# Facing the Dilemma of Trauma-Focused Therapy:

# Effects of Imagery-Based Interventions on Voluntary Memory

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*In Dankbarkeit, Hoffnung und Liebe meiner Familie.*

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# General Abstract

Trauma survivors often face a challenging dilemma: While clinical guidelines recommend early trauma-focused treatment to prevent chronic symptoms, legal actors frequently express concerns that such interventions – particularly imagery-based techniques like imagery rescripting (ImRs) and imaginal exposure (ImE) – could compromise the reliability of memory in legal contexts. This fear has led to widespread delays in clinical treatments until after judicial processes conclude, although empirical evidence from psychotherapy research supporting this cautious approach is lacking. The current dissertation systematically investigates whether and under which conditions imagery-based trauma-focused interventions impact voluntary, legally relevant memory of aversive events. To address this, three progressively building studies were conducted: two experimental analogue studies and one preregistered systematic review. Together, these studies aim to clarify potential memory effects of ImRs and ImE, compare their impact on memory accuracy, and integrate the findings into the broader memory distortion literature. This research offers essential insights for aligning clinical needs and forensic expectations in the treatment of trauma survivors.

Study I examined whether ImRs influences memory accuracy following real-life stress exposure. A total of 100 students were exposed to the Trier Social Stress Test (TSST), which reliably induces a personally experienced, psychosocially aversive event. Two days later, participants were randomly assigned to either a single ImRs session or a no-intervention control condition. Voluntary memory was assessed through free recall (before the intervention and one week later) and cued recall (one week later and after three months). The findings revealed that participants in the ImRs condition recalled significantly more correct details in free recall one week after the intervention compared to the control condition, without an increase in incorrect details. No differences between conditions emerged in cued recall after one week and after three months, however, voluntary memory tended to deteriorate over time. Contrary to expectations, this effect was not associated with ImRs.

Study II tested the effects of ImRs and ImE on memory accuracy following analogue trauma exposure. In a controlled laboratory setting, 120 highly anxious female participants watched a distressing scene involving sexual violence as part of the trauma-film paradigm. Twenty-four hours later, participants were randomly allocated to one of three conditions: ImRs, ImE, or a no-intervention control. Voluntary memory was measured through free recall (pre-intervention and six days post-intervention), cued recall, and recognition tasks (six days and two weeks post-intervention). The results showed that ImE significantly increased the number of correctly recalled details in free recall compared to both ImRs and control conditions, without increasing memory distortions. ImRs did not affect memory performance relative to the control condition. Across all condition, incorrect details decreased over time, and no evidence of false memory inflation was observed.

Study III presents a preregistered systematic review synthesizing evidence from 95 studies examining the effects of imagery tasks and imagery-based interventions on voluntary memory. This review included basic memory studies and experimental analogue applications of ImRs, ImE, and hypnosis. Isolated eye movement tasks, often used as components of EMDR but not full EMDR protocols, were also analyzed in non-clinical contexts. The analysis revealed that experimental imagery tasks and hypnosis were frequently associated with belief inflation, source confusion, and memory distortion. In contrast, structured clinical interventions, particularly ImRs and ImE, showed no evidence of memory impairment and, in some cases, even improved recall accuracy or narrative coherence. Effects of isolated eye movement tasks in non-clinical settings were mixed. Across studies, the risk of memory distortion appeared to be more strongly linked to suggestive procedures and a lack of autobiographical grounding than to the use of imagery per se. Overall, the findings suggest that imagery-based intervention, when applied in structured clinical contexts, do not compromise memory accuracy.

Collectively, the three studies provide converging evidence that manualized, structured imagery interventions such as ImRs and ImE do not compromise the factual accuracy of voluntary memory. They may facilitate access to correct details under certain conditions and with appropriate safeguards. Crucial protective factors include a clear session structure, sufficient time for memory consolidation, strong patient authorship, and transparent separation between original and rescripted memory elements. In contrast, suggestive, externally controlled, or hypnotic interventions remain problematic and can indeed pose a risk to memory credibility. The findings challenge the common practice of delaying trauma-focused therapy during legal proceedings out of fear of contaminating memory evidence. Instead, legal and clinical professionals should collaborate to ensure that psychological treatments is conducted under scientifically validated conditions that protect both the well-being of survivors and the integrity of their testimony. Ultimately, this dissertation offers a valuable framework for balancing therapeutic urgency with forensic reliability.

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# 1. General Introduction

*I was talking about time. It's so hard for me to believe in it. Some things go. Pass on. Some things just stay. I used to think it was my rememory. You know. Some things you forget. Other things you never do. But it's not. Places, places are still there. If a house burns down, it's gone, but the place—the picture of it—stays, and not just in my rememory, but out there, in the world. What I remember is a picture floating around out there outside my head. I mean, even if I don't think it, even if I die, the picture of what I did, or knew, or saw is still out there. Right in the place where it happened.*

— from *Beloved* by Toni Morrison (2004, p. 43)

## Facing the Dilemma: Trauma-Focused Therapy and Memory Integrity

In literature and public discourse, trauma is often portrayed as something that resists temporal resolution. Rather than fading into the past, it lingers – visibly or invisibly – in bodies, spaces, and memory images that defy forgetting. In *Beloved*, Toni Morrison (2004, p. 43) gives this notion a haunting metaphor: a "picture floating around out there outside my head", beyond conscious recollection or volition.

This idea – that traumatic experiences may remain hidden from awareness for years, only to resurface later in vivid form – is not merely poetic. It also shapes clinical practice, courtrooms, and cultural beliefs. Reports of long-forgotten trauma recovered in therapy are met with both empathy and skepticism. On one side stands the conviction that psychotherapy can uncover buried truths (Freyd, 1994); on the other, the concern that it may distort or even implant memories (Loftus, 2005). These opposing perspectives crystallize in what has come to be known as the *dilemma of trauma-focused therapy*: a fundamental conflict between the demands of psychological healing and the requirements of forensic certainty (Bublitz, 2023; Patihis et al., 2014).

Trauma survivors who seek psychological treatment – particularly for experiences of sexual or interpersonal violence – often find themselves caught in this dilemma. Early clinical intervention is essential to prevent chronic mental illness, especially for individuals already experiencing symptoms of traumatic stress (Roberts et al., 2019). Yet trauma-focused therapy may inadvertently alter the structure, content, or confidence associated with autobiographical memory, raising doubts about the credibility of future testimony (Branaman & Gottlieb, 2013; Otgaar, Howe, Patihis, et al., 2019). Legal actors, for their part, often demand that witness accounts remain "original" and unaltered. As a result, clinical interventions – especially those involving imagery and processing of traumatic memory – are frequently viewed with skepticism. They are thought to obscure the forensic distinction between accurate recollections, deliberate fabrications, and sincerely believed but false memories (Volbert & Steller, 2014). German courts, for example, have ruled that suggestive therapeutic influences must be ruled out to exclude the possibility of pseudo-memories (Federal Court of Justice [BGH], 2015). Although this view is scientifically debated, it has led to survivors being advised against psychological treatment while legal proceedings are pending (Branaman & Gottlieb, 2013).

At the same time, empirical research shows that trauma survivors – particularly those exposed to early interpersonal violence – face increased risk for PTSD, depression, anxiety, and other psychiatric conditions (Baldwin et al., 2023; Hailes et al., 2019; Kessler et al., 2017). Many individuals seeking psychological treatment, even outside trauma-specific settings, carry unresolved trauma histories (Mauritz et al., 2013). Early intervention is therefore not only clinically recommended but often urgent. And yet, survivors may be forced to choose between safeguarding their health and preserving the presumed forensic integrity of their memory. This dilemma lies at the heart of the present dissertation, which aims to better understand how trauma-focused interventions may influence declarative voluntary memory.

## Encoding Trauma: From Flashbacks to Reprocessing

To understand why trauma-focused interventions may affect not only emotional symptoms but also memory integrity, it is necessary to examine how traumatic experiences are encoded, stored, and retrieved in the brain. Post-traumatic stress disorder (PTSD) is the most prevalent psychiatric condition associated with exposure to traumatic events. According to the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision* (DSM-5-TR; American Psychiatric Association, 2022), PTSD is characterized by four symptom clusters: intrusive re-experiencing (e.g., flashbacks, nightmares), persistent avoidance of trauma-related stimuli, negative alterations in cognition and mood, and heightened arousal and reactivity. These symptom clusters suggest that trauma can interfere with emotional regulation, memory integration, and cognitive coherence – especially in how autobiographical experiences are encoded and recalled.

Of particular relevance here is the distinction between *involuntary* and *voluntary* autobiographical memory. Visser et al. (2018) propose multiple memory systems in which voluntary and involuntary autobiographical memories are supported by distinct cognitive mechanisms. Involuntary memories are more emotion- and perception-driven, whereas voluntary memories rely on executive control and contextualization. In PTSD, involuntary memories – often manifesting as vivid, sensory-laden flashbacks – emerge spontaneously and are typically experienced as emotionally intense and fragmented, lacking the coherence of normal autobiographical recollection. Voluntary memory, by contrast, involves the deliberate, structured recall of past events, but also tends to be fragmented, disorganized, and effortful (Brewin, 2014; Ehlers et al., 2004). These distinct memory systems offer a useful framework for understanding the nature of trauma-related recall. Notably, dual representation theories of PTSD suggest that trauma may be encoded in separate, loosely connected systems – one that supports situational, affect-driven fragments, and another that enables coherent, contextualized narrative (Brewin, 2014). This dissociation helps explain why certain therapeutic interventions can influence not only the intensity of symptoms but also the structure and accessibility of autobiographical memory. To better understand these processes, the *Dual Representation Theory* (DRT) offers a particularly influential neurocognitive framework.

***The Dual Representation Theory: Understanding Trauma Memory and Its Disruptions***

According to DRT (Brewin et al., 1996; Brewin et al., 2010), traumatic events are encoded in two distinct but interacting systems: situationally accessible representations (S-reps) and verbally accessible representations (C-reps). S-reps are automatically formed during moments of intense stress and contain vivid sensory, perceptual, and affective information – but lack temporal and spatial context. They are not readily accessible through deliberate recall and often resurface involuntarily as flashbacks, nightmares, or physiological responses triggered by reminders of the trauma. C-reps, in contrast, involve consciously encoded information such as time, place, and meaning. These are typically accessible through voluntary retrieval and form the basis of coherent autobiographical narratives.

In individuals with PTSD, DRT posits a disruption in the integration of these two systems. Heightened arousal during the trauma leads to an overrepresentation of S-reps and a relative underencoding of contextual information in C-reps. The result is a fragmented memory system: emotionally potent and perceptually rich experiences that are disconnected from the individual's broader autobiographical timeline. These fragmented S-reps can dominate experience through intrusive symptoms, while the narrative C-reps remain underdeveloped or inaccessible (Brewin, 2014; Ehlers & Clark, 2000).

This theoretical framework helps explain why trauma survivors may struggle to articulate what happened, despite being overwhelmed by vivid sensory fragments. It also provides a rationale for why imagery-based interventions might be effective: techniques such as imagery rescripting (ImRs), imaginal exposure (ImE), or Eye Movement Desensitization and Reprocessing (EMDR) can be seen as attempts to reconnect S-reps and C-reps. By reactivating sensory-laden memory fragments in a safe and structured context, and embedding them in a verbal or narrative framework, these interventions aim to reduce involuntary intrusions while restoring autobiographical coherence.

Despite its strengths, the DRT faces key conceptual and empirical challenges. The distinction between situationally accessible (S-reps) and contextually integrated (C-reps) representations is theoretically useful but not always reflected in empirical findings. For example, Pearson (2012) and Pearson et al. (2012) found that adding contextual information during trauma encoding increased, rather than decreased, intrusive memories – contradicting DRT's predictions. Brewin and Burgess (2014) argues this stems from a misunderstanding: additional information may actually intensify emotional engagement and thus strengthen S-reps, rather than effectively integrating C-reps. This highlights the difficulty of operationalizing "context" and raises questions about whether therapeutic memory modifications truly improve accuracy or merely enhance narrative fluency and confidence – factors easily mistaken for truth. These concerns become especially relevant when considering the broader malleability of memory.

**Reconstructing the Past: Forgetting, Distortion, and False Memory**

The susceptibility of memory to change is well documented in research on forgetting and distortion. According to theories of memory decay and interference, memories deteriorate either passively (through fading) or actively (via competition from new information) (e.g., Wixted, 2004). Rubin and Wenzel (1996) showed that most forgetting follows a logarithmic curve: rapid at first, then progressively slower. Autobiographical memories, however, exhibit less consistent patterns and tend to follow a characteristic distribution across the lifespan, with memories from adolescence and early adulthood disproportionately represented, while memories of early childhood years are rare (Rubin & Schulkind, 1997).

Importantly, forgetting is not a neutral process. Memory does not serve as a faithful record of past experiences but is actively reconstructed during retrieval, which can destabilize memories, open them to modification during reconsolidation, and ultimately make them vulnerable to distortion (Dudai et al., 2015; Schacter & Addis, 2007; Schiller et al., 2010). These vulnerabilities are especially relevant in forensic contexts. Research on eyewitness testimony has shown that post-event misinformation can distort memory – a phenomenon known as the *misinformation effect* (for a brief review, see Loftus & Klemfuss, 2023). For example, Loftus and Palmer (1974) found that participants' speed estimates for a car crash varied significantly depending on whether the verb "hit" or "smashed" was used. Similarly, memory conformity studies (e.g., Gabbert et al., 2003) reveal how co-witness discussion can lead individuals to incorporate details they never personally observed. Such findings illustrate how external inputs – social, verbal, or visual – can subtly reshape genuine memories.

Crucially, these vulnerabilities are not confined to forensic contexts. They are also highly relevant in therapeutic settings involving imagery-based techniques. When a memory is reactivated through such methods, it is thought to temporarily enter a labile state during which modification is possible before reconsolidation (Elsey et al., 2018; Nader et al., 2000). Intervening during this window – shortly after reactivation – may facilitate adaptive updating, but may also increase susceptibility to distortion (Schiller et al., 2010). These distortions often arise from source monitoring errors, in which imagined or suggested content is misattributed to actual experience (Johnson et al., 1993).

A central theoretical model for understanding these effects is the *Source Monitoring Framework*, which suggests that memories do not inherently contain information about their origin. Instead, judgments about the source of a memory rely on inferential cues – such as perceptual detail, emotional intensity, and contextual coherence. When imagined events are vivid and emotionally salient, they may resemble real memories, increasing the risk of source misattribution (Johnson et al., 1993; Mitchell & Johnson, 2000).

Beyond distortion of real events, memory research has increasingly turned to the construction of entirely false memories. Loftus and Pickrell (1995) provided evidence for *memory implantation* using the well-known *lost-in-the-mall* paradigm and demonstrated that about 25% of participants came to believe they had experienced a fabricated childhood event. Later work using doctored photographs (Wade et al., 2002) and imagination instructions (Garry et al., 1996) further showed how vivid imagery can create familiarity, leading to source misattribution and even full autobiographical confabulations. This phenomenon – known as *imagination inflation* – has been demonstrated across a range of experimental contexts. In a seminal study, Garry et al. (1996) found that participants who imagined specific childhood events, such as breaking a window with their hand, subsequently became more confident that these events had actually occurred. Building on this, Hyman and Pentland (1996) showed that the combination of guided imagination and external suggestion significantly increased the likelihood of false memory formation. Notably, such effects are not limited to emotionally significant childhood memories: Goff and Roediger (1998) demonstrated that even mundane imagined actions, like flipping a coin or breaking a toothpick, can later be misremembered as personally experienced if repeatedly rehearsed.

While individual susceptibility varies, reviews suggest non-trivial prevalence rates. Brewin and Andrews (2017) estimate robust false memory formation in about 15% of participants; Scoboria et al. (2016) report rates closer to 30%, rising to nearly 50% under conditions involving guided imagery and personal relevance. Although much of this evidence derives from laboratory studies with healthy participants, its implications extend well beyond the experimental setting – particularly into the domain of psychological treatment. These mechanisms are especially relevant in therapeutic approaches involving guided imagery. When clients are encouraged to imagine alternate outcomes, reframe events, or insert supportive figures into traumatic scenes, they may form elaborated mental representations that later resemble autobiographical memories. While such elaborations can foster emotional relief, they may also become blended with genuine autobiographical content. This does not imply fabrication or deception. Rather, it highlights the inherently reconstructive nature of human memory. However, in forensic contexts, such blending introduces uncertainty: How much of a recalled traumatic memory reflects genuine autobiographical content – and how much has been shaped, however unintentionally, by therapeutic intervention? (Lindsay & Johnson, 2000; Otgaar, Howe, Patihis, et al., 2019).

**What Happens in Therapy? Memory Change in Clinical Contexts**

While trauma-focused interventions are not intended to alter factual memory, many of their core techniques – such as vividly imagining past scenes, emotionally re-engaging with traumatic content, or introducing imagined elements – closely resemble cognitive processes known to affect both memory accuracy and confidence. Mental imagery, in particular, has been shown to blur the boundary between real and imagined experiences, especially when memories are emotionally charged, temporally distant, or repeatedly rehearsed (Loftus, 2003).

Trauma-focused interventions, widely recognized as first-line treatments for PTSD, aim to reduce distressing symptoms by facilitating structured emotional engagement with traumatic material (Ehlers et al., 2005; National Institute for Health and Care Excellence, 2018). Among the most studied approaches are ImRs, ImE, and EMDR. ImRs and ImE are rooted in cognitive behavioral theory and specifically target the emotional salience and representational structure of trauma-related imagery (Arntz, 2012; Holmes et al., 2007). ImRs encourages individuals to actively modify the narrative of a traumatic memory – introducing protective figures, changing outcomes, or reclaiming agency – without aiming to erase the memory itself (Arntz, 2012; Arntz & Weertman, 1999; Morina et al., 2017). ImE involves repeated, focused confrontation with traumatic imagery to support emotional processing and habituation (Foa et al., 2008). In EMDR, distressing memories and their associated negative cognitions are activated while patients engage in bilateral stimulation (e.g., eye movements, tones, or taps), which facilitates memory reprocessing and reduces emotional distress (Shapiro, 2018). Although its precise mechanisms remain under debate, EMDR has demonstrated comparable efficacy to other evidence-based trauma treatments (Lee & Cuijpers, 2013). These approaches are clinically effective in reducing PTSD symptoms and improving affect regulation. However, their potential to influence voluntary autobiographical memory – particularly in contexts where memory accuracy has legal or forensic implications – remains underexplored. Several lines of research, ranging from early case studies to analogue experiments and observational surveys, shed light on how psychotherapeutic interventions might shape autobiographical memory.

Early practitioner reports and surveys raised concerns about memory contamination through suggestive techniques, particularly in therapeutic efforts to recover childhood abuse memories (Lief & Fetkewicz, 1995; Poole et al., 1995). Retrospective surveys indicate that some clients later questioned the accuracy of trauma memories recovered in therapy, while therapists themselves varied widely in their beliefs and practices regarding repressed and recovered memories (Patihis & Pendergrast, 2019).

A UK-wide survey of clinical psychologists and hypnotherapists found that approximately 27% had encountered clients who recovered childhood abuse memories following a period of prior amnesia, suggesting that memory recovery remains a relevant issue in contemporary clinical practice (Ost et al., 2013). Interestingly, hypnotherapists reported such cases more frequently (39.8%) than clinical psychologists (20.0%). Clinical psychologists, however, more often reported exposure to cases involving alleged ritual or satanic abuse and tended to rate the accuracy of these memories more highly. These findings highlight considerable variability in clinical experiences and attitudes toward recovered and false memories.

More recently, a survey of German psychotherapists found that memory recovery is not uncommon, with 78% reporting at least one such case in their practice – typically among a minority of clients (Schemmel et al., 2024). While only 35% had deliberately used techniques to uncover suspected trauma memories, these often included suggestive methods such as dream interpretation and affect bridges, as well as bona fide trauma-focused interventions like prolonged exposure, ImRs, or EMDR. Despite concerns about suggestiveness, therapists rarely questioned the authenticity of recovered memories, often viewing their factual accuracy as secondary to therapeutic progress. Notably, most therapists lacked formal guidelines for handling recovered memories and expressed a desire for further training – indicating a gap between clinical practice and memory science.

Although most of the evidence on memory distortion stems from laboratory research, analogue studies have begun to explore the cognitive side effects of imagery-based trauma-focused interventions. Hagenaars and Arntz (2012) assigned participants who had watched a distressing film to ImRs, ImE, or a positive-imagery control condition. One week later, only the ImRs condition reported significantly fewer intrusive memories, while the ImE condition did not differ from controls. Importantly, both ImRs and ImE conditions recalled more correct factual details about the film than controls, suggesting that these interventions may enhance, rather than degrade, voluntary memory under certain conditions. Building on this, Siegesleitner et al. (2019) introduced a 24-hour delay between memory encoding and intervention. Again, ImRs led to a faster reduction in intrusive memories, while no differences emerged in voluntary recall across groups – indicating no memory impairment following either intervention. A related study by Romano et al. (2020) examined imagery-based interventions in individuals with social phobia who recalled negative autobiographical memories. Participants received a single session of ImRs, ImE, or supportive counselling without imagery. ImE was associated with an increase in reported negative memory details, while ImRs did not differ significantly from the control. Both imagery interventions – unlike supportive counselling – were linked to an increase in positive or neutral memory details. Although the study did not directly assess memory accuracy, it systematically tracked changes in reported memory characteristics over several follow-ups, demonstrating that imagery interventions can reshape the content and emotional tone of autobiographical memories over time.

Taken together, these findings suggest that, at least in controlled analogue settings, imagery-based interventions such as ImRs and ImE can reduce emotional distress and reshape the narrative tone of aversive memories without degrading – and in some cases potentially enriching – voluntary recall. Nevertheless, further research is needed to clarify whether such changes reflect beneficial narrative elaboration or could introduce risks of forensic misinterpretation. Understanding when and why such memory changes occur requires closer examination of the cognitive and contextual factors that may moderate these effects.

**When Memory Changes: Cognitive and Contextual Moderators**

While imagery-based interventions have proven clinically effective for processing traumatic experiences, their underlying mechanisms – such as mental imagery, narrative restructuring, and emotional amplification – are also implicated in experimental paradigms that produce memory distortion. This convergence raises an important theoretical question: under what conditions might therapeutic imagery affect the integrity of autobiographical memory?

Rather than producing uniform effects, memory change in therapeutic contexts is likely moderated by a range of factors. These may include the plausibility and emotional resonance of the imagined material, which enhance subjective realism and increase the likelihood of internalization (Mazzoni et al., 2001; Pezdek et al., 1997; Porter et al., 1999). The repetition and elaboration of imagery, especially without contextual tagging, can strengthen perceptual vividness and blur the boundary between imagination and recollection (Garry et al., 1996; Scoboria et al., 2016). The social framing of therapeutic interventions – such as the therapist's language, implicit expectations, or degree of suggestive structure – may further influence how imagery is encoded and later evaluated (Devilly & Brown, 2011; Frenda et al., 2011; Gabbert et al., 2003). In addition, individual differences such as dissociation, fantasy proneness, suggestibility, or imagery ability have been linked to increased vulnerability to source misattribution (Hyman & Billings, 1998; Lynn et al., 2015; Otgaar et al., 2009).

These converging strands of research suggest that the cognitive and forensic implications of therapeutic imagery may depend not only on what is imagined, but also on who imagines it, how, and under what contextual conditions. This becomes especially salient given the contrast between highly controlled analogue studies and the complexity of real-world clinical practice, where emotional intensity, interpersonal dynamics, and therapeutic framing are less standardized. While concerns about memory distortion in trauma-focused therapy are often voiced, they frequently rest on broad generalizations derived from laboratory-based misinformation studies (Loftus, 2005) or imagination inflation paradigms (Brewin & Andrews, 2017) that do not fully capture the nuances of clinical work. The assumption that trauma-focused therapy inherently poses a risk to memory accuracy may be an oversimplification that does not fully consider the potential moderating influence of individual and contextual factors. Rather than questioning imagery-based interventions solely on theoretical grounds and findings from basic memory research, it seems crucial to empirically investigate whether, and under which conditions, specific trauma-focused methods – particularly those considered potentially critical – might influence memory accuracy in more ecologically valid settings.

**Aims of the Thesis**

The overarching aim of this doctoral thesis is to address a key tension at the intersection of clinical and forensic psychology: the concern that trauma-focused psychological treatments – especially those involving imagery-based techniques such as ImRs and ImE – might inadvertently distort trauma survivors' voluntary autobiographical memory. This concern is particularly significant in legal contexts, where the accuracy and credibility of victims' testimony are central. Although clinical guidelines strongly recommend early trauma-focused intervention to reduce the risk of chronic PTSD, legal practice in some countries results in the postponement of such treatment until court proceedings have concluded, based on the assumption that these interventions could undermine memory integrity.

This thesis seeks to contribute to a more nuanced, evidence-based understanding of whether, and under what circumstances, trauma-focused therapy might influence memory accuracy. Specifically, it examines whether, and under which conditions, imagery-based trauma-focused interventions may affect voluntary memory for traumatic or stress-related events, and whether such changes pose risks or offer potential benefits for memory accuracy. By combining two tightly controlled experimental studies with a comprehensive systematic review, this work aims to develop an integrated understanding of the cognitive effects of imagery-based interventions on declarative memory and to provide a foundation for evidence-based recommendations that reconcile therapeutic efficacy with forensic reliability.

***Study I – The Impact of ImRs on Autobiographical Memory for a Stressful Event***

The first study aimed to provide a controlled, ecologically valid test of whether a single session of ImRs can alter voluntary recall of a stressful autobiographical experience. A sample of 100 participants was exposed to the Trier Social Stress Test (TSST; Kirschbaum et al., 1993) – a standardized psychosocial stress paradigm inducing a real, emotionally aversive experience. Participants were then randomly assigned to either a trauma-focused ImRs intervention or a no-intervention control condition. Voluntary memory was assessed at three (two post-intervention) time points using both free recall and cued recall formats, allowing for the quantification of correct versus incorrect memory details. The study also assessed emotional response and intrusive symptoms. The central goal was to determine whether ImRs, in the absence of suggestive input, leads to memory distortions that might threaten the forensic utility of testimony – thus empirically addressing the therapeutic – legal dilemma from a memory accuracy perspective.

***Study II – Comparing the Effects of ImRs and ImE on Memory for an Analogue Trauma***

The second study extended the findings of Study I by contrasting the effects of two widely used trauma-focused interventions – ImRs and ImE on voluntary memory for an analogue trauma. A sample of 120 high trait-anxious female participants watched a trauma film designed to simulate key features of real traumatic experiences (e.g., helplessness, threat). One week later, participants were randomly assigned to an ImRs, an ImE, or a no-intervention control condition. Voluntary memory was assessed through free recall, cued recall, and recognition tasks at three (two post-intervention) time points. This design allowed for direct comparison of memory effects across treatment modalities and control conditions. The study aimed to determine whether potential memory distortions are specific to ImRs (due to its active modification of memory content) or whether even widely established trauma-focused treatments such as ImE – which involve repeated emotional reliving of the trauma – carry similar risks.

***Study III – Systematic Review on the Effects of Imagery-Based Interventions on Voluntary Memory***

Study III presents a systematic review of empirical evidence examining the effects of imagery-based techniques on voluntary autobiographical memory. The review integrated findings from basic cognitive research and analogue clinical experiments to determine when and how imagery affects memory accuracy, confidence, or content. Studies were coded along four moderator domains: (1) sample characteristics (e.g., age, clinical status), (2) memory characteristics (e.g., valence, personal vs. fictitious), (3) intervention features (e.g., technique, suggestiveness, timing), and (4) outcome type (e.g., accuracy, confidence, memory change). The review addressed the gap between laboratory-based memory distortion research and clinical practice, where structured, autobiographically anchored imagery techniques are widely used. It aimed to clarify under which conditions imagery-based interventions pose risks to memory reliability – and under which they can be safely and effectively applied. The findings provide critical guidance for both therapists and legal stakeholders in managing the intersection of PTSD treatment and testimony integrity.

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# 2. Cumulative Publications of the Thesis

**Study I:**

# The Dilemma of Trauma-Focused Therapy: Effects of Imagery Rescripting on Voluntary Memory

This chapter is a post-peer-review, pre-copyedit version of an article published in *Psychological Research*.

Data, code, and supplementary materials are available online:

https://osf.io/x2c5u/?view_only=d7638bd261c44b70bbb8e6886a1a7859

**Ganslmeier, M.**, Kunze, A. E., Ehring, T., & Wolkenstein, L. (2023). The dilemma of trauma-focused therapy: effects of imagery rescripting on voluntary memory. *Psychological Research*, *87*(5), 1616-1631. https://doi.org/10.1007/s00426-022-01746-z

The final authenticated version is available online:

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**Abstract**

Trauma-focused imagery-based interventions are suspected to alter or even distort declarative voluntary memory of a traumatic event, especially if they involve the active modification of imagery, e.g., as used in imagery rescripting (ImRs). However, systematic research is lacking so far. To investigate whether ImRs modifies voluntary memory of a standardized autobiographical aversive event (Trier Social Stress Test) (Session 1), healthy participants (*N* = 100) were randomly assigned to either an intervention condition receiving one session of ImRs or to a no-intervention control condition (NIC) (Session 2). Voluntary memory was examined using a free recall (Sessions 2 and 3) and a cued recall (Sessions 3 and 4). Although voluntary memory tended to deteriorate over time, contrary to expectations, this effect was not associated with ImRs. Remarkably, the number of correct details in free recall even improved in ImRs but not in NIC. This challenges the view that ImRs alters voluntary memory.

## Introduction

Post-traumatic stress disorder (PTSD) is a prevalent and disabling disorder triggered by traumatic experiences, such as experiencing physical or sexual violence, and often requires psychological treatment (McCart et al., 2010). If survivors decide to sue the offender during or after therapy, the credibility of their testimony may be evaluated by eyewitness experts (Otgaar, de Ruiter, et al., 2017), and can include an assessment of whether the testimony could constitute a *false memory*, i.e., a memory that feels subjectively to be based on a true event but cannot be attributed to an actual experience (Brainerd et al., 2008). Since the 1990s, it has been commonly assumed that psychological interventions may distort declarative memory and might even be involved in the creation of false memories (Lindsay & Read, 1994; Porter et al., 2012). Trauma-focused cognitive behavioral therapy is the current gold standard treatment for PTSD and often includes imagery-based interventions (Courtois et al., 2017; Cusack et al., 2016; Weber et al., 2021) which have been suggested to carry a risk of distorting memory or even inducing (false) memories (Brainerd & Reyna, 2005; Ridley et al., 2012). Since narratives of false and true memories do not systematically differ from each other (Blandón-Gitlin et al., 2009), in the absence of objective information there is no evidence-based method to reliably distinguish between them. Thus, it is frequently assumed by courts and their expert witnesses that the credibility of a trauma survivor who has received imagery-based trauma-focused treatment can no longer be determined and is therefore regarded as potentially impaired (Finer, 1996; Otgaar, Howe, Muris, et al., 2019). Hence, lawyers often advise victims not to begin trauma-focused therapy before criminal proceedings are concluded (Bublitz, 2020). This leaves patients and therapists with the dilemma of having to choose between a patient's psychological well-being and the maintenance of credibility and the associated likelihood of legal success (Bublitz, 2020).

The assumption that imagery-based trauma-focused interventions can distort the declarative *voluntary*[1] memory of a traumatic event – which includes knowledge of facts and trauma episodes that are recalled deliberately when one decides to recount the trauma (Visser et al., 2018) – is based on evidence that human memory is dynamic. After encoding and consolidation, a memory becomes temporarily unstable upon reactivation (Kindt et al., 2009; Nader et al., 2000), allowing new information to be integrated into the existing memory trace (Moscovitch et al., 2005). During this reconsolidation phase, the content of the memory might temporarily be susceptible to interference, as factually incorrect information could also be integrated (Scully et al., 2017).

Analogue studies with healthy samples have shown that imagination may be particularly potent in altering memories. In these studies, three main experimental paradigms have been used to simulate possible therapy-induced biases in autobiographical memory: (1) imagination inflation paradigm, in which participants were asked to repeatedly imagine events that they actually have not experienced or (2) false feedback paradigm, in which participants are given false information (e.g., manipulated photos or videos) indicating that they likely experienced an event or (3) memory implantation paradigm, in which the presumed occurrence of an event that did not happen is supported, for example, by false statements by family members (Brewin & Andrews, 2017). Both familiar and usual (e.g., rest on the fire hydrant) as well as bizarre and unusual (e.g., shake hands with the fire hydrants) events were used. Afterwards participants were asked to rate how likely the event has occurred. Results show that imagery can induce and increase subjective confidence that imagined events have actually taken place (Goff & Roediger, 1998; Nash et al., 2009; Seamon et al., 2009; Thomas & Loftus, 2002). Even when participants were warned about the

[1]*Declarative voluntary* memory is abbreviated as *voluntary* memory in the following.

interfering effects of imagination in advance, imagery still increased the false confidence that certain actions had been performed (Nash et al., 2009). The proposed mechanism for this effect has been assumed to be that imagining an event (in all sensory modalities) is experienced and processed in a manner very similar to the sensory-perceptual representation of an actual event, including an overlap in activated brain areas (Holmes & Mathews, 2010).

Based on these findings from basic memory research, expert witnesses have proposed that imagery-based psychological treatment can have the same effect and can therefore result in altered or even false memories that are experienced as genuine experiences (Volbert & Steller, 2014). This may be particularly true for interventions such as imagery rescripting (ImRs), which is a promising intervention used to treat maladaptive and traumatic memories (Arntz & Weertman, 1999; Holmes et al., 2007). Therefore patients are instructed to imagine counterfactual events, i.e., changing the traumatic event into a more benign and less distressing mental image by integrating new information and helpful perspectives (Smucker et al., 1995). Specifically, during ImRs the original memory is first reactivated, which makes it accessible for modification (Arntz, 2012). In a second step, new information that has not happened in reality is actively integrated into the mental image of the memory (Arntz, 2012; Smucker et al., 1995). For example, a PTSD patient may rewrite memories of a sexual assault into a new script that involves successfully defending against the offender or rescuing the victim. ImRs has been shown to be effective in reducing symptom severity in PTSD (Morina et al., 2017).

When comparing imagery-based psychological interventions, such as ImRs, with the experimental manipulations used in the basic memory studies described above (Goff & Roediger, 1998; Nash et al., 2009; Seamon et al., 2009; Thomas & Loftus, 2002), it becomes clear that both indeed include strategies to actively modify memory representations. However, a number of differences are also noteworthy. First, in the analogue studies, memory traces of very short, personally non-relevant events are typically manipulated, whereas ImRs is applied to autobiographical memories of highly emotional aversive and/or traumatic events. As there is an association between emotional intensity during retrieval and strength of autobiographical memories (i.e., tend to be remembered longer, with greater vividness and a greater sense of recollection) (Talarico et al., 2004), this could be crucial. Second, in analogue studies participants are kept unclear about the goal of the manipulation, and the setting is deliberately designed to make it difficult to distinguish between the original and the altered experience. Additionally, instructions often explicitly requested additional details (i.e., imagining events that supposedly took place) or suggested a fictional context (i.e., false testimony of family members or faked photos). In ImRs, however, the integration of new information into the memory is made very salient, i.e., when entering the rescripting phase, the patient is informed that imagery is now used to deviate from the original memory. Besides, patients mainly decide for themselves what they imagine to change the meaning and/or the emotional experience of the memory in order to reduce the intrusive involuntary re-experiencing. Unlike basic memory studies, ImRs does not necessarily add plausible or similar information that might make it difficult for subjects to distinguish between imagined and experienced content because of the similarity in content.

Despite the procedural differences described above, it remains unclear whether ImRs can inadvertently affect patients’ factual knowledge and/or voluntary recollection of the original aversive event. So far, only two studies have addressed this issue. Using an aversive film as trauma analogue, both studies found that ImRs did not impair factual knowledge of the film when compared to active (i.e., positive imagery of a personal, pleasant experience) (Hagenaars & Arntz, 2012) or no-intervention control conditions (Siegesleitner et al., 2019). However, these results are limited in that the studies did not primarily aim to examine the effects of ImRs on voluntary memory and, therefore, lack methodological rigor to draw conclusions about such effects.

The main goal of the current study was to use an experimental analogue design to investigate to what extent ImRs changes autobiographic voluntary memory. In contrast to the aforementioned analogue studies testing the effects of ImRs on selected variables assessing voluntary memory as secondary outcomes (Hagenaars & Arntz, 2012; Siegesleitner et al., 2019), this is the first study directly addressing this research question. The methodology was adapted accordingly. First, although the trauma film paradigm has proven to effectively induce analogue PTSD symptoms (James et al., 2016), the autobiographical quality of the memory is missing when using a film as the stressor (Dibbets & Schulte-Ostermann, 2015). Hence, we used an adapted version of the Trier Social Stress Test (TSST) to induce a standardized but aversive autobiographical experience. Second, voluntary memory was assessed more comprehensively (e.g., using a larger number of cued recall items; adding a free recall task). Third, in addition to short- and mid-term effects we added a three-month follow-up to additionally investigate long-term memory changes. Lastly, the interval between aversive autobiographical experience and intervention was expanded to ensure sufficient time for consolidation.

Based on the theoretical ideas and empirical findings underlying current legal practice, we hypothesized that ImRs (compared to a no-intervention control) would lead to more false details and less details recalled correctly.

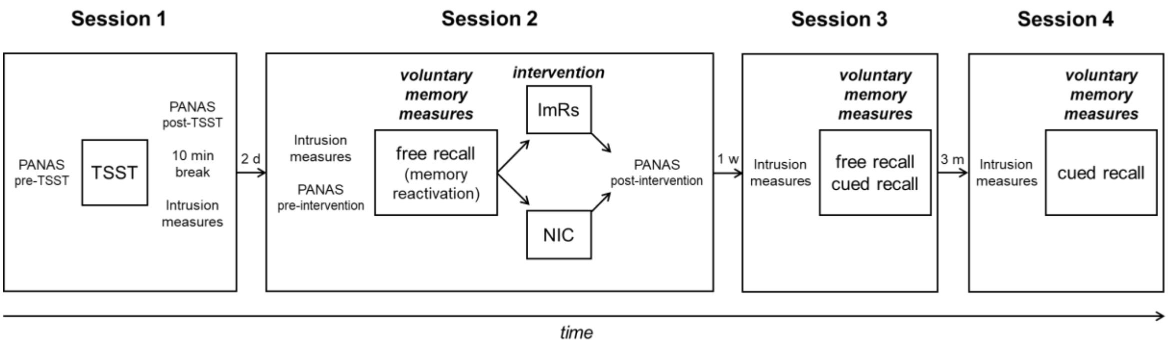
# Method

## Overview

The study comprised four sessions (see Figure 1.1). During Session 1, participants completed the TSST. Session 2 followed two days later and included the free recall and the intervention (ImRs vs. NIC). One week later (Session 3), voluntary memory was measured by a second free recall and a first cued recall. After three months (Session 4) the cued recall was repeated. To avoid carry-over effects between the tasks, cued recall was only assessed after the completion of both free recalls. The first three sessions were conducted in the laboratory. For Session 4, participants were contacted via e-mail and asked to fill in an online questionnaire (using the online survey software *Unipark*). Due to the online format, we could not repeat the free recall in Session 4.

**Figure 1.1**

*Experimental Procedure*




*Note.* PANAS = Positive and Negative Affect Schedule (Krohne et al., 1996); TSST = Trier Social Stress Test (Kirschbaum et al., 1993); ImRs = intervention condition: participants received ImRs as an intervention; NIC = no-intervention control condition: participants waited 15 minutes in front of the laboratory.

## Participants

Participants were recruited via announcements on social media, a student e-mail newsletter and public postings. We included university students meeting the following inclusion criteria: (1) age between 18 and 30 years, and (2) fluency in German. In addition, the following exclusion criteria were applied: (1) current psychological disorder (German version of the Mini-International Neuropsychiatric Interview [M.I.N.I.]; Ackenheil et al., 1999) or severe neurological disorder, (2) current psychological treatment, (3) consumption of illegal drugs within the last three days, or (4) alcohol consumption of more than three glasses of beer, wine, cocktails or hard liquor within the last 24 hours before the experiment. A total of 124 students were assessed for eligibility. Sixteen participants had to be excluded. In addition, six participants dropped out after Session 1, and two dropped out after Session 2. Thus, total sample size was $N = 100$ (71% female; age: $M = 22.18$, $SD = 3.05$). Participants were randomly allocated to one of two experimental conditions: ImRs ($n = 50$) or no-intervention control (NIC) ($n = 50$).

An a priori power analysis was carried out with G*Power (Faul et al., 2009) for sample size planning. Based on prior research (e.g., Garry et al., 1996; Horselenberg et al., 2000) we assumed the effect of imagery on voluntary memory to be of medium size ($f$ = 0.25). With $\alpha = .05$ and a statistical power of .80, it was necessary to enroll 34 participants to detect a Condition × Time interaction and 98 participants to detect a main effect of Condition or Time on voluntary memory as measured by free and cued recall (2 [Condition] × 2 [Time] ANOVAs).

Participants provided written informed consent and were reimbursed with either € 8 per hour or course credits. The study was approved by the local Research Ethics Committee (66_Wolkenstein_b).

## Materials

### *Trier Social Stress Test*

We used an adapted version of the Trier Social Stress Test (TSST; Kirschbaum et al., 1993) to induce a negative autobiographical memory (van der Zweerde, 2014). The TSST lasted approximately 15 min and comprised three tasks in front of a committee consisting of two females. First, participants were instructed to imagine having a job interview for a position they would really like to have. They had 3 min to prepare a presentation about their strengths and weaknesses to show why they are the perfect candidate for the position.

Afterwards, the committee members entered the room, sat down at a table and asked the participants to start their presentation, which then lasted 5 min. Second, participants were asked to do an arithmetic task (counting backwards from 1310 in steps of 13) for 3 min. As soon as participants made a mistake, they were interrupted and asked to start over. Third, they were asked to sing out loud the German version of the four-verse children's song *All my little ducklings*.

In order to enable voluntary memory tests later-on, members of the committee wore standardized clothing and followed a standardized protocol, specifying when to take notes, when to interrupt participants and how to provide standardized negative feedback (e.g., asking them to speak louder, count faster, sing more melodiously). They maintained a serious facial expression throughout the procedure. Furthermore, participants were told that the interview would be recorded on camera and that the committee was trained in the analysis of non-verbal behavior (neither of these elements was actually true and only told to participants to increase their stress induction).

***Intervention***

**Imagery Rescripting (ImRs).** Since ImRs usually involves memory reactivation first, in this design the free recall (see Measures section) immediately preceding ImRs was used for memory reactivation in order to initiate reconsolidation processes (detailed instructions are provided in Appendix A, S1). This was followed by the actual ImRs, for which a modified script adapted from the procedure developed by Arntz and Weertman (1999) was used (detailed instructions are provided in Appendix A, S2). First, participants were asked to name and briefly describe the most distressing moment during the TSST (hotspot). They were then instructed to close their eyes and reactivate and imagine the scene as vividly as possible from the start of the TSST up to the identified hotspot. They were asked to describe the scene in the present tense and using first person singular, including all sensory, emotional and physical sensations that occurred.

As soon as they had reached the hotspot, the investigators instructed participants to change the script in their imagination in order to achieve an outcome for the scene that was less stressful for them. Participants were told that the changed script could include events that could possibly happen as well as events that are not possible in reality. The investigators accompanied the participant during the imagination exercise by asking in-depth questions, e.g., about the location, people present in the situation, and about sensory perceptions, thoughts and body sensations. As soon as the participants indicated that the outcome of the situation felt comprehensively good to them, ImRs was concluded (duration [minutes]: $M$ = 16.32, $SD$ = 6.16).

ImRs was recorded on tape and the recording was given to the participants. In analogy to the use of ImRs in psychological treatment, they were instructed to listen to the recording three times before Session 3 (Smucker et al., 1995).

**No-Intervention Control Condition (NIC).** Participants in the control condition did not receive ImRs or any other intervention. They had a 15-min break, in which they sat outside the laboratory room.

## Measures

### *Voluntary Memory Measures*

Voluntary memory was assessed in two ways, using both free recall (in order to assess memory in a broad, complex and individual manner), and cued recall (to assess concrete and specific details).

**Free Recall.** A free recall task was used to assess possible changes in voluntary memory of the TSST that can be attributed to ImRs. The first free recall task took place in Session 2 and was repeated in Session 3.

