Journal of Behavior Therapy and Experimental Psychiatry 77 (2022) 101764

Contents lists available at ScienceDirect

Journal of Behavior Therapy and Experimental Psychiatry

journal homepage: www.elsevier.com/locate/jbtep

The effect of imagery rescripting on prospective mental imagery of a feared social situation

Elze Landkroon [a,*], Elske Salemink [a], Katharina Meyerbröker [a], Snir Barzilay [b], Eyal Kalanthroff [b], Jonathan D. Huppert [b], Iris M. Engelhard [a]

[a] Department of Clinical Psychology, Utrecht University, PO Box 80140, 3508 TC, Utrecht, the Netherlands
[b] Department of Psychology, The Hebrew University of Jerusalem, Mount Scopus, Jerusalem, 91905, Israel

ARTICLE INFO

Keywords:
Social anxiety
Imagery rescripting
Progressive relaxation
Aversive memories
Reappraisal
Prospective imagery

ABSTRACT

Background and objectives: Negative mental imagery appears to play a role in anxiety disorders and can involve aversive memories or anticipated future threats. Modulating aversive memories through imagery rescripting generally reduces negative memory appraisals and associated anxiety. This pre-registered two-day analog study investigated whether imagery rescripting of aversive memories also reduces negative imagery of future threats.
Methods: On Day 1, socially anxious individuals ($N = 52$) were randomly assigned to imagery rescripting of an aversive memory or progressive relaxation (control condition). Before each intervention, they were asked to imagine a feared social situation that may happen in their future and evaluate this situation. They also rated the aversive memory before and after the intervention phase. The feared future situation was again evaluated at follow-up on Day 2.
Results: Unexpectedly, no group differences were found on the main outcome measures. That is, negative memory appraisals reduced after both interventions. Likewise, in both groups, negative details decreased, and positive details increased in prospective mental imagery, and anxiety and avoidance towards the imagined event decreased. On the exploratory measures, the imagery rescripting group showed increased positive appraisals of memory and future threat, and decreased negative future-threat appraisals, compared to the progressive relaxation group.
Limitations: No passive control group was included, so potential time or placebo effects cannot be precluded.
Conclusions: The interventions had similar effects on the main outcomes and influenced mental imagery of future threats. Some differences were found on the exploratory measures that warrant further investigation with a passive control condition.

1. Introduction

Negative mental imagery is common in anxious individuals (Brewin, Gregory, Lipton, & Burgess, 2010; Holmes & Mathews, 2010). In social anxiety disorder, negative self-images are usually distorted mental representations of how an individual is perceived by others (Hackmann, Surawy, & Clark, 1998). This negative imagery often corresponds with aversive autobiographical memories (Dobinson, Norton, & Abbott, 2020; Hackmann, Clark, & McManus, 2000). Socially anxious individuals retrieve relatively more negative images and memories (Krans, de Bree, & Bryant, 2014; Moscovitch, Gavric, Merri, Bielak, & Moscovitch, 2011), and individuals with social anxiety disorder appraise these negative memories as more distressing and intrusive than healthy individuals (Moscovitch et al., 2018). Additionally, negative mental imagery can represent anticipated future threats (Brewin et al., 2010; Engelhard, van den Hout, Janssen, & van der Beek, 2010; Holmes & Mathews, 2010). Individuals with anxiety disorders typically imagine negative future scenarios more vividly, with greater distress and higher perceived likelihood, compared to individuals without anxiety disorders (Morina, Deeprose, Pusowski, Schmid, & Holmes, 2011). Taken together, socially anxious individuals tend to experience negative mental imagery about social situations.

Generally, mental imagery is useful to anticipate potential outcomes of future situations and adjust behavior (Schacter, Benoit, & Szpunar,

* Corresponding author. Center of Research on Psychological disorders and Somatic diseases (CoRPS), Department of Medical and Clinical Psychology, Tilburg University, PO Box 90153, 5000LE, Tilburg, the Netherlands.
E-mail address: e.landkroon@tilburguniversity.edu (E. Landkroon).

https://doi.org/10.1016/j.jbtep.2022.101764
Received 3 August 2021; Received in revised form 16 May 2022; Accepted 7 June 2022
Available online 9 September 2022

2017). To form mental representations of novel situations, people recombine elements of earlier experiences and knowledge (Schacter & Addis, 2007). Episodic *threat* memories of earlier experiences are crucial for survival because they enable us to learn and adapt future behavior (e.g., Bulley, Henry, & Suddendorf, 2017). However, when anticipated threats are exaggerated or unrealistic, mental imagery can become maladaptive and presumably play a role in maintaining anxiety and avoidance behavior (Clark & Wells, 1995; Hofmann, 2007; Miloyan, Bulley, & Suddendorf, 2016; Miloyan & Suddendorf, 2015; Rapee & Heimberg, 1997). Previous research in socially anxious individuals showed that holding a negative self-image in mind (compared to a neutral self-image), increases anxiety, negative thoughts, self-focused attention, and safety behaviors, and reduces performance in social interactions (e.g., Hirsch, Meynen, & Clark, 2004, 2003; Makkar & Grisham, 2011; Stopa & Jenkins, 2007; Vassilopoulos, 2005; for a review see Ng, Abbott, & Hunt, 2014). This may prevent individuals from judging their performance on the basis of objective evidence, and instead base their judgments on their negative self-images (Hirsch & Holmes, 2007). Similarly, imagining positive outcomes of feared future situations can reduce the perceived plausibility of negative outcomes and anxiety, and increase willingness to engage in feared situations (Landkroon, Meyerbröker, Salemink, & Engelhard, 2022). Thus, mental imagery can guide both approach and avoidance behavior.

An effective clinical intervention for modulating aversive threat memories is imagery rescripting. Imagery rescripting is an experiential technique in which the patient imagines changes to the sequence of events in a threat memory to update its meaning (Arntz, 2012; Wild & Clark, 2011). Patients are encouraged to change the imagined scenario in any way to make it more positive. Imagery rescripting can reduce symptomatology in a range of anxiety disorders, including social anxiety disorder (Morina, Lancee, & Arntz, 2017). There is evidence that imagery rescripting helps individuals with social anxiety disorder to reappraise encapsulated beliefs (Reimer & Moscovitch, 2015; Romano, Moscovitch, Huppert, Reimer, & Moscovitch, 2020; Wild, Hackmann, & Clark, 2007, 2008) and helps individuals suffering from nightmare disorder to regain a sense of mastery over nightmare content (Kunze, Lancee, Morina, Kindt, & Arntz, 2019). Interestingly, research has also demonstrated that after imagery rescripting, participants use more positive and neutral elements when describing their memory again compared to participants who received supportive counseling (however, a similar increase was found in an imaginal exposure condition; Romano, Moscovitch, et al., 2020). Yet, it remains unknown whether imagery rescripting of negative memories also affects the way socially anxious individuals imagine and appraise *future* fear-related events.

Given that negative threat memories should impact the mental representation of anticipated future threats (e.g., Schacter & Addis, 2007), this analog study aimed to investigate whether a single brief session of imagery rescripting of a negative threat memory changes how socially anxious individuals imagine the future threat event one day later. In line with earlier research, we hypothesized that imagery rescripting would reduce negative memory appraisals compared to progressive relaxation as a control intervention. Importantly, we hypothesized that imagery rescripting of a negative threat memory would reduce negative prospective mental imagery of threat compared to progressive relaxation (i.e., reduced negative details, increased positive details in prospective mental imagery, and reduced anticipatory anxiety and avoidance for this event). Finally, we explored whether imagery rescripting, compared to progressive relaxation, changes positive memory appraisals, emotional appraisals of the future imagined situation, avoidance towards a novel social situation, and whether changes in memory reappraisal were related to reappraisal of the imagined future situation.

