for other forms of psychopathology. Massoudie et al. (2018), for example, found e-health interventions for depression to be effective. It can therefore be seen as pressing to investigate whether an online analogue of EMDR therapy induces the same beneficial effects as the laboratory version used in other research (e.g. Mertens et al., 2018; Homer et al., 2016).

The goal of the present study is therefore twofold: we will investigate whether an online analogue of EMDR therapy is effective in reducing negative valence of autobiographical memories and simultaneously if manipulating outcome expectations affect the decrease in emotionality and vividness. Hypotheses are as follows: (1) We expect that the online implementation of an online WM task will be effective to reduce the emotionality and vividness of negative autobiographical memories. (2) We expect that participants who received prior positive expectancy information about this task will show larger decreases in memory vividness and emotionality than participants that received negative expectancy information.

Method

Participants

Recruitment of participants was done via multiple means including social media, posters at Utrecht University campus, and an online recruitment system. Initial number of participants that started the experiment was 155. With the help of prescreening questions participants were excluded on the basis of being treated by a psychiatrist or psychologist or for experiencing intrusive memories. Participants with incomplete data were removed from the dataset. Of the remaining 133 participants, 104 were female and 29 were male. Details per group are provided in Table 1. Informed consent was given by all participants. Participants were rewarded with course credit or had the chance of winning a coupon. Debriefing was done at the end of the study, in which participants were informed about the true intents and purposes of the research. Permission to conduct the study was granted by the Utrecht University Ethics Committee for Social and Behavioural Sciences.

Table 1.

Descriptive statistics

Group	Gender	<i>N</i>	<i>M age</i>
Positive	Male	13	24.15 (5.21)
	Female	52	22.50 (5.21)
	Total	65	22.83 (5.90)
Negative	Male	16	26.00 (12.02)
	Female	52	21.56 (5.44)
	Total	68	22.60 (7.65)

Manipulation check

To assess whether the manipulated letter of informed consent had an effect on self-reported outcome expectancy, the credibility/expectancy questionnaire (CEQ) designed by Devilly & Borkovec (2000) was used. Only the first four questions were used since these questions make up the factor of *expectancy*. The authors of this questionnaire report a Cronbach's α of between 0.79 and 0.90 for this factor. If the Cronbach's α approaches the same values in the current study, the weighted mean score of the four questions will be calculated and an independent T-test will be used to compare the mean scores between the positive and negative conditions.

Materials

To program and distribute the experiment, 'Millisecond inquisit' version 4 was used (<https://www.millisecond.com/>). Since the experiment was online, screen size was variable. However, the experiment was only functioning on laptops and desktops and not on mobile phones or tablets, to ensure that the task was clearly visible.

Procedure

Participants were sent an email with general information and a link to the online experiment. The experiment consisted of multiple parts and was estimated to take around 15 minutes. To reduce the effects of previous knowledge, the term 'EMDR' was omitted. Instead, the used dual-task in the experiment was called the Working Memory Symbol Recognition Task (WM-SRT). A

schematic overview of the whole procedure is provided in Figure 1. Prescreening was done before the actual experiment started.

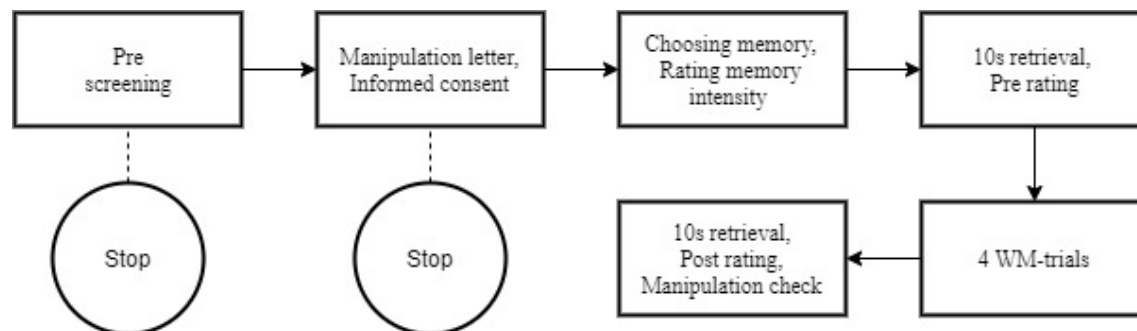


Figure 1. *Schematic overview of the procedure.*

After prescreening, participants received information about the experiment, including manipulated information about the effectiveness of the treatment they were about to receive. Participants were randomly assigned to two groups, one which received the negative manipulation letter and the other receiving the positive manipulation letter. Efforts were made to strengthen the manipulation used in previous studies of treatment expectations of EMDR, by increasing the valence of the words used (e.g. ‘extremely effective’ instead of ‘somewhat effective’). The negative manipulation group was informed that much research has been done around WM-SRT the last decades, which mainly showed that this treatment was not effective and that therefore most researchers and therapists were skeptical about this treatment. The positive manipulation group was informed that much research has been done around WM-SRT, and that this mainly showed that the treatment was extremely effective. Therefore, most researchers and therapists were enthusiastic about this treatment. For a translation of the manipulation see Appendix A.