Using a standardized script (for detailed instructions, see Appendix A, S1), participants were instructed to imagine their experience of the TSST and to verbally report their memory of the TSST as accurately and in as much detail as possible. As in ImRs, they were asked to close their eyes and to describe their experience in the first person singular and in the present tense as if they were experiencing it at that very moment. They were asked to continue describing the scene until they themselves decided that the scene was complete (duration [minutes]: Session 2: $M = 7.65$, $SD = 4.66$; Session 3: $M = 7.40$, $SD = 4.51$). The report was audio recorded, transcribed, and rated to analyze changes in voluntary memory. Changes in the content of voluntary memory were evaluated using a standardized protocol-based rating procedure adapted from Levine et al. (2002) and Jack et al. (2014). For this purpose, each free recall was segmented into informational details (adapted from Levine et al., 2002). A detail was defined as a unique event, observation, or thought, usually expressed as a grammatical clause (i.e., a subject and verb: "*I count backwards*"). Additional information (e.g., "*from 1310*") was scored separately (e.g., "I count backwards *from 1310*"). There were two broad groups of details: *internal* (specific to the time and place of the TSST, reflecting episodic reexperiencing) and *external* (not specific to the time and place of the TSST, semantic knowledge, repetitions, other details, retrospective appraisals). Internal details were divided into the following five exclusive categories: (a) event (e.g., "*I sing…*"), (b) place (e.g., "*to the right of the table*"), (c) time (e.g., "*then*", "*3 minutes*"), (d) perception (e.g., "*I see the camera*"), and (e) emotion/thought (e.g., "*I feel angry*", "*I think that they are really unfriendly*") (see Appendix A, S3).

The ratings were conducted by two independent raters, who were blind to the condition. Based on criteria suggested by Koo and Li (2016), interrater reliability, measured by intraclass correlations (ICC), was excellent for $ICC_{event}$ (1, 1) = .95, $ICC_{time}$ (1, 1) = .97

and $ICC_{emotion/thought}$ (1, 1) = .97. It was good for $ICC_{place}$ (1, 1) = .82, $ICC_{perception}$ (1, 1) = .87 and $ICC_{externals}$ (1, 1) = .78.

Following Jack et al. (2014), all internal details belonging to the categories (a) to (d) were rated as *correct* (if they represented details that had been present during the TSST) or *incorrect* (if they represented details that had *not* been present during the TSST). Details that could not be clearly classified as correct or incorrect (due to lack of video recording) were evaluated as *possible* (e.g., I leaned on the chair). Details belonging to the emotion/thought category were not rated as correct or incorrect because it could not be objectively judged what participants had been thinking or feeling during the TSST (see Appendix A, S3).

Ratings of correct vs. possible vs. incorrect details were also conducted by two independent raters, who were blind to the condition. Intraclass correlations (ICC) were excellent for $ICC_{correct\ details}$ (1, 1) = .95 and $ICC_{possible\ details}$ (1, 1) = .93. It was good for $ICC_{incorrect\ details}$ (1, 1) = .75.

Based on the ratings, sum scores were computed for (a) number of correct details, (b) number of incorrect details, and (c) total number of details provided (i.e., number of all internal and external details provided). The latter was used to control for the overall verbal output in subsequent analyses evaluating free recall.

**Cued Recall.** During Sessions 3 and 4, participants performed a cued recall test. The task was designed to include questions equivalent to those asked during an interrogation by the police (Hermanutz & Schröder, 2015), such as questions about the location (e.g., "*Please name all pieces of furniture, furnishings and living accessories that you remember.*"; correct answers: *table, chairs, lamp, picture, plant, curtain, flipchart:* incorrect answers: *all other, e.g., things that were not in the room, such as folders*), the characteristics of the people involved (e.g., "*What colors were the jury members' tops?*"; correct answers: *black, red;* incorrect answers: *all other*), and the procedure of the TSST (e.g., "*What were you asked to* *talk about during the presentation?*"; correct answers: *strengths and weaknesses / character traits*; incorrect answers: *all other*). The cued recall comprised a total of 33 questions (for the detailed cued recall, see Appendix A, S4). Two independent raters, who were blind to the condition, analyzed and rated the answers. They counted correct answers, incorrect answers, and the answering option "*I do not know*", which was one answering option of each cued recall item to avoid guessing. Interrater reliability measured by intraclass correlation (ICC) was excellent for the cued recall task: $ICC_{correct}$ (1, 1) = .99, $ICC_{I\ do\ not\ know}$ (1, 1) = .99, $ICC_{incorrect}$ (1, 1) = .97.

### *Manipulation Check*

Participants filled in the Positive and Negative Affect Schedule (PANAS; German version: Krohne et al., 1996) immediately pre- and post-TSST to assess whether the TSST was experienced as stressful. They also completed the PANAS immediately pre- and post-intervention to assess the effect of the intervention on participants mood. The PANAS consists of two scales (positive and negative affect) with ten items each. Participants indicated to what extent each of the affective states applied to them at the moment on a 5-point Likert scale (1 = *not at all*; 5 = *extremely*). Sum scores were calculated for each scale and measurement time. Internal consistencies were acceptable or good for both positive (pre-TSST: α = .87; post-TSST: α = .89; pre-intervention: α = .88; post-intervention: α = .92) and negative affect (pre-TSST: α = .86; post-TSST: α = .86; pre-intervention: α = .83; post-intervention: α = .77).

In all four sessions the occurrence of intrusions related to the TSST was assessed using a questionnaire (intrusion measures) similar to those used in paper tabular diaries (James et al., 2015). Participants indicated how often they had experienced intrusive memories after the TSST, the percentage of time (from 0 to 100) they had experienced them and – if they reported at least one intrusive memory – how stressful, controllable and vivid they experienced the intrusions (0 = *not at all* to 100 = *very much*).

***Control Variables***

We assessed general memory performance by the Verbal Learning and Memory Test (VLMT; Helmstaedter & Durwen, 1990) and social anxiety using the Social Interaction Anxiety Scale (SIAS; Stangier et al., 1999) and the Social Phobia Scale (SPS; Stangier et al., 1999) (see Table 1.1).

In addition, participants were asked whether they had gone through the TSST experience repeatedly, e.g., by talking to others or writing a diary (*yes* vs. *no*), and whether they had ever experienced a similar event before (*yes* vs. *no*). Sleep duration and quality after Session 2 and during the last week was also surveyed.

**Table 1.1**

*Means (M) and Standard Deviations (SD) of Sociodemographic and Control Variables*

| Variables | Condition: ImRs ($n$ = 50) | Condition: NIC ($n$ = 50) | Statistics | $p$ |
|---|---|---|---|---|
| Sociodemographic variables | *M (SD)* | *M (SD)* | | |
| Age | 22.24 (3.22) | 22.12 (2.90) | $t(98) = -0.20$ | .85 |
| Number of years of education | 15.06 (3.72) | 14.65 (3.07) | $t(98) = -0.60$ | .55 |
| | % | % | | |
| Gender (female) | 72 | 70 | $\chi^2(1) = 0.05$ | 1.00 |
| Lifetime mental illness (yes)[a] | 4.2 | 0.00 | | .12[b] |
| Lifetime psychotherapeutic/psychiatric treatment (yes) | 4 | 6 | $\chi^2(1) = 0.44$ | .74 |
| Control variables | *M (SD)* | *M (SD)* | | |
| Memory: learning performance (VLMT) | 57.88 (6.13) | 59.70 (8.34) | $t(98) = 1.24$ | .22 |
| Memory: consolidation (VLMT) | 0.62 (2.06) | 1.12 (1.98) | $t(98) = 1.24$ | .22 |
| Memory: recognition (VLMT) | 13.90 (1.22) | 14.02 (1.42) | $t(98) = 0.45$ | .65 |
| Social interaction anxiety (SIAS) | 20.48 (11.79) | 17.94 (11.59) | $t(98) = -1.09$ | .28 |
| Social performance anxiety (SPS) | 9.20 (7.60) | 7.26 (6.59) | $t(98) = -1.36$ | .18 |
| Sleep at night after Session 2: sleep duration (in hours)[c] | 7.42 (1.51) | 7.55 (0.83) | $t(88) = 0.47$ | .64 |
| Sleep at night after Session 2: sleep quality[c] | 1.89 (0.67) | 1.91 (0.42) | $t(76) = 0.15$ | .88 |
| Sleep during last week: sleep duration | 7.15 (0.83) | 7.27 (0.77) | $t(98) = 0.77$ | .44 |
| Sleep during last week: sleep quality | 2.00 (0.57) | 1.94 (0.55) | $t(98) = -0.54$ | .59 |
| | % | % | | |
| Sleep at night after Session 2: sleep normality (yes)[c] | 89.1 | 90.9 | | 1.00[b] |
| Sleep during last week: sleep normality (yes) | 80 | 76 | $\chi^2(1) = 0.23$ | .81 |
| Talked to sb. about TSST in the week after (yes) | 64 | 78 | $\chi^2(1) = 2.40$ | .19 |
| Wrote diary about TSST in the week after (yes)[d] | 0.00 | 0.00 | | |
| Ever had similar experience to TSST (yes) | 46 | 42 | $\chi^2(1) = 0.16$ | .84 |

*Note.* ImRs = intervention condition; NIC = no-intervention control condition; VLMT = Verbal Learning and Memory Test; SIAS = Social Interaction Anxiety Scale; SPS = Social Phobia Scale.

[a] ImRs ($n$ = 49); NIC ($n$ = 47).

[b] Fisher's exact test.

[c] ImRs ($n$ = 46); NIC ($n$ = 44).

[d] No calculation of the test statistic due to the constant value.

## Procedure

Session 1: After written informed consent was obtained, participants were screened for inclusion and exclusion criteria. Eligible participants were then tested for sociodemographic variables and control variables. This was followed by the PANAS pre-TSST, the TSST, and the PANAS post-TSST. After a 10-minute break, the first intrusion questionnaire was administered.[2]

Session 2: When participants returned to the laboratory, they were randomly assigned to one of two conditions (ImRs vs. NIC). Then, sleep quality and duration were assessed, and the intrusion questionnaire was administered for the second time. This was followed by the PANAS (pre-intervention) and the first free recall. After that, participants underwent the ImRs intervention (or the break), followed by the PANAS (post-intervention). At the end of the session, participants in the ImRs condition were instructed to listen to the audio recording of the intervention three times before Session 3.

Session 3: At the beginning, sleep quality and duration were collected again. This was followed by the intrusion questionnaire. Subsequently, the free recall was performed for the second time and the cued recall for the first time. In addition, participants were asked whether they had talked to others about the TSST or written a diary, and whether they had ever experienced a similar event before.

Session 4: The last survey took place online, and participants were sent a link to complete it at home. At the beginning, the intrusion questionnaire was presented for the fourth time. Following this, the cued recall was administered for the second time. Additionally, participants were asked about the supposed intention of the study. By means of a debriefing at the end of this session, participants were informed about the purpose and

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[2] Additionally, participants completed the Cognitive Emotion Regulation Questionnaire (CERQ; Loch et al., 2011), Difficulties in Emotion Regulation Scale (DERS; Ehring et al., 2013), Emotion Regulation Questionnaire (ERQ; Abler & Kessler, 2009), Stress Appraisal Measure (SAM; Delahaye et al., 2015), Multidimensional Mood Questionnaire (MMQ; Steyer et al., 1997), and the Heidelberg Form for Emotion Regulation Strategies (HFERST; Izadpanah et al., 2019) in Session 1. HFERST was repeated in Session 2, Session 3 and Session 4. SAM and MMQ were repeated in Sessions 3 and 4. However, these questionnaires are independent of the current research question and the results will be reported elsewhere. Therefore, for reasons of clarity, these measures will not be processed further in the present manuscript.

objectives of the study, and it was explained that they had not actually been recorded on video during the TSST.

The experimenter for Session 1 and Session 3 and participants were blind to the intervention condition. Session 2 was conducted by a clinical psychologist.

**Statistical Analyses**

Data analyses were conducted using SPSS (IBM SPSS Statistics, version 24). All hypotheses were tested two-sided with a significance level of $\alpha = .05$. Condition differences regarding sociodemographics and control variables were examined with independent *t*-tests and chi-square tests. We calculated 2 (Condition) × 2 (Time) ANOVAs to assess the effect of the TSST and the intervention, respectively, on participants' moods. Lastly, 2 (Condition) × 2 (Time) ANOVAs were used to assess the effect of the interventions on participants' free recall and cued recall.

The assumptions for parametric tests were checked. When testing differences of independent groups, following the recommendations of Bühner and Ziegler (2017), a *t*-test was still used in case of violation of the normal distribution assumption, a *t*-test for heterogeneous variances was used in case of variance heterogeneity, and the nonparametric *U*-test would have been used only in case of violation of one of the conditions in combination with an excess probability close to the significance threshold ($.04 < p < .06$) which was not the case in our data. As ANOVAs are considered robust to violations of the normal distribution assumptions (Harwell et al., 1992) and are less sensitive to variance heterogeneity (Field, 2013) when the groups are approximately equal in size, mixed ANOVAs were used even when the assumptions of normality and variance homogeneity were violated.

## Results

### Baseline Differences in Control Variables

The two conditions did not differ regarding any of the sociodemographic or control variables (see Table 1.1).

### Manipulation Check

#### *Trier Social Stress Test*

Descriptive statistics of the PANAS pre-TSST and post-TSST are presented in Table 1.2. To check whether the TSST was experienced as stressful for participants, two mixed 2 (Condition: ImRs vs. NIC) × 2 (Time: pre-TSST vs. post-TSST) ANOVAs were performed. Concerning negative affect, there was a main effect of time showing that negative affect was significantly higher post-TSST than pre-TSST, $F(1, 96) = 77.20$, $p < .001$, $\eta^2_p = .45$. There was neither a main effect of the Condition, $F(1, 96) = 1.84$, $p = .18$, $\eta^2_p = .02$, nor a Condition × Time interaction, $F(1, 96) = .05$, $p = .82$, $\eta^2_p = .001$. In contrast, positive affect did not change over time, $F(1, 96) = 1.70$, $p = .20$, $\eta^2_p = .02$. There was also no main effect of Condition, $F(1, 96) = .13$, $p = .72$, $\eta^2_p = .001$ and no interaction effect between Condition and Time, $F(1, 96) = 1.70$, $p = .20$, $\eta^2_p = .02$.

To test whether the TSST triggered intrusions, descriptive statistics of the intrusion measures were calculated and are presented in Table 1.3.

**Table 1.2**

*Means (M), Standard Deviations (SD), and Confidence Intervals (CI) of Positive and Negative Affect (PANAS) Pre- and Post-TSST for Both Conditions*

| | Condition | | | |
|---|---|---|---|---|
| | ImRs (*n* = 49) | | NIC (*n* = 49) | |
| PANAS | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI |
| Positive affect | | | | |
| pre-TSST | 30.10 (6.28) | [28.30; 31.90] | 30.49 (6.85) | [28.52; 32.46] |
| post-TSST | 30.38 (8.46) | [26.79; 30.81] | 28.80 (7.06) | [27.98; 32.78] |
| Negative affect | | | | |
| pre-TSST | 12.94 (4.25) | [11.72; 14.16] | 11.67 (2.31) | [11.01; 12.34] |
| post-TSST | 18.24 (7.31) | [16.14; 20.26] | 17.26 (5.27) | [15.88; 18.88] |

*Note.* ImRs = intervention condition; NIC = no-intervention control condition; PANAS = Positive and Negative Affect Schedule; TSST = Trier Social Stress Test.

**Table 1.3**

*Means (M), Standard Deviations (SD), and Confidence Intervals (CI) of Intrusion Measures at Sessions 1, 2, 3, and 4*

| | Total (*n* = 93) | |
|---|---|---|
| Intrusion measures | *M* (*SD*) | 95% CI |
| Number of intrusions | | |
| Session 1 | 3.09 (9.72) | [1.08; 5.09] |
| Session 2 | 2.19 (3.12) | [1.55; 2.84] |
| Session 3 | .86 (1.52) | [.55; 1.17] |
| Session 4 | 1.24 (2.40) | [.74; 1.73] |
| Percent of time with intrusions | | |
| Session 1 | 20.22 (24.49) | [15.17; 25.26] |
| Session 2 | 9.25 (12.87) | [6.60; 11.90] |
| Session 3 | 4.41 (8.40) | [2.68; 6.14] |
| Session 4 | 5.05 (11.86) | [2.61; 7.49] |
| Vividness of intrusions | | |
| Session 1 | 23.12 (27.86) | [17.38; 28.86] |
| Session 2 | 15.81 (20.13) | [11.66; 19.95] |
| Session 3 | 9.78 (19.34) | [5.80; 13.77] |
| Session 4 | 8.92 (15.64) | [5.70; 12.14] |
| Distress of intrusions | | |
| Session 1 | 19.14 (25.86) | [13.81; 24.47] |
| Session 2 | 11.83 (17.75) | [8.17; 15.48] |
| Session 3 | 5.70 (13.78) | [2.86; 8.54] |
| Session 4 | 6.88 (16.55) | [3.47; 10.29] |
| Controllability of intrusions | | |
| Session 1 | 40.43 (39.56) | [32.28; 48.58] |
| Session 2 | 45.27 (40.96) | [36.83; 53.70] |
| Session 3 | 23.87 (37.10) | [16.23; 31.51] |
| Session 4 | 26.77 (38.11) | [18.93; 34.62] |

*Note.* Session 2: 2 days after Session 1; Session 3: 1 week after Session 2; Session 4: 3 months after Session 3.

### *Intervention*

To check whether the intervention had an influence on participants' positive and negative affect, two mixed 2 (ImRs vs. NIC) × 2 (pre-intervention vs. post- intervention) ANOVAs were performed. Descriptive statistics are presented in Table 1.4.

Looking at the positive affect pre- and post-intervention, the ANOVA showed a main effect of Time, $F(1, 97) = 24.78$, $p < .001$, $\eta^2_p = .20$ and a main effect of Condition, $F(1, 97) = 4.65$, $p = .03$, $\eta^2_p = .05$. These were qualified by an interaction effect of Condition and Time, $F(1, 97) = 22.34$, $p < .001$, $\eta^2_p = .19$. As shown in Table 1.4, positive affect increased after ImRs, $t(48) = -5.86$, $p < .001$, $d = .84$, but not after NIC, $t(49) = -.18$, $p = .86$, $d = .02$.

For negative affect, the ANOVA yielded no main effect of Condition, $F(1, 97) = 2.86$, $p = .09$, $\eta^2_p = .03$, no main effect of Time, $F(1, 97) = .001$, $p = .98$, $\eta^2_p = .00$, and no interaction effect between Condition and Time, $F(1, 97) = .30$, $p = .58$, $\eta^2_p = .003$.

**Table 1.4**

*Means (M), Standard Deviations (SD), and Confidence Intervals (CI) of Positive and Negative Affect (PANAS) Pre- and Post-Intervention for Both Conditions*

| | Condition | | | |
|---|---|---|---|---|
| | ImRs (*n* = 49) | | NIC (*n* = 50) | |
| PANAS | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI |
| Positive affect | | | | |
| pre-intervention | 27.71 (6.22) | [25.93; 29.50] | 27.26 (6.82) | [25.32; 29.20] |
| post-intervention | 32.53 (7.81) | [30.29; 34.77] | 27.36 (6.85) | [25.41; 29.31] |
| Negative affect | | | | |
| pre-intervention | 13.04 (3.97) | [11.90; 14.18] | 11.96 (2.08) | [11.36; 12.55] |
| post-intervention | 12.88 (3.78) | [11.79; 13.96] | 12.14 (2.01) | [11.57; 12.71] |

*Note.* ImRs = intervention condition; NIC = no-intervention control condition; PANAS = Positive and Negative Affect Schedule.

**Free Recall**

Descriptive statistics for correct and incorrect details are presented in Table 1.5. The effect of the intervention on voluntary memory measured by free recall was investigated by two mixed 2 (ImRs vs. NIC) × 2 (Session 2 vs. Session 3) ANOVAs for the number of correct and incorrect details. Additionally, to control whether the length of the free recall differed between conditions, a further ANOVA with the same factors was run for the total number of reported details.

Looking at the number of correct details, there was a significant main effect of Time, $F(1, 97) = 23.99$ $p < .001$ , $\eta^2_p = .20$, but no significant main effect of Condition, $F(1, 97) = 2.36$, $p = .13$, $\eta^2_p = .02$. The Time effect was qualified, however, by a significant Time × Condition interaction, $F(1, 97) = 13.28$, $p < .001$ , $\eta^2_p = .12$. Whereas the number of correctly remembered details increased following ImRs, $t(49) = -5.96$, $p < .001$, $d = .84$, there was no significant change in the number of correctly remembered details in NIC over time, $t(48) = -.90$, $p = .37$, $d = .13$.

Looking at incorrect details, the ANOVA yielded neither a significant main effect of Time, $F(1, 97) = .17$, $p = .68$ , $\eta^2_p = .002$, nor a significant main effect of Condition, $F(1, 97) = .00$, $p > .99$ , $\eta^2_p = .00$, nor a Time × Condition interaction, $F(1, 97) = .78$, $p = .38$ , $\eta^2_p = .01$.

To control for the total verbal output, we also compared the total details of Sessions 2 and 3. Descriptive statistics are also presented in Table 1.5. The ANOVA yielded neither a significant main effect of Time, $F(1, 97) = .58$, $p = .45$, $\eta^2_p = .01$, nor a significant main effect of Condition, $F(1, 97) = 2.61$, $p = .11$, $\eta^2_p = .03$, nor a Time × Condition interaction, $F(1, 97) = 3.90$, $p = .05$, $\eta^2_p = .04$.

**Cued Recall**

Descriptive results for the cued recall task are shown in Table 1.5. The effect of the intervention on voluntary memory measured by a cued recall test was examined by three mixed 2 (ImRs vs. NIC) × 2 (Session 3 vs. Session 4) ANOVAs for the sum scores for correct, incorrect and "*I do not know*" answers.

Looking at the number of correctly remembered features in the cued recall, we found a significant main effect of Time, indicating that the number of correctly remembered details decreased from Session 3 to Session 4 in both conditions, $F(1, 94) = 73.11$, $p < .001$, $\eta^2_p = .44$. There was neither a significant main effect of the Condition, $F(1, 94) = 0.01$, $p = .93$, $\eta^2_p = .00$, nor a significant Time × Condition interaction effect, $F(1, 94) = 0.19$, $p = .67$, $\eta^2_p = .002$.

The ANOVA for the number of incorrect details also showed a significant effect of Time, $F(1, 94) = 5.24$, $p = .02$, $\eta^2_p = .05$, indicating that the number of incorrect remembered details significantly increased over time in both conditions. Again, the main effect of Condition, $F(1, 94) = 0.19$, $p = .67$, $\eta^2_p = .002$, and the Time × Condition interaction, $F(1, 94) = 0.09$, $p = .77$, $\eta^2_p = .001$, were not significant.

Similarly, the number "*I do not know*"-answers increased between Session 3 and 4 for both conditions, $F(1, 94) = 41.19$, $p < .001$, $\eta^2_p = .31$. Again, the effect of Condition, $F(1, 94) = 0.31$, $p = .58$, $\eta^2_p = .003$, and the Time × Condition interaction, $F(1, 94) = 0.001$, $p = .97$, $\eta^2_p = .00$, were not significant.

**Table 1.5**

*Means (M), Standard Deviations (SD), and Confidence Intervals (CI) of the Results for Free Recall at Sessions 2 and 3 and Cued Recall for Sessions 3 and 4*

| | Condition | | | |
|---|---|---|---|---|
| | ImRs (*n* = 50) | | NIC (*n* = 49) | |
| Free recall | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI |
| Number of correct details | | | | |
| Session 2 | 34.00 (12.49) | [30.45; 37.55] | 33.04 (12.39) | [29.48; 36.60] |
| Session 3 | 40.26 (11.41) | [37.02; 43.50] | 33.96 (12.92) | [30.25; 37.67] |
| Number of incorrect details | | | | |
| Session 2 | 3.02 (2.44) | [2.33; 3.71] | 3.24 (2.98) | [2.39; 4.10] |
| Session 3 | 3.14 (2.72) | [2.05; 3.79] | 2.92 (3.03) | [2.37; 3.91] |
| Total number of details | | | | |
| Session 2 | 123.84 (54.38) | [107.91; 139.77] | 112.51 (59.11) | [96.41; 128.61] |
| Session 3 | 132.10 (45.58) | [116.99; 147.21] | 108.84 (61.13) | [93.57; 124.10] |
| | ImRs (*n* = 49) | | NIC (*n* = 47) | |
| Cued recall | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI |
| Correct answers | | | | |
| Session 3 | 30.90 (5.14) | [29.42; 32.37] | 30.60 (5.83) | [28.88; 32.31] |
| Session 4 | 26.78 (5.61) | [25.16; 28.39] | 26.87 (7.22) | [24.75; 28.99] |
| Incorrect answers | | | | |
| Session 3 | 7.71 (3.40) | [6.74; 8.69] | 8.17 (3.55) | [7.13; 9.21] |
| Session 4 | 8.82 (5.03) | [7.37; 10.26] | 9.02 (4.90) | [7.58; 10;46] |
| "*I do not know*" | | | | |
| Session 3 | 6.86 (3.13) | [5.96; 7.76] | 6.38 (3.67) | [5.31; 7.46] |
| Session 4 | 9.65 (4.39) | [8.39; 10.91] | 9.21 (6.50) | [7.31; 11.12] |

*Note.* ImRs = intervention condition, NIC = no-intervention control condition; Session 2: 2 days after Session 1; Session 3: 1 week after Session 2; Session 4: 3 months after Session 3.

## Discussion

This study investigated the effect of ImRs on voluntary memory of an aversive autobiographical event in a healthy sample. Given the scarcity of studies in this area, the findings contribute to the debate about whether trauma-focused imagery-based interventions diminish memory accuracy of autobiographical (traumatic) events.

Contrary to expectations, ImRs did not increase the number of incorrect details reported in the free recall. However, we observed that the number of correct details reported in free recall increased in ImRs compared to the number reported in NIC. Hence, free recall findings did not support the assumption that ImRs deteriorates autobiographical memory, but instead suggest that the validity of voluntary autobiographic memory might even *improve* as a result of ImRs.

Results of the cued recall did not show any differential effects between conditions. However, participants' memory performance decreased over time in both conditions (i.e., increase in incorrect answers, decrease in correct answers). This was paralleled by a decrease in cued recall performance (i.e., higher number of features not remembered) in both conditions over the three-month follow-up period. These findings of memory deterioration over time across tasks are most likely due to normal forgetting processes (MacLeod, 2002).

Although some researchers (Brainerd & Reyna, 2005; Volbert & Steller, 2014) have claimed that most guided imagery-based techniques are similar to false memory procedures, taken together, we did not find evidence that ImRs distorts voluntary memory. According to the Source Monitoring Framework (Johnson, 2006; Johnson et al., 1993), imagined events may be mistaken for actual events if these events share some similarity with each other. Hence, if individuals are guided by ImRs to rescript imagined scenarios that are rich in perceptual details and emotional valence, it is conceivable that this may induce the belief that the imagined scenarios have actually taken place. However, our study does not support this assumption. Foley et al. (2006) assume that the extent of memory distortions depends very much on the characteristics of the instructions used for the imagery script. Their results suggest that it is mainly the source of the imagery script (oneself or another person) that affects reports of false memories. They observed a reduction in the error rate when participants generated the content of the imagery themselves. This was mainly the case in the intervention group of our study and may explain our results. If this result can be replicated, careful attention should be paid to the extent to which participants control their own imagery scripts in ImRs. In clinical practice, it is occasionally the therapist who initially performs rescripting, especially in childhood trauma and in more severe patients. According to the results and considerations of Foley et al. (2006), this might be critical. Our results may provide preliminary evidence that it is less critical to let the patients themselves be the authors of the rescripting in the first place. Moreover, transferring the results of Karanian et al. (2020), who warned individuals about the threat of misinformation by a simple warning and thus were able to reduce misinformation effects, it seems crucial to inform patients about the rational and the procedure of ImRs in detail before starting the rescripting process (i.e., to make the difference between reality and the script explicit and transparent).

The assumption that source errors are more likely when imagery is generated unintentionally than when it is generated intentionally is consistent with the view of the Source Monitoring Framework. Enhanced cognitive operations associated with a memory can make participants aware that the change was internally generated and thus facilitate discrimination (Henkel & Carbuto, 2008). Since ImRs involves making the integration of new information into memory salient, the active generation of script changes by participants may also make them more likely to encode and remember the cognitive operations of the ImRs procedure, which may prevent the memory from distorting. This also fits with the idea that ImRs rather builds up new memory representations than distorting existing ones. According to the ideas on working mechanisms (Arntz, 2012; Arntz & Weertman, 1999) ImRs is supposed to change the meaning of the fear memory (i.e., reevaluates the UCS representation) by forming a new less-distressing memory representation and is not supposed to replace or erase the factual details of the original memory representation. Following the retrieval competition hypothesis (Brewin, 2006), it could also be assumed that ImRs does not directly alter symptomatic semantic or episodic memories, but creates competing representations that integrate new positive elements into existing negative material (Brewin et al., 2010). If this process is successful, a sufficiently positive memory representation that neutralizes existing negative emotions and is sufficiently memorable wins the retrieval competition with the original negative and stressful representation (Brewin et al., 2009).

Moreover, our findings indicate that ImRs might even lead to an improved memory. The revised Dual Representation Theory (Brewin et al., 2010) provides a possible explanation for this finding. It states that two different types of memory representation are encoded during a traumatic event: (1) a sensory and emotion-laden representation of the traumatic event (S-rep), and (2) a more abstract structural representation that only includes a subset of the sensory input along with contextual information (C-rep). While in healthy memory C-rep is voluntarily accessible and tightly associated with S-rep, i.e., S-rep is retrieved via the associated C-rep, in trauma memory C-rep is either encoded only weakly or without the associated S-rep. Hence, the S-rep often is directly and involuntarily activated following trauma. ImRs, which includes retrieval of both the contextualized representations of the traumatic memory and the sensory-bound representations, might allow all relevant material in the sensory-bound representation to be fully contextualized by assigning it to a new and more elaborated, contextualized representation. Hence, it strengthens the association between these two types of memory representation, which might in turn support consolidation and improve the verbal accessibility of declarative memory (reflected by the increased number of correct memory details found in the current study).

However, as an active control was missing in our study, we cannot rule out the possibility that improved memory following ImRs was caused by the repeated listening to the recorded rehearsal of the memory activation part, which was not part of the NIC. This alternative and rather simple explanation is also indicated by a trend in the Time × Condition interaction towards an increase of the total number of details in free recall. This is in line with the results of Romano et al. (2020), who investigated the effects of ImRs on memory performance in social anxiety disorder. ImRs was compared with imaginal exposure (IE) and supportive counselling. Depending on the condition, the content of autobiographical memory representations changed in different ways: ImRs only promoted the increase of positive and neutral memory details, while IE promoted the increase of both positive, neutral and negative memory details, and supportive counselling did not induce any changes. The authors assume that the interventions each facilitated an increase in focused content, i.e. positive/neutral details in ImRs and both positive/neutral and negative details in IE, while there was no change in supportive counselling.

Our data could also be explained by findings from the Cognitive Interview literature. Nori et al. (2014) found that after interviewing with imagery, more correct information was remembered than after interviewing without imagery. In addition, as in our case, there was no increase in confabulations and false information following imagery. Nori et al. assume that the ability to remember a stimulus depends on the similarity between the way the stimulus is processed during encoding and the way it is processed during remembering. Even though in our study all participants had some imagery at least in free recall, the higher dose in ImRs may have a comparable effect. Accordingly, repeated imagery and associated reencoding (especially of sensory information) could facilitate a recall using imagery whereas it would not affect a pure verbal recall. This is in line with our results, showing that ImRs improved the free recall (in which participants were explicitly asked to imagine the TSST experience) whereas we found no group differences in the cued recall (in which participants were not instructed to imagine their experience). Since listening to audio recordings of ImRs sessions is not standard in many applications (at least not in all RCTs published to date), our results may also not be generalizable to all ImRs protocols. However, because of the higher dose due to listening, it is more likely that the effects of ImRs on voluntary memory are overestimated rather than underestimated.

The fact that ImRs did not deteriorate voluntary memory is in line with earlier studies looking at the effect of ImRs on voluntary memory in secondary analyses (Hagenaars & Arntz, 2012; Siegesleitner et al., 2019), and extends these results from studies using the trauma film paradigm to aversive *autobiographical* memories. Furthermore, this is the first study including a free recall task, which arguably shows a higher external validity than cued recall, and a three-month follow-up. In sum, results from the current study and the two earlier studies investigating the effects of ImRs on voluntary memory provide evidence that ImRs does not necessarily deteriorate (short- and long-term) voluntary memory. Preliminary results suggest that ImRs might even improve voluntary memory, but the latter finding is somewhat less consistent across studies.

The current findings compete with the wider basic memory literature showing that imagination can lead to distortions of voluntary memory (Garry et al., 1996; Goff & Roediger, 1998; Nash et al., 2009; Thomas & Loftus, 2002). Thus, although imagery-based interventions *can* lead to memory distortions, currently available evidence does not suggest that this *regularly* happens when applying a low dosage (only one session) of imagery-based intervention, even if these include imagining the experienced event in a counterfactual way. This raises the question of what moderates these differential effects of imagination on voluntary memory.

On the one hand, the goals, rationale, and exact procedures of imagery-based interventions could be of relevance. The aforementioned studies (e.g., Garry et al., 1996) looking at false memory effects explicitly asked for additional information or suggested a context for the imagination by using imagination inflation (i.e., imagining events that supposedly took place) or memory implantation (i.e., false testimony of family members or faked photos) (Brewin & Andrews, 2017). In contrast, the instructions used in state-of-the-art trauma-focused treatment make the purpose of the intervention transparent by simply asking patients to imagine the event in a first step and to integrate their own helpful perspectives in a second step to make the traumatic event less emotionally distressing (Arntz & Weertman, 1999).

On the other hand, it may be important how declarative change is measured. Previous studies (Garry et al., 1996; Goff & Roediger, 1998; Nash et al., 2009; Thomas & Loftus, 2002) did not assess changes of relevant details and facts about people, time, places, or actions, but instead assessed confidence regarding whether a previously performed and/or imagined action or event had actually taken place. Interestingly, empirical research suggests that believing that an event occurred and recollecting this event is not associated (Hart & Schooler, 2006; Pezdek, Blandon-Gitlin, Lam, et al., 2006), and may be even more dissociated than previously assumed (Roediger et al., 2012; Scoboria et al., 2014). Thus, subjective confidence is not qualified to predict memory accuracy.

Some limitations of the current study have to be kept in mind. First, TSST exposure is not comparable with experiencing a genuine trauma and is rather a mild manipulation, as indicated by not very high negative affect scores and stable positive affect scores throughout TSST. Future research could modify the TSST to further intensify negative affectivity and reduce positive affectivity. However, TSST still led to large increases in negative affect and triggered as many intrusions within a week as various trauma films did in previous studies (Arnaudova & Hagenaars, 2017). Furthermore, analogue designs inducing a negative to-be-remembered event are necessary to assess the accuracy of an episodic memory, which was of great importance in our study and is not possible for naturalistic events that are beyond experimental control.

Nevertheless, the generalizability of our results to a PTSD patient sample are limited (Brewin, 2007). On the one hand, strong emotions in PTSD patients might impair source monitoring (Johnson, 2006), making it more difficult to monitor reality and distinguish between imagined and actually experienced features. On the other hand, there is evidence that increased emotional arousal narrows attention to the central aspects of the event, though possibly at the expense of peripheral details (Kaplan et al., 2016). However, this suggests that PTSD patients are particularly good at remembering the relevant details anyway. It remains unclear how memory distortions (a common symptom of PTSD) influence our results. Evidence from a study by Bedard-Gilligan et al. (2017) examining the effect of imagery-based exposure therapy on voluntary memory in PTSD patients showed that the number of sensory details reported increased while memory quality (i.e. fragmentation) did not change between pre- and post-treatment. Furthermore, both the revised Dual Representation Theory (Brewin et al., 2010) and the cognitive model of PTSD (Ehlers & Clark, 2000) assume that traumatic memories are encoded differently as compared to non-traumatic memories. This also limits the generalizability of our results to PTSD samples and has to be further investigated by future research.

Second, an active control was missing in our study. Memory for the event may have been bolstered simply by discussing the event for 15 minutes – even without any ImRs. Therefore, as a next step, future studies should also include another control condition that discusses the event without using any imagery. Third, we used individualized ImRs scripts to increase the external validity of the intervention. However, this may have caused a greater variance with respect to the effects ImRs had on participants' voluntary memory, e.g., depending on which part of the TSST experience was rescripted. Increased variance may have made it more difficult to identify intervention effects on memory and could be controlled in future studies. In addition, like previous studies (Hagenaars et al., 2008;

Siegesleitner et al., 2019), we also applied only a single session of ImRs. In studies with clinical samples, the average number of sessions was 4.5, with a range of 1-16 sessions (Morina et al., 2017). Even though we were at the lower end of the dosage spectrum compared to the use of ImRs in psychological treatment, a single session has also been shown to be effective (Grunert et al., 2007).

Another limitation is that ImRs was presented relatively soon after the TSST. In clinical practice, there might be months or even years between a traumatic experience and the application of ImRs. Pansky et al. (2011) assume that memory representations consist of features that are interconnected to some degree, however, differ in the number of features encoded and in the strength of the connections between them, both of which determines their recall ability. Based on the Source Monitoring Framework (Johnson, 2006; Johnson et al., 1993), they assume that the connections linking features become weaker over time, so that some of the features are lost and lead to partial degradation of the original memory trace, potentially facilitating distortions. On the other hand, traumatic memories are considered to be particularly good to remember and appear to be recalled more reliably over time than non-traumatic emotional experiences (Peace & Porter, 2004). According to Goodman et al. (2017), even later adult memories of stressful to threatening childhood experiences are more accurate the more traumatic the event and the more traumatic its effects (e.g., more PTSD symptoms) were. In summary, a lack of personal relevance (as is often the case in basic studies on false memories) seems to be more crucial for susceptibility to distortion than time between event and intervention. However, further research is needed to clarify this definitively.

In sum, this study provides important novel evidence regarding the ongoing debate about whether imagery-based interventions might reduce memory accuracy of distressing events. Contrary to commonly held assumptions, no memory deterioration caused by ImRs was observed. This may weaken the position that after imagery-based interventions, survivors' accounts of their traumatic experiences cannot be deemed credible in the legal context. Importantly, we even observed an improvement of voluntary memory following ImRs. Future theoretical development and empirical research is needed to specify the circumstances under which trauma-focused treatment does or does not influence voluntary memory. This will help both victims and therapists to balance therapeutic and judicial concerns.

## Study II:

## Effects of Imagery Rescripting and Imaginal Exposure on Voluntary Memory

This chapter is a post-peer-review, pre-copyedit version of an article published in *Behaviour Research and Therapy*.

Data, code, and supplementary materials are available online:

https://osf.io/5ysbh/?view_only=7a34332db7ad4f9480a2cda3eec0f2be

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**Abstract**

Trauma-focused imagery-based interventions, such as Imagery Rescripting (ImRs) and Imaginal Exposure (ImE), are effective in reducing involuntary re-experiencing in PTSD. However, it has been suggested that they may impair voluntary memory. This study investigates whether ImRs and ImE distort voluntary memory of an analogue trauma. We presented a trauma film to *N* = 120 healthy participants (Session 1) and randomly allocated them to one of two intervention conditions (receiving one session of ImRs or ImE) or to a no-intervention control condition (NIC) afterwards (Session 2). Voluntary memory was assessed using a free recall (Sessions 2 and 3), and a cued recall as well as a recognition task (both Sessions 3 and 4). The ImRs and ImE groups did not differ from NIC in the cued recall task and the recognition task. However, ImE (compared to ImRs and NIC) led to an increase in correct reported details in the free recall. In sum, the current findings do not suggest that ImRs or ImE impair voluntary memory.

## Introduction

Negative memories are at the core of post-traumatic stress disorder (PTSD). Accordingly, it has been conceptualized as a *disorder of memory*. Visser et al. (2018), for example, classify three relevant memory systems involved in trauma-related alterations: First, the *declarative involuntary* memory system that is characterized by unwanted, emotionally aversive memories that come to mind unprompted in the form of sensory imagery. This resembles one of the core symptoms of PTSD – namely, involuntary re-experiencing of the traumatic event in the form of intrusive memories, flashbacks, or nightmares. Second, the *non-declarative involuntary* memory system refers to automatic psychophysiological responses that are typically triggered by trauma-related cues but can also occur spontaneously. This reflects characteristic PTSD symptoms such as elevated physiological reactions to trauma-related cues, hyperarousal, and hypervigilance. The third memory system is the *declarative voluntary* memory system which comprises intentionally recalled episodes and facts when choosing to report the trauma.

Given the burden caused by both declarative and non-declarative *involuntary* aspects of memory, it is not surprising that clinical interventions mainly target these processes aiming at reducing the frequency and severity of involuntary memory symptoms. At the same time, it appears important that treatment preserves *voluntary* attempts to recall the trauma. These aspects can be of critical importance not only to prevent revictimization but also for legal reports and testimony (e.g., in the context of civil or social claims or criminal proceedings against offenders) often associated with man-made trauma (Herman, 2003; Lau-Zhu et al., 2019).

The method of choice for the treatment of PTSD, namely trauma-focused cognitive behavioral therapy (TF-CBT) which often includes Imaginal Exposure (ImE) or – in recent times – Imagery Rescripting (ImRs), has repeatedly been shown to be effective in targeting

PTSD symptoms; in particular, it effectively reduces involuntary re-experiencing of emotional aversive memories (Courtois et al., 2017; Cusack et al., 2016; Morina et al., 2017; Weber et al., 2021). The effect of trauma-focused treatment on PTSD symptomatology has been shown in controlled trials with clinical samples (e.g., Arntz et al., 2007; Langkaas et al., 2017) and in analogue studies including healthy individuals (e.g., Hagenaars & Arntz, 2012; Rijkeboer et al., 2020; Strohm et al., 2019). However, while we can conclude that TF-CBT has the desired effect on involuntary aspects of memory, the effect of TF-CBT on voluntary aspects of memory has rarely been investigated in the past. Given that certain psychological interventions are suspected of distorting voluntary memory (Brainerd & Reyna, 2005; Ridley et al., 2012), this is rather surprising. Even more so, as this assumption has a huge impact on people who suffer from PTSD and need psychological treatment; police and lawyers even advise against psychological treatment before the conclusion of criminal proceedings (Bublitz, 2020; Wolf & Werner, 2021) because survivors' testimony may lose probative value in court when TF-CBT has already taken place.

Hence, although there is broad agreement that psychological treatment for PTSD should aim to reduce involuntary intrusive memories, while leaving voluntary trauma memory unchanged (Holmes et al., 2010; Visser et al., 2018), it remains unclear whether TF-CBT really has this selective effect on different trauma memory systems. From a basic memory perspective (e.g., Visser et al., 2018) it appears possible to selectively influence the voluntary and involuntary memory systems in the treatment of PTSD as they are mostly supplied by different brain regions (Squire, 2004). Furthermore, it has been shown that voluntary vs. involuntary memory can be independently targeted with experimental interventions (James et al., 2015; Soeter & Kindt, 2010) or can be selectively damaged (Adolphs et al., 2005; Weike et al., 2005).

These general assumptions regarding a differential impact of interventions on different memory systems are also in line with specific theories on information-processing in PTSD (Dalgleish, 2004), such as the (revised) Dual Representation Theory (Brewin et al., 1996; Brewin et al., 2010). This theory – a separate-trace model – assumes that two types of memory representations are encoded during a traumatic event: (1) a contextual representation (C-reps) that includes voluntary accessible aspects of the traumatic event and (2) a sensory and emotion-laden representation (S-reps) of the traumatic event that can only be accessed involuntarily. It is hypothesized that involuntary aspects of trauma memories (unlike non-traumatic memories) are not sufficiently contextualized within autobiographical memory, i.e., intrusive memories arise from poor associations of C-reps and S-reps (Brewin, 2014). According to this view, effective TF-CBT includes retrieving both C-reps and S-reps and may thus facilitate the integration of both and lead to a more elaborated and contextualized representation (Brewin, 2014). This possibly leads to better control of involuntary memory and higher voluntary accessibility of aspects of the trauma memory, which in sum is assumed to increase memory quality. Since both ImRs and ImE involve repeated rehearsal and retrieval of contextualized and sensory-bound representations, both interventions are likely to support this integration process. However, since ImRs (depending on how early or late the hotspot is) does not focus on the complete memory trace, this might be less pronounced here compared to ImE, where the complete memory is repeatedly processed.