2. Methods

2.1. Participants

Native Dutch-speaking individuals between 18 and 30 years old were included if they scored ≥30 on the Social Phobia Inventory (SPIN) via an online screening. Participants were excluded if they endorsed self-reported severe medical issues (e.g., heart problems, respiratory difficulties, neurological symptoms) and psychiatric complaints (i.e., suicidal ideation, psychotic symptoms, mania, or substance dependence; see Romano, Moscovitch, et al., 2020) on this screening. In line with the a priori power analysis, the final sample consisted of 52 participants (see Fig. 1).[1] G*Power yielded a sample size of 52 participants for an expected small to medium effect ($f = 0.20$, $\alpha = 0.05$ and power = .80) using a mixed ANOVA. The Ethics Committee of the Faculty of Social Sciences of Utrecht University approved this study (FETC20-154). All participants provided written informed consent and participated individually. This study was pre-registered on the Open Science Framework (https://osf.io/7yk8j/).

2.2. Interventions

The interventions were designed to last approximately 15 min, and such a brief imagery rescripting intervention was previously used in analog research (e.g., Strohm, Siegesleitner, Kunze, Ehring, & Wittekind, 2019). A treatment rationale was provided for each intervention. All participants were encouraged to close their eyes during the intervention.

2.2.1. Imagery rescripting

The imagery rescripting protocol consisted of three phases (Arntz & Weertman, 1999; Frets, Kevenaar, & Van Der Heiden, 2014; Romano, Moscovitch, et al., 2020; Wild & Clark, 2011). In phase one, participants were instructed to relive an aversive event as their younger self. They were encouraged to describe the sequence of events with as many details possible, including their thoughts and feelings. In phase two, participants were asked to imagine the event again but now from an observer perspective and see the events unfold as their current self. Participants were instructed to intervene in the situation in imagination to make the scene more positive or satisfying. In phase three, they were asked to relive the memory again from the younger self perspective, including the new information from phase two and making more changes if they desired.

2.2.2. Progressive relaxation

In the progressive relaxation group, participants were instructed to practice tensing and relaxing their muscles (Hazlett-Stevens, 2008). The experimenter demonstrated tensing the eight muscle groups. Participants were instructed to tense and relax each muscle group one by one for 5–7 s and then relax for 45–60 s. If participants still felt tension after the progressive relaxation intervention, they again tensed and relaxed this muscle group until they felt no more tension in their body. To prevent memory exposure, they were instructed to focus on the relaxation exercises, and they were not asked to think back to the memory.

2.3. Materials

2.3.1. Intervention credibility

Three items measured whether participants thought the intervention was credible on a 9-point scale (1 = *not at all useful*; 9 = *very useful*; Devilly & Borkovec, 2000; Romano, Moscovitch, et al., 2020), yielding a sum score (range: 3–27). Internal consistency was good in this study (α

[1] Participant recruitment continued until 52 participants were tested that could be included in the final analyses.

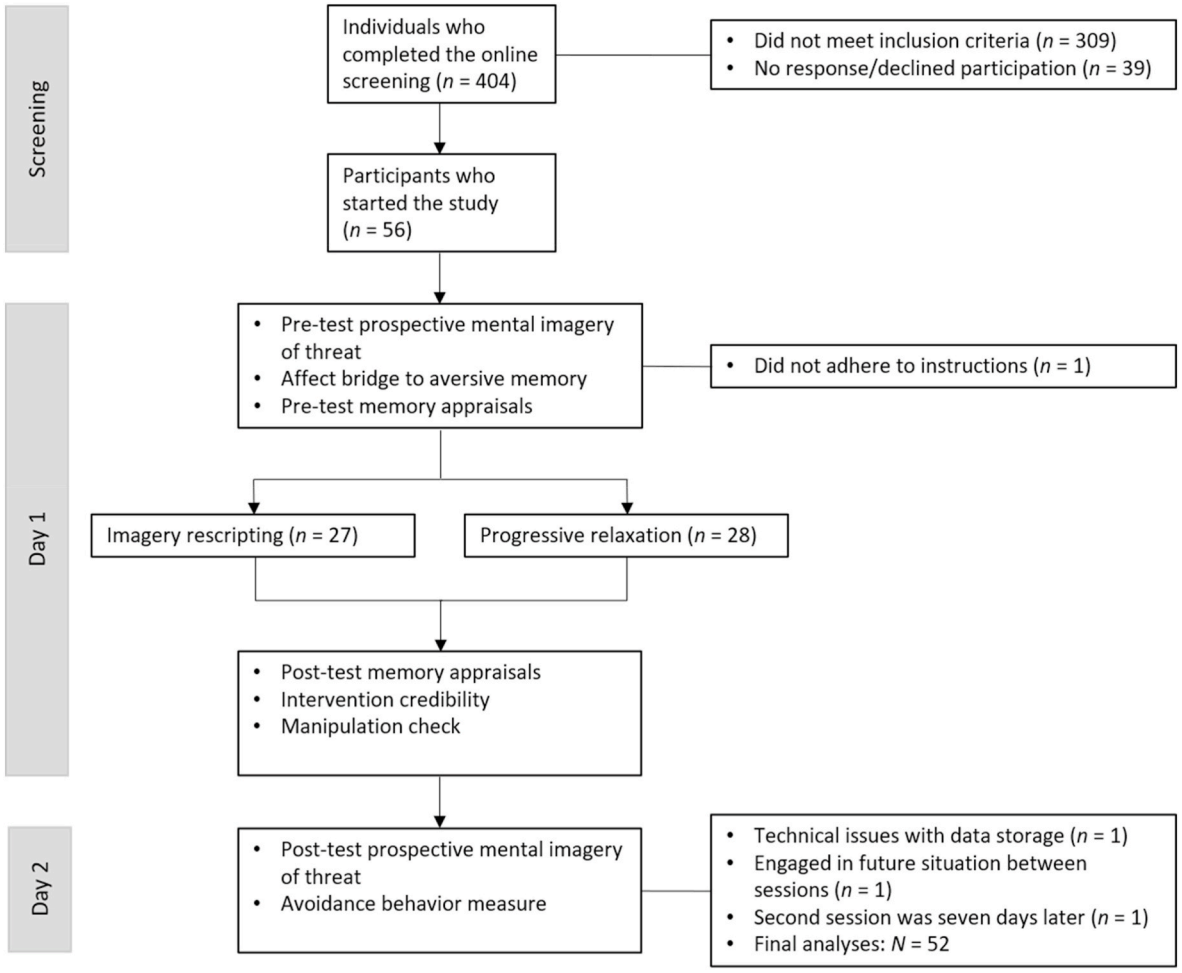

Fig. 1. Flow of participants and procedure.

= 0.80).

2.3.2. Manipulation check

Participants indicated whether they were able to follow the instructions during the intervention phase on a visual analog scale (VAS), namely whether they could imagine a positive ending to their memory or were able to tense and relax their muscles in the imagery rescripting group and progressive relaxation group respectively (0 = *not at all*; 100 = *extremely well*). Also, participants were asked whether they experienced the intervention as pleasant (0 = *not at all*; 100 = *extremely*) and whether they thought of the future situation (0 = *not at all*; 100 = *all the time*). The progressive relaxation group was asked whether they thought of the memory during the intervention (0 = *not at all*; 100 = *all the time*).