After this manipulation, both groups were asked to recall a memory of a situation that made them anxious or upset, which still has an emotional impact when they think about it. The situation had to be at least one week old. Participants then had to rate how upsetting this memory was on a scale from one to ten. After this, they were asked again to recall the memory as detailed as possible for ten seconds, while staring at a black screen. Emotionality (‘How unpleasant was the memory you just recalled?’) and vividness (‘How vivid was the memory you just recalled?’) on a Visual Analogue Scale (VAS) ranging from 0 (not unpleasant/not vivid) to 100 (very

unpleasant/ very vivid).

After this, the WM-task as used by Homer, Deepröse & Andrade (2016) began. In this task, participants were asked to look at letters presented on a screen with vertical stripes (see figure 1), whilst simultaneously thinking about the aversive memory. Letters were presented on the left and right side of the screen. For the most part, these were the same letters. Participants had to press the spacebar when they encountered a different letter than the ones previously presented. For example, the letter 'n' would be shown for a few times alternatingly on both sides of the screen (see Figure 2a), and then the letter 'm' would appear (see Figure 2c). In this case, participants had to press the spacebar. This was to make sure participants were paying attention. By looking at the letters, participants make bilateral, horizontal eye movements. This, in combination with distraction by the striped background, taxes the working memory similarly (but to a larger extent) to dot tracking (Mertens et al., 2019). This dual-task was chosen instead of the typical dot tracking to further reduce the influence of prior knowledge. Stimuli were presented on a black screen, and text was presented in 'Arial' font, size 12. The horizontal eye movements had a speed of 1 Hz, in line with standard protocol (van Veen et al., 2015). The duration of each block was 24 s and four blocks were presented.

After this, participants were asked to recollect the memory again as vividly as possible, whilst looking at a black screen for 10 s. They then had to rate emotionality and vividness again on the VAS. After completing the questions of the CEQ (Deville & Borkovec, 200) participants were thanked for their participation and they were informed to contact the supervisor of the project in case they had questions about the experiment or when they encountered any distress after the experiment.

Figure 2a.

Letters in the WM-task alternating between right and left side of the screen.

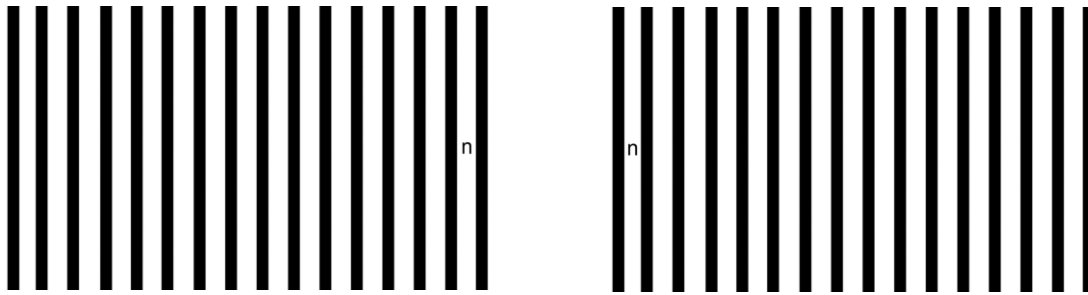
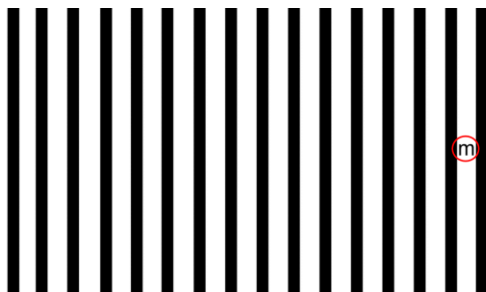


Figure 2b.

Target letter appearing



Design and statistical analysis

The current study used an experimental pretest-posttest within-between-subjects design with two conditions. Participants were randomly assigned to either the negative or positive manipulation condition. Participants who scored their selected memory lower than 5 were excluded from the data. Data was analyzed using IBM SPSS version 26. Independent t-tests and chi-square tests were used to assess significant group differences in demographic variables. Assumptions of linearity and homogeneity of variance were tested, but assumptions were met. Repeated Measures ANOVA were used to test both hypotheses, with condition (positive or negative manipulation) as a between-subjects variable and time (pre-test, post-test) as a within-subjects variable. Outcome measures were memory emotionality and vividness. An alpha level of .05 was used in all analyses.