A look at the results of experimental psychopathology strengthens the assumption that psychological interventions could indeed have the desired selective effect on involuntary and voluntary aspects of trauma memory. Analogue studies used the trauma film paradigm (Holmes & Bourne, 2008) to investigate the effects of ImRs or ImE on involuntary and voluntary memory as compared to an active (i.e., positive imagery of a personal, pleasant experience) (Hagenaars & Arntz, 2012) or a no-intervention control group (NIC)

(Siegesleitner et al., 2019). To assess voluntary memory a cued recall task was used. While both ImRs and ImE reduced the occurrence of intrusive memories (Hagenaars & Arntz, 2012; Siegesleitner et al., 2019), they left voluntary memory intact (Siegesleitner et al., 2019) or even improved it (Hagenaars & Arntz, 2012). However, interpretation of findings from these studies is complicated by the fact that (1) they looked at voluntary memory only as a secondary outcome, (2) effects of trauma-focused interventions on voluntary memory was only assessed in an exploratory way, and (3) studies used only a small number of cued recall items to assess voluntary memory. Therefore, Ganslmeier, Kunze, et al. (2023) conducted a more detailed follow-up analogue study directly investigating the effect of ImRs on voluntary memory. In line with the earlier analogue studies described above, the authors found an *improvement* in voluntary recall after ImRs whereas the number of intrusive memories did not differ between ImRs and a NIC.

The first study investigating the influence of ImRs and ImE (compared to supportive counselling) on both involuntary and voluntary aspects of memory in a clinical sample was carried out by Romano et al. (2020). The authors used a free recall task to measure the amount of remembered positive, neutral, and negative details of an autobiographical memory in a sample with social anxiety disorder. Involuntary aspects like intrusiveness, vividness, and negative affectivity associated with the memory decreased following both ImRs and ImE. In contrast, voluntary memory details reported *increased* after the imagery-based interventions but not in the supportive counseling group. Interestingly, while the number of positive, neutral as well as negative memory details increased after ImE, only the number of positive and neutral details increased after ImRs. These results suggest that primarily those aspects were reported in more detail following the interventions that were focused on in the interventions. That is, while ImE equally focuses on all kinds of memory details, ImRs purposefully changes negative aspects of memory. This might cause difficulties remembering specifically negative aspects of memory while improving positive aspects. However, Romano et al. (2020) did not examine whether the changes caused by ImRs and ImE reflected an influence on the accuracy of the memory. That is, the memory details that were added after the interventions could also be misremembered or incorrectly added details. To investigate to what extent ImRs and ImE change voluntary memory and to deal with the limitations of prior studies we adapted the methodology for this study as follows: First, we used the trauma film paradigm to induce a standardized but aversive experience. This has not only proven to effectively induce analogue PTSD symptoms (James et al., 2016), but also allows conclusions to be made about intervention effects on memory accuracy. Second, we used a multi-day set-up to extend the interval between analogue trauma and intervention such that there is enough time for consolidation. Third, voluntary memory was assessed more comprehensively than in earlier research by using a cued recall (with a greater number of items), a free recall assessing correct and incorrect details and a visual recognition task.

Based on the theoretical ideas of the separate-trace theories and earlier empirical findings, we hypothesized that ImRs and ImE (compared to NIC) would result in more details being remembered correctly and less details being remembered incorrectly.

## Method

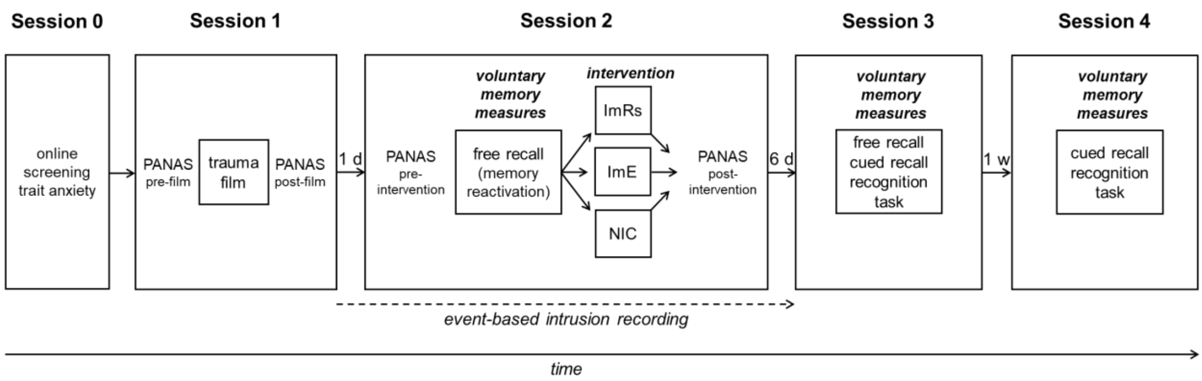
### Overview

The overall procedure included an online screening for trait anxiety (Session 0) and four study sessions (see Figure 2.1). One day after having watched the trauma film (Session 1) participants completed the free recall and received the intervention (ImRs vs. ImE vs. NIC) (Session 2). Six days later, voluntary memory was measured by a second free recall, a first cued recall and a first recognition task (Session 3). Another week later, the cued recall and the recognition task were repeated (Session 4).

To prevent carryover effects between tasks, cued recall and recognition task were only introduced after the two free recall tasks had been completed. While the first three sessions were conducted in the laboratory, Session 4 consisted of a web-based questionnaire; via e-mail, participants received a link to complete an online questionnaire (using the survey software *Unipark*). Since Session 4 was collected in online mode, a free recall was not conducted.

**Figure 2.1**

*Experimental Procedure*




*Note.* PANAS = Positive and Negative Affect Schedule (Krohne et al., 1996); ImRs = participants received imagery rescripting as an intervention; ImE = participants received imaginal exposure as an intervention; NIC = participants waited 15 minutes in front of the laboratory.

## Participants

Participants were recruited via a student email newsletter, advertisement in social media, and posters put up at university buildings. Since the film fragment showed the rape of a woman and women and men may process this differently, we included only female participants to rule out gender effects. We included female students who met the following inclusion criteria: (1) age between 18 and 30 years, and (2) fluency in German. In addition, the following exclusion criteria were applied: (1) current mental disorder or life-time PTSD, bipolar or psychotic disorders (German adaptation of the Structured Clinical Interview for DSM-5 Disorders [SCID-5]; Beesdo-Baum et al., 2019) or severe neurological disorder, (2) life-time experiences of sexual or physical violence (German version of the Life Events Checklist for DSM-5 [LEC-5]; Krüger-Gottschalk et al., 2017) (3) current psychological treatment, (4) current pregnancy (5) use of psychiatric medication, (6) consumption of illegal drugs within the last three days, or (7) alcohol consumption of more than three glasses of beer, wine, cocktails or hard liquor within the last 24 hours before the experiment. In terms of generalizability to reactions to traumatic events and external validity, we wanted to include individuals who had stronger emotional reactions to the film and experienced more intrusive memories. Since low baseline measures of trait anxiety are associated with the absence of analogue flashbacks (Clark et al., 2015), a total of 860 students were screened online via the survey software *Unipark* for trait anxiety (German Trait Scale of the State-Trait Anxiety Inventory [STAI-T]; Laux et al., 1981). Of these 860 students, only participants with high trait anxiety (cut-off: score > 39) were invited to participate in further investigation in the laboratory (Wiglusz et al., 2019). A total of 155 participants met this cut-off criterion and were invited to the laboratory. Twenty-seven participants had to be excluded based on inclusion or exclusion criteria. In addition, four participants dropped out due to corona restrictions (i.e., one or two measurement time points had already taken place, the following ones then had to be cancelled due to the lockdown), and two participants withdrew their consent after Session 1. Due to technical problems, data from two participants were lost. Thus, the final sample size was $N$ = 120 (age: $M$ = 22.24, $SD$ = 2.85). Participants were randomly allocated to one of three experimental conditions: ImRs ($n$ = 40), ImE ($n$ = 40) or no-intervention control (NIC) ($n$ = 40).

For sample size planning, an a priori power analysis was carried out with *G*Power* (Faul et al., 2009). Based on prior research (e.g., Ganslmeier, Kunze, et al., 2023; Garry et al., 1996; Horselenberg et al., 2000), we assumed the effect of imagery on voluntary memory to be of medium size ($f = 0.25$). With $\alpha = .05$ and a statistical power of .80, it was necessary to recruit 42 participants to detect a Condition × Time interaction, 120 participants to detect a main effect of Condition and 36 participants to detect a main effect of Time on voluntary memory as measured by recognition task, free and cued recall (3 [Condition] × 2 [Time] ANOVAs).

Participants signed a written informed consent and were provided compensation of either € 8 per hour or course credits. The study was approved by the local Research Ethics Committee (2019_36_Ganslmeier_c).

## Materials

### *Trauma Film*

During Session 1, participants watched a 14-min fragment of *Irréversible* (Noé, 2002) showing sexual and physical abuse of a woman. This is a useful method to induce analogue post-traumatic stress symptoms such as intrusive memories, negative emotions, and subjective distress (Arnaudova & Hagenaars, 2017). All participants were explicitly informed in the study information and informed consent that they would be shown a film with violent content. The film was shown on an 18-inch screen in a darkened room. Before the film started, participants were instructed to imagine they would witness the situation shown in the film scene at that very moment.

## Intervention

### *Imagery Rescripting (ImRs)*

ImRs usually involves memory reactivation first. For this, we used free recall (see Measures section) to initiate the reconsolidation process (detailed instructions are provided in

Appendix B, S1). This was followed by the actual ImRs using a modified script according to Arntz and Weertman (1999) (detailed instructions are provided in Appendix B, S2): Participants were instructed to reactivate the scene from the beginning of the film fragment to just before the rape (standardized hotspot) and to imagine this as vividly as possible with their eyes closed. They were asked to describe the scene in the present tense and in the first-person singular with all sensory, emotional, and physical sensations occurring.

Once participants reached the hotspot, the investigator instructed them to change the script in their imagination to achieve an outcome of the scene that was less stressful for them. For this purpose, the investigator suggested participants to imagine two men entering the scene and coming to the victim's aid before the perpetrator begins to rape her. Participants were then asked to imagine how the two men were confronting the perpetrator. Once the perpetrator was disempowered, the investigator instructed participants to imagine that the perpetrator is arrested by two police officers and that there is no more danger from him. At the end, participants were instructed to imagine the woman being cared for until she feels safe. During the imagination, the investigator asked in-depth questions, e.g., about the place, people present, sensory perceptions, thoughts, and bodily sensations. Once participants indicated that they were completely satisfied with the outcome of the situation, ImRs was concluded (duration [minutes]: $M = 21.28$, $SD = 5.23$).

ImRs was tape-recorded and participants were instructed to listen to the recording three times before Session 3 (Smucker et al., 1995).

***Imaginal Exposure (ImE)***

As with ImRs, ImE was preceded by free recall. This was followed by ImE using a modified script based on Foa et al. (2008) (detailed instructions are provided in Appendix B, S2): Participants were instructed to reactivate the scene from the beginning of the film fragment through the hotspot to the end of the scene and to imagine the whole scene as vividly as possible with their eyes closed. As with ImRs, they were asked to report in the present tense, first person singular, and to include all sensory, emotional, and physical sensations. The investigator also asked questions to deepen the imagination. Once participants reached the end of the scene in the imagination, ImE was completed (duration [minutes]: $M = 15.88$, $SD = 4.39$).

ImE was also tape-recorded, and participants were instructed to listen to it three times before Session 3.

### *No-Intervention Control Condition (NIC)*

Participants of the control condition received neither ImRs nor ImE and instead had a 15-min break, in which they sat outside the laboratory room.

## Measures

### *Voluntary Memory Measures*

Voluntary memory was assessed in three ways: with a free recall in order to assess memory in a broad, complex and individual manner and with a cued recall and a recognition task to assess concrete and specific details and images.

**Free Recall.** Two free recalls (Session 2 and Session 3) were used to assess possible changes in voluntary memory of the aversive film scene after ImRs or ImE. Using a standardized script (for detailed instruction, see Appendix B, S1), participants were instructed to imagine their experience of the situation of the aversive film scene as a witness at that moment and to verbally report everything they remembered of the film scene as accurately and in as much detail as possible. As in ImRs and ImE, they were asked to close their eyes and to describe their experience in the first person singular and in present tense as if they were experiencing it in this very moment. According to the instruction, they were to describe the scene until they themselves decided that the scene was complete (duration [minutes]: Session 2: $M = 8.76$, $SD = 4.08$; Session 3: $M = 8.03$, $SD = 3.41$). The report was tape-recorded, transcribed, and coded to enable us to analyze changes in voluntary memory using a standardized protocol-based assessment adapted from Levine et al. (2002) and Jack et al. (2014) (for detailed instruction, see Appendix B, S3).

For this purpose, each free recall was divided into information details defined as a unique event, observation, or thought, usually expressed as a grammatical clause (i.e., subject and verb) (adapted from Levine et al., 2002). Further information clauses (i.e., object, adverbs, adjectives, etc.) were additionally scored. Furthermore, all details that were specific to time and place of the trauma film fragment (reflecting episodic reexperiencing) (vs. not specific to time and place, semantic knowledge, repetitions, other details, retrospective appraisals) were rated as *correct* (if they represented details that had been present during the trauma film fragment) or *incorrect* (if they represented details that had *not* been present) (adapted from Jack et al., 2014). All other details with unclear validity were categorized as *possible*. Since thoughts and emotions cannot be evaluated for correctness, they were not rated here.

Based on the ratings, sum scores were computed for (a) number of correct details, (b) number of incorrect details, and (c) total number of details provided (to control for the overall verbal output). The ratings were conducted by two independent raters. Based on criteria suggested by Koo and Li (2016) interrater reliability, measured by intraclass correlations (ICC), was excellent for $ICC_{total}$ (1, 1) = .98 and $ICC_{correct\ details}$ (1, 1) = .95. It was good for $ICC_{possible\ details}$ (1, 1) = .77 and $ICC_{incorrect\ details}$ (1, 1) = .87.

**Cued Recall.** In Sessions 3 and 4, participants completed a cued recall which was inspired by a police interrogation guide (Hermanutz & Schröder, 2015). It included questions about the location, the acting persons, and the procedure. The cued recall comprised a total of 32 questions (for the detailed cued recall, see Appendix B, S4)

**Recognition Task.** During Session 3 and Session 4, participants were shown a series of images from the aversive film. Some of the images were actually taken from the film fragment the participants had seen, and some were from sections of the film not shown in the study. For each image, participants were asked to indicate whether they had seen it in the film scene presented during Session 1.

***Manipulation Check***

**Effect of the Trauma Film and the Intervention on Participants' Mood.** To assess how aversive participants had experienced the film fragment, the Positive and Negative Affect Schedule (PANAS; German version: Krohne et al., 1996) was filled in immediately pre- and post-film. In addition, participants answered the PANAS before and after the intervention to measure intervention effects on mood. The PANAS consists of two scales (positive and negative affect) with ten items each and asks participants to rate their current affective states on a 5-point Likert scale (1 = *not at all*; 5 = *extremely*). Sum scores were calculated for each scale and measurement time.[3]

**Intrusion Measures.** Adapted from paper tabular intrusion diaries used in earlier research (James et al., 2015), trauma film-related intrusive memories between Session 1 and Session 3 were assessed using the experience sampling app *tellmi*[4]. The application was installed on participants' smartphones at the end of Session 1. If a participant did not possess a smartphone, they were lent one by the experimenter. Participants were instructed to register an intrusive memory directly in the app every time they experienced one in their daily lives (event-based assessment). Every time they registered an intrusive memory, they were asked

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[3] Internal consistencies were good or excellent for both positive (pre-film: $\alpha = .85$; post-film: $\alpha = .85$; pre-intervention: $\alpha = .89$; post-intervention: $\alpha = .84$) and negative affect (pre-film: $\alpha = .80$; post-film: $\alpha = .92$; pre-intervention: $\alpha = .82$; post-intervention: $\alpha = .88$).
[4] See Acknowledgements

how stressful, controllable, and vivid they had experienced it (1 = *not at all* to 6 = *very much*).[5]

### *Control Variables*

We assessed trait anxiety using the German version of the STAI-T and suggestibility using a German translation of the Multidimensional Iowa Suggestibility Scale (MISS; Kotov et al., 2004) (see Table 2.1).

In addition, sleep duration and quality after Session 1 and 2 and in the week between Session 2 and 3 was surveyed. Participants were also asked whether they had known the film before study participation, whether they frequently watched films with similar violent content, and whether they had gone through the trauma film repeatedly by talking to others or writing a diary (*yes* vs. *no*).

## Procedure

Session 0: Interested participants completed the STAI-T online via *Unipark*. Only participants with a score above the cut-off were selected for further screening and could contact the experimenter to make an appointment.

Session 1: After participants having provided written informed consent and after inclusion as well as exclusion criteria had been checked, sociodemographic and control variables were collected from all eligible participants. This was followed by the PANAS pre-film, the trauma film fragment, and the PANAS post-film.[6] At the end, participants were instructed to install the app *tellmi*.

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[5] In addition, and as a back-up, in the case that the app would fail, participants were asked in each session to indicate how often they had experienced intrusive memories since the last session, the percentage of time (from 0 to 100) they had experienced them and – in case they reported at least one intrusive memory – how stressfully, controllably, and vividly they experienced them (0 = *not at all* to 100 = *very much*). Since the results do not differ with respect to their significance, only the ecologically more valid variant (i.e., event-based intrusive memories recording) is reported below. However, the descriptive statistics can be viewed in Appendix B, S5.
[6] Additionally, participants completed the German version of the Beck Depression Inventory II (BDI II; Hautzinger et al., 2009), Questionnaire for the Assessment of Disgust Responsiveness (FEE; Schienle et al., 2002), Scale for Assessing Disgust Sensitivity (SEE; Schienle et al., 2010), German translation of the Gudjonsson Suggestibility Scale (GSS; Gubi-Kelm & Schmidt, 2018), Stress Appraisal Measure (SAM;

Session 2: After participants had been randomly assigned to one of three conditions (ImRs vs. ImE vs. NIC), sleep quality and duration were collected. This was followed by PANAS pre-intervention and the first free recall. Participants then underwent the intervention (ImRs or ImE) or a short break (no intervention). This was followed by the PANAS post-intervention and, in the ImRs and ImE condition, the instruction to listen to the tape recording of the intervention three times before Session 3.

Session 3: As in Session 2, sleep quality and duration, and free recall were collected. Then the cued recall and recognition task were performed for the first time. In addition, participants were asked whether they had talked to others about the aversive film or had written a diary.

Session 4: Participants received a link via e-mail to answer an online questionnaire at home. Again, cued recall, and recognition task were administered. A debriefing followed at the end, informing about the purpose and objectives of the study, and including a contact address in case of persistent distress due to the film.

The experimenter for Session 1 and Session 3 as well as participants were all blind to the intervention condition.

**Statistical Analyses**

Data analyses were conducted using SPSS (IBM SPSS Statistics, version 29). All hypotheses were tested two-sided with a significance level of $\alpha = .05$.

Potential differences between experimental conditions regarding sociodemographic and control variables were examined with one-way independent ANOVA and chi-square tests.

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Delahaye et al., 2015), Multidimensional Mood Questionnaire (MMQ; Steyer et al., 1997) and Heidelberg Form for Emotion Regulation Strategies (HFERST; Izadpanah et al., 2019) in Session 1. HFERST was repeated in Session 2, Session 3 and Session 4. SAM and MMQ were repeated in Session 3 and Session 4. Due to the non-relevance of these questionnaires to the current research question, the results are reported elsewhere, and these measures are not further addressed in this manuscript for the sake of clarity.

We calculated mixed 3 (Condition) × 2 (Time) ANOVAs to assess the effect of the trauma film and the interventions, respectively, on participants' mood. Condition differences regarding intrusive memories were examined with MANOVA.

Lastly, mixed 3 (Condition) × 2 (Time) ANOVAs were used to assess the effect of the interventions on participants' free recall, cued recall, and recognition task.

Assumptions for parametric tests were examined. Given that ANOVAs are considered robust to violations of normal distribution assumptions (Harwell et al., 1992) and are less sensitive to variance heterogeneity (Field, 2013) when group sizes are approximately equal, ANOVAs were still used even when normality and variance homogeneity assumptions were violated.

## Results

### Baseline Differences in Control Variables

The three conditions did not differ regarding any of the sociodemographic or control variables (see Table 2.1).

**Table 2.1**

*Sociodemographic and Control Variables*

| Variables | Condition | | | Statistics | *p* |
|---|---|---|---|---|---|
| | ImRs (*n* = 40) | ImE (*n* = 40) | NIC (*n* = 40) | | |
| Sociodemographic variables | *M (SD)* | *M (SD)* | *M (SD)* | | |
| Age[a] | 22.62 (2.90) | 21.85 (2.58) | 22.25 (3.08) | *F*(2, 116) = .71 | .49 |
| Number of years of education[a, b] | 15.35 (2.48) | 15.40 (2.54) | 15.42 (2.71) | *F*(2, 115) = .01 | .99 |
| Control variables | *M (SD)* | *M (SD)* | *M (SD)* | | |
| Trait anxiety (STAI-T) | 46.00 (7.55) | 47.60 (7.03) | 47.33 (7.79) | *F*(2, 117) = .53 | .59 |
| Suggestibility (MISS)[a] | 176.59 (29.13) | 175.93 (23.25) | 182.05 (23.05) | *F*(2, 116) = .71 | .50 |
| Sleep at night after Session 1: sleep duration (in hours) | 7.35 (1.38) | 7.23 (1.22) | 7.83 (0.98) | *F*(2, 117) = 2.77 | .07 |
| Sleep at night after Session 1: sleep quality | 2.13 (0.69) | 2.05 (0.68) | 1.83 (0.50) | *F*(2, 117) = 2.48 | .09 |
| Sleep at night after Session 2: sleep duration (in hours)[a] | 7.35 (0.81) | 7.38 (1.47) | 7.64 (1.03) | *F*(2, 116) = .79 | .46 |
| Sleep at night after Session 2: sleep quality | 2.08 (0.53) | 2.08 (0.62) | 2.08 (0.42) | *F*(2, 117) = .00 | 1.00 |
| Sleep between Session 2 and 3: sleep duration | 7.23 (0.83) | 7.36 (0.98) | 7.49 (0.81) | *F*(2, 117) = .90 | .41 |
| Sleep between Session 2 and 3: sleep quality | 2.10 (0.55) | 2.15 (0.58) | 2.10 (0.50) | *F*(2, 117) = .11 | .89 |
| | % | % | % | | |
| Knew the film scene shown (no) | 95.0 | 92.5 | 95.0 | | .90[c] |
| Frequent watching of films with similar violent content (no) | 57.5 | 57.5 | 52.5 | | .93[c] |
| Talked to sb. about the trauma film in the week after (yes) | 77.5 | 65.0 | 65.0 | $\chi^2$ (1) = 1.95 | .42 |
| Wrote diary about the trauma film in the week after (no) | 90.0 | 85.0 | 90.0 | | .95[c] |

Note. ImRs = imagery rescripting; ImE = imaginal exposure; NIC = no-intervention control; STAI-T = Trait Scale of the State-Trait Anxiety Inventory.

[a] ImRs (*n* = 39).

[b] NIC (*n* = 39).

[c] Fisher's exact test.

## Manipulation Check

### *Trauma Film*

Trauma film increased negative affect and reduced positive affect. Descriptive statistics of the PANAS pre-film and post-film are presented in the Supplementary Material (see Appendix B, S5, Table 2.4).

To check whether the trauma film was experienced as stressful for participants, two mixed 3 (Condition: ImRs vs. ImE vs. NIC) × 2 (Time: pre-film vs. post-film) ANOVAs were performed. There was a main effect of Time showing that the negative affect was significantly higher post-film than pre-film, $F(1, 116) = 267.90$, $p < .001$, $\eta^2_p = .70$. However, neither a main effect of Condition, $F(2, 116) = .80$, $p = .45$, $\eta^2_p = .01$, nor a Condition × Time interaction emerged, $F(2, 116) = 2.02$, $p = .12$, $\eta^2_p = .04$.

There was a main effect of Time showing that the positive affect was significantly lower post-film than pre-film, $F(1, 116) = 187.19$, $p < .001$, $\eta^2_p = .62$, but no main effect of Condition, $F(2, 116) = 1.15$, $p = .32$, $\eta^2_p = .02$, and no Condition × Time interaction, $F(2, 116) = .32$, $p = .73$, $\eta^2_p = .01$.

The trauma film successfully triggered intrusive memories. Descriptive statistics of the intrusion measures (between Session 1 and Session 3) were calculated and are presented in the Supplementary Material (see Appendix B, S5, Table 2.5). In a MANOVA using Pillai's trace, there was no significant main effect of Condition on intrusion measures, $V = .06$, $F(8, 184) = .67$, $p = .71$, $\eta^2_p = .03$. As a back-up in the case of a failure of the app, we retrospectively collected intrusion measures at each of the measurement points. Again, it is found that the trauma film successfully triggered intrusive memories whose distress and vividness decreased over time and whose controllability increased over time. Yet again, there were no significant differences between the groups. Descriptive statistics are reported in the Supplementary Material (see Appendix B, S5, Table 2.6).

***Intervention***

To check whether the intervention had an impact on participants' positive and negative affect, two mixed 3 (Condition: ImRs vs. ImE vs. NIC) × 2 (Time: pre-intervention vs. post-intervention) ANOVAs were performed. Intervention increased negative and reduced positive affect. Descriptive statistics are presented in Table 2.2.

There was a main effect of Time showing that negative affect was significantly higher post-intervention than pre-intervention, $F(1, 117) = 202.91$, $p < .001$, $\eta^2_p = .63$. In addition, there was a Condition × Time interaction, $F(2, 117) = 10.19$, $p < .001$, $\eta^2_p = .15$, indicating that negative affect increased less in NIC than in the ImRs and ImE. However, no significant main effect of Condition emerged, $F(2, 117) = 1.61$, $p = .20$, $\eta^2_p = .03$.

In addition, a significant main effect of Time was found showing that positive affect was significantly lower post-intervention than pre-intervention, $F(1, 117) = 56.21$, $p < .001$, $\eta^2_p = .33$. Additionally, there was a significant main effect of Condition, $F(2, 117) = 6.29$, $p = .003$, $\eta^2_p = .10$. Bonferroni-adjusted post-hoc analysis revealed that positive affect was significantly lower in the ImE than in the ImRs ($p = .002$), with no differences between ImRs and NIC ($p = .11$) or ImE and NIC ($p = .50$). The Condition × Time interaction was not significant, $F(2, 117) = .08$, $p = .92$, $\eta^2_p = .00$.

**Table 2.2**

*Positive and Negative Affect (PANAS) Pre- and Post-Intervention for the Conditions*

| | Condition | | | | | |
|---|---|---|---|---|---|---|
| | ImRs (*n* = 40) | | ImE (*n* = 40) | | NIC (*n* = 40) | |
| PANAS | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI |
| Negative affect | | | | | | |
| pre-intervention | 14.13 (4.19) | [12.79; 15.46] | 13.43 (3.78) | [12.22; 14.63] | 14.93 (4.91) | [13.35; 16.50] |
| post-intervention | 24.10 (8.73) | [21.31; 26.89] | 25.95 (8.24) | [23.32; 28.58] | 20.33 (6.74) | [18.17; 22.48] |
| Positive affect | | | | | | |
| pre-intervention | 30.73 (7.81) | [28.23; 33.22] | 26.68 (5.53) | [24.91; 28.44] | 28.45 (6.46) | [26.38; 30.52] |
| post-intervention | 26.35 (7.36) | [24.00; 28.70] | 21.90 (5.63) | [20.10; 23.70] | 23.48 (5.16) | [21.82; 25.13] |

*Note*. ImRs = imagery rescripting; ImE = imaginal exposure; NIC = no-intervention control; PANAS = Positive and Negative Affect Schedule.

## Voluntary Memory Measures

### *Free Recall*

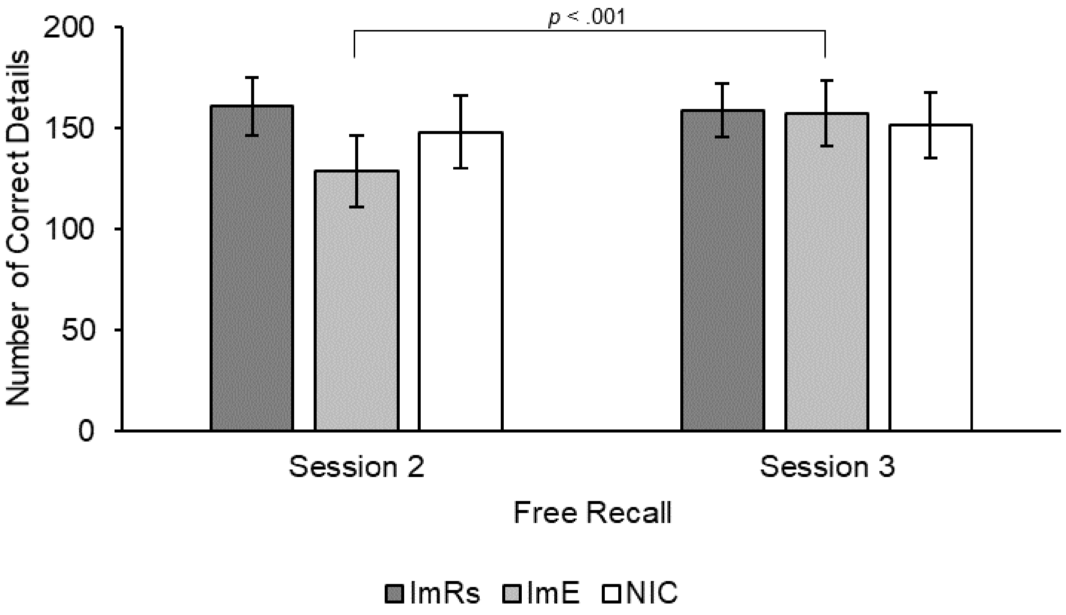
As the number of details remembered in free recall may be influenced by total verbal output, we first compared the total number of details of Session 2 and Session 3. The mixed 3 (ImRs vs. ImE vs. NIC) × 2 (Session 2 vs. Session 3) ANOVA yielded a significant Condition × Time interaction, $F(2, 116) = 14.04$, $p < .001$, $\eta^2_p = .20$. However, there was neither a significant main effect of Condition, $F(1, 116) = 1.32$, $p = .27$, $\eta^2_p = .02$, nor a significant main effect of Time, $F(1, 115) = 2.68$, $p = .10$, $\eta^2_p = .02$. Post-hoc analysis revealed that the interaction effect was qualified by a significant difference of baseline length of the free recall (Session 2) between conditions, $F(2, 117) = 4.11$, $p = .02$, $\eta^2_p = .07$. Hence, the total number of details reported in Session 2 was included as a covariate in all following analyses on the free recall data.

Descriptive statistics for correct, incorrect, and total details are presented in Table 2.3 and illustrated in Figure 2.2. The effect of the interventions on voluntary memory measured by free recall was investigated by two mixed 3 (ImRs vs. ImE vs. NIC) × 2 (Session 2 vs. Session 3) ANOVAs for the number of correct and incorrect details, respectively. Looking at the number of correct details, there was a significant main effect of Condition, $F(2, 115) = 5.91$, $p = .004$, $\eta^2_p = .09$ and a significant main effect of Time, $F(1, 115) = 30.64$ $p < .001$, $\eta^2_p = .21$. Additionally, there was a significant Condition × Time interaction, $F(2, 115) = 9.74$, $p < .001$, $\eta^2_p = .15$. Bonferroni-adjusted post-hoc analysis (based on the estimated marginal means) revealed a significant difference in Session 3 between ImRs and ImE ($p < .001$) and a significant difference between NIC and ImE ($p = .01$) showing that after the intervention the number of correctly remembered details increased after ImE, $F(1, 115) = 35.86$, $p < .001$, $\eta^2_p = .24$, whereas there was no significant change in the number of correctly remembered details in ImRs, $F(1, 115) = 0.09$, $p = .76$, $\eta^2_p = .00$, and in NIC over time, $F(1, 115) = .75$, $p = .39$, $\eta^2_p = .01$.

Looking at incorrect details, the ANOVA yielded a significant main effect of Time, $F(1, 115) = 19.84$, $p < .001$, $\eta^2_p = .15$ indicating that the number of incorrectly remembered details decreased over time. However, there was no significant main effect of Condition, $F(2, 115) = .47$, $p = .63$, $\eta^2_p = .01$ or Time × Condition interaction, $F(2, 115) = 1.24$, $p = .30$ , $\eta^2_p = .02$.

**Figure 2.2**

*Results for Free Recall at Sessions 2 and 3*




*Note.* The number of correctly remembered details in the free recall significantly increased following ImE but not following the other two conditions. ImRs = imagery rescripting ($n$ = 40); ImE = imaginal exposure ($n$ = 39); NIC = no-intervention control ($n$ = 40).

***Cued Recall***

Descriptive results for the cued recall are shown in Table 2.3. The effect of the intervention on voluntary memory measured by a cued recall was examined by three mixed 3 (ImRs vs. ImE vs. NIC) × 2 (Session 3 vs. Session 4) ANOVAs for the sum scores for correct, incorrect and "*I do not know*" answers.

In the two ANOVAs investigating effects on correctly and incorrectly remembered features, no significant effects emerged, main effect of Condition: $F(2, 117) = .50$, $p = .61$, $\eta^2_p = .01$ (correctly remembered), $F(2, 117) = 1.11$, $p = .33$, $\eta^2_p = .02$ (incorrectly remembered), main effect of Time: $F(1, 117) = 1.69$, $p = .20$, $\eta^2_p = .01$ (correctly remembered), $F(1, 117) = .46$, $p = .50$, $\eta^2_p = .00$ (incorrectly remembered), Time × Condition interaction effect: $F(2, 117) = 1.12$, $p = .33$, $\eta^2_p = .02$ (correctly remembered), $F(2, 117) = .47$, $p = .62$, $\eta^2_p = .01$ (incorrectly remembered).

Looking at the number of "*I do not know*" answers in the cued recall, there was a significant main effect of Time, $F(1, 117) = 5.04$, $p = .03$, $\eta^2_p = .04$, indicating a decrease in this type of answers from Session 3 to Session 4. However, there was neither a significant main effect of Condition, $F(2, 117) = 2.83$, $p = .06$, $\eta^2_p = .05$, nor a significant Condition × Time interaction, $F(2, 117) = 1.17$, $p = .32$, $\eta^2_p = .02$.

***Recognition Task***

Descriptive results for the recognition task are shown in Table 2.3. The effect of the intervention on voluntary memory measured by a recognition task was examined by a mixed 3 (ImRs vs. ImE vs. NIC) × 2 (Session 3 vs. Session 4) ANOVA for the sum scores for correct answers. There was neither a main effect of Condition, $F(2, 115) = .10$, $p = .91$, $\eta^2_p = .00$, nor a main effect of Time, $F(1, 115) = .00$, $p = .96$, $\eta^2_p = .00$, or a Condition × Time interaction, $F(2, 115) = .53$, $p = .59$, $\eta^2_p = .01$, for the number of correct answers in the recognition task.

**Table 2.3**

*Results for Free Recall at Sessions 2 and 3, and for Cued Recall and Recognition Task at Sessions 3 and 4*

| | Condition | | | | | |
|---|---|---|---|---|---|---|
| | ImRs (*n* = 40) | | ImE (*n* = 39) | | NIC (*n* = 40) | |
| Free recall | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI |
| Number of correct details | | | | | | |
| Session 2 | 160.57 (45.02) | [146.18; 174.97] | 128.59 (53.84) | [111.14; 146.04] | 147.88 (55.83) | [130.02; 165.73] |
| Session 3 | 158.55 (41.45) | [145.29; 171.81] | 157.38 (49.92) | [141.20; 173.57] | 151.35 (51.49) | [134.88; 167.82] |
| Number of incorrect details | | | | | | |
| Session 2 | 14.38 (9.06) | [11.48; 17.27] | 10.41 (6.16) | [8.41; 12.41] | 11.23 (7.48) | [8.83; 13.62] |
| Session 3 | 11.48 (6.50) | [9.39; 13.56] | 10.64 (5.25) | [8.94; 12.34] | 10.80 (5.49) | [9.04; 12.56] |
| Total number of details | | | | | | |
| Session 2 | 206.05 (58.87) | [187.22; 224.88] | 163.95 (66.28) | [142.46; 185.43] | 186.00 (72.25) | [162.89; 209.11] |
| Session 3 | 193.83 (51.14) | [177.47; 210.18] | 192.79 (60.10) | [173.31; 212.28] | 185.35 (64.98) | [164.57; 206.13] |
| | ImRs (*n* = 40) | | ImE (*n* = 40) | | NIC (*n* = 40) | |
| Cued recall | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI |
| Correct answers | | | | | | |
| Session 3 | 17.11 (3.47) | [16.00; 18.22] | 16.37 (2.80) | [15.47; 17.26] | 16.03 (3.28) | [14.98; 17.08] |
| Session 4 | 17.02 (4.62) | [15.54; 18.50] | 16.62 (2.91) | [15.69; 17.55] | 16.78 (3.40) | [15.69; 17.87] |
| Incorrect answers | | | | | | |
| Session 3 | 11.31 (2.64) | [10.47; 12.16] | 11.68 (3.37) | [10.61; 12.76] | 10.80 (2.71) | [9.93; 11.67] |
| Session 4 | 10.83 (3.37) | [9.76; 11.91] | 11.75 (3.38) | [10.67; 12.83] | 10.72 (3.70) | [9.54; 11.90] |
| "*I do not know*" | | | | | | |
| Session 3 | 3.68 (3.08) | [2.69; 4.66] | 4.00 (2.58) | [3.17; 4.83] | 5.43 (3.04) | [4.45: 6.40] |
| Session 4 | 3.58 (3.28) | [2.53; 4.62] | 3.70 (2.99) | [2.74; 4.66] | 4.73 (3.38) | [3.64; 5.81] |
| | ImRs (*n* = 39) | | ImE (*n* = 39) | | NIC (*n* = 40) | |
| Recognition task | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI |
| Session 3 | 7.36 (2.56) | [6.53; 8.19] | 7.62 (2.36) | [6.85; 8.38] | 7.70 (2.29) | [6.97; 8.43] |
| Session 4 | 7.59 (2.79) | [6.69; 8.49] | 7.38 (2.61) | [6.54; 8.23] | 7.68 (2.62) | [6.84; 8.51] |

*Note*. ImRs = imagery rescripting; ImE = imaginal exposure; NIC = no-intervention control; PANAS = Positive and Negative Affect Schedule.

## Discussion

This study examined the influence of two imagery-based interventions – namely ImRs and ImE – on voluntary memory of an analogue trauma (measured by a free recall, a cued recall, and a visual recognition task) in a healthy sample. As hypothesized, ImE did increase the number of correctly reported details in the free recall task. However, contrary to our expectations, ImRs did not. Furthermore, neither ImRs nor ImE had an influence on the number of incorrect details reported during free recall. Interestingly, incorrectly remembered details reduced over time in all conditions. Neither in the cued recall nor in the visual recognition task, any differences between conditions emerged. In summary, we found no negative effects of ImRs and ImE on memory accuracy. In contrast, there is evidence that ImE may actually improve the validity of autobiographical memory as we found an increase in correct details in free recall following ImE.

Overall, the findings suggest that involuntary and voluntary memory systems can be selectively and independently targeted. This is in line with suggestions from basic memory research (e.g., Visser et al., 2018) as well as separate-trace accounts of PTSD (Brewin et al., 1996; Brewin et al., 2010; Dalgleish, 2004), and mirrored by results of earlier studies (e.g., James et al., 2015; Krans et al., 2010), in which involuntary re-experiencing was reduced while voluntary recognition memory remained intact. This means that not all imaginative interventions necessarily have the same effects on voluntary memory.

The emerging literature on the effects of trauma-focused interventions on voluntary trauma memory, including the current study, has important implications for clinical and legal practice. Specifically, findings suggest that it is possible to reduce intrusive memories via psychological interventions without impairing voluntary memory and thus the quality of testimony in the context of legal trials.

How do our – and similar earlier findings – then align with earlier research showing the potential of imagery-based interventions to distort voluntary memory? In order to answer this important question, it appears necessary to focus more on the specific procedural details used in psychological treatment (e.g., ImRs or ImE) vs. procedures used in research on memory distortion.

Theoretically, it could be assumed that the repeated rehearsal and retrieval taking place in ImE and ImRs strengthens the association between C-reps and S-reps (Brewin et al., 1996; Brewin et al., 2010; Dalgleish, 2004), which should in turn enhance the elaboration and organization of memory facilitating the verbal accessibility of voluntary memory (as reflected in the increased number of correct details in free recall) (Brewin, 2014). However, in our study this beneficial effect emerged only for ImE, not for ImRs. One possible explanation for this differential effects of ImE and ImRs on voluntary memory in this study may be an imbalance of the two interventions with respect to rehearsal and testing effects due to the repetition and re-encoding of the memory (Rowland, 2014). While participants in the ImRs condition repeated the film scene only until the hotspot and rescripted what happened afterwards, participants in the ImE condition repeated all the details they saw throughout the whole film scene not only in the intervention session but also afterwards (by listening to the audio recording). This assumption is also in line with the results of Romano et al. (2020) who observed an increase of remembered details specifically for those aspects that have been focused in the different interventions. While they found an increase only in positive and neutral details after ImRs, all kinds of details (positive, neutral, and negative) increased after ImE. This suggests that the effect of imagery interventions on memory accuracy (i.e., number of remembered details) might depend on what exactly is repeated within an intervention (i.e., type and number of details). The fact that Romano et al. (2020) found an increase in remembered details following ImRs and we did not could be due to a methodological difference: instead of classifying the remembered details as positive, neutral, and negative, we assessed correct and incorrect details.

However, one earlier study by our group did find positive effects of ImRs on voluntary memory (e.g., Ganslmeier, Kunze, et al., 2023). This could be due to the fact that the hotspot in the present study (based from the trauma film) was rather early. In contrast, Ganslmeier, Kunze, et al. (2023) used a modified version of the Trier Social Stress Test (TSST; Kirschbaum et al., 1993) as an aversive autobiographical event in their study, and participants could decide individually which of the three tasks they had performed within the TSST (interview, arithmetic task, singing) represented the hotspot. Since some participants chose the second or even the third task as the hotspot, rehearsal and elaboration took place for a much larger proportion of the event memory in the earlier study than in the current one.

For the cued memory recall and the newly implemented visual recognition task, we did not find any changes from pre to post intervention – independently of the intervention condition. This is in line with other studies that used a cued recall (Ganslmeier, Kunze, et al., 2023; Siegesleitner et al., 2019). However, Hagenaars and Arntz (2012) found an improvement in cued recall after ImRs and ImE (compared to positive imagery of a personal, pleasant event), which may have been due to the facts that trauma film and intervention took place on the same day and that the control condition was different from ours. Both may have complicated (re)consolidation in their positive imagery condition: in contrast to the NIC in this study, in which participants repeated (within the free recall) what they had seen after sufficient consolidation time, participants in the positive imagery condition of Hagenaars and Arntz (2012) did not repeat the analogue trauma but imagined alternative material on the same day they saw the trauma film, which may have competed with the memory trace of the trauma film. This may have resulted in a greater disadvantage in their positive imagery condition and thus a greater difference between their control condition and ImRs or ImE than we observed when comparing ImRs and ImE to our NIC.

The fact that neither ImRs nor ImE had a negative impact on subjects' recall, i.e., no reduction in correct details, is particularly interesting in light of the Source Monitoring Framework (Johnson, 2006; Johnson et al., 1993). Here, it is assumed that imagined events may be mistaken for actual events based on similarity. Whereas in ImE participants are only exposed to the original experience in their imagination, ImRs additionally aimed to integrate helpful perspectives by explicitly modifying the mental image of the traumatic memory.

Hence, at first sight source monitoring errors may seem to be more likely in ImRs. However, the current findings do not suggest that voluntary memory is altered by scenarios that are imagined within ImRs. One reason could be that in our study the alternative script was predominantly generated by the participants themselves. There is some evidence from the earlier false memory research (e.g., Foley et al., 2006) that the source of the imagery script (generated by oneself vs. by another person) can have an impact on error rates or false memories: When participants (rather than someone else) created the scripts of their imagery themselves, the rate of false memories was significantly lower. Similarly, the source monitoring model predicts that source errors are more likely when images are generated unintentionally than when they are generated intentionally as intentional cognitive operations help to ensure that the modification of the memory was generated internally and thus facilitate discrimination between imagined and experienced events (Henkel & Carbuto, 2008). However, asking participants to generate the script themselves may not be the only factor preventing ImRs to lead to impairment of voluntary event memory. In addition, ImRs explicitly marks the integration of new information into memory (i.e., explicitly instructs the patient to imagine an alternative, less stressful outcome from the worst moment [hotspot] onwards) making participants aware of the cognitive operations of the ImRs procedure and thus potentially preventing memory bias.