2.3.3. Screening questionnaire

The Social Phobia Inventory (SPIN) is a 17-item self-report questionnaire that assesses fear, avoidance, and physiological symptoms characteristic of social anxiety (0 = *not at all;* 4 = *extremely*; Boelen & Reijntjes, 2009; Connor et al., 2000). Higher scores reflect higher levels of social anxiety (range: 0–68). Internal consistency was acceptable in this study (α = 0.77).

2.3.4. Main outcomes measures

2.3.4.1. Memory appraisals. ***Encapsulated beliefs.*** Participants were asked about their encapsulated belief in their aversive social memory with the downward arrow technique (Romano, Moscovitch, et al., 2020). They formulated an encapsulated belief and rated its credibility on a VAS (0 = *not at all credible*; 100 = *extremely credible*; Wild et al., 2007, 2008).

Emotional appraisals. Participants were instructed to retrieve their aversive memory and rate how they felt while thinking about the memory with the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS consists of 10 items concerning positive affect and 10 items concerning negative affect, forming two separate sum scores (range: 10–50). The items are scored on a 5-point scale (1 = *very slightly or not at all*; 5 = *extremely*). Previous studies used the PANAS to measure changes in affect following a brief imagery rescripting procedure (Siegesleitner, Strohm, Wittekind, Ehring, & Kunze, 2019, 2020; Strohm et al., 2019). Internal consistencies were acceptable to good in this study (α = 0.77-0.90).

Mastery. Three VASs measured how helpless participants felt when thinking about the aversive memory, the control they experienced over the memory content, and their tolerability of emotions elicited by the memory (0 = *not at all*; 100 = *extremely*; see Kunze et al., 2019; Landkroon et al., 2022). Internal consistency was acceptable (α = 0.69-0.71). The scores on these items were averaged (range: 0–100).[2]

2.3.4.2. Prospective mental imagery of threat. ***Narratives imagined future situation.*** Participants were asked to identify a social situation they feared may happen in their future, but that would not occur between testing sessions. They were instructed to imagine the situation

[2] We averaged the scores on these items instead of the pre-registered sum score to ease interpretation.

from their perspective by focusing on sensory details and bodily sensations and describe the event as detailed as possible, including their thoughts and feelings. The narratives were audiotaped and transcribed. They were coded following the standardized coding of the Autobiographical Interview (Levine, Svoboda, Hay, Winocur, & Moscovitch, 2002; see also Moscovitch et al., 2018; Romano, Moscovitch, et al., 2020). After selecting the main event in the narrative, the text was segmented into separate details that contain one piece of information. Each segment was classified as an internal (i.e., related to main event at a specific time and place) or external (i.e., unrelated to main event or semantic detail) detail. Furthermore, the valence of each segment was coded as positive, negative, or neutral (Moscovitch et al., 2018; Romano, Moscovitch, et al., 2020). Two separate sum scores were formed for negative and positive internal details, because internal details reflect episodic richness. The ratio between [negative internal details/total internal details] and [positive internal details/total internal details] was calculated to control for the total number of internal details. More details on the procedure and the reliability of the coding are provided in the supplemental materials.

Anticipatory anxiety and avoidance of the imagined future situation. Anxiety and avoidance towards the imagined future event were measured with the Fear Questionnaire (FQ; Marks & Mathews, 1979) using a 9-point scale (0 = *not fearful/would not avoid*; 8 = *extreme panic/would definitely avoid*). Although the correlations between items were low (t1: $r = -0.01$; t2: $r = 0.34$), the sum score was used because together these items reflect the severity of distress towards the event (range: 0–16).

2.3.5. Exploratory measures

2.3.5.1. Emotional appraisals of the imagined future situation. Emotional appraisals of the imagined feared future event were measured with the PANAS. Participants were instructed to fill in the questionnaire about how they felt when imagining the feared future event. Internal consistencies were low to good in the current study (α = 0.57-0.90).

2.3.5.2. Avoidance behavior. Participants were asked on a VAS whether they wanted to participate in another study during which they had to give a presentation as a measure of performance-related avoidance behavior (0 = *not at all;* 100 = *extremely*). If they did not want to participate, they were asked why.

2.4. Procedure

Participants were recruited via social media, student associations, and Sona Systems. Individuals who met the criteria in the online screening were invited for the study. Due to the COVID-19 pandemic, the entire study took place via video calls from participants' and experimenters' homes using StarLeaf.

2.4.1. Day 1

Participants were asked to describe an upcoming social situation they feared (see Fig. 1). Afterwards, they rated the FQ and PANAS concerning this event. All participants were asked to focus on the feelings, thoughts, and emotions that were associated with the feared situation. They were then asked to let go of the future situation and recall a memory during which they had experienced similar feelings. This method has been used previously to retrieve specific aversive memories in social anxiety disorder associated with a problematic recent social event (Frets et al., 2014). Then, participants were asked to relive the memory for 1 min focusing on their feelings, bodily sensations, and thoughts. Participants rated the credibility of their encapsulated belief, PANAS, and mastery. They were randomized using a randomizer tool (randomizer.org, stratified for gender) to one of two interventions: imagery rescripting of the aversive memory or progressive relaxation. After receiving the assigned intervention, participants were asked to relive the memory again for 1 min as they now experienced it, and rated the credibility of the encapsulated belief, PANAS, and mastery again. Also, participants rated the intervention credibility and manipulation check.

2.4.2. Day 2

Participants were asked to imagine and formulate the narrative of the upcoming social situation again. Importantly, participants were instructed that they could describe the situation however they imagined it now. Participants rated the FQ and PANAS regarding the future event again. Participants were then told that the study was finished and were asked about their willingness to participate in another study. Finally, participants were debriefed and reimbursed. Participants in the control condition were offered a session of imagery rescripting.

2.5. Data analyses

All analyses were conducted within a Null-Hypothesis Significance Testing and a Bayesian framework (see also Krypotos, Mertens, Leer, & Engelhard, 2020).[3] This was done because Bayesian analyses can provide evidence for both the null hypothesis and alternative hypothesis, whereas frequentist analyses do not typically provide evidence for the absence of an effect (i.e., null hypothesis; Krypotos, Blanken, Arnaudova, Matzke, & Beckers, 2017). Within the Null-Hypothesis Significance Testing framework, confidence intervals (CI) for effect sizes were reported using the MBESS package in R (Kelley, 2017). For partial eta-squared, 90% CIs were reported and 95% CIs for Cohen's *d* (α = 0.05; Lakens, 2013). Within the Bayesian framework, Bayes factors were computed that quantify the evidence that the data provides for the alternative hypothesis relative to the null hypothesis in JASP (default settings; JASP Team, 2020).[4] Independent *t*-tests were conducted to assess whether randomization was successful and the manipulation was executed properly. Separate 2 x 2 (time x condition) mixed ANOVAs were done on the main outcome measures and exploratory measures (see supplemental materials for a detailed description). We also explored whether changes in memory appraisals were related to changes in prospective mental imagery of threat by reporting correlations between these difference scores.

3. Results

3.1. Randomization check

There were no group differences in age, SPIN score, gender distribution, employment status, or highest education level (*ps* > .05; *ds* < 0.48; Cramer's *Vs* < 0.23; $BFs_{10} < 0.94$; see Table 1).

3.2. Credibility of the interventions and manipulation check

No group differences were found in intervention credibility and duration, whether participants followed the instructions during the intervention, intervention's pleasantness, or whether they thought about the feared future event during the intervention (*ps* > .05; *ds* < 0.50; $BFs_{10} < 1.02$; see Table 2). Additionally, participants in the progressive relaxation condition generally indicated that they barely thought about the memory during the intervention phase. This suggests that the manipulation was successful in both groups.