Results

Randomization

An independent sample T-test and a chi-squared test showed no significant difference in age ($t(131) = .192, p = .848$) and gender ($\chi^2(1) = .24; p = .62$), respectively. In addition, independent sample T-tests showed no significant differences in unpleasantness of the selected memory and self-reported attention paid to the experiment (see Table 2). Hence, randomization of participants over two conditions seems to be successful.

Manipulation check

Self-reported attention paid to the experiment was generally good: $M = 7.73, SD = 1.30$. Internal consistency of the manipulation check was good: *Cronbach's* $\alpha = 0.80$. The weighted mean of the four manipulation questions was therefore calculated. The mean scores of credibility/expectancy did show a small effect in the expected direction, but did not reach statistical significance: $t = 1.46, p = .147, \mu^2 = 0.016$. See Table 2 for details.

Table 2.

Ratings of paid attention, unpleasantness of memory and credibility/expectancy per condition.

Variable	α	Condition		$t(131)$	p	d
		POS ($N=65$)	NEG ($N=68$)			
Paid Attention		7.60 (1.27)	7.85 (1.33)	-1.21	.265	0.19
Unpleasantness of chosen memory		7.69 (1.36)	7.68 (1.26)	0.07	.945	0.00
Credibility/Expectancy	0.80	4.82 (1.33)	4.46 (1.57)	1.46	.147	0.25

Main analyses

Three repeated measure ANOVA's were used to test the hypotheses, one for each dependent variable, with Time (pre-test vs. post-test) as a within-subjects factor and Group (positive expectation vs. negative expectation) as a between-subjects factor. For an overview of mean scores, see table 3. Regarding emotionality, results showed a significant effect for Time, $F(1,131) = 44.38, p < .001, \eta_p^2 = .253$, but not for Condition, $F(1,131) = 0.03, p = .874, \eta_p^2 = .000$, or for the expected interaction between Time and Condition, $F(1, 131) = 0.427 p = .515, \eta_p^2 = .003$. These results are also displayed in figure 3. For vividness, results showed a significant effect for Time, $F(1,131) = 27.55, p < .001, \eta_p^2 = .174$, but not for Condition, $F(1,131) = 1.19, p = .278, \eta_p^2 = .009$, or for the expected interaction between Time and Condition, $F(1,131) = 0.35, p = .555, \eta_p^2 = .003$. These results are presented in Table 3.

Table 3. *Mean scores of pre- and post-test scores for emotionality, vividness and accessibility per condition*

	Positive condition		Negative condition	
	Pre-test <i>M (SD)</i>	Post-test <i>M (SD)</i>	Pre-test <i>M (SD)</i>	Post-test <i>M (SD)</i>
Emotionality	68.88 (16.05)	61.23 (18.12)	70.13 (15.88)	60.82 (18.05)
Vividness	70.83 (21.88)	60.15 (21.61)	73.38 (21.46)	64.87 (22.66)

Discussion

The aim of the present study was to examine whether experimentally manipulating outcome expectancy influenced the ability of an online EMDR therapy analogue (Homer, Deeprose & Andrade, 2016) to reduce emotionality and vividness of negative autobiographical memories. It was hypothesized that 1) an online implementation of the WM-task would be effective in reducing emotionality and 2) that participants in the positive expectancy condition would show larger decreases in memory vividness and emotionality than participants in the negative expectancy condition.

Results showed that a short online WM task was effective in reducing the emotionality and vividness of negative autobiographical memories. Participants scored lower on emotionality and vividness at posttest than at pretest. Thus confirming our hypothesis (1). These results are consistent with earlier research supporting the WM-theory of EMDR (Andrade et al., 1997; van den Hout & Engelhard, 2012). Our study therefore provides a first demonstration that an online WM-intervention is effective in reducing emotionality and vividness of negative autobiographical memories.

Since participants in the positive information condition did not show higher rates of outcome expectation than participants in the negative condition, the manipulation seems to have had no significant effect, even though the present study aimed to use a manipulation letter with more compelling and authoritative language with the aim of inducing stronger outcome expectations. Previous research of Gosselin & Matthews (1995) reported the same result with a similar manipulation. A possible explanation for these findings can be found in contextual variables not accounted for in the present study. Even though outcome expectations of patients are mostly generated during explanation of treatment rationale, as was done in the present study, they can be altered by their ongoing appraisal of the treatments efficacy (Constantino et al., 2018). Since the manipulation check was conducted after the WM-trials it cannot be ruled out these factors have interfered with manipulating outcome expectancy. This interpretation is supported by the observed reduction in emotionality and vividness in both conditions. The option to conduct the manipulation check before the WM-trials was considered but deemed suboptimal due to possible interference with the manipulation by means of revealing the true intentions of the study. Because manipulation did show an effect in the expected direction, it was decided to conduct the main analysis. It must be noted that results of the current study must therefore be

interpreted with caution and definitive conclusions should be postponed until additional research has been provided.