The finding that ImRs did not distort declarative memory of the film scene is also in line with the supposed working mechanisms of ImRs (Arntz, 2012; Arntz & Weertman, 1999). It is assumed that ImRs does not erase or replace the existing memory trace but that it rather changes the meaning of the trauma by the formation of a new and less stressful memory representation. According to the retrieval competition hypothesis (Brewin, 2006), this new and more positive memory representation increasingly wins the retrieval competition with the original negative memory when treated successfully with ImRs (Brewin et al., 2009).

To sum up, there was neither evidence in previous studies (Ganslmeier, Kunze, et al., 2023; Hagenaars & Arntz, 2012; Siegesleitner et al., 2019) nor in this study that trauma-focused treatment for PTSD in the form of imagery-based interventions distorts recall in the cued or free recall or recognition task. If anything, our results suggest that memory may even improve following imagery-based interventions. Hence, deterioration as hypothesized in basic false memory research (Garry et al., 1996; Goff & Roediger, 1998; Nash et al., 2009; Thomas & Loftus, 2002) and legal practice (Volbert & Steller, 2014), was not observed. We share the skepticism of other researchers (Patihis et al., 2018) about predicting memory distortions in real world situations in general – and in the context of psychological interventions specifically – based on experimental basic research alone. Patihis et al. (2018) showed that false memory production in one laboratory task does not reliably predict false memory production in other tasks. Against this background, instructions that are given in an experiment or intervention as well as the indices that are used to measure memory change may play a decisive role. While the aforementioned basic memory studies used imagination inflation and memory implantation techniques that actively queried or suggested additional, non-experienced information, the instructions in ImRs and ImE differ fundamentally in this regard. For ImRs, the modification of the script is made transparent and is usually more likely to be implemented by the participants themselves, whereas in basic research studies the suggestion comes from externally. As in ImE, participants are not instructed to change anything in the script, it seems unlikely that this leads to deterioration or increase of incorrect details in declarative memory. In addition, the basic research studies used confidence ratings as a dependent variable, whereas we used memory accuracy as an index for memory change. Since both are not necessarily related (Roediger et al., 2012; Scoboria et al., 2014), it appears questionable to draw conclusions about memory changes based on findings referring to memory confidence ratings.

Before drawing final conclusions some limitations of the current study have to be kept in mind. First, the use of an analogue trauma is crucial to reliably investigate the effects of imagery-based interventions on the accuracy of voluntary memory, as only then it is possible to know whether the loss or addition of memory details equals an increase or decrease in memory accuracy. The trauma film paradigm used in our study is a standard analogue task used to test responses to stress and trauma without actually exposing participants to real traumatic events, which would be ethically unacceptable (Arnaudova & Hagenaars, 2017). However, reactions to simulated trauma are not as intense as reactions to real-life personal trauma and our analogue trauma is of course not equivalent to real trauma, which limits the generalizability of our results to clinical samples (Brewin, 2007). Nevertheless, it has been shown that the paradigm (and especially the film Irréversible) is a useful method to induce analogue post-traumatic stress symptoms such as intrusive memories, negative emotions, and subjective distress (Arnaudova & Hagenaars, 2017) supporting the construct validity of the analogue design (see Vervliet & Raes, 2013). The results of this study also showed that the trauma film caused a large increase in negative affect and a large decrease in positive affect. Additionally, it triggered as many intrusions as various trauma films did in previous studies (Arnaudova & Hagenaars, 2017). In addition, by using an anxious sample, we used a sample that responds with more analogue flashbacks to trauma film than a less anxious sample (Clark et al., 2015). Second, as in previous analogue studies (Ganslmeier, Kunze, et al., 2023; Hagenaars & Arntz, 2012; Siegesleitner et al., 2019), we conducted only one single intervention session, which is at the very low end of the spectrum compared to clinical trials (average number of sessions: 4.5, with a range of 1-16; Morina et al., 2017). Nevertheless, single session interventions have also been shown to be effective (Grunert et al., 2007). In this analogue study, however, the interventions did not show the expected positive effects on mood and intrusive re-experiencing demonstrated in the therapeutic context. Therefore, the question arises whether our results can be generalized to therapeutic situations. Future studies should address this question by increasing the dose of the intervention to test whether negative effects on voluntary memory are omitted even when the interventions show the desired positive effects on analogue symptoms. Another limitation of this study is that the interval between trauma film and intervention was rather short. Whereas in clinical practice, there are often months or years between trauma and clinical treatment, it was only one day in the current study. In accordance with the Source Monitoring Framework (Johnson, 2006; Johnson et al., 1993), one can assume that older memories partially degrade over time and may be more susceptible to unintentional intervention effects in clinical practice. However, there is also evidence that traumatic memories (compared to non-traumatic ones) are retrieved more reliably and can usually be remembered well over time (Brewin, 2011; Goodman et al., 2017; Peace & Porter, 2004). This suggests that personal relevance is more crucial than time and implies that highly emotional memories, despite their age, are more likely to be difficult to change than younger, significantly less emotional memories. Nonetheless, the timing and dose of the interventions differs from the use of ImRs in clinical setting, which again is inherent to the analogue paradigm used. Due to short time period between event and intervention as well as the low intervention dose, our paradigm would clearly not be suitable to test effects of the intervention on symptomatology. This may also be reflected by the lack of intervention effects on mood and intrusions found in the current study. However, the aim of our study was to test the effects of ImRs on voluntary memory. Here, we do not see any reason to assume that a potential impact of ImRs on memory accuracy is strongly dependent on timing and dose. This view is shared in the extant literature (e.g., Garry et al., 1996; Goff & Roediger, 1998; Nash et al., 2009; Thomas & Loftus, 2002);

for examples, studies testing the implantation of false memories have also used rather brief interventions shortly after the event memory has formed. Nevertheless, it would be interesting if future studies examined this with longer time intervals. In sum, we argue that both the trauma film paradigm for inducing event memories and the ImRs intervention in our study demonstrate reasonable construct validity and are widely accepted in the literature. Our research necessitated the use of an analogue paradigm since testing it in real clinical settings was not feasible. Nevertheless, it is important to acknowledge that factors like event severity, time between the event and intervention, and dose (single vs. repeated intervention) could potentially influence the outcomes. For example, ImRs may only lead to reduced memory accuracy if the modified script is imagined repeatedly. However, we believe that these factors do not undermine the current study's findings but rather pose important questions that should be addressed in future research.

In summary, given the lack of specific research in this area, this study adds important new findings to the ongoing debate about the extent to which imagery-based interventions might reduce recall accuracy of traumatic life events. Our findings as well as other studies in this area call into question the view that testimony about traumatic experiences is less valid in court after imagery-based systematically investigate and specify the circumstances under which voluntary memory might be impaired by TF-CBT, in order to help both trauma survivors and their therapists out of the dilemma between therapeutic and legal concerns.

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**Study III:**

# Effects of Imagery-Based Interventions on Voluntary Memory: A Systematic Review

This chapter is a pre-print version of an article currently in submission, before formal peer-review and publication.

Supplementary materials including extracted data are available online:

https://osf.io/837tj/?view_only=7a94fc3255cc40bc88fef8ec8180f9eb

The review protocol was preregistered in the International Prospective Register of Systematic Reviews (PROSPERO) under the registration number CRD42024495683.

**Ganslmeier, M.**, Reineck, A., Aleksic, M., Günak, M. M., Nauerz, A. F., Geißler, C., Schulte, C., Leithner, C., Ehring, T., & Wolkenstein, L. (2025). *Effects of imagery-based interventions on voluntary memory: A systematic review*. Manuscript submitted for publication.

## Abstract

Trauma survivors are often advised to delay trauma-focused treatment due to concerns that it may compromise the credibility of legal testimony. However, postponing treatment can impede recovery and increase the risk of chronic posttraumatic stress disorder. This preregistered systematic review synthesized findings from 95 studies, using a narrative synthesis approach to examine the effects of experimental imagery tasks and imagery-based interventions (i.e., imagery rescripting [ImRs], imaginal exposure [ImE], eye movement desensitization and reprocessing, and hypnosis) on voluntary autobiographical memory. Experimental tasks and hypnosis were frequently associated with imagination inflation and source confusion. In contrast, structured clinical interventions such as ImRs and ImE were not associated with memory impairment and sometimes improved recall or narrative coherence. Isolated eye movement tasks showed mixed effects in non-clinical contexts. Overall, the evidence suggests that suggestive procedures and insufficient autobiographical grounding contribute more to the risk of memory distortion than imagery alone. While imagery-based therapies do not appear to impair memory in clinical settings, further research is needed to inform therapeutic safety and forensic standards.

## Introduction

In some jurisdictions, survivors of criminal violence are commonly advised to postpone trauma-focused psychological treatment until related legal proceedings have concluded. This practice is based on the assumption that such treatment could compromise the credibility of their testimony (Henkel & Carbuto, 2008; Mazzoni & Vannucci, 2007). However, survivors of interpersonal violence, such as rape, are at particularly high risk of developing posttraumatic stress disorder (PTSD) (Kessler et al., 2017), and delaying the initiation of evidence-based care raises serious clinical concerns. In short, it places both survivors and clinicians in a difficult position: choosing between addressing urgent therapeutic needs and protecting the integrity of legal testimony – a situation commonly referred to as the dilemma of trauma-focused therapy (Bublitz, 2023).

International clinical guidelines consistently recommend trauma-focused cognitive behavioral therapy (TF-CBT) and eye movement desensitization and reprocessing (EMDR) as first-line treatments for PTSD (Courtois et al., 2017; National Institute for Health and Care Excellence, 2018). TF-CBT comprises a range of methods that directly target traumatic memories and trauma-related cognitions, including imaginal exposure (ImE), in which individuals are guided to vividly recall and describe the traumatic event repeatedly; exposure in vivo to trauma-related cues or environments; the creation of a written trauma narrative; and cognitive techniques aiming to modify maladaptive trauma-related appraisals or beliefs (Ehlers & Clark, 2000; Elbert et al., 2022; Foa et al., 2008). TF-CBT also includes imagery rescripting (ImRs), an imagery-based technique in which therapists help patients imagine changing the narrative of the traumatic event in a way that reduces its emotional impact and replaces negative emotions with more adaptive and supportive emotional responses. This involves reframing how the experience is mentally represented – for example, by imagining the perpetrator as disempowered or by addressing the unmet needs of the former self, such as those for safety, comfort, or control (Arntz & Weertman, 1999; Schmucker & Köster, 2015). EMDR begins with the recall of the most distressing image associated with the traumatic event and the identification of related negative cognitions, which serve as entry points for an associative processing sequence. While holding this image in mind, patients engage in rhythmic bilateral stimulation, typically through side-to-side eye movements or, less frequently, auditory or tactile input. This process is theorized to facilitate the reprocessing of traumatic memories, allowing the associated emotional intensity and distress to diminish over time (Shapiro, 2018).

Timely intervention is critical to preventing symptom chronicity and worsening after trauma. Evidence from large-scale studies demonstrates that trauma-focused therapy that is initiated within days to weeks following the event, particularly in symptomatic individuals, can substantially reduce the risk of developing chronic PTSD (Roberts et al., 2019; Shalev et al., 2012). In line with this evidence, clinical guidelines such as the National Institute for Health and Care Excellence (NICE) guidance for PTSD (NG116) recommend offering trauma-focused interventions within the first month to individuals presenting with acute symptoms (NICE) . TF-CBT interventions such as ImE and ImRs, as well as EMDR, have been shown to reduce *involuntary* re-experiencing of the traumatic event and other symptoms of PTSD (Cusack et al., 2016; Morina et al., 2017; Weber et al., 2021).

However, the strong evidence supporting early intervention can conflict with the legal caution exercised in cases of criminal victimization. While psychological treatment should target *involuntary* memory phenomena, such as flashbacks, intrusive memories, and nightmares, to reduce PTSD-related distress, it is also important to preserve *voluntary* aspects of declarative memory, including the ability to intentionally recall specific episodes and facts. This is particularly relevant when legal proceedings against the perpetrator(s) take place during or after treatment (McNally, 2003; Visser et al., 2018).

Although psychological interventions were not traditionally assumed to affect declarative, voluntary memory for traumatic events, concerns about their potential memory-distorting effects gained momentum during the false memory debate of the early 1990s (Lindsay & Read, 1994; Porter et al., 2012). At that time, reports emerged of individuals recovering long-forgotten memories of childhood sexual abuse during therapy, some of which were later called into question or deemed implausible based on external evidence (Patihis & Pendergrast, 2019). This sparked critical debate about whether certain therapeutic techniques might inadvertently distort memory.

From a theoretical perspective, such concerns are grounded in well-established cognitive principles regarding the reconstructive nature of memory. Memory is not a perfect recording of past events but rather is actively reconstructed during retrieval, making it vulnerable to distortion (Schacter & Addis, 2007). One influential framework explaining such distortions is the *Source Monitoring Framework*, which posits that individuals may misattribute the origin of a memory – for example, confusing something imagined or suggested with something actually experienced (Johnson et al., 1993). This is particularly relevant in therapeutic contexts involving imagery-based techniques. When such interventions reactivate a memory trace, the trace enters a transiently labile state during which it is susceptible to modification before being re-stored – a phenomenon known as reconsolidation (Elsey et al., 2018; Nader et al., 2000). If misleading or suggestive information is introduced during this labile state, especially when vividly imagined, individuals may later struggle to distinguish between the original experience and the imagined alterations, leading to source-monitoring errors (Garry et al., 1996; Nash et al., 2009).

Research on eyewitness testimony supports these concerns. Even accurate memories are susceptible to external influences – a phenomenon known as the *misinformation effect*, in which post-event information alters original recall (Loftus, 2005; Loftus & Klemfuss, 2023). Subtle cues, such as leading language or misleading visuals, can alter what people remember (Loftus et al., 1978; Loftus & Palmer, 1974). Although early work focused on distortions of real events, later studies demonstrated that entirely false memories can also be created. For example, approximately 25% of participants in the *lost-in-the-mall* study reported false childhood memories (Loftus & Pickrell, 1995), and nearly 50% did so when shown doctored images of implausible events (Wade et al., 2002).

Such distortions can also emerge without explicit external suggestion. Garry et al. (1996) showed that imagining childhood events increased their perceived likelihood – a phenomenon known as *imagination inflation*. Hyman et al. (1995) and Hyman and Pentland (1996) extended these findings, demonstrating that spontaneous and guided imagery can foster vivid but false autobiographical memories, especially when supported by social cues or suggestion. False memories are not limited to childhood or emotional events; even simple imagined actions, such as flipping a coin, have been misremembered as real (Goff & Roediger, 1998). These findings raise concerns about the potential for memory distortion in the imagery-based interventions commonly used in the treatment of PTSD.

It is important to note, however, that the paradigms used in experimental eyewitness and false memory studies differ markedly from the procedures and interventions employed in clinical practice. Laboratory tasks often target implausible or emotionally neutral events, rely on repeated suggestions, and are conducted outside the clinical setting. In contrast, imagery-based interventions used in trauma-focused treatment are carefully guided, grounded in patients' autobiographical experiences, and implemented through structured clinical protocols designed to minimize suggestive influences. Moreover, experimental studies typically assess belief or confidence rather than the accuracy or content of memory, which are arguably more relevant in clinical and forensic contexts. Despite these differences, findings from experimental research are frequently cited as evidence of the potential risks associated with imagery-based interventions in clinical practice (Brainerd & Reyna, 2005; Loftus & Davis, 2006; Ridley et al., 2012)

These considerations point to an underexplored translational gap: although imagination has been shown to influence memory under specific laboratory conditions (for a review, see Brewin & Andrews, 2017), such conditions are not representative of evidence-based clinical practice. This raises important questions about the generalizability of laboratory findings to clinical settings and underscores the need for studies that directly investigate the effects of imagery-based interventions as implemented in routine clinical practice. To date, however, relatively few empirical studies have examined the impact of imagery-based interventions on voluntary memory in clinical or experimentally simulated (i.e., analogue) trauma-focused treatment settings. (e.g., Hagenaars & Arntz, 2012; Siegesleitner et al., 2019), and a structured synthesis of current evidence across study types is still missing. It therefore remains unclear when, how, and for whom imagery-based techniques may affect memory reliability. Although it is possible that mental imagery inherently poses risks to memory accuracy, it is also possible that such risks arise primarily under specific conditions, such as when imagery is combined with suggestive influences or applied in vulnerable populations (e.g., children). Clarifying whether imagery techniques are problematic in themselves or only under specific circumstances is essential for understanding their clinical and forensic implications.

Earlier reviews (e.g., Brewin & Andrews, 2017; Muschalla & Schönborn, 2021) have synthesized research on the induction of false memories through imagination and suggestion in laboratory paradigms, but have largely focused on childhood events and non-clinical settings and have not followed full systematic review standards. Existing systematic reviews and meta-analyses (e.g., Kenchel et al., 2022; Qin et al., 2021) have addressed only the role of eye movements in memory retrieval and distortion. None of these reviews has directly addressed imagery-based trauma interventions or their implications for the reliability of voluntary autobiographical memory, and an integrated synthesis combining findings from both basic memory research and clinical literature is still lacking.

We therefore aimed to address this gap by synthesizing findings from experimental, analogue, and clinical studies. Given the considerable conceptual and methodological diversity across studies in this field – particularly with respect to sample characteristics, memory characteristics, intervention characteristics, and memory outcome measures – we also examined potential moderator variables in order to identify factors that may influence the effects of imagery-based interventions on memory outcomes relevant to therapeutic and forensic applications.

**Objectives**

Our aim in this review was to systematically synthesize current evidence on when and how imagery-based interventions affect voluntary memory, and to identify the implications of these findings for their use in trauma-focused treatments such as TF-CBT and EMDR. To this end, we drew on findings from basic memory research (which investigates the influence of imagination on memory using emotionally neutral or artificially induced material under controlled, non-clinical conditions), clinically inspired analogue studies (which model therapeutic imagery techniques experimentally, outside actual treatment contexts), and clinical intervention studies (which examine imagery-based treatments in individuals with trauma-related symptoms or diagnoses). We synthesized the evidence on how imagery influences voluntary memory, considering the *direction of effect* (negative effect vs. positive effect vs. no effect), the *type of comparison* used (active vs. no-intervention control condition vs. pre–post measurements), and the *type of effect* reported (main effect of condition vs. main effect of time vs. interaction effect). Given the heterogeneity of study designs and outcome measures, we used a narrative synthesis approach to structure and interpret the findings.

We placed a particular focus on identifying moderators that may influence the likelihood of memory distortion, and structured findings along four conceptual domains: (1) sample characteristics (*age group*: children vs. adolescents vs. adults; *mental health status*: healthy vs. clinical symptoms or diagnoses), (2) memory characteristics (*lifetime period of memory*: childhood vs. adolescence vs. adulthood; *memory valence*: positive vs. neutral vs. negative vs. traumatic; *type of event*: imagery of a personal experience vs. a fictitious event vs. a mixture of both), (3) intervention characteristics (*time between (a) memory induction or (b) event and intervention*; *number of sessions*; *source of intervention script*: self-generated vs. other-generated vs. a mixture of both; *treatment technique or intervention*: imagery task vs. ImRs vs. ImE vs. EMDR vs. hypnosis vs. other trauma-focused intervention), and (4) outcomes (*time between intervention and memory test*; *type of memory-related outcome*: memory belief or confidence vs. memory accuracy vs. changes in memory content).

Finally, we sought to address the clinical and ethical implications of these findings, particularly how to balance the need for effective symptom reduction through evidence-based imagery techniques with concerns about their potential impact on memory reliability in therapeutic and legal contexts.

## Method

The review protocol was preregistered in the International Prospective Register of Systematic Reviews (PROSPERO) under the registration number CRD42024495683. The reporting of this systematic review conforms to the standards of the *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA; Page et al., 2021).

## Identification and Selection of Studies

### *Eligibility Criteria*

We included English-language publications that met the following criteria (see Appendix C, S1 for a list of included references):

(1) The study sample consisted of (a) healthy participants or (b) individuals with clinical symptoms or diagnoses.

(2) The intervention or treatment under investigation consisted of either (a) an imagery task[7] (defined here as a task involving the mental process of (re)creating and (re)experiencing sensory representations in the mind encompassing visual, auditory, tactile, olfactory, or gustatory sensations) related to a personally experienced or a fictitious event[8] or (b) an imagery-based clinical intervention (e.g., ImRs, ImE, EMDR, hypnosis,[9] or other trauma-focused intervention) targeting an analogue trauma (i.e., an experimentally induced event such as a trauma film), a sub-clinically distressing life event (e.g., workplace bullying, relationship dissolution), or a clinically relevant trauma (e.g., physical violence).

(3) The study design included one of the following: (a) an active control condition (between- or within-subjects design),[10] (b) a no-intervention control condition (between- or within-

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[7] While the term *task that involves imagery* was used in the preregistration, the more concise and established term *imagery task* is used throughout this manuscript to improve readability.

[8] The preregistered definition of *imagery task* was intentionally broad. In the present manuscript, additional inclusion rules were specified post hoc to improve methodological clarity and ensure that the included tasks involved event-related mental imagery, as originally intended. Studies were excluded if the imagery was not anchored to a personally relevant or plausible event – for example, scenarios that were purely hypothetical or semantic in nature, or source-monitoring designs in which some events were imagined and others were performed, but no intervention phase targeted the imagined events. Studies were included if the imagery referred to plausible autobiographical events, even if these events had not actually occurred (e.g., potential childhood experiences as used in Life Event Inventory paradigms). Finally, studies using static stimuli (e.g., pictures, word lists) were also excluded due to the absence of an autobiographical reference or event-related imagery.

[9] Hypnosis-based interventions were only included if they were clearly anchored to a specific event and the instructions explicitly involved imagery. This includes, for example, age regression procedures provided they guided participants to mentally re-enter and vividly imagine a specific past (or suggested) experience. Hypnosis procedures without an identifiable imagery component or without an event-related focus were excluded.

[10] The preregistered description of the required study design was further specified in the present manuscript to improve clarity. Both active and no-intervention control conditions were defined as being implemented in either between-subjects or within-subjects designs. This specification was consistent with the original intent of the criterion and did not alter the conceptual basis of the inclusion rule.

subjects design), or (c) for studies without a control condition, at least two measurement time points and a within-subjects control condition (e.g., involving events that were not imagined), allowing effects to be attributed specifically to the imagery intervention.[11]

(4) Outcomes were reported in the form of (a) memory accuracy (e.g., free recall, cued recall, recognition task), (b) memory belief or confidence, or (c) changes in memory content (e.g., consistency).

(5) The study was published in a peer-reviewed journal.

We applied no restrictions regarding intervention format (e.g., number of treatment sessions), the language in which the study was conducted, or the date of publication.

Studies were excluded if they met any of the following criteria: (1) no control condition and only a single measurement time point; (2) unpublished reports; (3) dissertations or theses; or (4) full text not available (even after contacting the corresponding authors).

***Search Strategy***

We conducted electronic searches in the following databases: Web of Science, PubMed, APA PsycINFO, APA PsycArticles, PSYNDEX Literature with PSYNDEX Tests, and PTSDpubs. We searched titles, abstracts, and keywords, using only free-text terms (no controlled vocabulary such as MeSH or APA Thesaurus).

Publications had to include terms related to (1) the phenomenon (e.g.,*"false memor*", "memor* distort*", "imagination inflation", "declarative memor*", misinformation*), and (2) the intervention (e.g., *imagination, imagery, EMDR, hypnosis, "trauma-focused"*), and (3) the memory measurement (*accuracy, confiden*, belief*, recall, retrieval*). Within each concept, search terms were connected by the Boolean operator "OR",

[11] In the preregistration, studies without a control condition were required to include at least two measurement time points. In the present manuscript, this criterion was further refined to additionally require a within-subjects control comparison (e.g., events that were not imagined), to ensure that observed effects could be specifically attributed to imagery.

and each concept was connected by the Boolean operator “AND”. Term truncation (*) and quotation marks (“”) were used as appropriate. A detailed description of the search strategy is provided in Appendix C, S2.

To identify additional relevant publications, we also examined the reference lists of included studies and of previous reviews (Brewin & Andrews, 2017; Kenchel et al., 2022; Muschalla & Schönborn, 2021; Qin et al., 2021). The search was conducted on May 25, 2024. The present review includes all studies published up to and including that date.

**Screening**

After completing the database searches, we imported the results into EndNote and removed duplicates. Titles, abstracts, and keywords of all remaining records were screened. Records that clearly did not meet the inclusion criteria were excluded at this stage.

**Study Selection**

In the next step, the full texts of all remaining records were independently assessed for eligibility by two reviewers (MG and AR). Both reviewers were blinded to each other’s decisions until screening was complete. Discrepancies were resolved through discussion; in isolated cases, the last author (LW) was consulted to reach a final decision.

**Data Extraction**

Due to the large number of included studies, data extraction could not be carried out solely by the two reviewers (MG, MA) originally planned in the preregistration. Instead, several additional reviewers (AR, LW, MMG, AN) were trained and supervised to ensure consistency across extractions. Data from each study were independently extracted by two reviewers using a predefined extraction protocol and entered into a standardized Excel spreadsheet. Discrepancies were discussed and resolved under the supervision of MG. Agreement rates for the initial independent ratings were not calculated, as consensus was typically reached after brief discussion. In very rare cases, the last author (LW) was consulted to reach a final decision.

We extracted and coded categorial variables in the following four domains: sample characteristics, memory characteristics, intervention characteristics, and outcome (for full coding scheme, see Table 3.1).

### *Sample Characteristics*

The following sample characteristics were coded: age group (children <12 years, adolescents 12–17 years, or adults 18+ years) and mental health status (healthy participants or individuals with clinical symptoms or diagnoses).

### *Memory Characteristics*

The following characteristics of participants' memories were coded: lifetime period of memory (childhood <12 years, adolescence 12–17 years, or adulthood 18+ years); memory valence (positive, neutral, negative, or traumatic); and type of event (personal experience [including personally observed events], fictitious event [i.e., an event that had not actually occurred], or a mixture of both).

While the label "personal experience" is often interpreted narrowly as referring only to autobiographical memories, we used it here as an umbrella category encompassing both autobiographical experiences and personally observed events. The latter refers to situations in which participants primarily acted as observers rather than being directly involved in the event (e.g., viewing a trauma film). These events were nonetheless considered personally experienced, as they were perceptually and emotionally processed by the participants.

We defined fictitious events as entirely imagined scenarios without any real experiential basis. This conceptual refinement was introduced post hoc (i.e., it was not part of the preregistered coding scheme) in order to improve clarity and coding precision.

The category “mixture of both” referred to cases in which participants imagined events containing elements that may have been personally experienced alongside elements that were likely fictional, such that it remained unclear which aspects were based on real experiences and which were not. This included, for example, plausible childhood memories that could not be externally verified, or imagined scenarios that combined real autobiographical components (e.g., familiar people or locations) with fictional content (e.g., actions or outcomes that never actually occurred).

### *Intervention Characteristics*

The following intervention characteristics were coded: time between memory induction or event and intervention; number of sessions; source of intervention script (predominantly self-generated, predominantly other-generated, or a mixture of both); and treatment technique or intervention type (imagery task, ImRs, ImE, EMDR, hypnosis, or other trauma-focused intervention)

### *Outcomes*

The following outcome variables were coded: time between intervention and memory test; direction of effect (negative: deterioration of memory, positive: improvement of memory, or no effect: no change in memory); type of comparison (active control condition, no-intervention control condition, or, in studies without a control condition, a within-subjects control comparison that included at least two measurement time points); type of effect (main effect of condition or time, or interaction effect); and aspect of memory (memory accuracy, memory belief or confidence, or changes in memory content).

**Table 3.1**

*Extracted and Coded Categorial Variables*

| Domain | Variable | Values |
|---|---|---|
| Sample characteristics | Age group | children (<12 years), adolescents (12–17 years), or adults (18+ years) |
| | Mental health status | healthy, clinical symptoms or diagnoses |
| Memory characteristics | Lifetime period of memory | childhood (<12 years), adolescence (12–17 years), or adulthood (18+ years) |
| | Memory valence | positive, neutral, negative, or traumatic |
| | Type of event | Personal experience (including personally observed events), fictitious event, or a mixture of both |
| Intervention characteristics | Time between memory induction or event and intervention | continuous (in minutes, hours, days, weeks, months, or years; exact value coded) |
| | Number of sessions | continuous (exact value coded) |
| | Source of intervention script | self-generated, other-generated, or a mixture of both |
| | Treatment technique or intervention | imagery task, ImRs, ImE, EMDR, hypnosis, or other trauma-focused intervention |
| Outcomes | Time between intervention and memory test | continuous (in minutes, hours, days, weeks, months, or years; exact value coded) |
| | Direction of effect | negative: deterioration of memory, positive: improvement of memory, or no effect: no change in memory |
| | Type of comparison(s) | active control, no-intervention control, or within-subject comparison in uncontrolled studies with at least two measurement time points |
| | Type of effect | main effect of condition or time, or interaction effect |
| | Aspect of memory | memory accuracy, memory belief or confidence, or changes in memory content |

*Note*. "Mixture of both" refers to a combination of personal experiences and fictitious events (type of event) or of self-generated and other-generated content (source of intervention script). ImRs = Imagery Rescripting; ImE = Imaginal Exposure; EMDR = Eye Movement Desensitization and Reprocessing.

## Risk of Bias Assessment

The risk of bias (RoB) was assessed using the Cochrane RoB 2 tool (Sterne et al., 2019). RoB 2 evaluates the risk of bias in the estimation of intervention effects from randomized trials across five domains: (1) randomization process, (2) deviations from intended interventions, (3) missing outcome data, (4) measurement of the outcome, (5) and selection of the reported result. Each domain is rated as *low risk of bias*, *some concerns*, or *high risk of bias*, with judgments generated through algorithms based on responses to predefined signaling questions (Sterne et al., 2019). The overall risk of bias is determined based on the domain-level ratings.

In this review, the focus was on assessing the effect of adherence to an intervention. Thus, in the domain *deviations from intended interventions*, the following aspects were evaluated: the occurrence of non-protocol interventions, failures in implementing the intervention that could have affected the outcome, and non-adherence to the assigned intervention by trial participants.

Three independent raters (CG, CS, CL) conducted the risk of bias assessments. For interrater reliability, a subset of 15% of the studies was independently evaluated by two raters per study, with rater combinations varying due to incomplete overlap across the three raters. This process continued until an overall agreement of ≥90% was reached. The remaining studies were then rated individually. Interrater reliability was estimated as the percentage agreement between rater pairs (96%). Discrepancies were resolved through discussion until consensus was reached.

**Data Synthesis**

As specified in the preregistered protocol, we conducted a narrative synthesis of the included studies, structured by the type of treatment technique or intervention: imagery tasks, imagery-based interventions such as ImRs, ImE, EMDR, and hypnosis. No studies were identified that investigated trauma-focused interventions outside these categories.

The category of imagery tasks was further subdivided based on methodological approach and task content. We distinguished between: (a) studies using the Life Event Inventory or similar structured approaches (e.g., based on the paradigm introduced by Garry et al., 1996); (b) studies involving imagination of action statements (e.g., based on the paradigm introduced by Goff & Roediger, 1998); (c) studies focused on inducing autobiographical false memories through imagery (e.g., based on the paradigm introduced by Hyman & Pentland, 1996); and (d) studies aiming to facilitate memory through imagery techniques. This post hoc categorization goes beyond what was outlined in the preregistration plan and was introduced to allow for a more precise differentiation of conceptually distinct task types and their potential influence on memory outcomes. The intent was to improve the clarity and interpretability of the synthesis by capturing important methodological and theoretical variations within the broader category of imagery tasks.

For each intervention and imagery task type, we recorded the number of studies reporting positive effects (e.g., improved memory performance or memory accuracy), negative effects (e.g., increased memory distortion, reduced accuracy), or no observable effects. Only statistically significant findings ($p < .05$) were classified as effects; marginal trends or near-significant results were not coded as effects even if the original authors interpreted them as such. This conservative coding strategy was adopted to ensure consistency and robustness in the evaluation of outcomes. We also noted how these outcomes related to key moderators. A detailed descriptive summary was prepared for each intervention type, outlining how the reported effects were distributed across study characteristics.

To ensure transparency and clarity, the findings are presented separately for each intervention category. Within each category, we conducted a narrative synthesis to identify trends and patterns, and to explore potential relationships between moderators and memory outcomes. This approach allowed us to assess, for instance, whether certain types of memory content were particularly susceptible to change.

Additionally, a *cross-intervention* narrative synthesis is presented in the Discussion section, integrating findings across all intervention types and moderator dimensions. This overarching synthesis is intended to identify broader patterns, commonalities, and divergences across the included studies, and provides a basis for drawing conclusions about practical implications and future research directions in the field of imagery-based trauma interventions. The synthesis relied on descriptive and narrative methods, in line with the heterogeneity of the included studies and the preregistered plan.

# Results

## Study Characteristics

A total of 78 reports, comprising 95 studies, were included in the review. Figure 3.1 presents a PRISMA flow diagram of the study selection process (see Appendix C, S3 for a list of excluded studies). Of the included reports, 73 were identified through systematic literature searches, and five additional reports were retrieved through backward reference searches of included articles and previously published reviews.

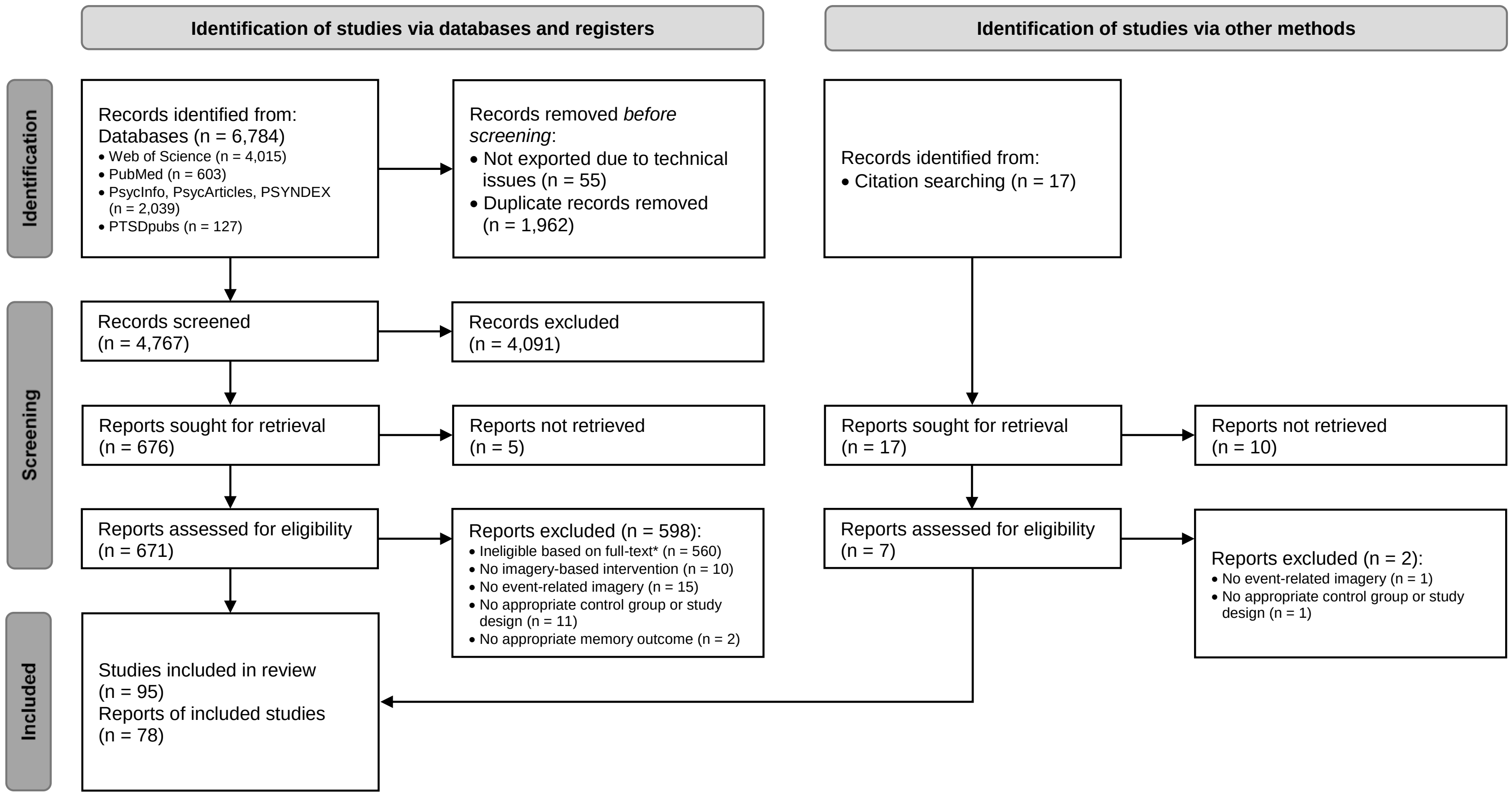
Among the included reports, *k* = 54 examined the role of mental imagery. For meaningful categorization, these were grouped into the following subcategories:

- reports using structured approaches such as the Life Event Inventory (23 reports, *k* = 26 studies)
- reports examining imagined action statements (18 reports, *k* = 26 studies)
- reports inducing autobiographical false memories through imagery (8 reports, *k* = 10 studies); and
- reports employing imagery to facilitate memory (5 reports, *k* = 5 studies).

Additionally, the review included reports that studied imagery-based clinical interventions: ImRs or ImE (6 reports, *k* = 6 studies), EMDR (9 reports, *k* = 12 studies), and hypnosis (9 reports, *k* = 10 studies).

**Figure 3.1**

*PRISMA Flow Diagram*




*Note.* PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analyses; *N* = number of reports.
* The 560 reports were excluded at the full-text screening stage for clearly not meeting the eligibility criteria (e.g., stimulus material not event-related, lack of imagery, inappropriate study design or outcome)

## Data Synthesis

### *Imagery Tasks*

**Studies Using the Life Event Inventory.** A total of 26 studies examined the effects of guided imagery on autobiographical memory using the Life Event Inventory (LEI) or methodologically similar paradigms. Extracted data and study summaries are presented in Table S4.1 (see Appendix C. S4).

All studies used externally provided event descriptions, which were typically drawn from a standardized LEI item pool. Participants were asked to imagine plausible childhood events that were unlikely to have actually occurred and were usually selected based on low initial confidence ratings (e.g., LEI scores of 1–4). These events were framed as autobiographical and personally relevant (e.g., common childhood scenarios such as getting lost or breaking a window) and were often deliberately ambiguous or generic.

Most studies reported evidence of imagination inflation, reflected in increased confidence that the imagined events had actually occurred. However, a considerable number of studies did not find significant effects, suggesting that the impact of imagery on memory confidence may be moderated by contextual or individual factors.

Across all 26 studies, none reported clearly positive[12] effects of imagery on memory accuracy (e.g., improved accuracy or reduced susceptibility to distortion). In contrast, 12 studies found negative effects, typically in the form of imagination inflation (Baran & Niedzwienska, 2002; Calvillo et al., 2019; Garry et al., 1996; Heaps & Nash, 1999; Horselenberg et al., 2000, Experiment 2; Landau & von Glahn, 2004; Mazzoni & Memon, 2003; Paddock et al., 1998, Experiment 1; Paddock et al., 1999; Sharman & Barnier, 2008; Sharman & Calacouris, 2010; Sharman & Scoboria, 2009).

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[12] negative: deterioration of memory, positive: improvement of memory, or no effect: no change in memory

Nine studies reported no significant effects, indicating that imagery did not meaningfully influence memory beliefs or confidence ratings (Bays et al., 2013; Bays et al., 2012; Clancy et al., 1999; Horselenberg et al., 2000, Experiment 1; Paddock et al., 1998, Experiment 2; Pezdek & Eddy, 2001; Qin et al., 2008, Experiment 1; Sharman et al., 2004; Sharman & Powell, 2013). In these cases, imagined events were judged as no more likely than non-imagined events.

Five studies reported mixed effects, with imagination inflation occurring only under specific task conditions or moderated by certain variables. For example, inflation occurred only under guided imagery instructions but not under prompted imagery (Bays et al., 2015); for highly plausible events (Pezdek, Blandon-Gitlin, & Gabbay, 2006); or when imagery was from a third-person perspective under certain experimental conditions. These included an interaction between test order and visual perspective, with imagination inflation occurring only when events were imagined from a third-person perspective and the LEI was completed prior to the plausibility ratings (Sharman et al., 2005); a selective effect of third-person imagery compared to first-person imagery (Marsh et al., 2014, Experiment 1); and a combined effect of perspective and memory age, with imagination inflation observed only for childhood events imagined from a third-person perspective (Marsh et al., 2014, Experiment 2). Across these five studies, imagination inflation did not occur uniformly but only under theoretically meaningful conditions.

***Sample Characteristics.*** All 26 studies were conducted with healthy participants. Most samples consisted of young adults who were university students, with some studies also including adolescents aged 16 and above. A few studies reported broader age ranges (Paddock et al., 1998, Experiment 2; Pezdek, Blandon-Gitlin, & Gabbay, 2006; Sharman & Barnier, 2008; Sharman & Powell, 2013).

Only one study explicitly compared younger and older adults: Pezdek, Blandon-Gitlin and Gabbay (2006) found no significant differences in imagination inflation between age groups. In contrast, Paddock et al. (1998, Experiment 2) tested a sample of middle-aged factory workers and found no imagination inflation effect; they raised the possibility that such effects may not generalize well beyond student populations. However, because this study did not include a directly comparable student sample, no firm conclusions about age-related or sample-dependent differences can be drawn.

Only one study (Clancy et al., 1999) included participants selected based on clinical background, comparing individuals with recovered memories of childhood sexual abuse to a non-clinical control group. No formal diagnoses were reported, and no significant group differences in confidence measures were found. Guided imagery did not significantly influence confidence measures in either group.

Overall, the available evidence does not provide sufficient or consistent support for the idea that demographic characteristics such as age or clinical background reliably moderate the presence or magnitude of imagination inflation in LEI-based paradigms.

***Memory Characteristics.*** Across all 26 studies, the targeted memories referred predominantly to childhood events. A few studies also included adult or recent events in addition to childhood memories.

Sharman and Barnier (2008) and Marsh et al. (2014, Experiment 2) directly compared childhood and adulthood events. In Marsh et al. (2014, Experiment 2), imagination inflation occurred only for childhood events imagined from a third-person perspective, suggesting that alignment with typical autobiographical retrieval style may increase inflation effects. In Sharman and Barnier (2008), inflation effects were seen for both childhood and adulthood events, but were modulated by memory valence: positive adulthood events produced greater increases than positive childhood events, whereas no differences were found for negative events. In Calvillo et al. (2019), imagination inflation occurred both for childhood events and for imagined actions performed in the lab, but the effects were not correlated, suggesting independent mechanisms.

In many studies, event descriptions were intentionally ambiguous or generic, resulting in a “mixture of both” – that is, events that could plausibly have been experienced by the participant without being clearly remembered as real or clearly recognized as fictional. This design aimed to simulate the ambiguity of everyday autobiographical memory and increase susceptibility to imagination-based distortions.

In terms of memory valence, most studies included a mix of positive, negative, and sometimes neutral events. Several studies directly manipulated valence to examine its influence on imagination inflation. Findings suggest that positively valenced events may be more susceptible to imagination inflation than negative ones. In Bays et al. (2015), positive events led to greater increases in confidence ratings regardless of imagery instructions. Similarly, Sharman and Barnier (2008) found stronger inflation effects for positive adulthood events compared to positive childhood events, while no differences were seen for negative events. Sharman and Calacouris (2010) found no moderating effect of valence: This suggests that the influence of emotional content may depend on specific task characteristics or instructions. Overall, valence appears to function as a conditional moderator, with some evidence that a positive emotional tone enhances susceptibility to imagination inflation, particularly when events are imagined in a guided or immersive manner.