[3] Information regarding the assumptions of the statistical tests is reported in the supplemental materials.

[4] For example, $BF_{10} = 3$ demonstrates that these data are three times more likely under the alternative hypothesis than the null hypothesis, and vice versa for $BF_{10} = 0.33$.

Table 1
Means (standard deviations) of demographics and randomization variables.

	Progressive Relaxation (n = 26)	Imagery Rescripting (n = 26)
Age (years old)	22.81 (2.87)	22.58 (2.75)
SPIN	39.15 (6.42)	43.00 (9.42)
Men/women/other	3/23/0	4/21/1
Student/employed/looking for work	21/4/1	24/2/0
Highest education level		
Secondary/intermediate vocational education	12	15
(Applied) university bachelor	10	10
University master	3	1
Other	1	0

Note. SPIN = Social Phobia Inventory.

Table 2
Means (standard deviations) of intervention characteristics.

	Progressive Relaxation (n = 26)	Imagery Rescripting (n = 26)
Credibility	18.62 (4.17)	19.96 (3.89)
Duration (min)	15.44 (0.99)	14.64 (5.20)
Followed instructions	79.23 (11.24)	72.04 (17.26)
Pleasantness	77.38 (17.22)	78.12 (16.55)
Thought of future event	12.12 (17.84)	17.85 (17.69)
Thought of memory	13.73 (16.28)	–

3.3. Main outcomes

3.3.1. Memory appraisals

3.3.1.1. Encapsulated beliefs. From before to after the intervention phase, there was a decrease in the credibility of the encapsulated belief, $F(1, 50) = 126.88$, $p < .001$, $\eta_p^2 = 0.72$, 90% [0.60, 0.78], $BF_{10} = 2.63 \times 10^{12}$ (see Table 3). Crucially, the Condition x Time interaction was not significant, $F(1, 50) = 3.03$, $p = .088$, $\eta_p^2 = 0.06$, 90% [0.00, 0.18], $BF_{10} = 0.93$, nor was the main effect of condition, $F(1, 50) = 2.76$, $p = .103$, $\eta_p^2 = 0.05$, 90% [0.00, 0.17], $BF_{10} = 0.99$.

3.3.1.2. Emotional appraisals. From before to after the intervention phase, negative emotional appraisals of the memory decreased, $F(1, 50) = 132.37$, $p < .001$, $\eta_p^2 = 0.73$, 90% [0.61, 0.79], $BF_{10} = 1.04 \times 10^{14}$ (see Table 3). Yet, the Condition x Time interaction was not significant, $F(1, 50) = 2.53$, $p = .118$, $\eta_p^2 = 0.05$, 90% CI [0.00, 0.17], $BF_{10} = 0.77$, nor was the main effect of condition, $F(1, 50) = 0.39$, $p = .533$, $\eta_p^2 = 0.01$, 90% CI [0.00, 0.09], $BF_{10} = 0.36$.

Table 3
Means (standard deviations) for the outcome measures.

	Progressive Relaxation (n = 26)		Imagery Rescripting (n = 26)	
	t1	t2	t1	t2
Memory appraisal				
Encapsulated belief	80.31 (15.23)	56.85 (20.98)	76.04 (20.50)	44.00 (24.54)
Negative emotional appraisal	36.54 (6.66)	26.00 (7.41)	37.12 (7.58)	23.19 (8.13)
Positive emotional appraisal	20.31 (6.20)	20.69 (6.48)	21.23 (5.26)	27.58 (6.89)
Mastery	48.90 (21.19)	65.79 (17.78)	49.15 (19.79)	72.22 (14.00)
Prospective mental imagery				
Fear Questionnaire	8.81 (2.79)	7.85 (3.32)	8.27 (2.66)	6.00 (2.59)
Negative emotional appraisal	34.31 (4.86)	29.69 (6.37)	36.81 (6.71)	27.23 (9.04)
Positive emotional appraisal	23.88 (4.94)	21.54 (6.41)	23.12 (3.40)	26.12 (6.70)

3.3.1.3. Mastery. From before to after the intervention, mastery increased, $F(1, 50) = 83.19$, $p < .001$, $\eta_p^2 = 0.63$, 90% CI [0.48, 0.71], $BF_{10} = 2.06 \times 10^9$ (see Table 3). However, the Condition x Time interaction was not significant, $F(1, 50) = 1.98$, $p = .165$, $\eta_p^2 = 0.04$, 90% CI [0.00, 0.15], $BF_{10} = 0.60$, nor was the main effect of condition, $F(1, 50) = 0.53$, $p = .472$, $\eta_p^2 = 0.01$, 90% CI [0.00, 0.10], $BF_{10} = 0.44$.

Taken together, after both interventions negative memory appraisals reduced, but unexpectedly, there were no differences between the interventions.

3.3.2. Prospective mental imagery of threat

3.3.2.1. Narratives future imagined situation. From Day 1 to Day 2, the ratio of negative internal details decreased, $F(1, 50) = 7.80$, $p = .007$, $\eta_p^2 = 0.14$, 90% CI [0.02, 0.28], $BF_{10} = 6.25$ (see Fig. 2). Unexpectedly, the Condition x Time interaction was not significant, $F(1, 50) = 0.22$, $p = .638$, $\eta_p^2 = 0.00$, 90% CI [0.00, 0.08], $BF_{10} = 0.30$, nor was the main effect of condition, $F(1, 50) = 0.11$, $p = .747$, $\eta_p^2 = 0.00$, 90% CI [0.00, 0.06], $BF_{10} = 0.30$. Likewise, the ratio of positive internal details increased from Day 1 to Day 2, $F(1, 50) = 11.66$, $p = .001$, $\eta_p^2 = 0.19$, 90% CI [0.05, 0.34], $BF_{10} = 29.38$. Again, the Condition x Time interaction was not significant, $F(1, 50) = 0.06$, $p = .802$, $\eta_p^2 = 0.00$, 90% CI [0.00, 0.05], $BF_{10} = 0.28$, nor was the main effect of condition, $F(1, 50) = 0.02$, $p = .883$, $\eta_p^2 = 0.00$, 90% CI [0.00, 0.03], $BF_{10} = 0.30$.

3.3.2.2. Anticipatory anxiety and avoidance of the imagined future situation. Anxiety and avoidance for the future event decreased from Day 1 to Day 2, $F(1, 50) = 21.07$, $p < .001$, $\eta_p^2 = 0.30$, 90% CI [0.13, 0.44], $BF_{10} = 453.74$ (see Table 3). Yet, the Condition x Time interaction was not significant, $F(1, 50) = 3.45$, $p = .069$, $\eta_p^2 = 0.07$, 90% CI [0.00, 0.19], $BF_{10} = 1.11$, nor was the main effect of condition, $F(1, 50) = 2.83$, $p = .099$, $\eta_p^2 = 0.05$, 90% CI [0.00, 0.18], $BF_{10} = 1.01$.[5]

Taken together, after both interventions negative prospective mental imagery of threat reduced and even became more positive. Unexpectedly, there were no differences between interventions.

3.3.3. Exploratory analyses

3.3.3.1. Positive emotional memory appraisals. Positive emotional memory appraisals increased over time, $F(1, 50) = 22.51$, $p < .001$, $\eta_p^2 = 0.31$, 90% CI [0.14, 0.45], $BF_{10} = 154.57$, and differed between groups, $F(1, 50) = 6.12$, $p = .017$, $\eta_p^2 = 0.11$, 90% CI [0.01, 0.25], $BF_{10} = 3.45$ (see Table 3). Crucially, there was a significant Condition x Time interaction on positive emotional memory appraisals, $F(1, 50) = 17.66$, $p < .001$, $\eta_p^2 = 0.26$, 90% CI [0.10, 0.41], $BF_{10} = 174.86$. Follow-up analyses demonstrated that positive emotional memory appraisals increased after imagery rescripting, $t(25) = 5.40$, $p < .001$, $d = 1.06$, 95% CI [0.57, 1.53], $BF_{10} = 1658.93$, but not after progressive relaxation, $t(25) = 0.48$, $p = .632$, $d = 0.09$, 95% CI [−0.29, 0.48], $BF_{10} = 0.23$.