Nevertheless, participants in the positive information condition did not show a larger decrease in vividness and emotionality of an autobiographical memory than did participants in the negative information condition. Thus disconfirming our hypothesis (2). This could imply EMDR is a robust therapy and that the effects of outcome expectancy do little to interfere with the specific ingredients of this therapy. Especially since our findings are in line with prior studies (Gosselin & Matthews, 1995; Littel et al., 2017), which also did not find an effect and the current study aimed to correct for certain potential limitations of earlier research, including using a difficult to recognize analogue of EMDR and a mock name for this disguised experiment. It is however remarkable that these findings contradict the evidence that early treatment outcome expectancy is associated with posttreatment outcomes (Constantino et al., 2011, 2018). An alternative explanation for these findings is discussed by Constantino et al. (2011). The authors propose that the therapeutic alliance, a much more thoroughly researched common variable, acts as a mediator for the effects of outcome expectancy. Several studies partially confirm this hypothesis (e.g. Joyce, Ogrodniczuk, Piper & McCallum, 2003). Since our study was completely conducted online this mediator might have been precluded, leading to a diminished effect of outcome expectancy on treatment outcome.

Limitations

Apart from the manipulation discussed above some limitations should be taken into account. First of all, no control condition was included in our experiment, which can be seen as crucial for definitive conclusions regarding effectivity of psychotherapies. Secondly, our study only measured pretest and posttest scores of emotionality and vividness. And the intervention duration was limited, with only four blocks of 24 seconds. There is evidence that the negative valence and vividness of memories can relapse 24 hours after a treatment session (van Veen et al., 2019), stressing the need to include follow-up measures in this type of research. Finally, even though our study aimed to recruit a more diverse population of participants, it cannot be guaranteed the population is generalizable to the general population. Thus, our results at this point of time only apply to the non-clinical population.

Clinical implications and future research

Taking into account the aforementioned limitations, the current research has clinical and research implications that can be seen as innovative. First of all, even though research into the effects of outcome expectancy of EMDR therapy is limited, clinicians still seem to invest time in raising outcome expectancy of clients, and setting reasonable expectancy is still part of starting EMDR therapy (Shapiro & Forrest, 2001). These recommendations could be reconsidered. Furthermore, our findings indicate that an online analogue of EMDR therapy can produce the same beneficial effects as when administered in a laboratory setting. When research questions allow this possibility, future experimentation with EMDR therapy can be done using an online setting, which is time and cost effective. Lastly, these findings can open up the possibility of research into the implementation of EMDR therapy in an e-health setting. Especially since this has been proven effective for other forms of psychotherapy for PTSD (e.g. cognitive behavioral therapy; Sijbrandij, Kunovski, & Cuijpers, 2016) and for other forms psychopathology like major depressive disorder (Massoudie et al., 2018). Additional research could consist of a short e-health EMDR intervention. It is strongly encouraged that these studies include multiple sessions, or at the least a follow-up measurement, to assess additional and lasting effectivity of an online intervention in reducing negative autobiographical memories.

Conclusions

Our study shows preliminary evidence for the effectivity of an online working memory intervention in reducing the emotionality and vividness of negative autobiographical memories and provides a basis for future research into the online implementation of EMDR therapy in an online setting. It could not be concluded that manipulated outcome expectations have an effect on treatment outcome of EMDR therapy. Since our manipulation did not provide the expected results this hypothesis could not be evaluated and researchers should invest in finding a sound way of manipulating outcome expectancy and increasing the effect size of such a manipulation.

APPENDIX A. *Segment of informed consent letter in which manipulation took place*

Positive manipulation condition:

[...]

These last decennia, a lot of research has been conducted to the subject of WM-SRT. Almost every single study concludes that WM-SRT is very effective to reduce the vividness and emotionality of memories.

Many researchers and clinicians are therefore extremely enthusiastic about the effectivity of WM-SRT.

In this study we will examine whether taxing the working memory influences memories that you have about your own life.

[...]

Negative manipulation condition:

[...]

These last decennia, a lot of research has been conducted to the subject of WM-SRT. Different results have emerged from these studies.

A small number of studies show moderately positive results, most researchers however have concluded that WM-SRT is not an effective treatment to reduce the vividness and emotionality of memories.

Many researchers and clinicians are therefore skeptical about the effectivity of WM-SRT.

[...]

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