Several studies also varied event plausibility to examine its influence on imagination inflation. Pezdek, Blandon-Gitlin and Gabbay (2006) found that inflation occurred only for highly plausible events, suggesting that prior knowledge or perceived likelihood may increase susceptibility. In contrast, Sharman and Scoboria (2009) observed inflation effects across all plausibility levels, with no significant moderation by plausibility. Similarly, Sharman and

Powell (2013) found no consistent effect of event plausibility on confidence or memory ratings; only a limited increase in personal plausibility was observed for moderately plausible events under specific instructions. These findings suggest that plausibility may act as a boundary condition but does not reliably moderate imagination inflation across studies.

***Intervention Characteristics.*** Across all studies, the interventions consisted of guided or imagery tasks, which were administered in a single session, typically after initial memory ratings had been collected in the same session. The number of imagination repetitions was usually limited to a single exposure. A few studies employed repeated imagination trials and found that a single trial was sufficient to produce imagination inflation, with additional repetitions having little or no additive effect (Sharman et al., 2004). Consistent with this, Bays et al. (2012) reported no significant main effects of repeated imagination.

A few studies manipulated the instructional style of the imagery task. Bays et al. (2015) found that guided imagery (but not prompted imagery) increased confidence ratings. In contrast, using cognitive interview techniques such as context reinstatement or report-everything instructions (Sharman & Powell, 2013) had no consistent impact on confidence ratings or memory outcomes. Qin et al. (2008) compared visualization with a thinking-based control condition and found that imagery alone did not increase false memory rates, suggesting that instructional context alone may not be sufficient to induce imagination inflation.

All studies used standardized, externally provided event descriptions from the LEI item pool. Although participants often selected events based on low initial confidence ratings (e.g., LEI scores of 1–4), the source of the intervention scripts was always external; no study used self-generated or autobiographically rich material. Thus, imagination inflation occurred in response to plausible but impersonal event scripts rather than personally meaningful content.

In studies that included warnings, there was consistent evidence that these can reduce imagination inflation, although they do not always eliminate it. Qin et al. (2008) used an explicit warning that imagining an event might increase the risk of false memories. Although imagery alone did not significantly increase false-memory reports, the warning nevertheless lowered participants' confidence in the imagined events, suggesting a protective effect against distortion. Similarly, Landau and von Glahn (2004) provided an explicit post-hoc warning after the imagery task, instructing participants to carefully consider whether each event had truly occurred; this significantly reduced the magnitude of imagination inflation.

Some studies also examined implicit source-monitoring prompts. In Sharman et al. (2005), administering a plausibility questionnaire before the LEI served as a metacognitive safeguard: under these conditions, imagination inflation did not occur for first-person imagery. (Marsh et al., 2014) found similar results: inflation was selectively observed for third-person imagery and only under specific conditions (e.g., childhood events, certain test orders), suggesting that encouraging early source monitoring can buffer against imagination inflation.

Taken together, these findings indicate that warnings and source-monitoring prompts can reduce or prevent imagination-related memory distortions, particularly when they encourage critical appraisal or source awareness. However, their effectiveness remains context-dependent and may interact with moderators such as imagery perspective, event plausibility, or retrieval structure.

***Outcomes.*** In all studies, confidence ratings were assessed before and after the intervention, typically during the same session (e.g., Garry et al., 1996). A few studies introduced short delays (up to one week), but no systematic differences in effects depending on test timing were observed (e.g., Calvillo et al., 2019; Mazzoni & Memon, 2003).

Most studies focused on confidence ratings, which were operationalized as subjective judgments of whether an event had occurred (e.g., using 8-point LEI scales). Memory accuracy and qualitative changes in memory content (e.g., consistency) were rarely assessed and, when included, showed no consistent effects. This distinction is supported by findings from Mazzoni and Memon (2003) and Calvillo et al. (2019), which showed that confidence ratings increased following imagination, but no corresponding changes in memory accuracy or content were observed. Overall, imagination consistently increased confidence ratings but did not reliably alter memory accuracy or content.

**Studies Using Action Statements.** A total of 26 studies examined the effects of guided imagery on autobiographical memory using paradigms based on action statements. Extracted data and study summaries are presented in Table S4.2 (see Appendix C, S4).

In these studies, participants were typically asked to imagine simple, everyday actions, such as turning on a light or tearing a piece of paper – most often immediately after the initial encoding phase. Some of these actions had been performed, some had only been heard or read, and others had not been presented during encoding. The studies varied widely in experimental design, including the number of imagination repetitions, perspective of imagery (self vs. other), memory valence and familiarity of the actions, and demographic characteristics (age, clinical status). Many studies reported evidence of imagination-related memory distortions, whereas others showed no or only conditional effects, suggesting that the impact of imagination depends strongly on contextual and participant-level factors, including encoding conditions (i.e., enacted, imagined, read, or novel), memory content (i.e., familiar vs. bizarre), and cognitive status (e.g., Korsakoff's syndrome, very mild Alzheimer's disease).

Across all 26 studies, none reported unambiguously positive effects of imagination on memory – that is, no study found improved memory accuracy or reduced susceptibility to distortion. In contrast, 12 studies reported clearly negative effects of imagination, which were typically reflected in increased false recognition rates, elevated source-monitoring errors, or greater confidence that actions had been experienced when they had not (Clark et al., 2022; El Haj & Robin, 2020; Goff & Roediger, 1998, Experiments 1 and 2; Lampinen et al., 2003; Lindner et al., 2010; Nash et al., 2009, Experiment 2; Seamon et al., 2006; Takarangi et al., 2013; Thomas et al., 2003, Experiments 1 and 2; Thomas & Loftus, 2002). These findings are consistent with the phenomenon of imagination inflation and suggest that repeated imagination can blur the boundary between real and imagined experiences.

The remaining 13 studies produced mixed effects, indicating that imagination can both enhance and impair memory depending on specific moderators. For example, imagination increased correct recognition of actions that had actually been encoded – typically through enactment, listening, or prior imagination (Dhammapeera et al., 2024; Lindner & Echterhoff, 2015, Experiments 1–3; O'Connor et al., 2015; Seamon et al., 2009; Thomas & Loftus, 2002, Experiments 1 and 2); improved hit rates for scenarios that were re-imagined exactly as first experienced (Gerlach et al., 2014, Experiments 1a and 1b); and modestly aided older adults' recall of rewarded tasks following recall or downward counterfactual simulation (Gerlach et al., 2014, Experiment 2). However, these same manipulations also increased memory distortion. Counterfactual or repeated imagination boosted false alarms for actions that had only been read, imagined, or never presented (Dhammapeera et al., 2024; Gerlach et al., 2014, Experiments 1a, 1b, and 2). Repetition further magnified source-monitoring errors and liberal response bias (Lindner & Echterhoff, 2015, Experiments 1–3; Thomas & Bulevich, 2006, Experiments 1 and 2), and imagining novel actions led participants to misattribute them as previously performed (Seamon et al., 2009). Imaginal retrieval increased both hit and false-alarm rates for bizarre, previously imagined actions, leading participants to endorse these items more readily than under enactment testing (Worthen & Wood, 2001). Even when no false memories were created, imagination alone still increased participants' belief that they had performed actions they had not actually done (Nash et al., 2009, Experiment 1). Only one study reported no significant effects of imagination on memory: in that experiment, repeated imagination neither increased false recognition nor altered source-monitoring performance, suggesting that under some circumstances, imagination may leave memory representations unaffected (Stróżak, 2008).

Taken together, these findings point to the ambivalent nature of guided imagery as a memory intervention. Although certain forms of imagination can reinforce accurate memory traces under specific boundary conditions, they more commonly introduce distortion through heightened source confusion, inflated false recognition, and greater confidence that actions had been experienced when they had not.

***Sample Characteristics*.** All studies were conducted with healthy adult participants, with a few exceptions. Clark et al. (2022) included participants with mild cognitive impairment in addition to healthy controls, El Haj and Robin (2020) tested individuals with Korsakoff's syndrome, and O'Connor et al. (2015) included individuals with very mild Alzheimer's disease. In all three studies involving clinical populations, the clinical groups showed higher false alarm rates and reduced source memory performance compared to healthy controls.

In terms of age, adolescents aged 16 years or older were included in the broad age ranges of two studies (Seamon et al., 2009; Takarangi et al., 2013), but age-related effects were not explicitly examined. However, such effects were explicitly assessed in Gerlach et al. (2014, Experiments 1a, 1b, and 2) and Thomas and Bulevich (2006, Experiments 1 and 2). In both studies, older adults showed lower recognition accuracy and greater susceptibility to imagination-induced memory distortions than younger participants.

***Memory Characteristics.*** All studies focused on short, neutral descriptions of everyday adult actions (e.g., turning on a light or tearing a piece of paper) that were either performed, imagined, read, or not presented during encoding. In most cases, action statements were standardized and externally provided.

Memory valence was manipulated in only a few studies. Gerlach et al. (2014, Experiments 1a, 1b, and 2) included moderately positive and negative scenarios, but found no consistent moderation of imagination effects by emotional tone. All other studies used emotionally neutral content.

Familiarity was more commonly varied and typically operationalized through the use of bizarre or unusual actions (Seamon et al., 2009; Seamon et al., 2006; Thomas & Loftus, 2002; Worthen & Wood, 2001). These studies reported mixed findings, with bizarre actions sometimes leading to better discrimination but also to increased false alarms.

Memories referred almost exclusively to actions from adulthood. Events from adolescence were included only indirectly in studies with broader age ranges (Seamon et al., 2009; Takarangi et al., 2013), and no study explicitly investigated childhood events. In all cases, action statements referred to non-personal material. Across studies, no systematic differences in imagination effects were observed based on memory valence or lifetime period of memory, whereas familiarity showed a tendency for familiar actions to be more susceptible to imagination-induced distortions than bizarre actions.

In addition to content-related factors, the way actions were encoded strongly influenced the effects of imagination. Most studies contrasted actions that had been performed during encoding with those that were only imagined, read/heard, or not presented. Across experiments, a robust enactment effect was observed: performed actions were remembered most accurately and were least affected by imagination inflation (Goff & Roediger, 1998; Lampinen et al., 2003; Lindner & Echterhoff, 2015). In contrast, imagined and read-only actions showed the largest increases in false "performed" responses after imagination (Lindner et al., 2010; Thomas et al., 2003; Thomas & Loftus, 2002). Unpresented actions also became vulnerable once imagined, although the strongest inflation effects were observed for actions previously encountered in non-enacted form (Goff & Roediger, 1998; Lampinen et al., 2003). One study further showed that source confusion increased when the imagined agent matched the original actor (Lindner & Echterhoff, 2015, Experiment 3).

Taken together, these findings suggest that enactment provides the most robust protection against imagination-related memory distortions, whereas less active encoding leaves memory more vulnerable to source confusion and false recognition.

***Intervention Characteristics.*** All studies employed a single-session intervention, which was typically embedded in a controlled experimental paradigm. The imagery task was conducted as a brief mental simulation in which participants were instructed to vividly imagine performing specific actions. Action statements were externally provided and emotionally neutral; participants were not asked to generate autobiographical content or imagine self-relevant events.

Most interventions were administered immediately after the initial encoding phase; however, roughly half of the studies introduced a delay of one day or more (e.g., Dhammapeera et al., 2024; Gerlach et al., 2014; Goff & Roediger, 1998, Experiment 1; Nash et al., 2009; Seamon et al., 2009; Seamon et al., 2006; Thomas & Bulevich, 2006; Thomas et al., 2003; Thomas & Loftus, 2002; Worthen & Wood, 2001). Only one study systematically compared early versus delayed imagery and found the inflation effect to be attenuated when imagination was delayed by two weeks until just before the test (Goff & Roediger, 1998, Experiment 2); however, this was confounded by temporal proximity to retrieval, making it unclear whether the reduction was due to delay. Lampinen et al. (2003) also varied the placement of the imagery task but reported no timing effects. Thus, timing may modulate imagination effects in some paradigms, but evidence remains limited.

All studies were conducted in laboratory settings using standardized procedures. Overall, the interventions were short, well controlled, and narrowly focused on the imagination of simple, everyday actions, allowing for clear attribution of observed memory effects to the imagery manipulation.

The number of imagination repetitions varied considerably across studies. Some experiments employed only a single imagination trial (Gerlach et al., 2014, Experiment 1a and 1b; Seamon et al., 2009; Seamon et al., 2006), whereas others used repeated trials across one or more phases (e.g., Goff & Roediger, 1998; Lampinen et al., 2003; Lindner & Echterhoff, 2015; Thomas & Bulevich, 2006; Thomas & Loftus, 2002). Studies using repeated imagination trials generally reported stronger effects on both true and false memory than those with a single trial. Repetition was consistently associated with increased false “performed” responses for non-enacted items (Lampinen et al., 2003; Thomas et al., 2003) and with amplified source-monitoring errors and liberal response bias (Lindner & Echterhoff, 2015). Nevertheless, repetition alone did not consistently produce distortion, as illustrated by the null findings of Stróżak (2008), despite three imagination trials.

Visual perspective was explicitly manipulated in a small number of studies by instructing participants to imagine either themselves (first-person perspective) or another person (third-person perspective) performing the action (Lindner & Echterhoff, 2015; Seamon et al., 2006). Results were mixed. In one study, false memories were more frequent under self-imagery than other-imagery conditions (Lindner & Echterhoff, 2015, Experiment 1). In another study, source confusion increased when participants imagined the same person performing a new action after previously seeing that person perform a different action (Lindner & Echterhoff, 2015, Experiment 3), suggesting that perspective effects may depend on agent overlap rather than perspective alone. In contrast, Seamon et al. (2006) found no interaction between self- versus other-imagery and repetition; perspective did not moderate imagination inflation in that study. Taken together, visual perspective appears to be a potentially relevant but inconsistent moderator, with no robust pattern across studies.

***Outcomes.*** Most studies assessed memory accuracy using recognition or source-monitoring tasks, typically after a delay ranging from 24 hours to two weeks. In the small number of studies that systematically varied the retention interval, findings were mixed. Goff and Roediger (1998, Experiment 2) found weaker imagination inflation immediately after the intervention; however, this was confounded by the effects of delayed imagination. In contrast, Thomas and Bulevich (2006, Experiments 1 and 2) reported stronger distortions after two weeks than after two days, particularly among older adults. In both experiments, repeated imagination increased false memories more substantially after longer intervals. Taken together, these findings suggest that test timing modulates the magnitude, but not the direction, of imagination effects, with longer retention intervals generally associated with increased distortion, particularly in vulnerable groups such as older adults.

Outcome measures were predominantly geared toward objective accuracy. Of the 26 studies, 23 assessed recognition performance or source monitoring, and three (Nash et al., 2009, Experiments 1 and 2; Takarangi et al., 2013) collected explicit ratings of memory belief or confidence. Across the studies, imagination most consistently increased false “performed” responses for actions that had only been imagined, heard, or not presented during encoding. These distortions were generally accompanied by more frequent source-monitoring errors (memory accuracy) and, in some cases, high confidence ratings for non-experienced events (Nash et al., 2009; Takarangi et al., 2013). In contrast, improvements in true memory were less consistent and were primarily observed for actions that had been enacted during encoding.

A notable dissociation emerged within the Nash et al. (2009) study series: whereas Experiment 2 demonstrated increases in both false recognition and false belief, Experiment 1 showed a selective inflation of memory belief without affecting objective accuracy.

**Studies on Imagery-Induced Autobiographical False Memories.** A total of 10 studies examined the effects of imagery on autobiographical memory distortions, specifically focusing on the formation or reinforcement of false autobiographical memories. Extracted data and study summaries are presented in Table S4.3 (see Appendix C, S4).

Across studies, a consistent trend toward increased memory distortion following imagery-based tasks was observed, particularly in the form of false memories or inflated belief in the occurrence of non-experienced events.

Five studies reported negative effects of imagery-based interventions, reflected in increased false memory rates, higher rates of conjunction errors, or greater confidence that fabricated or unlikely autobiographical events had actually occurred (Devitt, Monk-Fromont, et al., 2016; Herndon et al., 2014; Hyman & Pentland, 1996; Paddock & Terranova, 2001). Three studies (Paddock et al., 2000; Parker & Dagnall, 2019; Segovia & Bailenson, 2009) reported mixed or no main effects of imagery, although subgroup analyses identified relevant interactions, including differences between “remember” and “know” responses, effects of visual interference (e.g., static vs. dynamic noise), and participant age. One study (Devitt, Tippett, et al., 2016) found no main effect of imagery but identified significant moderating influences, such as prior exposure and participant age. Dynamic visual interference (Parker & Dagnall, 2019) and younger age (Devitt, Tippett, et al., 2016) emerged as potential moderators that may buffer against imagery-related memory distortions, whereas static visual interference or prior exposure appeared to increase susceptibility in some subgroups.

***Sample Characteristics.*** All studies were conducted with healthy participants. In most studies, the samples consisted of university students or general adult populations. One study explicitly compared younger and older adults (Devitt, Tippett, et al., 2016), and another study examined both preschool and elementary school children (Segovia & Bailenson, 2009). No study investigated clinical populations. Across studies, no systematic differences in imagery effects were observed based on age group, although some age-related interactions were identified. In Devitt, Tippett, et al. (2016), older adults were generally more susceptible to conjunction memory errors, irrespective of the imagery condition. In Segovia and Bailenson (2009), imagery-related memory distortions were observed in elementary-aged children but not in preschoolers, suggesting that developmental factors may influence susceptibility to imagery-induced false memories.

***Memory Characteristics.*** Seven studies targeted childhood-related autobiographical events (Herndon et al., 2014; Hyman & Pentland, 1996; Paddock & Terranova, 2001; Paddock et al., 2000; Parker & Dagnall, 2019; Segovia & Bailenson, 2009). Three studies focused on more recent events (from the past 10 years), which could include both childhood and adulthood events depending on participants' age and interpretation (Devitt, Monk-Fromont, et al., 2016; Devitt, Tippett, et al., 2016). Across studies, no systematic differences in imagery effects emerged based on lifetime period.

Memory valence was inconsistently reported. Four studies examined positive and negative events (Hyman & Pentland, 1996; Parker & Dagnall, 2019; Experiment 2) positive events (Segovia & Bailenson, 2009), or traumatic events (Herndon et al., 2014). In the remaining studies, valence was unspecified. No consistent valence-related effects on outcomes were observed. Eight studies used mixed event types, combining remembered, known-but-not-experienced, and fabricated events (Devitt, Monk-Fromont, et al., 2016; Devitt, Tippett, et al., 2016; Hyman & Pentland, 1996; Paddock & Terranova, 2001; Paddock et al., 2000; Parker & Dagnall, 2019). Two studies (Herndon et al., 2014; Segovia &

Bailenson, 2009) used explicitly fictitious scenarios. Across studies, imagery effects did not systematically differ by event type or source.

***Intervention Characteristics.*** All studies employed a single-session imagery-based intervention administered immediately after event induction or within the same experimental session. In three studies, imagery was used not as a post-event intervention but as a means of memory induction, providing the basis for later false memory testing (Devitt, Monk-Fromont, et al., 2016; Devitt, Tippett, et al., 2016). In most studies, imagery tasks were experimenter-generated, using pre-defined prompts or guided visualization procedures. Only one study (Parker & Dagnall, 2019; Experiment 1) employed self-generated imagery content. No systematic differences in outcomes were observed based on the test timing or the source of the imagery material.

The content and purpose of the imagery tasks varied. While most aimed to simulate plausible autobiographical experiences for later belief ratings or memory judgments, several included elements designed to challenge source monitoring. For example, Devitt, Monk-Fromont, et al. (2016) used conjunction lures that recombined real autobiographical details into novel scenarios; imagery increased false recognition of these lures, indicating source-based false memories rather than memories for entirely fabricated events. In contrast, Hyman and Pentland (1996) and Herndon et al. (2014) used misleading suggestions about fictitious childhood experiences, resulting in more conventional false memory formation through imagination. Some interventions also included experimental moderators that influenced outcomes. For example, visual noise during imagery (Parker & Dagnall, 2019) and social influence via group settings (Herndon et al., 2014) modulated the strength of imagery effects. However, these effects were specific to experimental conditions and not attributable to the imagery component alone.

***Outcomes.*** Most studies assessed memory performance immediately after the imagery intervention, typically within the same session. Exceptions were three studies by Devitt, Monk-Fromont, et al. (2016) and Devitt, Tippett, et al. (2016), in which memory tests were conducted approximately one week later. Across studies, no systematic differences in effect patterns were observed based on the timing of the memory test.

Most studies investigated memory accuracy, which was typically operationalized as false memory formation, conjunction errors, or source misattribution (e.g., Devitt, Monk-Fromont, et al., 2016; Herndon et al., 2014; Hyman & Pentland, 1996). Others assessed belief or confidence in memory, typically via "remember/know" judgments or belief ratings for imagined events (e.g., Paddock et al., 2000; Parker & Dagnall, 2019). Negative effects of imagery were most consistently found for memory accuracy, such as increased false memory reports or higher conjunction error rates. Effects on memory belief were also reported but appeared to be more dependent on contextual moderators (e.g., source credibility, visual interference). Some studies indicated interactions between memory type and imagery effects: for example, guided imagery shifted "know" and "unsure" memories towards "remember" ratings but had no effect on clearly remembered events (Paddock et al., 2000), and belief inflation effects were reduced by dynamic visual noise (Parker & Dagnall, 2019). In contrast, performance for true memories (i.e., for events known to have occurred) was largely unaffected by imagery across studies (Hyman & Pentland, 1996; Paddock et al., 2000; Parker & Dagnall, 2019).

Overall, imagery effects were most consistently observed for memory accuracy, including increased rates of false memories or conjunction errors. Effects on memory belief were also documented but appeared more dependent on contextual moderators and were less consistently assessed across studies. As a result, apparent differences in susceptibility between outcome types may partly reflect variability in measurement frequency and operationalization.

**Studies on Memory Facilitation.** A total of five studies investigated the effects of imagery-based tasks on memory facilitation. Extracted data and study summaries are displayed in Table S4.4 (see Appendix C, S4). None of the studies reported uniformly positive or null effects across all memory outcomes and experimental conditions. One study (Wright et al., 2001) found negative effects of imagery, indicated by increased false recall and false recognition, as well as reduced accurate recall of actually witnessed scenes. In contrast, four studies yielded mixed findings, suggesting that the influence of imagery on memory is context-sensitive and affected by moderator variables.

Geiselman et al. (1985) reported that both the cognitive interview (including an imagery-based context reinstatement component) and hypnosis (without explicit event-related imagery instructions) improved correct recall compared to a standard police interview, particularly in complex, high-density event scenarios. However, this benefit was limited to certain types of events, and no differences were found in rates of incorrect or confabulated recall, indicating a selective and content-dependent effect. Memon et al. (2002) found that context reinstatement partially mitigated the negative effects of misleading mugshot exposure on lineup decisions, although it did not outperform a no-mugshot control group.

Ready et al. (1997) found no effects of hypnosis or context reinstatement on factual memory or susceptibility to misinformation. However, hypnosis (alone or in combination with context reinstatement) improved facial recognition accuracy in certain lineup situations, especially when the target person from the original event was present in the lineup, and among participants with lower anxiety levels. At the same time, hypnosis increased false identifications in the target-absent lineups. Similarly, Wagstaff et al. (2007) found improved memory performance only in the condition combining meditation with context reinstatement, whereas context reinstatement alone did not yield any memory advantage over the no-intervention control group.

***Sample Characteristics.*** All studies were conducted with healthy adult participants. In three studies, the samples consisted of undergraduate students recruited through university subject pools (Geiselman et al., 1985; Ready et al., 1997; Wright et al., 2001). In contrast, Memon et al. (2002) and Wagstaff et al. (2007) recruited broader adult samples that extended beyond typical student populations. Only one study explicitly examined age-related differences: Memon et al. (2002) found that older participants were more likely to make lineup errors, particularly through incorrect foil identifications. Geiselman et al. (1985) reported a significant main effect of gender, with male participants producing more memory errors than female participants. No other study systematically investigated or reported the role of demographic variables such as age or gender in relation to memory outcomes.

***Memory Characteristics.*** Across all five studies, the memories under investigation referred exclusively to events from adulthood and were uniformly negative in valence. All memories concerned personally observed or experienced real-world events. No study examined childhood memories, fictional scenarios, or positively valenced material. Accordingly, no systematic differences in imagery effects based on memory valence or lifetime period of memory could be assessed.

Two studies (Geiselman et al., 1985; Memon et al., 2002) reported selective content-related effects. Geiselman et al. (1985) found that the cognitive interview was particularly effective for complex, high-density crime scenarios (e.g., bank robbery videos), suggesting that imagery-based retrieval may confer greater benefits for richly detailed events.

***Intervention Characteristics.*** All studies employed a single-session intervention involving some form of imagery-based technique. Most studies employed context reinstatement instructions, which were typically implemented as self-guided mental imagery exercises prompting participants to mentally revisit the previously witnessed event (Geiselman et al., 1985; Memon et al., 2002; Ready et al., 1997; Wagstaff et al., 2007). In contrast, Wright et al. (2001) demonstrated that imagining a scene that had never occurred markedly increased false recall and recognition of the imagined content while also reducing accurate recall of the originally witnessed material. This finding illustrates that imagery tasks can also introduce risk, as imagining non-experienced content may distort memory representations. None of the interventions involved repeated sessions, and in all cases, imagery was self-generated based on standardized instructions rather than externally scripted content.

Two studies directly compared imagery-based interventions to hypnosis (Geiselman et al., 1985; Ready et al., 1997). In both cases, hypnosis was implemented without explicit event-related imagery instructions and served as an active control condition. Hypnosis alone did not improve factual memory performance; however, Ready et al. (1997) reported that, under certain conditions, combining hypnosis with context reinstatement enhanced facial recognition accuracy, whereas context reinstatement alone did not show a clear advantage. Wagstaff et al. (2007) combined a meditation element with context reinstatement in one condition, which proved more effective than context reinstatement alone.

The time interval between event and intervention varied across studies. In three studies (Geiselman et al., 1985; Memon et al., 2002; Ready et al., 1997), the intervention was performed approximately 48 hours after the event. Wagstaff et al. (2007) examined memory for a public event that had occurred several years earlier. Wright et al. (2001) conducted the imagination task immediately after exposure to the video material, within the same session. Across studies, no systematic differences in outcomes were observed based on the timing of the intervention.

***Outcomes.*** Across all five studies, memory performance was assessed after the intervention during the same experimental session. All studies focused on memory accuracy – that is, the correct recall or recognition of previously encountered information and the occurrence of memory distortions. No study assessed confidence ratings, subjective memory belief, or qualitative characteristics of the remembered material. Thus, the reported outcomes represent short-term, post-intervention memory performance only.

***Imagery Rescripting and Imaginal Exposure***

A total of six studies investigated the effects of imagery-based interventions such as ImRs and ImE on autobiographical memories. Extracted data and study summaries are displayed in Table S4.5 (see Appendix C, S4). No study reported negative effects such as decreased memory accuracy, increased false recall, or other types of memory deterioration. In contrast, four studies reported positive effects, including enhanced memory recognition (Aleksic et al., 2024), improved cued recall performance (Hagenaars & Arntz, 2012), and an increased number of correct details in free recall (Ganslmeier, Ehring, et al., 2023; Ganslmeier, Kunze, et al., 2023).

In addition, one study focusing on negative or distressing autobiographical events (Romano et al., 2020) found meaningful changes in memory content. Although these changes do not reflect memory improvement or impairment in the narrow sense of accuracy, they suggest content-related alterations following intervention. However, because the study addressed autobiographical memories, these content-related changes cannot be evaluated in terms of objective accuracy, as the factual correctness of individual details is inherently unverifiable. Another study (Siegesleitner et al., 2019) reported no significant effects of imagery-based interventions on memory outcomes in recall tests. In addition, three studies (Aleksic et al., 2024; Ganslmeier, Ehring, et al., 2023; Ganslmeier, Kunze, et al., 2023) that reported positive effects also included outcomes that did not differ significantly from control conditions.

**Sample Characteristics.** One study (Romano et al., 2020) was conducted with adults diagnosed with social anxiety disorder, representing the only clinical sample. The remaining five studies were conducted with healthy adult participants. One of these studies (Ganslmeier, Ehring, et al., 2023) recruited subgroups with elevated but non-clinical levels of trait anxiety. No systematic differences in effects were found based on age or mental health.

**Memory Characteristics.** Across studies, the memories that were addressed predominantly concerned events from adulthood. In one study, the time frame of the memories was not explicitly defined, so they may have referred to adolescence or childhood (Romano et al., 2020). Although this study observed alterations in memory content over time, it did not compare the effects of the intervention across lifetime periods. In sum, no systematic differences in effects between memories from different lifetime periods were observed.

Regarding memory valence, all studies focused on negative or distressing memories. As no study systematically investigated positive or neutral memories, differences in effects as a function of memory valence cannot be evaluated. Across all six studies, the memories were predominantly autobiographical in nature. The negative or distressing content included trauma analogues (trauma films; Aleksic et al., 2024; Ganslmeier, Ehring, et al., 2023; Hagenaars & Arntz, 2012; Siegesleitner et al., 2019), social-evaluative situations (Trier Social Stress Test; Ganslmeier, Kunze, et al., 2023), or personally significant negative experiences (Romano et al., 2020). Romano et al. (2020) observed changes in memory content following interventions targeting distressing experiences. However, these effects are not clearly distinguishable from those found in studies using other types of negatively valenced autobiographical material, as similar changes were reported in the other included studies.

In this context, memory clarity influenced memory performance: participants exposed to a clear (unfiltered) film version produced more correct responses and fewer incorrect or "I don't know" responses than those who viewed the blurred version. These effects were independent of the intervention condition (Aleksic et al., 2024).

**Intervention Characteristics.** All six studies employed short-term, laboratory-based interventions using imagery-based techniques such as ImRs, ImE, or closely related variants like Imagery Rehearsal (IRE). Positive effects of ImE and IRE were reported in two studies. Ganslmeier, Ehring, et al. (2023) observed improved recall performance following ImE, and Hagenaars and Arntz (2012) found that IRE enhanced memory accuracy. In addition, Romano et al. (2020) reported that ImE increased both positive/neutral and negative details.

For ImRs, positive effects were reported in several studies. Aleksic et al. (2024) found improved recognition performance following ImRs with a sensory-perceptual focus, even when the original memory was incomplete or unclear. Ganslmeier, Kunze, et al. (2023) reported a higher number of correct details in a free recall task following ImRs, suggesting enhanced voluntary memory retrieval. Hagenaars and Arntz (2012) found that participants in the ImRs condition showed improved cued recall performance compared to an active control group that received positive imagery. Romano et al. (2020) reported that ImRs significantly increased the number of internal positive and neutral details over time, although no change was observed for negative details.

All interventions were delivered in a single-session format, with no study using a multi-session or longitudinal design. However, three studies (Ganslmeier, Ehring, et al., 2023; Ganslmeier, Kunze, et al., 2023; Romano et al., 2020) included homework assignments as part of the intervention protocol, which involved either listening to an audio recording of the imagery session or mentally rehearsing the rescripted memory content.

The time interval between the original event and the intervention varied across studies. In those using standardized experimental paradigms such as trauma films or the Trier Social Stress Test (TSST), the intervention was typically administered within one to two days after the memory-inducing event (Aleksic et al., 2024; Ganslmeier, Ehring, et al., 2023; Ganslmeier, Kunze, et al., 2023; Siegesleitner et al., 2019). One study implemented the intervention just 30 minutes after the event (Hagenaars & Arntz, 2012). In contrast, Romano et al. (2020), who focused on real-life autobiographical memories, did not specify the time interval between the memory and the intervention.

Despite this variability, no systematic differences in effects were observed based on the time interval. Some studies using short intervals reported positive effects on memory elaboration or accuracy, whereas others did not. Similarly, one study addressing older autobiographical memories reported changes, though primarily in memory content rather than accuracy. However, because no study systematically manipulated or compared different time intervals, no firm conclusions can be drawn regarding its moderating role.

With the exception of Aleksic et al. (2024), who used other-generated scripts delivered via standardized audio recordings, and Ganslmeier, Ehring, et al. (2023), who used partly self-generated content in the ImRs condition (with fully self-generated content in the ImE condition), all other studies followed standardized protocols in which participants self-generated imagery content based on their own autobiographical memories. These procedures were typically guided by established ImRs protocols (e.g., Arntz & Weertman, 1999; Foa et al., 2008; Kunze et al., 2017). No systematic differences in outcomes were observed based on the source of the intervention script.

**Outcomes.** The timing of memory testing after the intervention varied across the six studies. One study (Aleksic et al., 2024) conducted memory testing one day after the intervention, and two studies (Ganslmeier, Ehring, et al., 2023; Siegesleitner et al., 2019) assessed memory after six days. The remaining three studies (Ganslmeier, Kunze, et al., 2023; Hagenaars & Arntz, 2012; Romano et al., 2020) used a one-week delay between intervention and testing.

Three of the studies (Ganslmeier, Ehring, et al., 2023; Ganslmeier, Kunze, et al., 2023; Romano et al., 2020) also employed a follow-up design, with repeated testing from one week up to three months post-intervention. However, only Romano et al. (2020) reported memory-related effects that extended beyond the one-week interval; in the other studies, no lasting effects were observed at later follow-ups.

Concerning the aspect of memory examined, five studies focused on memory accuracy, which was typically assessed through free recall, cued recall, or recognition tasks (Aleksic et al., 2024; Ganslmeier, Ehring, et al., 2023; Ganslmeier, Kunze, et al., 2023; Hagenaars & Arntz, 2012; Siegesleitner et al., 2019). One study examined changes in memory content (Romano et al., 2020). Memory belief or confidence was not assessed in any of the included studies.

Importantly, the type of memory outcome used may moderate the likelihood of detecting intervention effects. Positive effects were consistently observed in studies that used free recall tasks (Ganslmeier, Ehring, et al., 2023; Ganslmeier, Kunze, et al., 2023). For cued recall and recognition tasks, the results were mixed: whereas some studies found positive effects in a recognition task (Aleksic et al., 2024) or in a cued recall task (Hagenaars & Arntz, 2012), others found no significant group differences (Ganslmeier, Ehring, et al., 2023; Ganslmeier, Kunze, et al., 2023; Siegesleitner et al., 2019). In addition, changes in memory content were observed in both studies that examined this aspect (Romano et al., 2020), although these effects may reflect narrative reconstruction processes rather than improvements in memory reliability or accuracy.

In sum, these results suggest that more open-ended or perception-based tasks (such as free recall) may be more sensitive to changes induced by imagery-based intervention.

***Eye Movements (Desensitization and Reprocessing)***

A total of 12 studies investigated the effects of interventions involving eye movements on autobiographical memories. Extracted data and study summaries are displayed in Table S4.6 (see Appendix C, S4). None of the studies employed a classic EMDR protocol. Instead, all 12 examined horizontal, saccadic, or bilateral eye movements outside the traditional EMDR context.

The findings were heterogeneous: Two studies reported negative effects: a decreased number of correct answers and an increased acceptance of misinformation following eye movements (Houben et al., 2018), and a short-term reduction in visual memory recognition accuracy that was no longer present at follow-up (Xu et al., 2023). In contrast, five studies reported positive effects of eye movements on memory performance, which were mainly reflected in increased recall of autobiographical details (Christman et al., 2003; Lyle, 2018, Experiment 2), improved discrimination between previously seen and unseen information (Lyle & Jacobs, 2010, Experiments 1 and 2), increased hit rates in recognition tasks (Lyle & Jacobs, 2010, Experiment 2; Parker et al., 2009), and reduced susceptibility to misinformation (Parker et al., 2009). Four of the studies that reported positive effects also included outcome measures that showed no significant group differences (Lyle, 2018, Experiment 2; Lyle & Jacobs, 2010, Experiments 1 and 2; Parker et al., 2009). The remaining five studies found no significant effects of eye movements on memory performance (Calvillo & Emami, 2019; Lyle, 2018, Experiment 1; Meckling et al., 2024, Experiments 1 and 2; van Schie & Leer, 2019)

Across the nine studies reporting either no effects or a mixture of positive and null results, no consistent differences were found in the number of correctly recalled or recognized details, misinformation acceptance, or changes in memory content between eye movements and control groups (Calvillo & Emami, 2019; Lyle, 2018, Experiments 1 and 2; Lyle & Jacobs, 2010, Experiments 1 and 2; Meckling et al., 2024, Experiments 1 and 2; van Schie & Leer, 2019; Xu et al., 2023).

**Sample Characteristics.** All studies were conducted with healthy adult participants. One exception was Meckling et al. (2024, Experiment 1), who additionally included adolescents aged 17 years and older. No systematic differences in effects were found based on age or clinical characteristics.

Some evidence suggests that individual differences in handedness may influence episodic memory performance and potentially moderate the effects of eye movements, as individuals who are not strongly right-handed frequently perform better on memory tasks. One study indicated that eye movements might be particularly beneficial for strongly right-handed individuals, but this pattern was not consistently observed across studies (Lyle, 2018; Lyle & Jacobs, 2010).

**Memory Characteristics.** Across studies, memories predominantly concerned events from adulthood. In one study, memories could also have referred to adolescence or childhood (Meckling et al., 2024); however, no systematic differences in effects were observed between memories from different lifetime periods were observed.

Regarding memory valence, all studies investigated negative or neutral-to-negative memories. In one study, memories ranged from mundane to highly significant events (Christman et al., 2003), but no differences in effects were found based on valence.

In terms of event type, all studies focused on personally experienced real-life events (e.g., autobiographical memories or standardized trauma analogues).

**Intervention Characteristics.** All studies employed a single-session intervention using isolated horizontal, saccadic, or bilateral eye movements outside the classic EMDR context. No study applied a full EMDR protocol. No systematic differences in effects were observed based on the number of eye-movement sets administered.

The time interval between memory induction or event and the intervention varied considerably across studies, ranging from immediately after a standardized event (e.g., Houben et al., 2018; Lyle, 2018) to interventions addressing memories that were at least one week old (Christman et al., 2003; Meckling et al., 2024). No systematic differences in effects were observed based on intervention timing.

All interventions were conducted in laboratory settings and followed standardized procedures based on typical eye-movement paradigms used in experimental research. The source of the intervention script (i.e., whether self-generated or provided by the experimenter) was not described in any of the studies. However, given the standardized procedures, it can be assumed that no specific memory content was suggested or provided during the intervention.

**Outcomes.** In most studies, memory performance was assessed immediately after the intervention, typically within a few minutes (e.g., Houben et al., 2018; Lyle, 2018). Only one study (Xu et al., 2023) assessed memory both immediately and again after one week. In this study, a short-term reduction in visual recognition accuracy was observed following eye movements, but the effect had disappeared at follow-up. No comparable effect was found for verbal material, suggesting a modality-specific and transient influence of eye movements. Overall, no systematic differences in effects were observed based on the timing of memory testing.

Concerning the aspect of memory examined, most studies focused on memory accuracy, which was operationalized as correct recall or recognition of previously presented information, or susceptibility to misinformation or false memories (e.g., Christman et al., 2003; Houben et al., 2018; Parker et al., 2009). Meckling et al. (2024) additionally examined memory content, such as the amount, consistency, or specificity of recalled details across repeated recall attempts. Memory belief or confidence was not explicitly assessed in any of the included studies. No systematic differences in effects were observed based on the aspect of memory examined.

***Hypnosis***

A total of 10 studies investigated the effects of hypnosis on autobiographical memories or experimentally induced events. Extracted data and study summaries are displayed in Table S4.7 (see Appendix C, S4). Overall, the findings showed a trend toward memory distortion. Eight studies reported negative effects of hypnosis on memory performance, including reduced memory accuracy (e.g., increased false memories or errors in free or structured recall; Barnier & McConkey, 1992; Sheehan et al., 1992; Sheehan & Statham, 1989; Sheehan et al., 1991a, 1991b; Sheehan & Tilden, 1983; Wagstaff et al., 2008), decreased narrative consistency (Krackow et al., 2005), and distortions in memory belief or source monitoring (Nourkova & Vasilenko, 2018).

In six of these studies, suggestibility or hypnotizability significantly moderated the effects, with more pronounced memory distortion among highly suggestible participants (Barnier & McConkey, 1992; Sheehan et al., 1992; Sheehan & Statham, 1989; Sheehan et al., 1991a, 1991b; Sheehan & Tilden, 1983). One study (Sheehan et al., 1992) also reported a negative interaction with interpersonal rapport, indicating that maintaining rapport during hypnosis amplified pseudomemory formation in highly suggestible participants. Two further studies (Sheehan & Statham, 1989; Sheehan & Tilden, 1983) reported misinformation effects, showing that exposure to misleading post-event information increased memory errors, especially when combined with hypnosis or high suggestibility. The two remaining studies

(Wagstaff et al., 2008, Experiments 1 and 2) found partial positive effects of hypnosis in reducing misinformation effects. In both experiments, hypnosis combined with a warning and error-reduction suggestion led to fewer memory errors than standard misinformation procedures. However, performance did not exceed that of non-hypnotic pre-warning conditions, which were more effective overall. Moreover, when hypnosis was administered after a post-test warning, it was associated with fewer correct responses than a pre-warning alone, indicating limited potential to correct misinformation once it has been accepted. Because warnings and hypnosis were combined, the specific contribution of each component remains partly confounded.

Finally, four of the 10 studies reported no significant effects of hypnosis on memory performance for specific measures or test items (Barnier & McConkey, 1992; Krackow et al., 2005; Sheehan & Statham, 1989; Sheehan & Tilden, 1983).

**Sample Characteristics.** All included studies were conducted with healthy adolescent and adult participants. An exception was Nourkova and Vasilenko (2018), who recruited participants from an anxiety management training program, although no clinical diagnoses were reported. Several studies explicitly included adolescent participants aged 16 years or older (Krackow et al., 2005; Sheehan et al., 1991a, 1991b), while others focused on university students or did not provide detailed information on participant age. No systematic differences in effects were found based on age or clinical characteristics.

**Memory Characteristics.** Across studies, memories concerned personally experienced real-life events or experimentally induced scenarios. Most studies investigated negative or neutral-to-negative events, such as witnessing a simulated robbery (e.g., Sheehan & Statham, 1989; Sheehan et al., 1991a, 1991b), listening to a threatening conversation (Wagstaff et al., 2008), or recalling details surrounding public tragedies (Krackow et al., 2005). In one study (Nourkova & Vasilenko, 2018), participants recalled self-defining autobiographical memories related to anxiety and self-competence.

Memory content typically referred to events from adulthood or adolescence; no study explicitly investigated childhood memories. Across studies, no systematic differences in effects were observed based on memory valence, lifetime period, or the type of event (e.g., personal experience vs. personally observed standardized event).

**Intervention Characteristics.** All studies employed a single-session hypnosis intervention, with the exception of (Nourkova & Vasilenko, 2018), who performed three weekly sessions using Ericksonian conversational hypnosis. No consistent differences in outcomes were found based on the number of sessions or the source of the intervention material.

In most studies, the intervention was conducted immediately after memory encoding (e.g., after watching a video or slide sequence), whereas in others it targeted pre-existing memories weeks, months, or even years after the original event (Krackow et al., 2005; Nourkova & Vasilenko, 2018). Across studies, no systematic differences in effects were observed based on the timing of the intervention.

In nearly all cases, hypnosis was conducted using standardized, other-generated scripts, usually including suggestions, regressions, or misinformation components. One exception was Nourkova and Vasilenko (2018), who required participants to work with self-generated content embedded in a therapeutic framework.

There were notable differences in the content and purpose of the hypnotic instructions across studies. In those reporting negative effects, hypnosis typically included misleading suggestions or the introduction of misinformation prior to or during the intervention (Sheehan & Statham, 1989; Sheehan & Tilden, 1983). In contrast, the studies by Wagstaff et al. (2008) employed hypnosis with explicit instructions to reduce errors and warnings about misinformation, which were associated with more positive memory outcomes. However, as these studies combined hypnosis with pre- or post-warning components, the specific contribution of hypnosis itself was partly confounded.

**Outcomes.** Most studies assessed memory performance immediately after the hypnosis intervention, typically during the same session. In a few cases, memory was tested after a longer delay – approximately four months later in Nourkova and Vasilenko (2018), and two weeks later in Sheehan et al. (1991b). Across studies, no systematic differences in effects were observed based on the timing of the memory test.

Memory outcomes primarily focused on memory accuracy, such as the number of correct or false details recalled or recognized. In contrast, Krackow et al. (2005) examined the consistency and completeness of recalled information, while Nourkova and Vasilenko (2018) explicitly assessed memory belief, showing reduced ability to distinguish between original and imagined memories following hypnosis.

Across outcome types, negative effects of hypnosis were observed most consistently for memory accuracy, followed by changes in memory content and, in one case, distortions in memory belief. No consistent patterns emerged to suggest that a specific aspect of memory (e.g., accuracy vs. confidence) was more or less affected by hypnosis overall.