3.3.3.2. Emotional appraisals of the imagined future event. From Day 1 to Day 2, negative emotional appraisals of the future event decreased, $F(1, 50) = 47.19$, $p < .001$, $\eta_p^2 = 0.49$, 90% CI [0.31, 0.60], $BF_{10} = 1.04 \times 10^{14}$, with no main effect of condition, $F(1, 50) = 0.00$, $p = .991$, $\eta_p^2 = 0.00$, 90% CI [0.00, 0.00], $BF_{10} = 0.36$ (see Table 3). The effect was further evidenced by a significant Condition x Time interaction, $F(1, 50)$

[5] When anxiety and avoidance were analyzed separately given the low correlation between items at t1, the results remained the same as when the sum score was used.

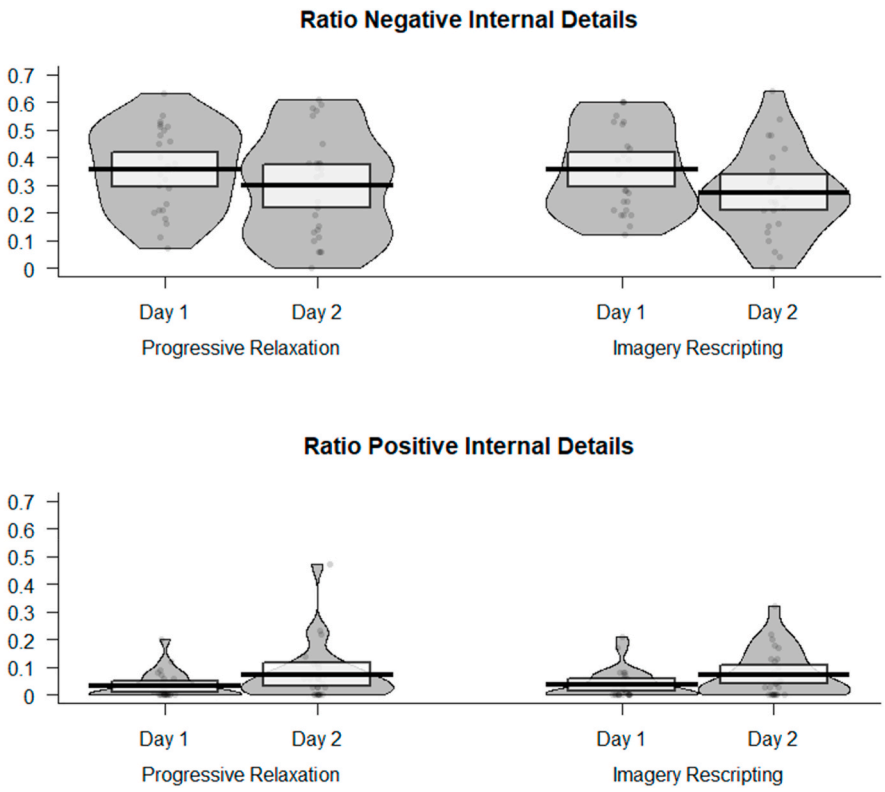

Fig. 2. Ratio of negative internal details (negative internal details/total internal details) and positive internal details (positive internal details/total internal details) in the narratives of the future imagined situation before (Day 1) and after (Day 2) the interventions. Means (lines), 95% confidence intervals (boxes), individual data points (dots), and the density of the data distribution (beans).

$= 5.78$, $p = .020$, $\eta_p^2 = 0.10$, 90% CI [0.01, 0.24], $BF_{10} = 0.77$. Follow-up paired *t*-test demonstrated that after both progressive relaxation, $t(25) = 3.45$, $p = .002$, $d = 0.68$, 95% CI [0.24, 1.10], $BF_{10} = 18.58$, and imagery rescripting, $t(25) = 6.09$, $p < .001$, $d = 1.19$, 95% CI [0.68, 1.69], $BF_{10} = 8241.43$, negative emotional appraisals decreased, with a stronger decrease after imagery rescripting. There were no main effects of time, $F(1, 50) = 0.17$, $p = .684$, $\eta_p^2 = 0.00$, 90% CI [0.00, 0.07], $BF_{10} = 0.22$, or condition, $F(1, 50) = 2.12$, $p = .151$, $\eta_p^2 = 0.04$, 90% CI [0.00, 0.16], $BF_{10} = 0.68$, on positive emotional appraisals of the future event from Day 1 to Day 2. Importantly, the Condition x Time interaction was significant, $F(1, 50) = 11.18$, $p = .002$, $\eta_p^2 = 0.18$, 90% CI [0.05, 0.33], $BF_{10} = 24.01$. While the positive appraisals of the future event decreased after progressive relaxation, $t(25) = 2.57$, $p = .017$, $d = 0.50$, 95% CI [0.09, 0.91], $BF_{10} = 3.07$, they increased after imagery rescripting, $t(50) = 2.29$, $p = .031$, $d = 0.45$, 95% CI [0.04, 0.85], $BF_{10} = 1.86$.

3.3.3.3. Avoidance behavior. Groups did not differ significantly in willingness to participate in another experiment in which participants would be required to give a presentation, $t(50) = 1.98$, $p = .053$, $d = 0.55$, 95% CI [−0.01, 1.10], $BF_{10} = 1.37$, although the effect was in the expected direction (progressive relaxation: $M = 39.85$, $SD = 32.50$; imagery rescripting: $M = 57.96$, $SD = 33.33$).

3.3.3.4. Correlations. The correlations between difference scores on memory appraisals and difference scores on the prospective mental imagery of threat are reported in the supplemental materials. These correlations suggest that memory reappraisal is positively related to how individuals imagine feared future situations.

4. Discussion

This study aimed to investigate whether a single brief imagery rescripting session of a negative threat memory, compared to progressive relaxation, changes how socially anxious individuals imagine a feared future event one day later. Similar to previous research, imagery rescripting reduced the credibility of the encapsulated belief of the aversive memory and negative emotional memory appraisals, and increased mastery, indicating memory reappraisal (Kunze et al., 2019; Reimer & Moscovitch, 2015; Romano, Moscovitch, et al., 2020; Wild et al., 2007, 2008). In contrast with our hypotheses, this effect was similar in the imagery rescripting and progressive relaxation groups. Unexpectedly, after both interventions, negative internal details decreased and positive internal details increased in the prospective mental imagery of threat, resulting in more positive narratives. Similarly, anxiety and avoidance towards this imagined event decreased in both groups. Additionally, the exploratory findings showed that only after imagery rescripting, positive emotional appraisals regarding the memory and the future threat increased, and that negative emotional future-threat appraisals decreased most after imagery rescripting. Our study extends previous work by showing that imagery rescripting also changes *future-threat* appraisals compared to progressive relaxation, suggesting that imagery rescripting of an aversive memory also influenced reappraisal of a related imagined future event. Finally, memory reappraisal was positively related to changes in prospective mental imagery of threat in the full sample. Taken together, both intervention groups showed reappraisal of the aversive memory, which was indirectly related to changes in prospective mental imagery of threat via reappraisal of the future event.

The efficacy of progressive relaxation contrasts earlier findings that suggested that adding imagery rescripting to cognitive behavioral therapy is more effective in reducing test anxiety than progressive relaxation (Reiss et al., 2017). Yet, a recent study also found that progressive relaxation reduced social anxiety (Cougle et al., 2020). Although participants in this study generally indicated that they did not think about the aversive memory during the intervention, they may have associated relaxation with the memory. Participants were asked to relive

the aversive memory for 1 min after progressive relaxation and before rating the outcome measures. Individuals with anxiety-related disorders typically use emotional responses to infer the presence or absence of threat (e.g., 'If I feel anxious/relaxed, it must be unsafe/safe'; Arntz, Rauner, & Van den Hout, 1995; Engelhard & Arntz, 2005; Miloyan & Suddendorf, 2015). Although progressive relaxation may have a short-lived effect on emotions, it may have led to cognitive reappraisal of the aversive memory because participants noticed they could cope with the memory. This may have enhanced self-efficacy in implementing cognitive reappraisal, which seems an important mediator in cognitive behavioral therapy to reduce social anxiety (Goldin et al., 2012; Kivity, Cohen, Weiss, Elizur, & Huppert, 2021).

Several other explanations can elucidate why both interventions were overall similarly effective. First, participants were exposed to their aversive memory during the pre- and post-test and it has been suggested that imaginal exposure can reduce social anxiety (Huppert, Roth, & Foa, 2003). This explanation seems unlikely given that the imaginal exposure period was short, and memory appraisal effects are not strong then (van Veen, van Schie, van de Schoot, van den Hout, & Engelhard, 2020). Even so, merely disclosing a stressful memory to someone else can reduce psychological distress (Radcliffe, Lumley, Kendall, Stevenson, & Beltran, 2007), which may have resulted in reduced negative responses during reliving at post-test. Second, time or placebo effects and demand characteristics could have played a role in this study. However, the group differences in positive memory appraisals and in future-threat appraisals suggest that the interventions had some specific differential effects. Indeed, previous work suggests that both interventions can reduce social anxiety (Cougle et al., 2020; Morina et al., 2017). Third, the absence of differences between the interventions should be interpreted with caution, because the Bayes factors indicated that there was not enough evidence to favor the null or alternative hypothesis on several measures. This indicates that the study was likely underpowered. Future research should replicate these findings with larger samples and using different control groups, such as a passive control group, an imaginal exposure alone group and a disclosure alone group to rule out these alternative explanations.

One striking finding is that reappraisal of an aversive memory was related to positive changes in how an individual imagines a future feared situation one day after both interventions (see Schacter & Addis, 2007; Schacter et al., 2017). This finding extends previous research demonstrating that imagery rescripting facilitates increases in positive/neutral memory details during later recall (Romano, Moscovitch, et al., 2020). Additionally, reappraisal of prospective mental imagery of threat was associated with more positive narratives of future events. This optimistic outlook on future situations is critical because it can reduce anxiety and increase approach behavior (Miloyan & Suddendorf, 2015; Schacter et al., 2017). Indeed, our findings show reduced fear and avoidance towards the imagined future situation (see also Reimer & Moscovitch, 2015), but there was no significant correlation between more positive narratives and decreased avoidance towards a novel situation. An important future endeavor is to investigate whether changes in prospective mental imagery are retained over time, given that anxious individuals have difficulties recalling memory for positive prospective mental imagery after a time lapse, which may reduce effective goal-directed behavior (Montijn, Gerritsen, & Engelhard, 2021; Romano, Tran, & Moscovitch, 2020), and whether individuals engage more in the feared situation. Future analog research may also investigate how to enhance the efficacy of imagery rescripting on future threat reappraisal even further, for instance by increasing the intervention duration as in clinical practice (e.g., Wild & Clark, 2011).

Several limitations should be noted. First, as mentioned above, no passive control group was used, rendering it impossible to rule out potential time or placebo effects. Second, the procedure took place via video calls. Although participants generally indicated that video calling did not interfere with the study, it may have increased (e.g., through increased self-focused attention) or decreased (e.g., through more safety cues at home) anxiety. Third, the reliability of several measures was limited and therefore the results of the exploratory analyses should be interpreted with caution. Future research should include better-validated instruments. Finally, as abovementioned, this study was likely underpowered to detect small to medium effects. Therefore, a replication study using a larger sample size is warranted.

Taken together, this study suggests that modulating an aversive memory also updates appraisals of prospective mental imagery of threat which are related to positive changes in imagery content, regardless of how these changes in memory occur. Although emotional appraisals of the aversive memory and the prospective mental imagery of threat were more positive after imagery rescripting than progressive relaxation, this study found no further differences in the interventions' efficacy (i.e., credibility of encapsulated beliefs, mastery, prospective mental imagery of threat narratives). More research on the working mechanisms of the interventions is necessary using different control groups. In conclusion, this study underlines the impact of negative memories on feelings towards the future and the potential benefit of modifying these aversive memories during treatment for social anxiety disorder.

CRediT authorship contribution statement

Elze Landkroon: Conceptualization, Funding acquisition, Formal analysis, Investigation, Methodology, Supervision, Writing – original draft, Visualization. **Elske Salemink:** Conceptualization, Funding acquisition, Methodology, Writing – review & editing. **Katharina Meyerbröker:** Methodology, Supervision, Writing – review & editing. **Snir Barzilay:** Conceptualization, Funding acquisition, Methodology, Writing – review & editing. **Eyal Kalanthroff:** Conceptualization, Funding acquisition, Methodology, Writing – review & editing. **Jonathan D. Huppert:** Conceptualization, Funding acquisition, Methodology, Writing – review & editing. **Iris M. Engelhard:** Conceptualization, Funding acquisition, Methodology, Writing – review & editing.

Declaration of competing interest

The authors declare no conflict of interest.

Acknowledgments

EL and IME are supported by a VICI grant (grant number: 453-15-005) from the Netherlands Organization for Scientific Research (NWO). ES is supported by a NWO VIDI grant (grant number: 195-041). JDH is supported by an Israel Science Foundation grant (grant number: 1905/20). The research presented in this paper was also supported by a Hebrew University of Jerusalem/Utrecht University Center for Partnership in Science (HUPS) grant awarded to JDH, EK, SB, ES, IME, & EL. We thank Renate Bakker, Floor Gelmers, and Ilse van der Laan for their help in data collection. We are very grateful to Ilse van der Laan for coding the narratives.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jbtep.2022.101764.

References

Arntz, A. (2012). Imagery rescripting as a therapeutic technique: Review of clinical trials, basic studies, and research agenda. *Journal of Experimental Psychopathology, 3*(2), 189–208. https://doi.org/10.5127/jep.024211

Arntz, A., Rauner, M., & Van den Hout, M. (1995). If I feel anxious, there must be danger": Ex-consequentia reasoning in inferring danger in anxiety disorders. *Behaviour Research and Therapy, 33*(8), 917–925. https://doi.org/10.1016/0005-7967(95)00032-S

Arntz, A., & Weertman, A. (1999). Treatment of childhood memories: Theory and practice. *Behavior Research and Therapy, 37*(8), 715–740. https://doi.org/10.1016/S0005-7967(98)00173-9

Boelen, P. A., & Reijntjes, A. (2009). Intolerance of uncertainty and social anxiety. *Journal of Anxiety Disorders, 23*(1), 130–135. https://doi.org/10.1016/j.janxdis.2008.04.007

Brewin, C. R., Gregory, J. D., Lipton, M., & Burgess, N. (2010). Intrusive images in psychological disorders: Characteristics, neural mechanisms, and treatment implications. *Psychological Review, 117*(1), 210–232. https://doi.org/10.1037/a0018113

Bulley, A., Henry, J. D., & Suddendorf, T. (2017). Thinking about threats: Memory and prospection in human threat management. *Consciousness and Cognition, 49*, 53–69. https://doi.org/10.1016/j.concog.2017.01.005

Clark, D. M., & Wells, A. (1995). A cognitive model of social phobia. In *Social phobia: Diagnosis, assessment, and treatment*. Guilford Publications.