## Risk of Bias Assessment

The results of the risk of bias assessment are reported separately for each intervention method (for figures, see Appendix C, S5).

### *Imagery Tasks*

Among the 67 studies using imagery tasks, we rated 35.8% ($k$ = 24) as raising *some concerns*, primarily due to unclear randomization procedures and the absence of pre-specified analysis plans. We rated the remaining 64.2% ($k$ = 43) as having a *high risk of bias*, most often due to missing data or lack of transparency regarding data availability. Some studies also failed to report whether outcome assessors were blinded to the intervention.

### ***Imagery Rescripting and Imaginal Exposure***

Of the six studies using ImRs and ImE, we rated 83.3% (*k* = 5) as raising *some concerns* and 16.7% (*k* = 1) as having a *high risk of bias*. The main concerns were related to insufficient information about randomization procedures and the absence of a pre-specified analysis plan or deviations from it.

### ***Eye Movements***

Of the 12 studies applying eye movements, we rated 83.3% (*k* = 10) as raising *some concerns* and 16.7% (*k* = 2) as having a *high risk of bias*. Most concerns related to a lack of reporting on randomization procedures. In addition, none of the studies included a pre-specified analysis plan, raising concerns about selective reporting.

### ***Hypnosis***

Of the 10 studies using hypnosis, we rated 90% (*k* = 9) as having a *high risk of bias* and 10% (*k* = 1) as raising *some concerns*, primarily due to missing information about whether outcome assessors were blinded to the intervention. Additional concerns included unclear randomization procedures and the absence of pre-specified analysis plans.

## **Discussion**

This systematic review examined the empirical literature on whether, and under which conditions imagery-based interventions affect memory accuracy, memory-related confidence, and content across experimental, analogue, and clinical studies. The aim was to inform the ongoing debate concerning a central dilemma in trauma-focused therapy: whether imagery-based interventions, despite their demonstrated effectiveness in reducing PTSD symptoms, might unintentionally compromise the reliability of voluntary autobiographical memory. This concern is particularly relevant in forensic contexts, in which the accuracy of a survivor's memory can play a decisive role in legal proceedings. Although randomized trials of bona fide interventions in clinical populations would provide valuable evidence in this context, no such studies were identified, underscoring a gap in the literature. The present review therefore focused on studies that used a range of alternative paradigms.

The review included 95 studies drawn from 78 reports, ranging from basic experimental research on imagination and memory ($k = 67$) to analogue studies ($k = 28$) simulating therapeutic procedures. In addition to categorizing effects as negative (deterioration of memory), positive (improvement of memory), or neutral (no change), the review also examined potential moderators across four domains: (1) sample characteristics (age, mental health), (2) memory characteristics (lifetime period of memory, memory valence, type of event), (3) intervention characteristics (time between memory induction or event and intervention, number of sessions, treatment technique or intervention, source of intervention script), and (4) memory outcomes (time between intervention and memory test, aspect of memory assessed).

A cross-intervention synthesis of the results identified clear patterns regarding the conditions under which different imagery-based procedures influence voluntary autobiographical memory. Memory distortions were observed more frequently in imagery tasks used in experimental settings and in hypnosis, whereas structured clinical interventions such as ImRs and ImE were not associated with memory impairment. Among the studies of isolated eye movements, none employed a full EMDR protocol, and their findings were mixed: some reported benefits, others showed no effect, and a few indicated potential memory distortion.

In basic experimental paradigms, imagery tasks using the LEI often increased confidence in imagined childhood events (e.g, Garry et al., 1996; Mazzoni & Memon, 2003). Among 26 LEI studies, nearly half reported such effects, whereas others found null results (e.g., Bays et al., 2013) or context-dependent outcomes (e.g., Marsh et al., 2014). Studies using action statements yielded similarly mixed results: some reported increased rates of false recognition and source confusion (e.g., Goff & Roediger, 1998; Nash et al., 2009), while others reported improved recognition of previously encoded actions under certain conditions (e.g., Lindner & Echterhoff, 2015). Studies on autobiographical false memories further confirmed that guided imagery can elicit vivid but inaccurate recollections (e.g., Herndon et al., 2014; Hyman & Pentland, 1996). Findings on imagery-based memory facilitation were similarly variable, with some studies reporting improved recall (e.g., Geiselman et al., 1985) and others increased susceptibility to distortion (e.g., Wright et al., 2001), underscoring the strong influence of context and design. These patterns are consistent with prior research showing that imagery can increase confidence in imagined events, particularly in suggestive contexts (Brewin & Andrews, 2017; Scoboria et al., 2016), and that distortion is especially likely when imagery is combined with social or suggestive reinforcement.

Extending this work, our review indicates that structured clinical imagery techniques, particularly ImRs and ImE, do not appear to carry comparable risks, even when the imagery is vivid or emotionally charged. Across six studies, ImRs and ImE were associated either with improved recognition (e.g., Ganslmeier, Ehring, et al., 2023; Hagenaars & Arntz, 2012), no significant change (e.g., Siegesleitner et al., 2019), or content-related narrative shifts whose accuracy could not be objectively verified due to the autobiographical nature of the material (e.g., Romano et al., 2020). This is consistent with two recent preprints examining the effects of ImRs and ImE on autobiographical memory: neither intervention significantly affected memory accuracy in cued recall compared to a no-intervention control condition (Aleksic, Ehring, Kunze, & Wolkenstein, 2025). Moreover, no evidence of memory impairment was found in measures of memory consistency: ImRs showed no significant differences in omissions, additions, or contradictions. Although ImE led to a higher number of additions, there were no significant differences in omissions or contradictions, suggesting no overall detrimental effect on memory consistency (Aleksic, Ehring, Kunze, Han, et al., 2025). Together, the findings from our review and the preprints suggest that although content-related changes may occur, ImRs and ImE do not negatively affect memory accuracy or consistency in structured recall tasks.

Among studies of isolated eye movements, findings were mixed. Some studies reported benefits, such as improved recall (e.g., Christman et al., 2003), whereas others found null effects (e.g., Calvillo & Emami, 2019; Meckling et al., 2024) or occasional negative outcomes, such as increased distortion (e.g., Houben et al., 2018). Prior reviews (Kenchel et al., 2022; Qin et al., 2021) also suggest task- and sample-dependent effects, with potential retrieval benefits in some contexts, but null findings and distortion-related outcomes in others. Overall, these findings indicate that eye movements may influence memory, although their effects appear variable and context-dependent. More recently, two preprints (Aleksic, Ehring, Kunze, Han, et al., 2025; Aleksic, Ehring, Kunze, & Wolkenstein, 2025) have extended this line of research by applying full EMDR protocols. Neither study found significant effects on memory performance: there were no changes in the consistency of autobiographical memories (e.g., number of omissions, additions, or contradictions), nor were there significant differences in recall accuracy (e.g., cued recall) compared to a no-intervention control group.

The only method consistently associated with memory distortion was hypnosis. Eight out of 10 studies reported increased false memories, reduced consistency, or greater suggestibility (e.g., Krackow et al., 2005; Sheehan et al., 1992). Although corrective instructions mitigated some effects (Wagstaff et al., 2008), hypnosis remained more distortion-prone than non-hypnotic methods. Consistent with a recent review, hypnosis was found to impair memory particularly in emotionally charged or autobiographical contexts involving guided imagery or regression (Leo et al., 2025). However, the same review also reported improved recall for neutral, non-episodic material in highly hypnotizable individuals, suggesting stimulus-dependent effects.

In sum, the highest risk of memory distortion was found in unstructured, suggestive imagery tasks, including hypnosis, which was consistently the most distortion-prone intervention, particularly in suggestible individuals. Structured clinical techniques such as ImRs and ImE appeared to show no detrimental effects on memory and, in some cases, supported memory recall. Among studies of isolated eye movements, findings were mostly neutral or mildly beneficial, with occasional negative outcomes reported in two studies (Houben et al., 2018; Xu et al., 2023). In both studies, however, memory was tested immediately after the intervention before consolidation could occur. Xu et al. (2023) found reduced visual recognition but no impact on verbal recognition, and no impairment when memory was tested again after one week. In Houben et al. (2018), misinformation was explicitly introduced after the intervention – a design that does not reflect standard EMDR protocols. Two direct replications of this study (Calvillo & Emami, 2019; van Schie & Leer, 2019) found no negative effects, reporting only null results. These findings suggest that the occasional negative outcomes observed in isolated studies are more likely attributable to methodological factors than to the eye-movement component itself. Overall, the evidence indicates that memory vulnerability is less influenced by imagery per se than by the manner in which it is implemented, pointing to an important distinction between experimental and clinical applications of imagery-based techniques.

## When and How Imagery Affects Memory: Moderating Variables

### *Sample Vulnerability: Age and Clinical Status as Moderators*

Evidence for age- or diagnosis-related moderation was partial and largely confined to basic experimental paradigms. Older adults and individuals with cognitive impairments (e.g., Korsakoff's, Alzheimer's, mild cognitive impairment) showed higher false-alarm rates and weaker source monitoring in action-statement tasks (Clark et al., 2022; El Haj & Robin, 2020; O'Connor et al., 2015). Similarly, older adults (Devitt, Tippett, et al., 2016) and elementary-aged children, but not preschoolers (Segovia & Bailenson, 2009), were more susceptible to imagery-based distortions in autobiographical false-memory paradigms. These findings are consistent with longstanding evidence that both children and older adults are more prone to suggestion due to developmental or cognitive constraints (e.g., Ceci & Bruck, 1993; Karpel et al., 2001). Only one study, in the memory-facilitation category (Memon et al., 2002), examined age effects and found that older adults were more likely to make lineup errors, but this was not consistently replicated. In studies using the LEI, age and clinical status were rarely examined as moderators, and when they were (Clancy et al., 1999; Pezdek, Blandon-Gitlin, & Gabbay, 2006), no systematic effects were found.

In contrast, studies of ImRs, ImE, and eye movements did not show age- or diagnosis-based differences. Although theoretical models suggest that individuals with PTSD, depression, or dissociative symptoms may be more susceptible to memory distortions due to impairments in cognitive control or source monitoring (e.g., Clancy et al., 2000; Johnsen & Asbjørnsen, 2008; Rock et al., 2014; Scott et al., 2015), such effects were not observed in the reviewed studies. However, this likely reflects the predominance of healthy or subclinical samples rather than conclusive evidence against such moderation effects. A small number of studies included individuals with social anxiety disorder or elevated trait anxiety (Ganslmeier, Ehring, et al., 2023; e.g., Romano et al., 2020), yet their findings were consistent with those from non-clinical samples. Similarly, studies on eye movements and hypnosis did not identify systematic moderating effects. Exploratory analyses of handedness in eye-movement paradigms (Lyle, 2018) suggested some variation but no consistent effects on memory outcomes.

In sum, current findings provide further evidence of increased vulnerability to memory distortion in older adults and cognitively impaired individuals, but only in basic experimental paradigms. Studies on ImRs, ImE, hypnosis, and eye movements did not examine age or cognitive status as moderators, leaving their potential impact in clinical settings unknown. Although clinical symptoms such as PTSD, depression, or dissociation are theoretically linked to suggestibility, relevant diagnoses were largely absent. In studies where subclinical anxiety was assessed, the results were consistent with those of non-clinical samples. Rather than indicating true resilience, these null findings likely reflect sample homogeneity. With over 70% of studies based on healthy student samples, current evidence is insufficient to determine whether and how age or diagnosis moderates memory outcomes in imagery-based interventions.

### *How Memory Characteristics Affect Susceptibility to Distortion*

The content of a memory may influence its susceptibility to distortion.

**Lifetime Period of Memory.** Prior research suggests that the lifetime period to which a memory is thematically connected affects its accessibility: childhood memories are retrieved less frequently and with longer response times than adult memories, which has been interpreted as evidence of reduced accessibility or weaker encoding (Rubin & Schulkind, 1997; Rubin & Wenzel, 1996). Consistent with this, some LEI studies found stronger imagination inflation for childhood versus adulthood events, suggesting that early memories may be more vulnerable to suggestion and visualization (e.g., Marsh et al., 2014). However, most of the reviewed studies focused on adult events, and few systematically manipulated lifetime period. Clinical interventions, including ImRs, ImE, hypnosis, and eye movements, uniformly targeted autobiographical or personally observed adult events, providing no comparative data.

**Memory Valence.** Findings on the role of memory valence have been inconsistent. Some studies reported greater susceptibility to imagination inflation for positive events (Bays et al., 2015; Sharman & Barnier, 2008), whereas others found no moderating effects (Sharman & Calacouris, 2010). Overall, the findings suggest that positive valence may enhance susceptibility under certain conditions, but that such effects are not robust across paradigms. Because clinical studies predominantly focused on distressing material, conclusions about the influence of valence in therapeutic contexts remain limited.

These findings are consistent with theoretical models proposing a dual role of emotion in memory. Emotionally intense and personally significant events, especially traumatic ones, are often remembered more vividly and with greater confidence (Berntsen & Rubin, 2006), yet high emotional arousal can narrow attention to central details while increasing susceptibility to errors in peripheral aspects (Christianson, 1992; Kensinger & Schacter, 2006). These mechanisms suggest that emotional salience does not uniformly protect against distortion but may interact with attentional and contextual factors. The present review extends prior work by providing evidence that emotionally charged content, even when vividly encoded, is not inherently more resistant to distortion in imagery-based procedures.

**Type of Event.** Clinical interventions consistently involved autobiographical material, such as stress-related personal experiences or emotionally charged film excerpts. However, this experiential grounding was not associated with differences in memory accuracy or distortion. Under hypnosis, false memories emerged regardless of whether the content was self-experienced or merely witnessed. In contrast, laboratory paradigms that systematically varied event characteristics produced more differentiated effects. For example, findings on event plausibility were mixed: Pezdek, Blandon-Gitlin and Gabbay (2006) observed imagination inflation only for highly plausible childhood events, whereas other studies reported effects across all plausibility levels or only found only minimal, instruction-dependent effects (e.g., Sharman & Powell, 2013; Sharman & Scoboria, 2009). In action-statement tasks, actually performing an action provided robust protection against later source confusion, whereas reading or imagining an action increased vulnerability (e.g., Lindner et al., 2010; Thomas et al., 2003; Thomas & Loftus, 2002). Some effects may stem from perceived familiarity: bizarre actions sometimes improved discrimination but also increased the rate of false alarms (e.g., Seamon et al., 2006; Thomas & Loftus, 2002; Worthen & Wood, 2001). Memory-facilitation techniques such as the cognitive interview improved recall for richly encoded events (Geiselman et al., 1985). Experimental studies using fictitious, plausible, or ambiguous scenarios (e.g., Herndon et al., 2014; Marsh et al., 2014; Parker & Dagnall, 2019; Pezdek, Blandon-Gitlin, & Gabbay, 2006; Segovia & Bailenson, 2009; Sharman & Barnier, 2008) did not show consistent differences, suggesting that experiential status alone does not reliably moderate memory outcomes.

These findings converge with prior laboratory research showing that repeatedly imagining plausible but non-experienced events increases vividness and familiarity (e.g., Hyman & Billings, 1998; Hyman & Pentland, 1996; Lindsay et al., 2004), thereby promoting source-monitoring errors, especially when imagined content feels personally meaningful and plausible (Scoboria et al., 2004; Scoboria et al., 2016). In contrast, the analogue studies reviewed here consistently involved real autobiographical memories and did not show increased distortion, suggesting that experiential grounding may provide some cognitive protection. This pattern supports theoretical accounts emphasizing the role of personal relevance: self-referent information is more deeply encoded and better remembered (Symons & Johnson, 1997), and autobiographical memories that are integrated into the working self are more likely to be maintained and rehearsed over time, making them functionally more stable (Conway & Pleydell-Pearce, 2000).

In sum, these findings suggest that characteristics of memory content, such as temporal origin, emotional tone, personal relevance, experiential grounding, and plausibility, influence susceptibility to distortion, though not consistently across paradigms. While these results are broadly consistent with models proposing that personal relevance and plausibility may improve memory stability, they also suggest that neither emotional intensity nor experiential grounding reliably protects against error. Clinical interventions may benefit from the stabilizing effects of real-life content, but some risk of distortion remains.

***How Intervention Design Influences Memory: Timing, Authorship, and Procedural Factors***

Across imagery-based procedures, evidence that intervention characteristics moderate voluntary memory outcomes is limited and inconsistent.

**Time Between Memory Induction or Event and Intervention.** The interval between memory induction and intervention varied widely across studies, ranging from immediate administration to delays of several days or even years. In imagery task paradigms, interventions were typically conducted during the same session, immediately after memory induction. Some action-statement studies introduced longer delays (e.g., Goff & Roediger, 1998), but only Goff and Roediger (1998, Experiment 2) systematically compared early versus delayed imagery. They found that imagination inflation was lower after a two-week delay, an effect likely influenced by the proximity of memory retrieval. Clinical interventions such as ImRs, ImE, and eye movement procedures employed highly variable time intervals, ranging from a few minutes post-event to several weeks or longer for autobiographical memories. However, no study directly manipulated the timing variable, and there were no consistent differences in memory outcomes (e.g., Hagenaars & Arntz, 2012; Romano et al., 2020). Similarly, hypnosis studies reported both immediate and delayed implementations (e.g., Geiselman et al., 1985; Krackow et al., 2005; Memon et al., 2002), again without reliable effects of timing.

Overall, although timing may influence memory under certain conditions, it has not been consistently identified as a moderator of intervention effects. Theoretically, however, timing could play a critical role in determining susceptibility to distortion. Intervening shortly after memory encoding, when traces are still undergoing consolidation, may increase vulnerability to distortion or enable reconsolidation-based updating (Schiller et al., 2010). In contrast, consolidated memories accessed after longer delays might be more resistant to change but could also reactivate more stable, schematic representations. Emotional salience and the presence of retrieval cues likely interact with timing, shaping the effectiveness and direction of intervention outcomes.

**Number of Sessions.** Most interventions, regardless of type, were conducted as single-session procedures. Only one hypnosis study (Nourkova & Vasilenko, 2018) used a multi-session design, and a few ImRs/ImE studies included homework elements such as audio-guided rehearsal (e.g., Ganslmeier, Ehring, et al., 2023). Across paradigms, however, the number of sessions showed no systematic association with memory distortion. Imagery tasks and eye-movement protocols also relied exclusively on single exposures. Although repeated imagination trials often amplified both true and false memories – particularly increasing false “performed” responses and source-monitoring errors (Lampinen et al., 2003; Lindner & Echterhoff, 2015; Thomas et al., 2003) – repetition alone was not sufficient to produce distortion. Some studies observed belief inflation after a single trial (Sharman et al., 2004), whereas others reported no effect despite multiple repetitions (Bays et al., 2012; Stróżak, 2008). Theoretically, repetition may increase memory distortion by enhancing familiarity and fluency, which can bias source monitoring. Repeated imagination strengthens perceptual detail and retrieval ease, both of which are cues often misattributed to real experience (Johnson et al., 1993). However, these effects vary with individual and contextual factors.

**Source of Intervention Script.** The source and personalization of imagery content varied across paradigms but showed no consistent moderating effects on memory outcomes. In clinical interventions such as ImRs and ImE, imagery scripts were typically self-generated, autobiographically rich, and emotionally salient. Participants either described their own distressing experiences or revisited previously viewed trauma films. Even in semi-standardized formats (Ganslmeier, Ehring, et al., 2023) or fully standardized audio scripts (Aleksic et al., 2024), the content remained grounded in personal autobiographical material. These studies generally reported no adverse effects on memory accuracy and, in some cases, even found facilitative outcomes such as improved recognition following sensory-perceptually focused ImRs (Aleksic et al., 2024).

In contrast, experimental studies largely relied on impersonal, externally generated material. LEI paradigms used fictitious childhood events, while action-statement and false-memory studies employed neutral or ambiguous prompts, with little personalization. Nevertheless, findings by Parker and Dagnall (2019) indicate that even self-generated imagery is not immune to distortion, suggesting that personalization alone does not ensure memory stability. Across studies, belief change was more commonly observed in response to plausible but impersonal content than to richly autobiographical material.

Studies that examined the role of visual perspective (first-person versus third-person) found no consistent main effects on memory outcomes. Some evidence suggests that perspective interacts with other factors such as memory age, task timing, and referent overlap. For instance, memory inflation for childhood events was more likely when these were imagined from a third-person perspective (Marsh et al., 2014; Sharman et al., 2005), possibly reflecting typical retrieval styles for distant memories. In contrast, recent events showed no clear perspective effects. Findings from action-statement paradigms were mixed: Lindner and Echterhoff (2015) observed more source-monitoring errors for first-person imagery (modulated by actor overlap), whereas Seamon et al. (2006) found no effect even after repeated trials. Overall, visual perspective appears to influence memory only through interaction with contextual and structural variables.

Warning instructions, whether explicit or metacognitive, consistently reduced imagery-induced memory distortions. Pre-imagery warnings and plausibility ratings (e.g., Qin et al., 2008; Sharman et al., 2005) were especially effective, in some cases eliminating imagination inflation entirely. Post-imagination warnings (Landau & von Glahn, 2004) also reduced distortion, albeit less completely. Similar protective effects were observed in hypnosis studies: warnings about misinformation improved accuracy (Wagstaff et al., 2008), counteracting the susceptibility seen when misleading details were introduced without caution (Sheehan & Statham, 1989; Sheehan & Tilden, 1983). The effectiveness of warning varied depending on plausibility and task structure.

Not all intervention features appear to influence memory equally. Personalized autobiographical scripts, which are common in clinical settings, did not increase distortion and may even improve accuracy. Nevertheless, because self-generated imagery is not distortion-proof, active patient involvement in content creation, as is implemented in ImRs, may help ground imagery in authentic experience and support source monitoring. According to the Source Monitoring Framework (Johnson et al., 1993), engaging reality-checking operations, such as evaluating sensory detail, temporal context, and cognitive effort, can reduce imagery-induced distortions. Studies show that such processes improve source discrimination (e.g., Bulevich & Thomas, 2012), particularly when imagery is generated intentionally (Henkel & Carbuto, 2008). ImRs may benefit from this mechanism by explicitly prompting patients to generate alternative outcomes and to mark their integration, thereby strengthening memory for associated cognitive operations. This could explain why ImRs did not impair memory accuracy in any of the reviewed studies. Unlike laboratory studies, which frequently rely on externally suggested, low-relevance content under suggestive conditions, clinical imagery is embedded in a structured therapeutic framework with different goals. Importantly, bona fide interventions such as ImRs are transparent about the purpose of any modifications, which are clearly framed and contextualized to reduce distress (Arntz, 2012) – not to recover forgotten memories or introduce new autobiographical material. In contrast, free-associative methods like EMDR may increase the risk of source confusion, as the origin of emerging content is frequently unclear.

Warning instructions reliably reduced memory distortion, especially when provided before imagery, highlighting the potential value of metacognitive framing in clinical settings.

Visual perspective showed no uniform effect but may interact with memory age, role, or emotional distance. In ImRs, for example, it may matter whether patients re-enter scenes as a child or from an adult perspective, especially when switching roles (e.g., protector vs. survivor). This suggests that a more detailed understanding of perspective effects in therapeutic memory work is needed. Finally, differences in ecological validity, emotional salience, and intervention goals must be considered when translating laboratory findings into clinical practice.

In sum, these results point to the need for systematic, theory-driven research on how intervention characteristics affect memory under emotionally charged, autobiographical conditions.

### *Outcome-Specific Effects: Timing and Nature of Memory Measures*

**Time Between Intervention and Memory Test.** Timing effects on memory outcomes were limited and inconsistent across studies. In LEI and false-memory tasks, belief or confidence changes typically emerged within the same session, with delays of up to a week showing no systematic moderation (e.g., Calvillo et al., 2019; Devitt, Monk-Fromont, et al., 2016; Mazzoni & Memon, 2003). In contrast, action-statement tasks showed stronger distortions after longer delays, particularly in older adults (Thomas & Bulevich, 2006), possibly reflecting an accumulation or consolidation of source-monitoring errors over time. This trend was also observed by Goff and Roediger (1998), although their findings were confounded by design elements.

Eye movements and hypnosis were mostly tested immediately after the intervention and produced comparable short-term effects. Of the two studies reporting negative effects of eye movements, one (Xu et al., 2023) found only transient visual (but not verbal) memory impairments, with effects limited to immediate testing and no impairment observed after one week. In contrast, hypnosis consistently reduced recall accuracy in both short-term (e.g., Krackow et al., 2005) and long-term assessments (e.g., Nourkova & Vasilenko, 2018). ImRs and ImE studies assessed memory across a broader range of intervals (1 day to 3 months). Some short-term effects were observed (e.g., Aleksic et al., 2024; Ganslmeier, Ehring, et al., 2023; Romano et al., 2020), but no lasting changes beyond one week were reported, apart from narrative-level restructuring (Romano et al., 2020).

In sum, while some experimental studies suggest that timing may modulate the strength of memory effects, particularly over longer intervals, these patterns are not consistently replicated across paradigms. In clinical studies, memory outcomes were typically assessed within short- to medium-term intervals, and the few studies that included delayed follow-up reported no lasting impairments. Current evidence is therefore insufficient to draw firm conclusions about the moderating role of timing, particularly in applied settings.

**Aspects of Memory.** Across outcome types, findings from experimental and clinical analogue studies diverged. Experimental imagery tasks reliably impaired accuracy and inflated confidence (e.g., Calvillo et al., 2019; Goff & Roediger, 1998; Mazzoni & Memon, 2003), whereas clinical interventions showed no such impairments and sometimes improved recall (e.g., Aleksic et al., 2024; Ganslmeier, Kunze, et al., 2023; Hagenaars & Arntz, 2012). Belief outcomes were rarely assessed in clinical studies, with the exception of those on hypnosis, in which distortions were observed (Nourkova & Vasilenko, 2018). This may reflect the fact that belief (or plausibility) and accuracy (verifiable recall) are distinct constructs and should be assessed jointly in applied settings (e.g., Calvillo et al., 2019; Mazzoni & Memon, 2003; Nash et al., 2009).

Narrative changes were seldom examined in laboratory research and were only reported in only one clinical analogue study included in this review. Romano et al. (2020) found that ImRs and ImE altered narrative structure, likely reflecting therapeutic reframing rather than distortion. A recent preprint by Aleksic, Ehring, Kunze, Han, et al. (2025) supports this pattern for ImE, but not for ImRs or EMDR, suggesting potential differences across procedures. In contrast, hypnosis was more consistently associated with reduced accuracy or narrative consistency (Krackow et al., 2005).

Memory outcomes depend strongly on how they are defined and measured. Prior work has shown that confidence is particularly susceptible to imagery (Scoboria et al., 2016). In this review, clinical interventions did not impair recall or increase memory errors and occasionally improved narrative coherence. In contrast, experimental tasks reliably inflated confidence and, depending on the paradigm, also increased source-monitoring errors. This pattern suggests that imagery primarily alters the subjective experience or framing of memories – such as vividness or plausibility – rather than their factual content. Diverging outcome metrics likely contribute to these differences: experimental research tends to assess subjective constructs, whereas clinical and forensic contexts prioritize the stability of specific details (Volbert & Steller, 2014). Taken together, the findings point to a dissociation between confidence and accuracy and underscore the need for outcome-specific assessments when evaluating memory reliability in applied settings.

In sum, experimental imagery tasks can inflate confidence and occasionally impair accuracy, while clinical interventions did not show adverse effects on memory accuracy. However, belief-related outcomes have not been examined in clinical contexts, limiting the ability to draw firm conclusions in this regard.

**Strengths and Limitations of the Present Review**

This systematic review has several important limitations that should be considered when interpreting its results. First, the included studies were highly heterogeneous in design, population, and intervention characteristics, precluding a quantitative meta-analysis and necessitating a narrative synthesis. Second, many primary studies – particularly those using imagery tasks and hypnosis – were classified as having a high risk of bias, limiting the strength of causal inferences. Third, most samples consisted of healthy, young, often student participants, which constrains generalizability to clinical populations, children, or older adults. Fourth, most interventions were conducted in brief, single-session laboratory settings, raising concerns about ecological validity and applicability to real-world clinical practice.

Despite these limitations, the review also has several notable strengths. It is the first to systematically synthesize findings across a broad range of imagery-based interventions, encompassing brief laboratory tasks, clinically established methods such as ImRs, ImE, and hypnosis, and analogue procedures such as eye movements – with a specific focus on their effects on voluntary memory. The preregistration of the review protocol and adherence to PRISMA guidelines enhance its transparency and methodological rigor. Comprehensive searches across six major databases, combined with independent double-screening and data extraction, ensured a thorough and reliable study selection and analysis process. Finally, the use of a structured, multidimensional coding framework allowed for detailed comparisons across intervention types, memory content, and outcome domains, providing a valuable foundation for future empirical and clinical work.

**Conclusions and Implications for Clinical Practice**

This systematic review examined whether imagery-based interventions in trauma-focused treatment compromise voluntary autobiographical memory. While basic experimental research has demonstrated that certain imagery tasks, hypnosis, and, in some cases, isolated eye movements can lead to memory distortions – such as imagination inflation and false memories – no such effects were observed in studies of structured clinical interventions, including ImRs and ImE. These findings suggest that direct generalizations from experimental research to clinical contexts may be premature. First, empirical studies of structured clinical interventions do not show comparable memory impairments in memory accuracy. Second, considerable variability within the basic research literature itself highlights the role of moderating factors, many of which are still only partially understood.

Four domains of moderating variables help to explain why imagery-based interventions produce such divergent memory outcomes: (1) Sample vulnerability: Older adults and cognitively impaired individuals were more susceptible to distortion in experimental tasks. However, effects in clinical populations remain unclear due to a lack of randomized studies. (2) Memory characteristics: Childhood memories, plausible but non-experienced events, and – less consistently – positively valenced memories appeared more prone to distortion, whereas personally meaningful and trauma-related memories seemed more robust. (3) Intervention characteristics: Key factors included structure, suggestiveness, timing, repetition, and visual perspective. Structured procedures with clear goals and metacognitive framing reduced the risk of distortion, whereas suggestive, unstructured methods such as hypnotic regression increased it. Interventions conducted shortly after encoding may heighten susceptibility, while targeting consolidated memories could promote greater stability, although evidence remains limited. Repeated imagination amplified familiarity and susceptibility to error mainly under suggestive conditions. Visual perspective had no consistent effect but interacted with factors such as memory age and personal relevance. Overall, these findings suggest that memory reliability depends less on the use of imagery itself than on the procedural structure and how the imagery is cognitively framed. (4) Outcome specificity: Imagery tended to affect belief and vividness more than factual accuracy. Clinical studies generally prioritized measures of memory consistency and detail, whereas experimental research focused more on subjective outcomes, contributing to the divergence in findings.

Taken together, while caution regarding the use of imagery remains warranted, structured clinical interventions appear to be safer than is sometimes assumed. Nonetheless, further research is needed to clarify the specific conditions under which imagery-based techniques may affect memory accuracy, particularly in applied therapeutic settings.

These findings have important practical implications. They suggest that structured imagery-based therapies may be forensically acceptable, as no evidence of memory impairment was found. However, they also underscore the importance of structured, transparent protocols in clinical practice and caution against uncritical generalization from experimental paradigms to clinical and forensic contexts. Although clinical interventions appear safe, the experimental literature shows that imagery tasks that are suggestive, repetitive, or not grounded in actual experience can reliably distort memory, particularly under conditions of high plausibility, source ambiguity, and emotional engagement. If such procedures were used in trauma-focused treatment, one could reasonably expect similar or even stronger effects given the added influences of therapeutic authority, biographical relevance, and extended processing time (Muschalla & Schönborn, 2021; Otgaar et al., 2022).

Even when factual accuracy remains intact, changes in belief or plausibility, which were rarely assessed in clinical studies, may nonetheless reduce individuals' confidence in their memory, potentially undermining testimony in legal contexts. As illustrated by cases from the 1980s and 1990s, suggestive therapeutic practices can contribute to false accusations with serious consequences (Loftus & Davis, 2006). Certain practices should therefore be explicitly avoided in trauma-focused therapy, including speculative imagery of events without autobiographical grounding, repeated visualization of events known not to have occurred, and any framing that blurs the boundary between real and imagined material.

The current evidence base remains limited. Most studies relied on samples of healthy students and brief, single-session designs. Future research should include more diverse and clinical populations, investigate long-term effects, and explore how memory characteristics (e.g., emotional tone, age, personal relevance) interact with intervention features. This may help bridge the gap between experimental and applied settings and support the development of safer, evidence-based imagery procedures. A clearer distinction between belief and accuracy measures is also needed to assess memory reliability in therapeutic and forensic contexts more effectively.

In sum, there is currently no evidence that structured imagery-based treatments compromise memory; on the contrary, they may support memory performance in certain contexts. However, this cautiously optimistic conclusion goes hand in hand with a clear warning against suggestive therapeutic techniques that risk undermining memory integrity.

# 3. General Discussion

*"She is a friend of my mind. She gather me, man. The pieces I am, she gather them and give them back to me in all the right order."*

— from *Beloved* by Toni Morrison (2004, p. 321)

**Framing the Dilemma: Balancing Therapeutic Urgency and Forensic Integrity**

The present dissertation addresses a clinically urgent and forensically consequential dilemma: the tension between initiating trauma-focused therapy early – even while legal proceedings are ongoing – and postponing treatment to protect the evidentiary integrity of autobiographical memory. Specifically, this dissertation offers initial, analogue-based evidence concerning the potential impact of trauma-focused interventions – when conducted according to best and evidence-based practice – on memory for the traumatic event and, consequently, the survivor's credibility.

This dilemma reflects fundamentally competing imperatives that remain unresolved to date. International guidelines (Bisson et al., 2019; National Institute for Health and Care Excellence, 2018) recommend the timely initiation of trauma-focused interventions to prevent the development of chronic PTSD and comorbid psychopathology. At the same time, forensic stakeholders raise concerns that trauma-focused interventions involving mental imagery, such as ImRs, ImE, and EMDR, may compromise the reliability of autobiographical memory and, in turn, affect the credibility of witness testimony (Brewin & Andrews, 2017; Howe & Knott, 2015). These concerns resonate with the broader "memory wars" debate, which continues to shape both clinical and legal discourse (Otgaar, Howe, Patihis, et al., 2019). While extensive research has addressed memory suggestibility (Loftus, 2005) and strong evidence supports the efficacy of trauma-focused therapies (Courtois et al., 2017; Cusack et al., 2016; Morina et al., 2017; Weber et al., 2021), research on how such interventions affect voluntary, forensically relevant recall remains scarce (Brewin, 2018; Otgaar et al., 2021).

In practice, this tension often creates a therapeutic limbo: survivors are frequently advised to postpone psychological treatment until court proceedings have concluded, prioritizing the stability of evidence over the survivor's mental health. However, this postponement policy lacks a robust empirical foundation. A recent German position paper by the Expert Group "Psychotherapy and Credibility" (Expertinnen- und Expertengruppe „Psychotherapie und Glaubhaftigkeit" im Bundesministerium der Justiz, 2024) explicitly underscores the importance of starting clinical treatment as early as possible to mitigate the risk of symptom chronicity. The authors further emphasize that there is no general reason to postpone psychological treatment solely due to ongoing criminal proceedings, although this position is primarily based on clinical plausibility and expert consensus rather than systematic empirical evidence from forensic contexts.

Against this background, the present discussion pursues three overarching aims. First, it integrates the findings of two empirical studies and one systematic review, which collectively examined how imagery-based interventions – particularly ImRs and ImE – affect memory performance following stress or analogue trauma. Second, it evaluates these findings in the context of contemporary memory models, including the Dual Representation Theory (Brewin et al., 1996; Brewin et al., 2010), the Source Monitoring Framework (Johnson et al., 1993), and reconsolidation-based accounts (Nader & Hardt, 2009). Third, it seeks to translate these insights into concrete clinical recommendations, thereby contributing to the ongoing effort to balance therapeutic urgency with evidentiary integrity.

The three consecutive studies of this dissertation address complementary aspects of this overarching aim. Study I investigated whether a single session of ImRs, administered after a standardized psychosocial stressor, influences the accuracy of free and cued memory recall. Study II compared ImRs and ImE within a trauma-film paradigm to examine how different imagery-based interventions affect memory performance across free, cued, and recognition-based recall tasks. Study III, a systematic review, synthesized findings from 95 studies, including both basic laboratory memory research involving imagery tasks and experimental studies on imagery-based analogue clinical interventions, focusing on their effects on memory accuracy, memory belief, and memory content characteristics.

Taken together, these studies offer a nuanced, evidence-based perspective, provide important initial insights into how early imagery-based trauma interventions may align with forensic considerations of memory reliability when key risk factors are carefully considered, and contribute to the development of refined risk management strategies. This body of work may serve as a foundation for further interdisciplinary research aimed at addressing the dilemma in a way that considers the needs of all parties involved while balancing both health and justice concerns.

## Summary of Findings: Do Imagery-Based Trauma-Focused Interventions Affect Memory?

Study I addressed this question using the Trier Social Stress Test (TSST; Kirschbaum et al., 1993) as an analogue psychosocial stressor. One hundred participants were randomly assigned to receive either a single session of ImRs or no intervention. Memory performance was assessed immediately before the intervention, one week later, and again at a three-month follow-up. Results showed that participants in the ImRs condition recalled significantly more correct details in free recall after one week than those in the no-intervention control condition, with no increase in incorrect details. No differences between the conditions emerged in cued recall.

Study II employed a trauma-film paradigm with 120 female participants high in trait anxiety, who were randomized to ImRs, ImE, or no intervention. Memory was assessed at three time points: before the intervention, six days later, and again two weeks post-intervention. Notably, only ImE led to a significant increase in correct free recall, while ImRs produced no measurable change compared to the no-intervention control condition. Across all conditions, accuracy remained stable in both cued recall and recognition.

Study III, a systematic review of 95 empirical studies, provided a broader synthesis. The findings indicate that structured, manualized, and patient-led imagery-based trauma-focused interventions – such as ImRs and ImE – do not systematically impair memory accuracy. In several studies, these interventions were even associated with enhanced recall and narrative richness. In contrast, techniques characterized by high suggestibility – such as hypnosis, experimenter-generated scripts, unstructured imaginative exercises, and the lack of autobiographical grounding – are linked to an increased risk of memory distortion, particularly under conditions of high plausibility, source ambiguity, and emotional engagement.

## Theoretical Integration: From Empirical Findings to Mechanistic Understanding

The empirical findings from the present studies challenge simplistic assumptions that trauma-focused imagery interventions necessarily distort memory. Instead, they reveal more differentiated patterns of memory modulation, which can be meaningfully interpreted through three complementary cognitive frameworks: the *Dual Representation Theory* (DRT), the *Source Monitoring Framework* (SMF), and models of memory reconsolidation. These models provide a conceptual basis for understanding how imagery-based interventions influence memory accuracy, narrative structure, and vulnerability to distortion.

### *Dual Representation Theory: Integrating Sensory and Contextual Memory Traces*

From the perspective of DRT (Brewin et al., 1996; Brewin et al., 2010), the observed memory improvements following ImE and ImRs can be interpreted as processes that support the reactivation and integration of sensory-bound (S-reps) and contextualized (C-reps) memory representations. ImE, by repeatedly exposing individuals to perceptual trauma content, may facilitate the reconnection of S-reps with their contextual counterparts, enhancing voluntary memory access. This is consistent with our finding that ImE improved free recall performance in Study II. This interpretation also aligns with theoretical models that emphasize the role of avoidance in memory retrieval. According to avoidance theory (Cloitre et al., 1992), individuals may engage in cognitive and behavioral strategies to suppress access to stressful memories in order to reduce emotional distress. While this avoidance may offer short-term relief, it can disrupt memory retrieval and maintain fragmented memory representations. From a DRT perspective, such restricted retrieval may limit opportunities to rebind sensory representations (S-reps) to their contextual counterparts (C-reps). Imagery-based interventions like ImE may help overcome this avoidance by providing a structured and tolerable retrieval context, which facilitates memory access and integration – but this process likely depends on sufficient engagement with the memory material.

A similar mechanism may also operate during ImRs, at least up to the trauma hotspot. In Study I, we observed memory improvements following ImRs that were comparable to those seen with ImE in Study II. However, this effect was not replicated in the ImRs condition of Study II. One possible explanation concerns the position of the trauma hotspot. In Study I (autobiographical TSST), participants selected their most distressing moment, which typically occurred later in the memory sequence, allowing rehearsal of a larger portion of the original event. In contrast, in Study II (trauma film), the hotspot was standardized and located early in the scene, which restricted rehearsal to a much shorter memory segment. This procedural difference may have limited retrieval intensity in the ImRs condition of Study II and could account for the absence of memory improvements.

It is also noteworthy that ImE sessions were typically shorter but covered the entire memory sequence, whereas ImRs sessions focused more intensively on emotional processing up to the trauma hotspot. These differences may have influenced the extent to which sensory and contextual memory representations were revisited and integrated. From the perspective of DRT, the effects of ImRs may primarily operate through the modification and strengthening of contextualized representations (C-reps) by reshaping the emotional and narrative meaning of the memory. In Study I, which involved a personally experienced stressor, this process may have enhanced narrative coherence and improved voluntary memory access by reinforcing the linkage between sensory and contextual elements. In contrast, the trauma film in Study II likely elicited weaker, less personally relevant C-reps, which may have limited the impact of rescripting.

At first glance, our findings may appear to contradict a substantial body of basic memory research showing that imagination can distort memory. However, several key differences may account for this apparent discrepancy. The imagination inflation literature typically involves generating sensory details for events that never actually occurred, often without providing a stable contextual framework (e.g., Garry et al., 1996; Hyman & Pentland, 1996). From a DRT perspective, this can lead to the creation of free-floating sensory representations (S-reps) that lack appropriate contextual binding (C-reps), thereby increasing the risk of source monitoring errors. In contrast, the imagery-based interventions used in the present studies were anchored in real, autobiographical events, where S-reps and C-reps were already at least partially established. A critical distinction may be that, in imagination inflation studies, the imagined content often either lacks an original autobiographical memory trace (e.g., Garry et al., 1996; Hyman & Pentland, 1996) or is based on banal, short-lived laboratory actions that are personally insignificant (Goff & Roediger, 1998). From a DRT perspective, the absence of a meaningful original memory or the trivial nature of the event may make it particularly difficult to bind new sensory traces to appropriate contextual representations, which increases the likelihood of source monitoring errors and false memories.

### *Source Monitoring Framework: The Role of Self-Generated Imagery*

The SMF (Johnson et al., 1993) offers additional support for the idea – already proposed in the DRT discussion – that structured, self-guided imagery interventions are unlikely to impair memory accuracy. Source monitoring depends on qualitative cues such as sensory detail, emotional intensity, and contextual coherence, which help individuals distinguish real memories from imagined content. Across both Study I and Study II, structured, predominantly participants-generated interventions like ImRs and ImE appeared to preserve these source cues, even when vivid imagery and counterfactual elements were involved. This likely explains why no systematic memory distortions were observed – a pattern consistent with our systematic review (Study III), which identified increased distortion risks primarily in externally guided interventions that used unstructured or suggestive techniques. Previous research (Lindsay & Johnson, 2000; Otgaar, Howe, Patihis, et al., 2019) indicates that imagination-related memory errors typically occur when imagery is externally suggested or poorly anchored in autobiographical experiences. Since none of these high-risk factors were present in the two experimental studies, the consistent absence of memory distortions is unsurprising.

Notably, the differences between Study I and Study II suggest that source monitoring may not function equally across all memory contexts. Study I (autobiographical TSST) involved personally relevant memories with stronger source cues, whereas Study II (trauma film) used video material with potentially weaker source information. Nevertheless, memory accuracy remained stable in both studies, suggesting that self-generated imagery within a structured protocol provides sufficient source cues, even when the material is less self-relevant. Additionally, as already suggested in the DRT discussion, the retrieval dosage likely influenced source monitoring quality. In Study I, the later positioning of the hotspot allowed for rehearsal of a larger memory segment, potentially reinforcing source cues. In Study II, the early hotspot limited rehearsal, yet no source confusion emerged.

***Memory Reactivation and Reconsolidation: The Role of Timing and Retrieval Intensity***

Reconsolidation models distinguish three central phases in memory processing: initial consolidation, reactivation, and reconsolidation (Nader & Hardt, 2009; Nader et al., 2000). Newly formed memories first stabilize through consolidation, becoming resistant to interference. Upon retrieval, memories can re-enter a labile state if reactivation is sufficiently strong, making them temporarily susceptible to modification. In this reconsolidation phase, memories can be updated, strengthened, or altered.

The findings from Studies I and II suggest that while memory reactivation occurred, the imagery-based interventions likely did not induce a destabilization sufficient to trigger maladaptive memory modification. The timing of the interventions – at least 24 hours after initial encoding – meant that the memories were already consolidated. According to reconsolidation theory (Nader & Hardt, 2009; Nader et al., 2000), reactivation alone is not sufficient; specific boundary conditions must be met, such as a strong emotional engagement, the presence of a prediction error, or sufficiently prolonged and intense reactivation.

It is important to note, however, that analogue paradigms typically do not reach the level of emotional intensity, nor the duration or intensity of reactivation and intervention, that are characteristic of clinical interventions. As such, these experimental conditions may not fully satisfy the boundary conditions necessary to induce memory destabilization, which limits the generalizability of the findings to clinical contexts. Nevertheless, it remains essential to transparently inform patients about the rationale and procedures of the intervention and to carefully manage their expectations regarding the emotional and experiential aspects of the intervention, particularly in relation to the traumatic memory.

Retrieval-based learning theories (Roediger & Butler, 2011; Rowland, 2014) further suggest that repeated retrieval – especially when contextually grounded – tends to strengthen existing memory representations rather than create distortions. This perspective is consistent with the observed memory stability in the current studies. Importantly, participants in both the ImE and ImRs conditions were instructed to repeatedly listen to audio recordings of their intervention sessions. This retrieval rehearsal likely contributed to additional memory consolidation. Notably, the extent of rehearsal differed between conditions: In the ImE condition, participants repeatedly rehearsed the entire trauma scene, whereas in the ImRs condition, rehearsal was limited to the memory segment up to the identified hotspot before the rescripting phase began. This difference in retrieval dosage may partly explain the superior memory performance observed following ImE in Study II.

These findings are further supported by MacLeod et al. (2018), who demonstrated that both detailed and component memory reactivations significantly mitigated forgetting across retention intervals of up to 28 days. Their results suggest that repeated reactivation – even when only partial elements of the memory are recalled – can substantially enhance memory stability over time without increasing false memory rates. The authors argue that such reactivations strengthen the neural representations of the memory and may promote reconsolidation-like processes that contribute to long-term memory persistence.

Neurobiological evidence further supports these conclusions. Optogenetic studies in animals demonstrate that specific memory traces can be selectively reactivated and manipulated (Grella et al., 2022; Liu et al., 2012; Ramirez et al., 2013). These studies show that memories can indeed be modified under controlled conditions, but crucially, the effectiveness of such modifications depends on the precision, emotional valence, and timing of the reactivation. For example, Grella et al. (2022) demonstrated that reactivating a positive memory during the reconsolidation window could disrupt maladaptive fear memories, but only under stringent conditions where the reactivation was precisely timed and sufficiently intense to engage the memory trace. Additionally, Ramirez et al. (2013) demonstrated that even false memories could be implanted through optogenetic stimulation when artificial reactivation was combined with aversive experiences, highlighting the plasticity – but also the specificity – of memory modification processes.

***An Integrated Framework for Memory Modulation in Imagery-Based Interventions***

Drawing on the DRT (Brewin et al., 1996; Brewin et al., 2010), the SMF (Johnson et al., 1993), and reconsolidation models (Nader & Hardt, 2009; Nader et al., 2000), this final synthesis integrates their explanatory value to outline how trauma-focused imagery interventions can modulate memory without compromising forensic reliability. Taken together, the three frameworks suggest that structured, patient-generated, and well-timed interventions such as ImRs and ImE may support memory accessibility and narrative coherence without necessarily increasing distortion risks.

According to DRT, ImE may strengthen sensory-bound representations (S-reps) by reconnecting them with contextualized representations (C-reps), as reflected in improved free recall in Study II. ImRs may primarily update C-reps by reshaping the emotional and narrative meaning of memories, which was particularly effective when larger memory segments were rehearsed, as in Study I. When the trauma hotspot was positioned early, as in Study II, retrieval intensity was limited, which may explain the absence of memory improvements. The SMF supports the finding that self-generated, structured imagery carries low distortion risk, as source cues like sensory detail, emotional intensity, and contextual coherence were preserved across both studies. Reconsolidation models further suggest that while memory reactivation occurred, the interventions likely did not meet the boundary conditions necessary for destabilization, particularly given the delay of at least 24 hours after encoding and the absence of external suggestion. Study III supports this, indicating that distortion risks were mainly associated with suggestive interventions shortly after encoding. Finally, retrieval dosage differed between conditions: In ImE, participants rehearsed the entire trauma sequence, likely contributing to stronger memory stability in Study II, whereas ImRs was limited to segments up to the trauma hotspot.

Overall, these findings support a model of memory recontextualization and integration (Brewin & Burgess, 2014), suggesting that therapeutic memory updating and the preservation of forensic memory integrity can coexist. Memory outcomes likely depend on modifiable factors such as timing, structure, retrieval intensity, and patient authorship. While structured, patient-led imagery interventions appear to enhance memory accessibility without increasing distortion, it is important to recognize that these benefits are not universally guaranteed. Their effectiveness and safety likely hinge on specific boundary conditions and moderating factors that critically shape memory outcomes.

## When Does Imagery Become Risky? Key Moderators and Clinical Implications

Viewed together, the three studies offer a coherent empirical foundation for evaluating memory reliability following imagery-based trauma-focused interventions. Rather than uniformly impairing memory, structured approaches such as ImRs and ImE show no evidence of systematic distortion so far and may – under specific conditions – contribute to the preservation of memory accuracy or the enhancement of narrative richness. Importantly, the risk of false memories does not appear to stem from imagery itself but from a constellation of moderating factors including suggestive content, externally imposed scripts, poor structure, low client agency, and the cognitive framing of the intervention.

The synthesis of the systematic review indicates that distortion risk is particularly associated with two key moderators: (1) high individual suggestibility and (2) externally imposed or poorly structured scripts with low patient agency. These moderators were virtually absent in Studies I and II: the participants were healthy young adults, the procedures were highly structured, and the intervention scripts were predominantly participants-generated. This alignment likely explains why no memory impairments emerged in these experimental analogue studies while the review still emphasized potential risks in less-controlled or highly suggestive settings, such as hypnosis or unstructured imagination tasks.

***Structure Matters: How Procedural Design Shapes Memory Outcomes***

Unstructured and highly suggestive imagery tasks – particularly those used in basic memory research or in the context of hypnosis – carry the highest risk of memory distortion (e.g., Barnier & McConkey, 1992; Garry et al., 1996; Hyman & Pentland, 1996). In contrast, structured, manualized trauma-focused interventions such as ImRs and ImE have shown no systematic adverse effects on factual memory and, in several studies, even modest gains in recall quality or narrative coherence (Hagenaars & Arntz, 2012; Romano et al., 2020; Siegesleitner et al., 2019). Two recent, preregistered analogue studies that compared EMDR, ImRs, ImE, and a no-treatment control further extend this evidence. These studies were not included in the systematic review, as they were only available as preprints at the time of writing. Neither study found any decrement in cued-recall accuracy or memory consistency, while ImE increased narrative richness without introducing contradictions or omissions (Aleksic, Ehring, Kunze, Han, et al., 2025). One week later, after allowing for memory consolidation, all three interventions again left objective accuracy fully intact (Aleksic, Ehring, Kunze, & Wolkenstein, 2025).

Building on this, adherence to manualized, structured therapeutic procedures appears crucial in further minimizing the risk of memory distortion. Techniques such as ImRs and ImE, when delivered within the boundaries of established protocols, offer a well-defined framework that clearly differentiates systematic clinical work from open-ended, potentially suggestive imaginative exercises. However, strict protocol adherence alone is not sufficient.

It is equally essential to ensure that the therapeutic process remains transparent to the patient at all times.

This transparency involves explicitly communicating when and how imagery is being modified, carefully distinguishing between original memories and rescripted elements, and providing clear instructions on how to manage spontaneously emerging images, thoughts, or details. Supporting patients in actively reflecting on whether new content is connected to autobiographical memory or whether it should be understood as part of the therapeutic imagination process can be a key safeguard against inadvertent suggestion. This deliberate clarification helps prevent the misattribution of rescripted or imagined content as factual memory.

***Safeguarding Memory: The Protective Role of Warnings and Metacognitive Framing***

The systematic review further underscores that explicit warnings and metacognitive instructions can reliably reduce imagination-induced memory distortions. Several studies demonstrated that both pre-warnings and metacognitive prompts can effectively mitigate the formation of false memories. For example, Qin et al. (2008) showed that pre-warnings provided before an imagination task significantly reduced the likelihood of memory distortions. Sharman et al. (2005) found that metacognitive plausibility ratings after imagination could prevent the development of false memories, particularly when participants engaged in first-person imagination. Landau and von Glahn (2004) reported that post-warnings, administered after imagination tasks, were also capable of reducing false-memory effects, though not always fully eliminating them. In addition, Wagstaff et al. (2008) observed that memory distortions in hypnosis contexts could be reduced through warnings. This highlights the importance of integrating educational and awareness-raising components into therapeutic procedures to support source monitoring.

Building on this, actively supporting the patient's ability to distinguish between memory and imagination emerges as a central protective factor. Recent research, including Aleksic et al. (2024), highlights that focusing on sensory richness, perceptual detail, and emotional nuance can strengthen memory accuracy. Interventions that deliberately emphasize the sensory grounding of recalled scenes – by drawing attention to specific sensory cues such as sounds, smells, colors, or bodily sensations – appear to help patients differentiate between authentic memories and imagined content. Notably, these findings challenge earlier assumptions from the false-memory literature, which suggested that increasing sensory detail might heighten vulnerability to source confusion. Instead, the production of sensory detail in imagery-based interventions may facilitate more accurate source monitoring, particularly when patients are aware that some elements of the imagery have been deliberately rescripted (Aleksic et al., 2024).

Moreover, integrating clear psychoeducation and explicit warnings into the therapeutic process is essential. Clinical observations indicate that the spontaneous emergence of new or unexpected imagery during trauma-focused interventions can commonly occur and should be presented to patients as a normal part of the process. It is crucial to explicitly convey that the therapeutic aim is not to validate the factual accuracy of all images, nor to search for hidden memories, but rather to work with the mental representations that surface in service of emotional processing and psychological healing. This framing helps reduce the risk that patients will overinterpret new imagery or feel compelled to categorize every mental image as definitively true or false.

Sensory elaboration, metacognitive prompts, and anticipatory warnings have each been identified as strategies that can reduce the risk of false memories in specific contexts. While their combined application in imagery-based interventions has not yet been systematically studied, their routine inclusion may offer a pragmatic, low-cost, and theoretically supported safeguard to help protect memory integrity and enhance therapeutic safety.

### *Who Shapes the Narrative? Autobiographical Anchoring and the Importance of Authorship*

Another critical factor is the authorship of the intervention content. Self-generated, autobiographically rich material – typical of clinical interventions such as ImRs and ImE – was generally associated with stable or even improved memory performance (Ganslmeier, Ehring, et al., 2023; Hagenaars & Arntz, 2012). In contrast, experimental studies using externally generated scripts more frequently observed belief changes and memory distortions (Bays et al., 2015; Herndon et al., 2014; Hyman & Pentland, 1996; Qin et al., 2008).

Active patient involvement in content generation may therefore help to anchor imagination in authentic experiences and support source monitoring, while also maximizing patient agency – an important safeguard against memory distortion. When patients actively generate their own imagery content, their mental representations typically preserve key autobiographical features such as first-person perspective, emotional continuity, and context-specific detail – elements essential for effective source monitoring (Marsh et al., 2014; Sharman et al., 2005). Facilitating this process through open-ended prompts like “What image comes to mind?” or “How would you have wanted this scene to end?” helps ensure that patients remain the primary authors of their imagery, thereby supporting autobiographical embedding and reducing the risk of source confusion.

Importantly, active patient involvement does not necessarily imply the absence of initial therapeutic guidance. Current clinical protocols explicitly recommend that the early stages of ImRs be therapist-led, particularly to ensure emotional safety and to provide patients with a secure and structured entry into the process (Bosch & Arntz, 2023). Within this framework, patient authorship is progressively cultivated: as therapy advances, patients are increasingly encouraged to generate their own imagery and take an active role in reshaping their traumatic memories. This stepwise transition – from therapist-guided to patient-led rescripting – offers a meaningful balance: while the initial guidance helps prevent emotional overwhelm and facilitates therapeutic engagement, the later focus on self-generated content strengthens autobiographical anchoring and supports effective source monitoring. By maintaining narrative ownership with the patient, this approach also appears to safeguard memory integrity and reduce the risk of source confusion.

Conversely, therapeutic practices that involve speculative imagination of events without an autobiographical basis, repeated visualization of events known not to have occurred, or framings that blur the line between real and imagined content should be explicitly avoided in trauma-focused therapy. Evidence suggests that such practices can undermine memory integrity and increase the likelihood of false memories (Devitt, Monk-Fromont, et al., 2016; Horselenberg et al., 2000; Wright et al., 2001).

***Individual Vulnerabilities: Age, Clinical Status, and Memory Content as Risk Factors***

Additional factors such as age and clinical status (e.g., PTSD or dissociative symptoms) have likewise been discussed as possible moderators. Study III explicitly synthesized the available evidence on these variables, but the findings were limited and inconsistent among basic memory research, with imagery-based trauma-focused interventions typically not investigating these moderators in clinical or high-risk samples. Further empirical research shows that older adults display heightened reality-monitoring errors for imagined actions (McDaniel et al., 2008); a recent meta-analysis indicates that the probability of implanting rich autobiographical false memories is similarly high in children/adolescents and adults, with no significant age difference (Arce et al., 2023); clinical reviews suggest that individuals with PTSD or depression can exhibit elevated false-memory rates when exposed to emotionally associative material, whereas this effect is less consistent when neutral material is used (Otgaar, Muris, et al., 2017); and dissociative symptoms have been linked to higher hypnotic suggestibility and greater susceptibility to false-memory paradigms, although the overall associations appear small and effects tend to be limited to trauma-relevant or high-arousal stimuli (Dalenberg et al., 2012). Importantly, Study I and Study II did not directly test these additional moderators, as their participant samples were homogeneous and largely comprised healthy young adults. As such, generalizing these findings to clinical populations or high-risk groups must be done with caution.

The type of memory content may also influence susceptibility to distortion. Memories of events that were actually performed tend to be more resistant to later source confusion (Goff & Roediger, 1998; Lampinen et al., 2003; Lindner et al., 2010; Thomas et al., 2003; Thomas & Loftus, 2002), whereas imagining events increases the likelihood of source-monitoring errors (Lindner et al., 2010; Thomas et al., 2003). Some studies suggest that imagination inflation effects may be more pronounced for childhood memories (e.g., Marsh et al., 2014) or for positive events (Bays et al., 2015; Sharman & Barnier, 2008), although these findings were not consistently replicated across paradigms (Sharman & Calacouris, 2010).

It is also essential to differentiate between belief in a memory and its factual accuracy. Experimental imagery tasks often influenced belief and memory confidence (e.g., Mazzoni & Memon, 2003; Nash et al., 2009), whereas clinical trauma-focused interventions generally did not impair factual accuracy and, in some cases, even improved memory performance (Aleksic et al., 2024; Ganslmeier, Ehring, et al., 2023; Ganslmeier, Kunze, et al., 2023; Hagenaars & Arntz, 2012). Notably, many of these basic memory research procedures involved emotionally neutral or plausible everyday episodes – and in some cases even bizarre, clearly implausible events – combined with repeated suggestions. Such designs can induce belief inflation and source-monitoring errors, particularly when imagination is reinforced by social pressure or suggestive feedback (e.g., Thomas & Loftus, 2002; Wade et al., 2002). This distinction suggests that imagination may primarily affect the subjective experience and framing of memories – such as vividness or plausibility – rather than their factual content.

In light of these findings, it is crucial to avoid techniques that have been repeatedly associated with increased suggestibility and a potential risk of memory distortion, particularly in vulnerable individuals and forensic contexts. Methods such as hypnosis, therapist-imposed scripts, forced imagery, or fantasy rehearsal have been linked in several studies to a higher likelihood of false memories, especially among children, individuals with dissociative symptoms, or those with high fantasy-proneness (Ceci & Bruck, 1993; Giesbrecht et al., 2008). While the evidence is not entirely uniform, these approaches appear to carry a measurable risk, particularly when applied in emotionally charged or trauma-relevant settings. Maintaining clear clinical boundaries – by avoiding speculative reconstruction, refraining from introducing specific imagery content, and not pursuing memory recovery as a therapeutic goal – can help mitigate these risks.

**Cautious Optimism: Boundary Conditions and Future Directions**

Taken together, the findings cautiously suggest that well-structured, patient-generated imagery-based trauma-focused interventions may not inherently pose a general threat to memory reliability, provided that appropriate safeguards regarding structure, suggestibility, and patient agency are in place. This cautiously optimistic view aligns with broader theoretical perspectives suggesting that autobiographical memory, while reconstructive and malleable, remains generally reliable in the absence of external contamination or prolonged suggestion (Brewin et al., 2020).

Several important boundary conditions, however, constrain this preliminary conclusion. First, the vast majority of studies – including both experimental studies reported here – were conducted with healthy or subclinical samples, which limits the generalizability to individuals with PTSD or those involved in ongoing legal proceedings. Second, the review did not identify any published EMDR studies employing full protocols that met the inclusion criteria for assessing forensically relevant memory outcomes. While isolated eye movement tasks yielded mixed, context-dependent effects – ranging from minor recall enhancement to occasional spontaneous distortions – two recent preprints using full-session EMDR protocols reported no significant impact on the reliability of autobiographical memory (Aleksic, Ehring, Kunze, Han, et al., 2025; Aleksic, Ehring, Kunze, & Wolkenstein, 2025). Nevertheless, EMDR should be applied with the same safeguards as ImRs and ImE – structured delivery, patient agency, reality-monitoring support, and transparent framing. Given EMDR's reliance on associative memory processes and the potential emergence of vivid but unverifiable content, it is essential to provide clear psychoeducation: new images or sensations may arise that do not necessarily reflect factual memories. Especially in forensically sensitive contexts, careful clarification and ongoing support for source monitoring remain critical to prevent misattribution and to ensure therapeutic and legal safety.

***Bridging the Gap: Forensic Awareness in Trauma-Focused Interventions***

Finally, the elevated distortion risk observed in some studies was consistently tied to suggestive, externally driven procedures, not to manualized imagery-based trauma-focused interventions such as ImRs or ImE. This highlights important limitations of basic memory research, particularly its restricted ecological validity and limited transferability to clinical practice. These considerations emphasize the need for cautious generalization and underscore the importance of future clinical trials that jointly assess memory accuracy and therapeutic efficacy in more ecologically valid and clinically relevant contexts.

When working with patients involved in legal proceedings, early, structured, and transparent communication with legal professionals is strongly recommended. Sharing the therapeutic rationale, the manualized structure, and the specific safeguards in place can help to build trust and demonstrate that carefully applied trauma-focused therapy is compatible with legal standards (Expertinnen- und Expertengruppe „Psychotherapie und Glaubhaftigkeit“ im Bundesministerium der Justiz, 2024). The recently published “Praxishinweise zum Verhältnis von Psychotherapie und Strafverfahren” by the German Federal Ministry of Justice (2024) explicitly emphasize that psychotherapy does not generally jeopardize the credibility of testimony and that trauma-focused treatment can proceed even during ongoing criminal investigations. These guidelines discourage blanket delays or avoidance of necessary treatment due to legal concerns and highlight that the impact of psychotherapy on the credibility of a statement must always be examined on a case-by-case basis.

In line with this guidance, interdisciplinary cooperation is essential. Psychotherapists should, where appropriate and with the patient's consent, proactively engage with legal professionals to clarify the nature, scope, and procedural safeguards of the intervention. This collaborative transparency not only helps to protect forensic integrity but can also reduce unwarranted suspicion and prevent unnecessary delays in urgently needed psychological treatment.

Despite increasing structure and empirical support for trauma-focused interventions, their forensic implications remain a source of clinical uncertainty. Survey data indicate that many clinicians still hold outdated beliefs about memory, such as repressed and later recovered memories, and feel ill-equipped to navigate legal intersections of their work (Ost et al., 2013; Patihis & Pendergrast, 2019; Schemmel et al., 2024). This highlights a persistent gap between clinical practice and current memory science.

To address this, forensic literacy and empirically grounded memory models – such as source monitoring, reconsolidation, and distortion risk factors – should be systematically integrated into clinical training. Complex cases, particularly those involving legal processes, may benefit from interdisciplinary supervision that balances therapeutic goals with forensic considerations. In legally sensitive contexts, structured clinical decision-making is essential. Key factors such as time since trauma, legal status, psychological stability, and comorbidities should guide whether to proceed with imagery-based interventions. In high-risk situations, deferring such techniques in favor of stabilization and interdisciplinary consultation may be appropriate. Conversely, in stable cases without foreseeable legal consequences, structured methods like ImRs or ImE can be confidently applied with appropriate safeguards. Future research should further develop decision-making tools, explore applications in vulnerable clinical populations. While structured imagery techniques show promise, their use in forensic-relevant settings requires careful judgment, population-specific adaptation, and an informed understanding of memory processes.

## Methodological Reflections: Strengths, Limitations, and Lessons Learned

### *Strengths and Limitations*

This dissertation is based on a deliberate combination of different methods. Study I used the Trier Social Stress Test to probe memory effects under tightly controlled stress conditions; Study II applied a trauma-film paradigm to model emotionally salient, image-rich events; Study III synthesized 95 empirical papers to map boundary conditions and risk factors. Across the two experiments, random assignment, manualized protocols, and multiple time-point assessment provided high internal rigor. Critically, memory was captured with three complementary indices – free recall, cued recall, recognition – so that potential shifts in free recall and recognition could be separated. This multi-method, multi-metric design offers a solid platform for convergent inference while preserving ecological plausibility.

However, some key limitations also should be mentioned. First, the generalizability of the findings is naturally limited. Both experiments were conducted with healthy volunteers, and Study II further narrowed the sample to women with high trait anxiety. Whether comparable effects would emerge in clinical PTSD populations or in witnesses under courtroom pressure remains an open question. Second, the intervention dose was minimal, as both studies used single-session designs. In clinical practice, however, trauma-focused imagery typically involves three to eight sessions (Arntz, 2012; Arntz & Weertman, 1999; Ehlers & Clark, 2000). The present data should therefore be viewed as proof-of-principle rather than representative of full clinical treatment. Third, the trauma-film paradigm, although widely validated, does not capture the autobiographical depth or existential significance of real-life trauma, which may unpredictably amplify or attenuate memory effects. At the same time, the TSST is not a classical analogue trauma and primarily induces acute social-evaluative stress rather than trauma-like experiences. Finally, Study III was limited to published studies and may therefore be subject to publication bias. Taken together, these considerations advise caution when attempting to directly transfer the present findings to clinical or forensic settings.

***Lessons Learned and Future Research Agenda***

Next-step studies must move into clinical territory – PTSD, complex trauma, and developmental populations – using multi-session, ecologically valid protocols and follow-ups extending to 12 months and beyond. Moderator analyses should examine dissociation, imagery ability, suggestibility, age, and cultural narrative norms. Finally, translational efforts are needed: guideline panels should integrate memory-reliability evidence, and joint legal–clinical position papers could help replace blanket treatment delays with more nuanced, risk-based recommendations. Free recall emerged as the most sensitive index; cued recall and recognition were comparatively stable, echoing previous reports that open-ended tasks are more responsive to both strengthening and distortion. Manual coding of correct versus incorrect details achieved good reliability, yet future work should apply natural-language-processing pipelines to scale coding and probe subtle narrative shifts. The present methodology furnishes a robust yet expandable base: it demonstrates that the crucial research question is not whether memory changes, but how and under what conditions. Addressing that question now requires clinical samples, longer horizons, richer technologies, and tighter integration between cognitive science, clinical treatment, and the law.

**Conclusion: Integrating Trauma-Focused Therapy and Forensic Integrity**

This dissertation examined whether imagery-based trauma-focused interventions pose a risk to memory integrity that would justify delaying their use in psychological treatment when legal or forensic issues are involved. Based on two empirical studies, a systematic review, and current theoretical frameworks, the present data should be understood as proof-of-principle supporting a cautiously negative answer – there is currently no evidence that structured, patient-led imagery interventions like ImRs or ImE inherently compromise memory reliability in ways that would require their delay.

Across experimental and analogue designs, neither ImRs nor ImE systematically increased false memories. On the contrary, both were associated with enhanced free recall in some conditions, suggesting improved memory accessibility rather than distortion. Theoretical models offer explanatory support. According to DRT, ImRs and ImE modify contextual and sensory aspects of trauma without destabilizing their connection. The SMF explains the observed memory stability by emphasizing that self-generated imagery retains source cues more reliably than externally suggested formats. Reconsolidation research highlights that the timing, intensity, and emotional engagement during memory reactivation are crucial determinants of whether memory traces are strengthened or disrupted.

Taken together, these findings suggest that evidence-based trauma-focused interventions are not inherently associated with memory distortion. Rather, its implications depend on how the intervention is conducted and under what conditions. For clinicians, these findings may support the careful and timely use of trauma-focused, imagery-based interventions – provided they are applied with appropriate safeguards, such as structured protocols, procedures that preclude suggestibility, and reality-monitoring support. For forensic experts, these findings may help to nuance concerns about memory contamination, underlining the importance of differentiated, context-sensitive evaluation rather than blanket caution.

In sum, this work aims to contribute to a more balanced and constructive dialogue between therapeutic and forensic perspectives. When carefully and responsibly applied, structured imagery-based interventions may support both psychological recovery and the preservation of memory reliability. Nevertheless, further research is needed to substantiate these preliminary findings, particularly in clinical high-risk populations and legally sensitive contexts.

# 4. Deutsche Zusammenfassung

# Das Dilemma der Traumafokussierten Therapie:

# Auswirkungen Imaginationsbasierter Interventionen auf die

# Deklarative Erinnerung

In einigen Ländern wird Überlebenden von Gewaltverbrechen geraten, eine traumafokussierte psychologische Behandlung so lange aufzuschieben, bis die entsprechenden strafrechtlichen Verfahren abgeschlossen sind. Diese Praxis beruht auf der Annahme, dass eine solche Behandlung die Glaubhaftigkeit ihrer Zeugenaussage beeinträchtigen könnte (Henkel & Carbuto, 2008; Mazzoni & Vannucci, 2007). Allerdings sind insbesondere Überlebende zwischenmenschlicher Gewalt, wie beispielsweise nach einer Vergewaltigung oder andauernden gewalttätigen Übergriffen, einem besonders hohen Risiko ausgesetzt, eine posttraumatische Belastungsstörung (PTBS) zu entwickeln (Kessler et al., 2017). Frühzeitige klinische Interventionen sind daher entscheidend, um die Entstehung chronischer psychischer Erkrankungen zu verhindern – vor allem dann, wenn bereits Symptome einer Traumafolgestörung auftreten (Roberts et al., 2019). Traumafokussierte Verfahren wie Imaginal Exposure (ImE), Imagery Rescripting (ImRs) und Eye Movement Desensitization and Reprocessing (EMDR) konnten nachweislich das ungewollte Wiedererleben des traumatischen Ereignisses und andere PTBS-Symptome reduzieren (Cusack et al., 2016; Morina et al., 2017; Weber et al., 2021) und sind das Mittel der Wahl bei der Behandlung von Traumafolgestörungen (NICE). Gleichzeitig stehen psychotherapeutische Interventionen – insbesondere solche, welche die aktive Auseinandersetzung mit den traumatischen Erinnerungen in der Imagination beinhalten – in Verdacht die Struktur, den Inhalt oder das Vertrauen in die autobiografischen Erinnerungen an das Erlebte selbst zu verändern. Dies kann im Verlauf eines Gerichtsprozesses Zweifel an der Glaubhaftigkeit späterer Zeugenaussagen aufwerfen (Branaman & Gottlieb, 2013; Otgaar et al., 2019). Es wird dabei vor allem befürchtet, dass sie die forensisch bedeutsame Unterscheidung zwischen korrekten Erinnerungen, bewussten Falschaussagen und aufrichtig geglaubten, aber falschen Erinnerungen verwischen könnten (Volbert & Steller, 2014). Juristische Akteure fordern daher häufig, dass Zeugenaussagen unbeeinflusst bleiben. So hat etwa der Bundesgerichtshof entschieden, dass suggestive therapeutische Einflüsse ausgeschlossen sein müssen, um die Möglichkeit von Pseudoerinnerungen zu verwerfen (BGH, 2015). Auch wenn diese Sichtweise wissenschaftlich umstritten ist, hat sie dazu geführt, dass Betroffenen mitunter von einer Therapie abgeraten wird, solange ein Strafverfahren anhängig ist (Branaman & Gottlieb, 2013). Ein Aufschub evidenzbasierter Behandlungsmöglichkeiten bringt sowohl die Betroffenen als auch die behandelnden Therapeutinnen und Therapeuten in ein schwieriges Spannungsfeld: Sie müssen zwischen der dringenden therapeutischen Versorgung und dem Schutz der forensischen Aussagekraft wählen – ein Problem, das als Dilemma der traumafokussierten Therapie bekannt wurde (Bublitz, 2023).

Auch wenn in Grundlagenstudien zu Imagination und Gedächtnis gezeigt werden könnte, dass Erinnerungen durch imaginative Verfahren verändert und sogar beeinträchtigt werden können (Brewin & Andrews, 2017), so fehlen Studien im Kontext von Psychotherapie, die die aktuelle forensische Praxis gut begründen würden. Bisher gibt es nur wenige Studien, die systematisch den Einfluss von imaginationsbasierten Verfahren auf die Erinnerung an eine belastende Situation untersucht haben. Zwei Analogstudien liefern erste explorative Ergebnisse, die den Befunden der Grundlagenforschung entgegenstehen: Hagenaars und Arntz (2012) sowie Siegesleitner et al. (2019) fanden in ihren Analogstudien beide keine negativen Einflüsse auf die deklarative Erinnerung an einen Traumafilm nach ImRs oder ImE. Bei Hagenaars und Arntz (2012) verbesserte sich die Erinnerung nach ImRs und ImE sogar im Vergleich zu einer Kontrollbedingung. Es liegt daher die Vermutung nahe, dass sich die Befunde aus der Grundlagenforschung zu Gedächtnis und Imagination nicht ohne weiteres auf die klinische Praxis übertragen lassen und weitere Forschung notwendig ist, um eine fundierte Schlussfolgerung zu ermöglichen.

Die vorliegende Dissertation hat das Ziel diese empirische Lücke zu adressieren und untersucht dafür systematisch, ob und inwieweit imaginationsbasierte, traumafokussierte Interventionen die deklarative Erinnerung an belastende Erlebnisse beeinflussen. Ziel ist es dabei, auch weitere Erkenntnisse zu gewinnen, unter welchen Bedingungen Beeinträchtigungen wahrscheinlichen sind. Dazu wurden insgesamt zwei randomisierte und kontrollierte experimentelle Analogstudien durchgeführt sowie eine systematische Übersichtsarbeit erstellt.

Studie I verfolgte das Ziel, in einem kontrollierten Versuchsdesign – im analogen Kontext zu Psychotherapie – zu untersuchen, ob bereits eine einzige Sitzung ImRs die deklarative Erinnerung an ein stress-induzierendes autobiografisches Erlebnis verändern kann. Dazu nahmen 100 Personen am Trier Social Stress Test (TSST; Kirschbaum et al.,1993) teil. Anschließend wurden die Teilnehmenden zufällig entweder einer ImRs-Intervention oder einer Kontrollbedingung ohne Intervention zugewiesen. Die deklarative Erinnerung wurde im Verlauf dann zu drei Messzeitpunkten (einmal vor der Intervention und zweimal nach der Intervention) erhoben. Im freien Bericht und in einem Erinnerungsfragebogen wurden sowohl korrekte als auch inkorrekte Erinnerungsdetails erhoben. Die Ergebnisse zeigten, dass die Teilnehmenden in der ImRs-Bedingung nach einer Woche im freien Bericht signifikant mehr korrekte Details abrufen konnten als diejenigen in der Kontrollgruppe ohne Intervention, ohne dass dabei die Anzahl inkorrekter Details anstieg. Im Erinnerungsfragebogen zeigten sich keine Unterschiede zwischen den Bedingungen. Dies stellte die Annahme, dass ImRs die deklarative Erinnerung beeinträchtigt und imaginationsbasierte Verfahren grundsätzlich problematisch für die Glaubhaftigkeit sein können, vorsichtig in Frage.

Studie II baute auf den Ergebnissen von Studie I auf und untersuchte neben ImRs auch den Einfluss von ImE auf die deklarative Erinnerung an ein Traumaanalog. Hierzu sahen 120 hoch ängstliche weibliche Teilnehmende einen Traumafilm, der explizite körperliche und sexuelle Gewalt beinhaltete und somit zentrale Merkmale realer traumatischer Erlebnisse (z.B. Hilflosigkeit, Bedrohung) simulierte. Eine Woche später wurden sie zufällig einer ImRs-, einer ImE- oder einer Kontrollbedingung ohne Intervention zugewiesen. Die deklarative Erinnerung wurde wieder im freien Bericht und in einem Erinnerungsfragebogen sowie einem neukonzipierten visuellen Wiedererkennungstest zu mehreren Messzeitpunkten erhoben. Die ImRs- und ImE-Bedingungen unterschieden sich im Erinnerungsfragebogen und im visuellen Wiedererkennungstest nicht von der Kontrollgruppe ohne Intervention. Allerdings führte ImE – im Vergleich zur ImRs und der Kontrollbedingung – zu einer Zunahme korrekt erinnerter Details im freien Bericht. Zusammenfassend deuten die vorliegenden Ergebnisse, ebenso wie Studie I, nicht darauf hin, dass ImRs oder ImE die deklarative Erinnerung beeinträchtigen. Unter bestimmten Bedingungen kam es auch in Studie II zu Verbesserungen der deklarativen Erinnerung.

Um diese Bedingungen besser zu verstehen, fasste Studie III den aktuellen Forschungsstand zu den Effekten imaginationsbasierter Techniken auf deklarative autobiografische Erinnerungen zusammen. Die präregistrierte, systematische Übersichtsarbeit integrierte dafür die Ergebnisse von 95 Studien aus der Grundlagenforschung zu Gedächtnis und Imagination sowie aus experimentellen Analogstudien im klinischen Kontext. Klinische Patientenstudien fehlen bisweilen. Die inkludierten Studien wurden anhand vier relevanter Moderatoren analysiert: (1) Stichprobenmerkmale (Alter, psychische Gesundheit), (2) Erinnerungsmerkmale (Ursprung der Erinnerung: Kindheit, Jugend oder Erwachsenenalter, Valenz der Erinnerung, autobiografisches vs. fiktives Ereignis,), (3) Interventionsmerkmale (z.B. Imaginationsaufgabe ohne klinischen Bezug vs. traumfokussierte Interventionen, wie ImRs, ImE oder EMDR, Dosis der Intervention, selbst- oder fremdgeneriertes

Interventionsskript) und (4) Aspekte der Erinnerungsmessung (z.B. Erinnerungsgenauigkeit; Überzeugung, dass ein Ereignis passiert ist oder inhaltliche Veränderungen der Erinnerung).

Ziel war es dabei, die divergierenden Ergebnisse zwischen Grundlagenforschung zu Gedächtnis und Imagination und den experimentellen Befunden aus Analogstudien in einen größeren Kontext einzuordnen und fundierte Hinweise zu finden, unter welchen Bedingungen imaginationsbasierte Interventionen ein erhöhtes Risiko haben, die deklarative Erinnerung zu beeinträchtigen und unter welchen Voraussetzungen, sie aber auch gut begründet angewendet werden können. Die Zusammenfassung der Ergebnisse zeigte, dass Imagination, wie sie in der Grundlagenforschung und in Studien zu Hypnose häufig angewendet wurde, regelhaft dazu führte, dass sich die Überzeugung erhöhte, ein imaginiertes – nicht erlebtes – Ereignis habe tatsächlich stattgefunden. Im Gegensatz dazu zeigten strukturierte, klinische Interventionen, wie ImRs und ImE, Beeinträchtigung der Erinnerungsleistung und führten in einigen Fällen sogar zu einer verbesserten Erinnerungsleistung oder einer höheren narrativen Kohärenz. Studien zu EMDR gibt es bislang nicht. Studien, die isoliert Augenbewegungen untersuchten fanden uneinheitliche Effekte, jedoch auch nur selten Beeinträchtigungen. Insgesamt deuten die verfügbaren Daten darauf hin, dass die Anfälligkeit der Erinnerung eher von suggestiven Vorgehensweisen und fehlenden Bezug zu tatsächlich autobiografischen Erlebtem als von lege artis durchgeführten imaginationsbasierten, traumafokussierten Interventionen ausgeht.

Zusammengefasst deuten die Ergebnisse der drei Studien dieser Dissertation darauf hin, dass strukturierte, von Patienten selbstgenerierte, imaginationsbasierte Interventionen nicht regelhaft die Erinnerung an belastende Ereignisse beeinträchtigen. Weder ImRs noch ImE führten systematisch zu einer Zunahme falscher Erinnerungen. Unter manchen Bedingungen waren beide Interventionen teilweise sogar mit einer verbesserten Erinnerungsleistung assoziiert, was auf eine gesteigerte Zugänglichkeit der Erinnerung nach einer Intervention hindeuten kann. Theoretische Modelle stützen diese Befunde. Entsprechend der Annahmen der Dualen Repräsentationstheorie (Brewin et al., 1996; Brewin et al., 2010) verändern ImRs und ImE kontextuelle und sensorische Aspekte des Traumas und stärken deren Verbindung, was den deklarativen Abruf erleichtern könnte. Im Rahmen des Source-Monitoring-Frameworks (Johnson et al., 1993) kann man die Stabilität der Erinnerungen dadurch erklären, dass von Patientinnen und Patienten selbstgenerierte Bilder (anders als externe Suggestionen) zuverlässiger als eigene Quelle erkannt werden und daher weniger Anfällig für Quellenverwechslungsfehler sind. Die Rekonsolidierungsforschung (Nader & Hardt, 2009; Nader et al., 2000) betont zudem, dass Faktoren wie der Zeitpunkt, die Intensität und die emotionale Aktivierung während der Intervention eine entscheidende Rolle spielen, ob Erinnerungen gefestigt oder geschwächt werden. Insgesamt sprechen die Ergebnisse dafür, dass evidenzbasierte Interventionen nicht grundsätzlich problematisch sind. Vielmehr kommt es darauf an, wie und unter welchen Rahmenbedingungen sie durchgeführt werden. Für die klinische Praxis könnten diese Erkenntnisse die rechtzeitige, sorgfältige Anwendung imaginationsbasierter, traumafokussierter Intervention unterstützen. Wichtig ist es dabei aber auch, die vorgeschlagenen Schutzmaßnahmen, wie strukturiertes, Manual basiertes Vorgehen, Vermeidung von Suggestion und der Bezug zu tatsächlich Erlebtem eingehalten werden. Für forensische Fachleute bieten die Ergebnisse die Möglichkeit, pauschale Bedenken zu relativieren und differenzierte, kontextabhängige Bewertungen vorzunehmen. Diese Arbeit möchte so zu einem ausgewogenen und konstruktiven Dialog zwischen therapeutischen und forensischen Perspektiven beitragen. Sorgfältig und verantwortungsvoll angewendet, können strukturierte imaginationsbasierte Interventionen sowohl die psychische Heilung unterstützen als auch die Zuverlässigkeit von Erinnerungen erhalten. Dennoch ist weitere Forschung notwendig, insbesondere mit klinischen Hochrisikogruppen und in juristisch sensiblen Kontexten.

# References

References marked with an asterisk indicate studies included in the systematic review.

Abler, B., & Kessler, H. (2009). Emotion Regulation Questionnaire – Eine deutschsprachige Fassung des ERQ von Gross und John. *Diagnostica*, *55*(3), 144-152. https://doi.org/10.1026/0012-1924.55.3.144

Ackenheil, M., Stotz-Ingenlath, G., Dietz-Bauer, R., & Vossen, A. (1999). *Mini international neuropsychiatric interview, German version 5.0.0 DSM IV*. Psychiatric University Clinic.

Adolphs, R., Tranel, D., & Buchanan, T. W. (2005). Amygdala damage impairs emotional memory for gist but not details of complex stimuli. *Nature Neuroscience*, *8*(4), 512-518. https://doi.org/10.1038/nn1413

Aleksic, M., Ehring, T., Kunze, A., Han, Y., Funk, H., & Wolkenstein, L. (2025). *Selective effects of eye movement desensitization and reprocessing, imagery rescripting and imaginal exposure on voluntary and involuntary memory of an aversive autobiographical event* [Preprint]. Open Science Framework. https://doi.org/10.31219/osf.io/9hmdb

Aleksic, M., Ehring, T., Kunze, A., & Wolkenstein, L. (2025). *Does treating emotional memories come at a price? Comparing the effects of imagery rescripting, eye movement desensitization and reprocessing and imaginal exposure on memory accuracy* [Preprint]. Open Science Framework. https://doi.org/10.31219/osf.io/qvwhu_v1

*Aleksic, M., Reineck, A., Ehring, T., & Wolkenstein, L. (2024). When does imagery rescripting become a double-edged sword? - Investigating the risk of memory distortion through imagery rescripting in an online Trauma film study. *Behaviour*

*Research and Therapy*, *174*, Article 104495. https://doi.org/10.1016/j.brat.2024.104495

American Psychiatric Association. (2022). *Diagnostic and statistical manual of mental disorders (5th ed., text rev.; DSM-5-TR)*. American Psychiatric Publishing. https://doi.org/10.1176/appi.books.9780890425787

Arbuthnott, K. D. (2005). The effect of repeated imagery on memory. *Applied Cognitive Psychology*, *19*(7), 843-866. https://doi.org/10.1002/acp.1126

Arce, R., Selaya, A., Sanmarco, J., & Fariña, F. (2023). Implanting rich autobiographical false memories: Meta-analysis for forensic practice and judicial judgment making. *International Journal of Clinical and Health Psychology*, *23*(4), Article 100386. https://doi.org/10.1016/j.ijchp.2023.100386

Arnaudova, I., & Hagenaars, M. A. (2017). Lights… action: Comparison of trauma films for use in the trauma film paradigm. *Behaviour Research and Therapy*, *93*, 67-77. https://doi.org/10.1016/j.brat.2017.02.007

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., Tiesema, M., & Kindt, M. (2007). Treatment of PTSD: A comparison of imaginal exposure with and without imagery rescripting. *Journal of Behavior Therapy and Experimental Psychiatry*, *38*(4), 345-370. https://doi.org/10.1016/j.jbtep.2007.10.006

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

Baldwin, J. R., Wang, B., Karwatowska, L., Schoeler, T., Tsaligopoulou, A., Munafò, M. R., & Pingault, J.-B. (2023). Childhood maltreatment and mental health problems: A systematic review and meta-analysis of quasi-experimental studies. *American journal of psychiatry*, *180*(2), 117-126. https://doi.org/10.1176/appi.ajp.20220174

*Baran, B., & Niedzwienska, A. (2002). Imagination inflation and implicit memory theories. *Imagination, Cognition and Personality*, *22*(3), 227-289. https://doi.org/10.2190/E4FW-3414-X5DB-EDV9

Barber, T. X. (1969). *Hypnosis: A scientific approach*. Van Nostrand Reinhold.

*Barnier, A. J., & McConkey, K. M. (1992). Reports of real and false memories: The relevance of hypnosis, hypnotizability, and context of memory test. *Journal of Abnormal Psychology*, *101*(3), 521-527. https://doi.org/10.1037/0021-843X.101.3.521

*Bays, R. B., Foley, M. A., & Zabrucky, K. M. (2013). Timing does matter: Examining imagery's impact on the temporal origins of false beliefs. *Acta Psychologica*, *142*(1), 30-37. https://doi.org/10.1016/j.actpsy.2012.10.004

*Bays, R. B., Zabrucky, K. M., & Foley, M. A. (2015). Imagery induction processes differentially impact imagination inflation. *Imagination, Cognition and Personality*, *35*(1), 5-25. https://doi.org/10.1177/0276236615574487

*Bays, R. B., Zabrucky, K. M., & Gagne, P. (2012). When plausibility manipulations work: An examination of their role in the development of false beliefs and memories. *Memory*, *20*(6), 638-644. https://doi.org/10.1080/09658211.2012.692797

Beaulieu-Prévost, D., & Zadra, A. (2015). When People Remember Dreams They Never Experienced: A Study of the Malleability of Dream Recall Over Time [Article]. *Dreaming*, *25*(1), 18-31. https://doi.org/10.1037/a0038788

Bedard-Gilligan, M., Zoellner, L. A., & Feeny, N. C. (2017). Is trauma memory special? Trauma narrative fragmentation in PTSD: Effects of treatment and response. *Clinical Psychological Science*, *5*(2), 212-225. https://doi.org/10.1177/2167702616676581

Beesdo-Baum, K., Zaudig, M., & Wittchen, H.-U. (2019). *SCID-5-CV Strukturiertes Klinisches Interview für DSM-5-Störungen – Klinische Version*. Hogrefe.