Connor, K. M., Davidson, J. R. T., Churchill, L. E., Sherwood, A. W., Foa, E., & Weisler, R. H. (2000). Psychometric properties of the social phobia inventory (SPIN): New self-rating scale. *British Journal of Psychiatry, 176*, 379–386. https://doi.org/10.1192/bjp.176.4.379

Cougle, J. R., Wilver, N. L., Day, T. N., Summers, B. J., Okey, S. A., & Carlton, C. N. (2020). Interpretation bias modification versus progressive muscle relaxation for social anxiety disorder: A web-based controlled trial. *Behavior Therapy, 51*(1), 99–112. https://doi.org/10.1016/j.beth.2019.05.009

Devilly, G. J., & Borkovec, T. D. (2000). Psychometric properties of the credibility/expectancy questionnaire. *Journal of Behavior Therapy and Experimental Psychiatry, 31*(2), 73–86. https://doi.org/10.1016/S0005-7916(00)00012-4

Dobinson, K. A., Norton, A. R., & Abbott, M. J. (2020). The relationship between negative self-imagery and social anxiety in a clinically diagnosed sample. *Cognitive Therapy and Research, 44*(1), 156–170. https://doi.org/10.1007/s10608-019-10051-w

Engelhard, I. M., & Arntz, A. (2005). The fallacy of ex-consequentia reasoning and the persistence of PTSD. *Journal of Behavior Therapy and Experimental Psychiatry, 36*, 35–42. https://doi.org/10.1016/j.jbtep.2004.11.004

Engelhard, I. M., van den Hout, M. A., Janssen, W. C., & van der Beek, J. (2010). Eye movements reduce vividness and emotionality of "flashforwards. *Behaviour Research and Therapy, 48*(5), 442–447. https://doi.org/10.1016/j.brat.2010.01.003

Frets, P. G., Kevenaar, C., & Van Der Heiden, C. (2014). Imagery rescripting as a stand-alone treatment for patients with social phobia: A case series. *Journal of Behavior Therapy and Experimental Psychiatry, 45*(1), 160–169. https://doi.org/10.1016/j.jbtep.2013.09.006

Goldin, P. R., Ziv, M., Jazaieri, H., Werner, K., Kraemer, H., Heimberg, R. G., et al. (2012). Cognitive reappraisal self-efficacy mediates the effects of individual cognitive-behavioral therapy for social anxiety disorder. *Journal of Consulting and Clinical Psychology, 80*(6), 1034–1040. https://doi.org/10.1037/a0028555

Hackmann, A., Clark, D. M., & McManus, F. (2000). Recurrent images and early memories in social phobia. *Behaviour Research and Therapy, 38*(6), 601–610. https://doi.org/10.1016/S0005-7967(99)00161-8

Hackmann, A., Surawy, C., & Clark, D. M. (1998). Seeing yourself through others' eyes: A study of spontaneously occurring images in social phobia. *Behavioural and Cognitive Psychotherapy, 26*, 3–12. https://doi.org/10.1017/S1352465898000022

Hazlett-Stevens, H. (2008). Relaxation strategies. In *Psychological approaches to generalized anxiety disorder* (pp. 81–106). Springer Science & Business Media. https://doi.org/10.1007/978-0-387-76870-0.

Hirsch, C. R., Clark, D. M., Mathews, A., & Williams, R. (2003). Self-images play a causal role in social phobia. *Behaviour Research and Therapy, 41*(8), 909–921. https://doi.org/10.1016/S0005-7967(02)00103-1

Hirsch, C. R., & Holmes, E. A. (2007). Mental imagery in anxiety disorders. *Psychiatry, 6*(4), 161–165. https://doi.org/10.1016/j.mppsy.2007.01.005

Hirsch, C. R., Meynen, T., & Clark, D. M. (2004). Negative self-imagery in social anxiety contaminates social interactions. *Memory, 12*(4), 496–506. https://doi.org/10.1080/09658210444000106

Hofmann, S. G. (2007). Cognitive factors that maintain social anxiety disorder: A comprehensive model and its treatment implications. *Cognitive Behaviour Therapy, 36*(4), 193–209. https://doi.org/10.1080/16506070701421313

Holmes, E. A., & Mathews, A. (2010). Mental imagery in emotion and emotional disorders. *Clinical Psychology Review, 30*(3), 349–362. https://doi.org/10.1016/j.cpr.2010.01.001

Huppert, J. D., Roth, D. A., & Foa, E. B. (2003). Cognitive-behavioral treatment of social phobia: New advances. *Current Psychiatry Reports, 5*(4), 289–296. https://doi.org/10.1007/s11920-003-0058-5

JASP Team. (2020). JASP (Version 0.13.1) [Computer software]. https://jasp-stats.org/.

Kelley, K. (2017). Mbess *(*Version 4.0.*0. and higher) [computer software and manual]* http://cran.r-project.org.

Kivity, Y., Cohen, L., Weiss, M., Elizur, J., & Huppert, J. D. (2021). The role of expressive suppression and cognitive reappraisal in cognitive behavioral therapy for social anxiety disorder: A study of self-report, subjective, and electrocortical measures. *Journal of Affective Disorders, 279*, 334–342. https://doi.org/10.1016/j.jad.2020.10.021

Krans, J., de Bree, J., & Bryant, R. A. (2014). Autobiographical memory bias in social anxiety. *Memory, 22*(8), 890–897. https://doi.org/10.1080/09658211.2013.844261

Krypotos, A.-M., Blanken, T. F., Arnaudova, I., Matzke, D., & Beckers, T. (2017). A primer on bayesian analysis for experimental psychopathologists. *Journal of Experimental Psychopathology, 8*(2), 140–157. https://doi.org/10.5127/jep.057316

Krypotos, A.-M., Mertens, G., Leer, A., & Engelhard, I. M. (2020). Induction of conditioned avoidance via mental imagery. *Behaviour Research and Therapy, 132*, Article 103652. https://doi.org/10.1016/j.brat.2020.103652

Kunze, A. E., Lancee, J., Morina, N., Kindt, M., & Arntz, A. (2019). Mediators of change in imagery rescripting and imaginal exposure for nightmares: Evidence from a randomized wait-list controlled trial. *Behavior Therapy, 50*(5), 978–993. https://doi.org/10.1016/j.beth.2019.03.003

Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: A practical primer for t-tests and ANOVAs. *Frontiers in Psychology, 4*, 863. https://doi.org/10.3389/fpsyg.2013.00863

Landkroon, Meyerbröker, Salemink, & Engelhard. (2022). Future-oriented imagery rescripting facilitates conducting behavioral experiments in social anxiety. *Behaviour Research and Therapy, 155*, Article 104130. https://doi.org/10.1016/j.brat.2022.104130

Levine, B., Svoboda, E., Hay, J. F., Winocur, G., & Moscovitch, M. (2002). Aging and autobiographical memory: Dissociating episodic from semantic retrieval. *Psychology and Aging, 17*(4), 677–689. https://doi.org/10.1037//0882-7974.17.4.677

Makkar, S. R., & Grisham, J. R. (2011). Social anxiety and the effects of negative self-imagery on emotion, cognition, and post-event processing. *Behaviour Research and Therapy, 49*(10), 654–664. https://doi.org/10.1016/j.brat.2011.07.004

Marks, I. M., & Mathews, A. M. (1979). Brief standard self-rating for phobic patients. *Behavior Research and Therapy, 17*(3), 263–267. https://doi.org/10.1016/0005-7967(79)90041-X

Miloyan, B., Bulley, A., & Suddendorf, T. (2016). Episodic foresight and anxiety: Proximate and ultimate perspectives. *British Journal of Clinical Psychology, 55*(1), 4–22. https://doi.org/10.1111/bjc.12080

Miloyan, B., & Suddendorf, T. (2015). Feelings of the future. *Trends in Cognitive Sciences, 19*(4), 196–200. https://doi.org/10.1016/j.tics.2015.01.008

Montijn, N. D., Gerritsen, L., & Engelhard, I. M. (2021). Forgetting the future: Emotion improves memory for imagined future events in healthy individuals but not individuals with anxiety. *Psychological Science*. https://doi.org/10.1177/0956797620972491

Morina, N., Deeprose, C., Pusowski, C., Schmid, M., & Holmes, E. A. (2011). Prospective mental imagery in patients with major depressive disorder or anxiety disorders. *Journal of Anxiety Disorders, 25*(8), 1032–1037. https://doi.org/10.1016/j.janxdis.2011.06.012

Morina, N., Lancee, J., & Arntz, A. (2017). Imagery rescripting as a clinical intervention for aversive memories: A meta-analysis. *Journal of Behavior Therapy and Experimental Psychiatry, 55*, 6–15. https://doi.org/10.1016/j.jbtep.2016.11.003

Moscovitch, D. A., Gavric, D. L., Merri, C., Bielak, T., & Moscovitch, M. (2011). Retrieval properties of negative vs. positive mental images and autobiographical memories in social anxiety: Outcomes with a new measure. *Behaviour Research and Therapy, 49*(8), 505–517. https://doi.org/10.1016/j.brat.2011.05.009

Moscovitch, D. A., Vidovic, V., Lenton-Brym, A. P., Dupasquier, J. R., Barber, K. C., Hudd, T., et al. (2018). Autobiographical memory retrieval and appraisal in social anxiety disorder. *Behaviour Research and Therapy, 107*, 106–116. https://doi.org/10.1016/j.brat.2018.06.008

Ng, A. S., Abbott, M. J., & Hunt, C. (2014). The effect of self-imagery on symptoms and processes in social anxiety: A systematic review. *Clinical Psychology Review, 34*(8), 620–633. https://doi.org/10.1016/j.cpr.2014.09.003

Radcliffe, A. M., Lumley, M. A., Kendall, J., Stevenson, J. K., & Beltran, J. (2007). Written emotional disclosure: Testing whether social disclosure matters. *Journal of Social and Clinical Psychology, 26*(3), 362–384. https://doi.org/10.1521/jscp.2007.26.3.362

Rapee, R. M., & Heimberg, R. G. (1997). A cognitive-behavioral model of anxiety in social phobia. *Behaviour Research and Therapy, 35*(8), 741–756. https://doi.org/10.1016/S0005-7967(97)00022-3

Reimer, S. G., & Moscovitch, D. A. (2015). The impact of imagery rescripting on memory appraisals and core beliefs in social anxiety disorder. *Behaviour Research and Therapy, 75*, 48–59. https://doi.org/10.1016/j.brat.2015.10.007

Reiss, N., Warnecke, I., Tolgou, T., Krampen, D., Luka-Krausgrill, U., & Rohrmann, S. (2017). Effects of cognitive behavioral therapy with relaxation vs. imagery rescripting on test anxiety: A randomized controlled trial. *Journal of Affective Disorders, 208*, 483–489. https://doi.org/10.1016/j.jad.2016.10.039

Romano, M., Moscovitch, D. A., Huppert, J. D., Reimer, S. G., & Moscovitch, M. (2020). The effects of imagery rescripting on memory outcomes in social anxiety disorder. *Journal of Anxiety Disorders, 69*, Article 102169. https://doi.org/10.1016/j.janxdis.2019.102169

Romano, M., Tran, E., & Moscovitch, D. A. (2020). Social anxiety is associated with impaired memory for imagined social events with positive outcomes events. *Cognition & Emotion, 34*(4), 700–712. https://doi.org/10.1080/02699931.2019.1675596

Schacter, D. L., & Addis, D. R. (2007). The cognitive neuroscience of constructive memory: Remembering the past and imagining the future. *Philosophical Transactions of the Royal Society B: Biological Sciences, 362*(1481), 773–786. https://doi.org/10.1098/rstb.2007.2087

Schacter, D. L., Benoit, R. G., & Szpunar, K. K. (2017). Episodic future thinking: Mechanisms and functions. *Current Opinion in Behavioral Sciences, 17*, 41–50. https://doi.org/10.1016/j.cobeha.2017.06.002

Siegesleitner, M., Strohm, M., Wittekind, C. E., Ehring, T., & Kunze, A. E. (2019). Effects of imagery rescripting on consolidated memories of an aversive film. *Journal of Behavior Therapy and Experimental Psychiatry, 62*, 22–29. https://doi.org/10.1016/j.jbtep.2018.08.007

Siegesleitner, M., Strohm, M., Wittekind, C. E., Ehring, T., & Kunze, A. E. (2020). Improving imagery rescripting treatments: Comparing an active versus passive approach. *Journal of Behavior Therapy and Experimental Psychiatry, 69*, Article 101578. https://doi.org/10.1016/j.jbtep.2020.101578

Stopa, L., & Jenkins, A. (2007). Images of the self in social anxiety: Effects on the retrieval of autobiographical memories. *Journal of Behavior Therapy and Experimental Psychiatry, 38*(4), 459–473. https://doi.org/10.1016/j.jbtep.2007.08.006

Strohm, M., Siegesleitner, M., Kunze, A. E., Ehring, T., & Wittekind, C. E. (2019). Imagery rescripting of aversive autobiographical memories: Effects on memory distress, emotions, and feelings of mastery. *Cognitive Therapy and Research, 43*, 1005–1017. https://doi.org/10.1007/s10608-019-10021-2

Vassilopoulos, S. (2005). Social anxiety and the effects of engaging in mental imagery. *Cognitive Therapy and Research, 29*(3), 261–277. https://doi.org/10.1007/s10608-005-2993-4

van Veen, S. C., van Schie, K., van de Schoot, R., van den Hout, M. A., & Engelhard, I. M. (2020). Making eye movements during imaginal exposure leads to short-lived memory effects compared to imaginal exposure alone. *Journal of Behavior Therapy and Experimental Psychiatry, 67*, Article 101466. https://doi.org/10.1016/j.jbtep.2019.03.001

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063–1070.

Wild, J., & Clark, D. M. (2011). Imagery rescripting of early traumatic memories in social phobia. *Cognitive and Behavioral Practice, 18*(4), 433–443. https://doi.org/10.1016/j.cbpra.2011.03.002

Wild, J., Hackmann, A., & Clark, D. M. (2007). When the present visits the past: Updating traumatic memories in social phobia. *Journal of Behavior Therapy and Experimental Psychiatry, 38*(4), 386–401. https://doi.org/10.1016/j.jbtep.2007.07.003

Wild, J., Hackmann, A., & Clark, D. M. (2008). Rescripting early memories linked to negative images in social phobia: A pilot study. *Behavior Therapy, 39*(1), 47–56. https://doi.org/10.1016/j.beth.2007.04.003