Bernstein, D. M., Laney, C., Morris, E. K., & Loftus, E. F. (2005a). False beliefs about fattening foods can have healthy consequences. *Proceedings of the National Academy of Sciences of the United States of America*, *102*(39), 13724-13731. https://doi.org/10.1073/pnas.0504869102

Bernstein, D. M., Laney, C., Morris, E. K., & Loftus, E. F. (2005b). False memories about food can lead to food avoidance [Article]. *Social Cognition*, *23*(1), 11-34. https://doi.org/10.1521/soco.23.1.11.59195

Berntsen, D., & Rubin, D. C. (2006). The centrality of event scale: A measure of integrating a trauma into one's identity and its relation to post-traumatic stress disorder symptoms. *Behaviour research and therapy*, *44*(2), 219-231. https://doi.org/10.1016/j.brat.2005.01.009

Bisson, J. I., Berliner, L., Cloitre, M., Forbes, D., Jensen, T. K., Lewis, C., Monson, C. M., Olff, M., Pilling, S., Riggs, D. S., Roberts, N. P., & Shapiro, F. (2019). The International Society for Traumatic Stress Studies New Guidelines for the Prevention and Treatment of Posttraumatic Stress Disorder: Methodology and Development Process. *Journal of Traumatic Stress*, *32*(4), 475-483. https://doi.org/10.1002/jts.22421

Blandón-Gitlin, I., Pezdek, K., Lindsay, D. S., & Hagen, L. (2009). Criteria-based content analysis of true and suggested accounts of events. *Applied Cognitive Psychology*, *23*(7), 901-917. https://doi.org/10.1002/acp.1504

Bosch, M., & Arntz, A. (2023). Imagery Rescripting for Patients With Posttraumatic Stress Disorder: A Qualitative Study of Patients' and Therapists' Perspectives About the

Elements of Change. *Cognitive and Behavioral Practice*, *30*(1), 18-34. https://doi.org/10.1016/j.cbpra.2021.08.001

Brainerd, C. J., & Reyna, V. F. (2005). *The science of false memory*. Oxford University Press.

Brainerd, C. J., Reyna, V. F., & Ceci, S. J. (2008). Developmental reversals in false memory: A review of data and theory. *Psychological Bulletin*, *134*(3), 343-382. https://doi.org/10.1037/0033-2909.134.3.343

Branaman, T. F., & Gottlieb, M. C. (2013). Ethical and legal considerations for treatment of alleged victims: When does it become witness tampering? *Professional Psychology: Research and Practice*, *44*(5), 299-306. https://doi.org/10.1037/a0033020

Brewin, C. (2006). Understanding cognitive behaviour therapy: A retrieval competition account. *Behaviour Research and Therapy*, *44*(6), 765-784. https://doi.org/10.1016/j.brat.2006.02.005

Brewin, C. (2007). Autobiographical memory for trauma: Update on four controversies. *Memory*, *15*(3), 227-248. https://doi.org/10.1080/09658210701256423

Brewin, C. (2011). The nature and significance of memory disturbance in posttraumatic stress disorder. *Annual Review of Clinical Psychology*, *7*, 203-227. https://doi.org/10.1146/annurev-clinpsy-032210-104544

Brewin, C. (2014). Episodic memory, perceptual memory, and their interaction: foundations for a theory of posttraumatic stress disorder. *Psychological Bulletin*, *140*(1), 69-97. https://doi.org/10.1037/a0033722

Brewin, C., & Andrews, B. (2017). Creating memories for false autobiographical events in childhood: A systematic review. *Applied Cognitive Psychology*, *31*(1), 2-23. https://doi.org/10.1002/acp.3220

Brewin, C., Dalgleish, T., & Joseph, S. (1996). A dual representation theory of posttraumatic stress disorder. *Psychological Review*, *103*(4), 670-686. https://doi.org/10.1037/0033-295X.103.4.670

Brewin, C., 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

Brewin, C., Wheatley, J., Patel, T., Fearon, P., Hackmann, A., Wells, A., Fisher, P., & Myers, S. (2009). Imagery rescripting as a brief stand-alone treatment for depressed patients with intrusive memories. *Behaviour Research and Therapy*, *47*(7), 569-576. https://doi.org/10.1016/j.brat.2009.03.008

Brewin, C. R. (2018). Memory and forgetting. *Current Psychiatry Reports*, *20*(10), Article 87. https://doi.org/10.1007/s11920-018-0950-7

Brewin, C. R., Andrews, B., & Mickes, L. (2020). Regaining consensus on the reliability of memory. *Current Directions in Psychological Science*, *29*(2), 121-125. https://doi.org/10.1177/0963721419898122

Brewin, C. R., & Burgess, N. (2014). Contextualisation in the revised dual representation theory of PTSD: A response to Pearson and colleagues. *Journal of Behavior Therapy and Experimental Psychiatry*, *45*(1), 217-219. https://doi.org/10.1016/j.jbtep.2013.07.011

Bryant, R. A., & Barnier, A. J. (1999). Eliciting autobiographical pseudomemories: The relevance of hypnosis, hypnotizability, and attributions. *International Journal of Clinical and Experimental Hypnosis*, *47*(4), 267-283. https://doi.org/10.1080/00207149908410037

Bublitz, C. (2020). Gesundheit oder Glaubhaftigkeit? Auswege aus dem traumatherapeutischen Dilemma. *Ethik in der Medizin*, *32*, 65-83. https://doi.org/10.1007/s00481-019-00560-3

Bublitz, J. C. (2023). When is Disbelief Epistemic Injustice? Criminal Procedure, Recovered Memories, and Deformations of the Epistemic Subject. *Criminal Law and Philosophy*, 1-28. https://doi.org/10.1007/s11572-023-09695-3

Bühner, M., & Ziegler, M. (2017). *Statistik für Psychologen und Sozialwissenschaftler*. Pearson Deutschland GmbH.

Bulevich, J. B., & Thomas, A. K. (2012). Retrieval effort improves memory and metamemory in the face of misinformation. *Journal of Memory and Language*, *67*(1), 45-58. https://doi.org/10.1016/j.jml.2011.12.012

Burgess, C. A., & Kirsch, I. (1999). Expectancy information as a moderator of the effects of hypnosis on memory. *Contemporary Hypnosis*, *16*(1), 22-31. https://doi.org/10.1002/ch.146

*Calvillo, D. P., & Emami, A. S. (2019). Do lateral eye movements increase susceptibility to misinformation? A registered replication. *Psychonomic Bulletin & Review*, *26*(6), 1905-1910. https://doi.org/10.3758/s13423-019-01641-6

*Calvillo, D. P., Vasquez, A. N., & Pesavento, A. (2019). Imagination inflation effects are unrelated across two imagination inflation tasks. *Psychology of Consciousness: Theory, Research, and Practice*, *6*(1), 90-98. https://doi.org/10.1037/cns0000178

Castelli, P., & Ghetti, S. (2014). Resisting imagination and confabulation: Effects of metacognitive training. *Journal of Experimental Child Psychology*, *126*, 339-356. https://doi.org/10.1016/j.jecp.2014.04.005

Ceci, S. J., & Bruck, M. (1993). Suggestibility of the child witness: a historical review and synthesis. *Psychological Bulletin*, *113*(3), 403-439. https://doi.org/10.1037/0033-2909.113.3.403

Christianson, S.-Å. (1992). Emotional stress and eyewitness memory: a critical review. *Psychological Bulletin*, *112*(2), 284-309. https://doi.org/10.1037/0033-2909.112.2.284

*Christman, S. D., Garvey, K. J., Propper, R. E., & Phaneuf, K. A. (2003). Bilateral eye movements enhance the retrieval of episodic memories. *Neuropsychology*, *17*(2), 221-229. https://doi.org/10.1037/0894-4105.17.2.221

*Clancy, S. A., McNally, R. J., & Schacter, D. L. (1999). Effects of guided imagery on memory distortion in women reporting recovered memories of childhood sexual abuse. *Journal of Traumatic Stress*, *12*(4), 559-569. https://doi.org/10.1023/A:1024704815234

Clancy, S. A., Schacter, D. L., McNally, R. J., & Pitman, R. K. (2000). False recognition in women reporting recovered memories of sexual abuse. *Psychological Science*, *11*(1), 26-31. https://doi.org/10.1111/1467-9280.0021

*Clark, E. L., Daley, R. T., Deason, R. G., O'Connor, M. K., Budson, A. E., & DeCaro, R. E. (2022). Cue-utilization in the imagination inflation effect paradigm in older adults with mild cognitive impairment. *Neuropsychology*, *36*(4), 297-313. https://doi.org/10.1037/neu0000801

Clark, I. A., Mackay, C. E., & Holmes, E. A. (2015). Low emotional response to traumatic footage is associated with an absence of analogue flashbacks: An individual participant data meta-analysis of 16 trauma film paradigm experiments. *Cognition and Emotion*, *29*(4), 702-713. https://doi.org/10.1080/02699931.2014.926861

Conway, M. A., & Pleydell-Pearce, C. W. (2000). The construction of autobiographical memories in the self-memory system. *Psychological Review, 107*(2), 261-288. https://doi.org/10.1037/0033-295X.107.2.261

Courtois, C. A., Sonis, J., Brown, L. S., Cook, J., Fairbank, J. A., Friedman, M., Gone, J. P., Jones, R., Greca, A. L., Mellman, T., Roberts, J., & Schulz, P. (2017). *Clinical Practice Guideline for the Treatment of Posttraumatic Stress Disorder (PTSD) in Adults*. American Psychological Association. Retrieved June 13, 2025, from https://apacustomout.apa.org/commentPracGuidelines/Practice/Full%20PTSD%20text%20clean%2010-4-16%20revised.pdf

Crawley, S. E., & French, C. C. (2005). Field and observer viewpoint in remember-know memories of personal childhood events. *Memory*, *13*(7), 673-681. https://doi.org/10.1080/09658210444000296

Crowe, S. E., Barutchu, A., & Houston, D. (2003). The accuracy of source monitoring across the auditory, visual and action modalities. *Australian Journal of Psychology*, *55*(3), 135-139. https://doi.org/10.1080/0004953042000298582

Cusack, K., Jonas, D. E., Forneris, C. A., Wines, C., Sonis, J., Middleton, J. C., Feltner, C., Brownley, K. A., Olmsted, K. R., & Greenblatt, A. (2016). Psychological treatments for adults with posttraumatic stress disorder: A systematic review and meta-analysis. *Clinical Psychology Review*, *43*, 128-141. https://doi.org/10.1016/j.cpr.2015.10.003

Dalenberg, C. J., Brand, B. L., Gleaves, D. H., Dorahy, M. J., Loewenstein, R. J., Cardena, E., Frewen, P. A., Carlson, E. B., & Spiegel, D. (2012). Evaluation of the evidence for the trauma and fantasy models of dissociation. *Psychological Bulletin*, *138*(3), 550-588. https://doi.org/10.1037/a0027447

Dalgleish, T. (2004). Cognitive approaches to posttraumatic stress disorder: the evolution of multirepresentational theorizing. *Psychological Bulletin*, *130*(2), 228-260. https://doi.org/10.1037/0033-2909.130.2.228

Dancu, C., & Foa, E. (1993). Posttraumatic Stress Disorder. In A. Freeman & F. M. Dattilio (Eds.), *Comprehensive Casebook of Cognitive Therapy*. (pp. 79-89). Kluwer Academic/Plenum Publishers.

Dasgupta, A. M., Juza, D. M., White, G. M., & Maloney, J. F. (1995). Memory and hypnosis: A comparative analysis of guided memory, cognitive interview, and hypnotic hypermnesia. *Imagination, Cognition and Personality*, *14*(2), 117-130. https://doi.org/10.2190/M2MB-A6RD-2NEM-JKD1

De Brigard, F., Szpunar, K. K., & Schacter, D. L. (2013). Coming to Grips With the Past: Effect of Repeated Simulation on the Perceived Plausibility of Episodic Counterfactual Thoughts. *Psychological Science*, *24*(7), 1329-1334. https://doi.org/10.1177/0956797612468163

Delahaye, M., Stieglitz, R. D., Graf, M., Keppler, C., Maes, J., & Pflueger, M. (2015). Deutsche Übersetzung und Validierung des Stress Appraisal Measure (SAM). *Fortschritte der Neurologie – Psychiatrie*, *83*(5), 276-285. https://doi.org/10.1055/s-0034-1399727

Devilly, G. J., & Brown, L. (2011). The role of imagery rehearsal with and without eye movements in the creation of false memories. *Psychology Crime & Law*, *17*(6), 529-543. https://doi.org/10.1080/10683160903397524

*Devitt, A. L., Monk-Fromont, E., Schacter, D. L., & Addis, D. R. (2016). Factors that influence the generation of autobiographical memory conjunction errors. *Memory*, *24*(2), 204-222. https://doi.org/10.1080/09658211.2014.998680

*Devitt, A. L., Tippett, L., Schacter, D. L., & Addis, D. R. (2016). Autobiographical memory conjunction errors in younger and older adults: Evidence for a role of inhibitory ability. *Psychology and Aging*, *31*(8), 927-942. https://doi.org/10.1037/pag0000129

*Dhammapeera, P., Brunskill, C., Hellerstedt, R., & Bergström, Z. M. (2024). Counterfactual imagination impairs memory for true actions: EEG and behavioural evidence. *Cognitive Neuroscience*, *15*(1), 12-23. https://doi.org/10.1080/17588928.2024.2315814

Dibbets, P., & Schulte-Ostermann, M. A. (2015). Virtual reality, real emotions: a novel analogue for the assessment of risk factors of post-traumatic stress disorder. *Frontiers in Psychology*, *6*. https://doi.org/10.3389/fpsyg.2015.00681

Dilevski, N., Paterson, H. M., & van Golde, C. (2020). Investigating the Effect of Emotional Stress on Adult Memory for Single and Repeated Events. *Psychology Public Policy and Law*, *26*(4), 425-441. https://doi.org/10.1037/law0000248

Dudai, Y., Karni, A., & Born, J. (2015). The Consolidation and Transformation of Memory. *Neuron*, *88*(1), 20-32. https://doi.org/10.1016/j.neuron.2015.09.004

Ehlers, A., & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour research and therapy*, *38*(4), 319-345. https://doi.org/10.1016/S0005-7967(99)00123-0

Ehlers, A., Clark, D. M., Hackmann, A., McManus, F., & Fennell, M. (2005). Cognitive therapy for post-traumatic stress disorder: development and evaluation. *Behaviour research and therapy*, *43*(4), 413-431. https://doi.org/10.1016/j.brat.2004.03.006

Ehlers, A., Hackmann, A., & Michael, T. (2004). Intrusive re-experiencing in post-traumatic stress disorder: Phenomenology, theory, and therapy. *Memory*, *12*, 403-415. https://doi.org/10.1080/09658210444000025

Ehring, T., Svaldi, J., Tuschen-Caffier, B., & Berking, M. (2013). *Validierung der Difficulties in Emotion Regulation Scale – deutsche Version (DERS-D)* [unpublished manuscript]. Universität Münster.

*El Haj, M., & Robin, F. (2020). The thin line between reality and imagination: The imagination inflation effect in Korsakoff's syndrome. *Neuropsychology*, *34*(5), 569-577. https://doi.org/10.1037/neu0000635

Elbert, T., Schauer, M., & Neuner, F. (2022). Narrative Exposure Therapy (NET): Reorganizing Memories of Traumatic Stress, Fear, and Violence. In U. Schnyder & M. Cloitre (Eds.), *Evidence Based Treatments for Trauma-Related Psychological Disorders: A Practical Guide for Clinicians* (pp. 255-280). Springer International Publishing. https://doi.org/10.1007/978-3-030-97802-0_12

Elsey, J. W., Van Ast, V. A., & Kindt, M. (2018). Human memory reconsolidation: A guiding framework and critical review of the evidence. *Psychological Bulletin*, *144*(8), 797-848. https://doi.org/10.1037/bul0000152

Expertinnen- und Expertengruppe „Psychotherapie und Glaubhaftigkeit" im Bundesministerium der Justiz. (2024). *Praxishinweise zum Verhältnis von Psychotherapie und Strafverfahren [Practical guidelines on the relationship between psychotherapy and criminal proceedings]* [Fachpublikation]. https://www.bmjv.de/SharedDocs/Publikationen/DE/Fachpublikationen/Praxishinweise_Psychotherapie.pdf

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2009). *G*Power*. In (Version 3.1.9.2) [Computer software]. University of Duesseldorf.

Federal Court of Justice [BGH]. (2015). *Decision of 21 January 2015 – 2 StR 455/14*. HRRS. https://www.hrr-strafrecht.de/hrr/2/14/2-455-14.php

Field, A. (2013). *Discovering statistics using SPSS*. SAGE Publications Ltd.

Finer, J. J. (1996). Therapists' liability to the alsely accused for inducing illusory memories of childhood sexual abuse-current remedies and a proposed statute. *Journal of Law and Health*, *11*, 45-131.

Foa, E. B., Chrestman, K. R., & Gilboa-Schechtman, E. (2008). *Prolonged exposure therapy for adolescents with PTSD: emotional processing of traumatic experiences, therapist guide*. Oxford University Press.

Foa, E. B., Hembree, E. A., & Rothbaum, B. O. (2007). *Prolonged exposure therapy for PTSD: Emotional processing of traumatic experience*. Oxford University Press.

Foa, E. B., Steketee, G., & Rothbaum, B. O. (1989). Behavioral/cognitive conceptualizations of post-traumatic stress disorder. *Behavior Therapy*, *20*(2), 155-176. https://doi.org/10.1016/S0005-7894(89)80067-X

Foley, M. A., Wozniak, K. H., & Gillum, A. (2006). Imagination and false memory inductions: Investigating the role of process, content and source of imaginations. *Applied Cognitive Psychology*, *20*(9), 1119-1141. https://doi.org/10.1002/acp.1265

Frenda, S. J., Nichols, R. M., & Loftus, E. F. (2011). Current Issues and Advances in Misinformation Research. *Current Directions in Psychological Science*, *20*(1), 20-23. https://doi.org/10.1177/0963721410396620

Freyd, J. J. (1994). Betrayal Trauma: Traumatic Amnesia as an Adaptive Response to Childhood Abuse. *Ethics & Behavior*, *4*(4), 307-329. https://doi.org/10.1207/s15327019eb0404_1

Gabbert, F., Memon, A., & Allan, K. (2003). Memory conformity: Can eyewitnesses influence each other's memories for an event? *Applied Cognitive Psychology: The Official Journal of the Society for Applied Research in Memory and Cognition*, *17*(5), 533-543. https://doi.org/10.1002/acp.885

*Ganslmeier, M., Ehring, T., & Wolkenstein, L. (2023). Effects of imagery rescripting and imaginal exposure on voluntary memory. *Behaviour Research and Therapy*, *170*, Article 104409. https://doi.org/10.1016/j.brat.2023.104409

*Ganslmeier, M., Kunze, A. E., Ehring, T., & Wolkenstein, L. (2023). The dilemma of trauma-focused therapy: effects of imagery rescripting on voluntary memory. *Psychological Research*, *87*(5), 1616-1631. https://doi.org/10.1007/s00426-022-01746-z

*Garry, M., Manning, C. G., Loftus, E. F., & Sherman, S. J. (1996). Imagination inflation: Imagining a childhood event inflates confidence that it occurred. *Psychonomic Bulletin & Review*, *3*(2), 208-214. https://doi.org/10.3758/BF03212420

*Geiselman, R. E., Fisher, R. P., MacKinnon, D. P., & Holland, H. L. (1985). Eyewitness memory enhancement in the police interview: Cognitive retrieval mnemonics versus hypnosis. *Journal of Applied Psychology*, *70*(2), 401-412. https://doi.org/10.1037/0021-9010.70.2.401

*Gerlach, K. D., Dornblaser, D. W., & Schacter, D. L. (2014). Adaptive constructive processes and memory accuracy: Consequences of counterfactual simulations in young and older adults. *Memory*, *22*(1), 145-162. https://doi.org/10.1080/09658211.2013.779381

Ghetti, S., Lyons, K. E., Lazzarin, F., & Cornoldi, C. (2008). The development of metamemory monitoring during retrieval: The case of memory strength and memory absence. *Journal of Experimental Child Psychology*, *99*(3), 157-181. https://doi.org/10.1016/j.jecp.2007.11.001

Giesbrecht, T., Lynn, S. J., Lilienfeld, S. O., & Merckelbach, H. (2008). Cognitive processes in dissociation: an analysis of core theoretical assumptions. *Psychological Bulletin*, *134*(5), 617–647. https://doi.org/10.1037/0033-2909.134.5.617

*Goff, L. M., & Roediger, H. L. (1998). Imagination inflation for action events: Repeated imaginings lead to illusory recollections. *Memory & Cognition*, *26*(1), 20-33. https://doi.org/10.3758/BF03211367

Goodman, W. K., Janson, J., & Wolf, J. M. (2017). Meta-analytical assessment of the effects of protocol variations on cortisol responses to the Trier Social Stress Test. *Psychoneuroendocrinology*, *80*, 26-35. https://doi.org/10.1016/j.psyneuen.2017.02.030

Grella, S. L., Fortin, A. H., Ruesch, E., Bladon, J. H., Reynolds, L. F., Gross, A., Shpokayte, M., Cincotta, C., Zaki, Y., & Ramirez, S. (2022). Reactivating hippocampal-mediated memories during reconsolidation to disrupt fear. *Nature Communications*, *13*(1), Article 4733. https://doi.org/10.1038/s41467-022-32246-8

Grunert, B. K., Weis, J. M., Smucker, M. R., & Christianson, H. F. (2007). Imagery rescripting and reprocessing therapy after failed prolonged exposure for post-traumatic stress disorder following industrial injury. *Journal of Behavior Therapy and Experimental Psychiatry*, *38*(4), 317-328. https://doi.org/10.1016/j.jbtep.2007.10.005

Gubi-Kelm, S., & Schmidt, A. F. (2018). The role of intonation for interrogative suggestibility. *Applied Cognitive Psychology*, *32*(1), 117-128. https://doi.org/10.1002/acp.3384

*Hagenaars, M. A., & Arntz, A. (2012). Reduced intrusion development after post-trauma imagery rescripting: an experimental study. *Journal of Behavior Therapy and Experimental Psychiatry*, *43*(2), 808-814. https://doi.org/10.1016/j.jbtep.2011.09.005

Hagenaars, M. A., van Minnen, A., Holmes, E. A., Brewin, C., & Hoogduin, K. A. (2008). The effect of hypnotically induced somatoform dissociation on the development of intrusions after an aversive film. *Cognition and Emotion*, *22*(5), 944-963. https://doi.org/10.1080/02699930701575151

Hailes, H. P., Yu, R., Danese, A., & Fazel, S. (2019). Long-term outcomes of childhood sexual abuse: an umbrella review. *The Lancet Psychiatry*, *6*(10), 830-839. https://doi.org/10.1016/S2215-0366(19)30286-X

Hart, R. E., & Schooler, J. W. (2006). Increasing belief in the experience of an invasive procedure that never happened: The role of plausibility and schematicity. *Applied Cognitive Psychology*, *20*(5), 661-669. https://doi.org/10.1002/acp.1218

Harwell, M. R., Rubinstein, E. N., Hayes, W. S., & Olds, C. C. (1992). Summarizing Monte Carlo results in methodological research: The one-and two-factor fixed effects ANOVA cases. *Journal of Educational Statistics*, *17*(4), 315-339. https://doi.org/10.2307/1165126

Hautzinger, M., Keller, F., & Kühner, C. (2009). *BDI-II Beck-Depressions-Inventar Revision*. Pearson.

*Heaps, C., & Nash, M. (1999). Individual differences in imagination inflation. *Psychonomic Bulletin & Review*, *6*(2), 313-318. https://doi.org/10.3758/BF03214120

Helmstaedter, C., & Durwen, H. (1990). VLMT: Verbaler Lern-und Merkfähigkeitstest: Ein praktikables und differenziertes Instrumentarium zur Prüfung der verbalen Gedächtnisleistungen. *Schweizer Archiv für Neurologie, Neurochirurgie und Psychiatrie*, *141*(1), 21-30.

Henkel, L. A., & Carbuto, M. (2008). Remembering what we did: How source misattributions arise from verbalization, mental imagery, and pictures. In M. R. Kelley (Ed.), *Applied Memory* (pp. 213-234). Nova Science Publishers.

Henkel, L. A., Franklin, N., & Johnson, M. K. (2000). Cross-modal source monitoring confusions between perceived and imagined events. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *26*(2), 321-335. https://doi.org/10.1037/0278-7393.26.2.321

Henquet, C., Krabbendam, L., Dautzenberg, J., Jolles, J., & Merckelbach, H. (2005). Confusing thoughts and speech: source monitoring and psychosis. *Psychiatry Research*, *133*(1), 57-63. https://doi.org/10.1016/j.psychres.2004.08.009

Herman, J. L. (2003). The Mental Health of Crime Victims: Impact of Legal Intervention. *Journal of Traumatic Stress*, *16*(2), 159-166. https://doi.org/10.1023/A:1022847223135

Hermanutz, M., & Schröder, J. (2015). *Leitfaden zur Vernehmung von Zeugen und Beschuldigten mit Vernehmungskarten*. Hochschule Hannover. https://doi.org/10.25968/opus-623

*Herndon, P., Myers, B., Mitchell, K., Kehn, A., & Henry, S. (2014). False memories for highly aversive early childhood events: Effects of guided imagery and group influence. *Psychology of Consciousness: Theory, Research, and Practice*, *1*(1), 20-31. https://doi.org/10.1037/cns0000011

Holmes, E. A., Arntz, A., & Smucker, M. R. (2007). Imagery rescripting in cognitive behaviour therapy: Images, treatment techniques and outcomes. *Journal of behavior therapy and experimental psychiatry*, *38*(4), 297-305. https://doi.org/10.1016/j.jbtep.2007.10.007

Holmes, E. A., & Bourne, C. (2008). Inducing and modulating intrusive emotional memories: A review of the trauma film paradigm. *Acta Psychologica*, *127*(3), 553-566. https://doi.org/10.1016/j.actpsy.2007.11.002

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

Holmes, E. A., Sandberg, A., & Iyadurai, L. (2010). Erasing trauma memories. *British Journal of Psychiatry*, *197*(5), 414-415. https://doi.org/10.1192/bjp.197.5.414b

*Horselenberg, R., Merckelbach, H., Muris, P., Rassin, E., Sijsenaar, M., & Spaan, V. (2000). Imagining fictitious childhood events: The role of individual differences in imagination inflation. *Clinical Psychology & Psychotherapy*, *7*(2), 128-137. https://doi.org/10.1002/(SICI)1099-0879(200005)7:2<128::AID-CPP238>3.0.CO;2-Q

*Houben, S. T., Otgaar, H., Roelofs, J., & Merckelbach, H. (2018). Lateral eye movements increase false memory rates. *Clinical Psychological Science*, *6*(4), 610-616. https://doi.org/10.1177/2167702618757658

Howe, M. L., & Knott, L. M. (2015). The fallibility of memory in judicial processes: Lessons from the past and their modern consequences. *Memory*, *23*(5), 633-656. https://doi.org/10.1080/09658211.2015.1010709

Hyman, I. E., & Billings, F. J. (1998). Individual differences and the creation of false childhood memories. *Memory*, *6*(1), 1-20. https://doi.org/10.1080/741941598

Hyman, I. E., Husband, T. H., & Billings, F. J. (1995). False memories of childhood experiences. *Applied cognitive psychology*, *9*(3), 181-197. https://doi.org/10.1002/acp.2350090302

*Hyman, I. E., Jr., & Pentland, J. (1996). The role of mental imagery in the creation of false childhood memories. *Journal of Memory and Language*, *35*(2), 101-117. https://doi.org/10.1006/jmla.1996.0006

Izadpanah, S., Barnow, S., Neubauer, A. B., & Holl, J. (2019). Development and validation of the Heidelberg Form for Emotion Regulation Strategies (HFERST): factor structure, reliability, and validity. *Assessment*, *26*(5), 880-906. https://doi.org/10.1177%2F1073191117720283

Jack, F., Leov, J., & Zajac, R. (2014). Age-related differences in the free-recall accounts of child, adolescent, and adult witnesses. *Applied Cognitive Psychology*, *28*(1), 30-38. https://doi.org/10.1002/acp.2951

James, E. L., Bonsall, M. B., Hoppitt, L., Tunbridge, E. M., Geddes, J. R., Milton, A. L., & Holmes, E. A. (2015). Computer game play reduces intrusive memories of experimental trauma via reconsolidation-update mechanisms. *Psychological Science*, *26*(8), 1201-1215. https://doi.org/10.1177/0956797615583071

James, E. L., Lau-Zhu, A., Clark, I. A., Visser, R. M., Hagenaars, M. A., & Holmes, E. A. (2016). The trauma film paradigm as an experimental psychopathology model of psychological trauma: intrusive memories and beyond. *Clinical Psychology Review*, *47*, 106-142. https://doi.org/10.1016/j.cpr.2016.04.010

Johnsen, G. E., & Asbjørnsen, A. E. (2008). Consistent impaired verbal memory in PTSD: A meta-analysis. *Journal of Affective Disorders*, *111*(1), 74-82. https://doi.org/10.1016/j.jad.2008.02.007

Johnson, M. K. (2006). Memory and reality. *American Psychologist*, *61*(8), 760-771. https://doi.org/10.1037/0003-066X.61.8.760

Johnson, M. K., Hashtroudi, S., & Lindsay, D. S. (1993). Source monitoring. *Psychological Bulletin*, *114*(1), 3-28. https://doi.org/10.1037/0033-2909.114.1.3

Kaplan, R. L., Van Damme, I., Levine, L. J., & Loftus, E. F. (2016). Emotion and false memory. *Emotion Review*, *8*(1), 8-13. https://doi.org/10.1177/1754073915601228

Karanian, J. M., Rabb, N., Wulff, A. N., Torrance, M. G., Thomas, A. K., & Race, E. (2020). Protecting memory from misinformation: Warnings modulate cortical reinstatement during memory retrieval. *Proceedings of the National Academy of Sciences*, *117*(37), 22771-22779. https://doi.org/10.1073/pnas.2008595117

Karpel, M. E., Hoyer, W. J., & Toglia, M. P. (2001). Accuracy and Qualities of Real and Suggested Memories: Nonspecific Age Differences. *The Journals of Gerontology: Series B*, *56*(2), P103-P110. https://doi.org/10.1093/geronb/56.2.P103

Kenchel, J. M., Domagalski, K., Butler, B. J., & Loftus, E. F. (2022). The messy landscape of eye movements and false memories. *Memory*, *30*(6), 678-685. https://doi.org/10.1080/09658211.2020.1862234

Kensinger, E. A., & Schacter, D. L. (2006). Reality monitoring and memory distortion: Effects of negative, arousing content [Article]. *Memory & Cognition*, *34*(2), 251-260. https://doi.org/10.3758/bf03193403

Kessler, R. C., Aguilar-Gaxiola, S., Alonso, J., Benjet, C., Bromet, E. J., Cardoso, G., Degenhardt, L., de Girolamo, G., Dinolova, R. V., & Ferry, F. (2017). Trauma and PTSD in the WHO world mental health surveys. *European Journal of Psychotraumatology*, *8*(sup5), 1353383. https://doi.org/10.1080/20008198.2017.1353383

Kindt, M., Soeter, M., & Vervliet, B. (2009). Beyond extinction: erasing human fear responses and preventing the return of fear. *Nature Neuroscience*, *12*(3), 256-258. https://doi.org/10.1038/nn.2271

Kirschbaum, C., Pirke, K.-M., & Hellhammer, D. H. (1993). The 'Trier Social Stress Test' – a tool for investigating psychobiological stress responses in a laboratory setting. *Neuropsychobiology*, *28*(1-2), 76-81. https://doi.org/10.1159/000119004

Koch, P. (2010). *Picco* [film]. P. Worm & T. Walker;

Koo, T., & Li, M. (2016). Cracking the code: providing insight into the fundamentals of research and evidence-based practice a guideline of selecting and reporting intraclass correlation coefficients for reliability research. *Journal of Chiropractic Medicine*, *15*(2), 155-163. https://doi.org/10.1016/j.jcm.2016.02.012

Kotov, R., Bellman, S., & Watson, D. (2004). *Multidimensional Iowa Suggestibility Scale (MISS)*. Stony Brook University.

*Krackow, E., Lynn, S. J., & Payne, D. G. (2005). The death of Princess Diana: The effects of memory enhancement procedures on flashbulb memories. *Imagination, Cognition and Personality*, *25*(3), 197-219. https://doi.org/10.2190/FBCF-T8VG-L5LJ-N8VL

Krans, J., Näring, G., Holmes, E. A., & Becker, E. S. (2010). Motion effects on intrusion development. *Journal of Trauma & Dissociation*, *11*(1), 73-82. https://doi.org/10.1080/15299730903318483

Krohne, H. W., Egloff, B., Kohlmann, C.-W., & Tausch, A. (1996). Untersuchungen mit einer deutschen Version der "Positive and Negative Affect Schedule" (PANAS). *Diagnostica*, *42*(2), 139-156.

Krüger-Gottschalk, A., Knaevelsrud, C., Rau, H., Dyer, A., Schäfer, I., Schellong, J., & Ehring, T. (2017). The German version of the Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5): psychometric properties and diagnostic utility. *BMC Psychiatry*, *17*, Article 379. https://doi.org/10.1186/s12888-017-1541-6

Kunze, A. E., Arntz, A., Morina, N., Kindt, M., & Lancee, J. (2017). Efficacy of imagery rescripting and imaginal exposure for nightmares: A randomized wait-list controlled trial. *Behaviour Research Therapy*, *97*, 14-25. https://doi.org/10.1016/j.brat.2017.06.005

Lakshmanan, A., & Krishnan, H. S. (2009). How does imagery in interactive consumption lead to false memory? A reconstructive memory perspective. *Journal of Consumer Psychology*, *19*(3), 451-462. https://doi.org/10.1016/j.jcps.2009.04.005

*Lampinen, J. M., Odegard, T. N., & Bullington, J. L. (2003). Qualities of memories for performed and imagined actions. *Applied Cognitive Psychology*, *17*(8), 881-893. https://doi.org/10.1002/acp.916

*Landau, J. D., & von Glahn, N. (2004). Warnings reduce the magnitude of the imagination inflation effect. *The American Journal of Psychology*, *117*(4), 579-593. https://doi.org/10.2307/4148993

Laney, C., Fowler, N. B., Nelson, K. J., Bernstein, D. M., & Loftus, E. F. (2008). The persistence of false beliefs. *Acta Psychologica*, *129*(1), 190-197. https://doi.org/10.1016/j.actpsy.2008.05.010

Langkaas, T. F., Hoffart, A., Øktedalen, T., Ulvenes, P. G., Hembree, E. A., & Smucker, M. (2017). Exposure and non-fear emotions: A randomized controlled study of exposure-based and rescripting-based imagery in PTSD treatment. *Behaviour Research and Therapy*, *97*, 33-42. https://doi.org/10.1016/j.brat.2017.06.007

Lankton, S. (2012). An Ericksonian approach to clinical hypnosis. In M. R. Nash & A. J. Barnier (Eds.), *The Oxford handbook of hypnosis: Theory, research, and practice* (pp. 467–486). Oxford University Press. https://doi.org/10.1093/oxfordhb/9780198570097.013.0018

Lau-Zhu, A., Henson, R. N., & Holmes, E. A. (2019). Intrusive memories and voluntary memory of a trauma film: Differential effects of a cognitive interference task after encoding. *Journal of Experimental Psychology: General*, *148*(12), 2154-2180. https://doi.org/10.1037/xge0000598

Laux, L., Glanzmann, P., Schaffner, P., & Spielberger, C. D. (1981). *STAI Das State-Trait-Angstinventar*. Beltz.

Lee, C. W., & Cuijpers, P. (2013). A meta-analysis of the contribution of eye movements in processing emotional memories. *Journal of behavior therapy and experimental psychiatry*, *44*(2), 231-239. https://doi.org/10.1016/j.jbtep.2012.11.001

Leo, D. G., Bruno, D., & Proietti, R. (2025). Remembering what did not happen: the role of hypnosis in memory recall and false memories formation. *Frontiers in Psychology*, *16*. https://doi.org/10.3389/fpsyg.2025.1433762

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

Li, C., Wang, J., & Otgaar, H. (2020). Creating nonbelieved memories for bizarre actions using an imagination inflation procedure. *Applied Cognitive Psychology*, *34*(6), 1277-1286. https://doi.org/10.1002/acp.3722

Lief, H. I., & Fetkewicz, J. (1995). Retractors of false memories: The evolution of pseudo-memories. *The Journal of Psychiatry & Law*, *23*(3), 411-435. https://doi.org/10.1177/009318539502300305

*Lindner, I., & Echterhoff, G. (2015). Imagination inflation in the mirror: Can imagining others' actions induce false memories of self-performance? *Acta Psychologica*, *158*, 51-60. https://doi.org/10.1016/j.actpsy.2015.03.008

*Lindner, I., Echterhoff, G., Davidson, P. S. R., & Brand, M. (2010). Observation inflation: Your actions become mine. *Psychological Science*, *21*(9), 1291-1299. https://doi.org/10.1177/0956797610379860

Lindsay, D. S., Hagen, L., Read, J. D., Wade, K. A., & Garry, M. (2004). True photographs and false memories. *Psychological Science*, *15*(3), 149-154. https://doi.org/10.1111/j.0956-7976.2004.01503002.x

Lindsay, D. S., & Johnson, M. K. (2000). False memories and the source monitoring framework: Reply to Reyna and Lloyd (1997). *Learning and Individual Differences*, *12*(2), 145-161. https://doi.org/10.1016/S1041-6080(01)00035-8

Lindsay, D. S., & Read, J. D. (1994). Psychotherapy and memories of childhood sexual abuse: A cognitive perspective. *Applied Cognitive Psychology*, *8*(4), 281-338. https://doi.org/10.1002/acp.2350080403

Liu, X., Ramirez, S., Pang, P., Puryear, C., Govindarajan, A., Deisseroth, K., & Tonegawa, S. (2012). Optogenetic stimulation of hippocampal engram activates fear memory recall. *Nature*, *484*, 381-385. https://doi.org/10.1038/nature11028

Loch, N., Hiller, W., & Witthöft, M. (2011). Der Cognitive Emotion Regulation Questionnaire (CERQ). *Zeitschrift für Klinische Psychologie und Psychotherapie*, *44*(2), 94-106. https://doi.org/10.1026/1616-3443/a000079

Loftus, E. F. (1979). Reactions to blatantly contradictory information. *Memory & Cognition*, *7*(5), 368-374. https://doi.org/10.3758/BF03196941

Loftus, E. F. (1991). Made in Memory: Distortions in Recollection After Misleading Information. In G. H. Bower (Ed.), *Psychology of Learning and Motivation* (Vol. 27, pp. 187-215). Academic Press. https://doi.org/10.1016/S0079-7421(08)60124-3

Loftus, E. F. (2003). Make-believe memories. *American Psychologist*, *58*(11), 867-873. https://doi.org/10.1037/0003-066X.58.11.867

Loftus, E. F. (2005). Planting misinformation in the human mind: A 30-year investigation of the malleability of memory. *Learning & Memory*, *12*(4), 361-366. https://doi.org/10.1101/lm.94705.

Loftus, E. F., & Davis, D. (2006). Recovered memories. *Annu. Rev. Clin. Psychol.*, *2*, 469-498. https://doi.org/10.1146/annurev.clinpsy.2.022305.095315

Loftus, E. F., & Klemfuss, J. Z. (2023). Misinformation – past, present, and future. *Psychology, Crime & Law*, 312-318. https://doi.org/10.1080/1068316X.2023.2219813

Loftus, E. F., Miller, D. G., & Burns, H. J. (1978). Semantic integration of verbal information into a visual memory. *Journal of experimental psychology: Human learning and memory*, *4*(1), 19-31. https://doi.org/10.1037/0278-7393.4.1.19

Loftus, E. F., & Palmer, J. C. (1974). Reconstruction of automobile destruction: An example of the interaction between language and memory. *Journal of Verbal Learning and Verbal Behavior*, *13*(5), 585-589. https://doi.org/10.1016/S0022-5371(74)80011-3

Loftus, E. F., & Pickrell, J. E. (1995). The formation of false memories. *Psychiatric Annals*, *25*(12), 720-725. https://doi.org/10.3928/0048-5713-19951201-07

*Lyle, K. B. (2018). Effects of handedness consistency and saccade execution on eyewitness memory in cued- and free-recall procedures. *Memory*, *26*(9), 1169-1180. https://doi.org/10.1080/09658211.2017.1420802

*Lyle, K. B., & Jacobs, N. E. (2010). Is saccade-induced retrieval enhancement a potential means of improving eyewitness evidence? *Memory*, *18*(6), 581-594. https://doi.org/10.1080/09658211.2017.1420802

Lynn, S. J., Evans, J., Laurence, J.-R., & Lilienfeld, S. O. (2015). What Do People Believe about Memory? Implications for the Science and Pseudoscience of Clinical Practice. *The Canadian Journal of Psychiatry*, *60*(12), 541-547. https://doi.org/10.1177/070674371506001204

MacLeod, M. (2002). Retrieval-induced forgetting in eyewitness memory: forgetting as a consequence of remembering. *Applied Cognitive Psychology*, *16*(2), 135-149. https://doi.org/10.1002/acp.782

MacLeod, S., Reynolds, M. G., & Lehmann, H. (2018). The mitigating effect of repeated memory reactivations on forgetting. *NPJ Science of Learning*, *3*, 9. https://doi.org/10.1038/s41539-018-0025-x

Mammarella, N. (2007). The role of spaced repetitions in imagination inflation. *European Journal of Cognitive Psychology*, *19*(6), 882-897. https://doi.org/10.1080/09541440600943182

Mammarella, N., Altamura, M., Padalino, F. A., Petito, A., Fairfield, B., & Bellomo, A. (2010). False memories in schizophrenia? An imagination inflation study. *Psychiatry Research*, *179*(3), 267-273. https://doi.org/10.1016/j.psychres.2009.05.005

*Marsh, B. U., Pezdek, K., & Lam, S. T. (2014). Imagination perspective affects ratings of the likelihood of occurrence of autobiographical memories. *Acta Psychologica*, *150*, 114-119. https://doi.org/10.1016/j.actpsy.2014.05.006

Matthews, W. J., Conti, J., & Starr, L. (1999). Ericksonian hypnosis: A review of the empirical data. *Sleep and Hypnosis*, *1*(1), 47-56. https://www.sleepandhypnosis.org/research/article_id-90.html

Mauritz, M. W., J., G. P. J., Nel, D., & and van Achterberg, T. (2013). Prevalence of interpersonal trauma exposure and trauma-related disorders in severe mental illness. *European Journal of Psychotraumatology*, *4*(1), Article 19985. https://doi.org/10.3402/ejpt.v4i0.19985

*Mazzoni, G., & Memon, A. (2003). Imagination can create false autobiographical memories. *Psychological Science*, *14*(2), 186-188. https://doi.org/10.1046/j.1432-1327.1999.00020.x

Mazzoni, G., & Vannucci, M. (2007). Hindsight bias, the misinformation effect, and false autobiographical memories. *Social Cognition*, *25*(1), 203-220. https://doi.org/10.1521/soco.2007.25.1.203

Mazzoni, G. A. L., Loftus, E. F., & Kirsch, I. (2001). Changing beliefs about implausible autobiographical events: A little plausibility goes a long way. *Journal of Experimental Psychology-Applied*, *7*(1), 51-59. https://doi.org/10.1037//1076-898x.7.1.51

McBrien, C. M., & Dagenbach, D. (1998). The contributions of source misattributions, acquiescence, and response bias to children's false memories. *American Journal of Psychology*, *111*(4), 509-528. https://doi.org/10.2307/1423549

McCart, M. R., Smith, D. W., & Sawyer, G. K. (2010). Help seeking among victims of crime: A review of the empirical literature. *Journal of Traumatic Stress*, *23*(2), 198-206. https://doi.org/10.1002/jts.20509

McCloskey, M., & Zaragoza, M. (1985). Misleading postevent information and memory for events: arguments and evidence against memory impairment hypotheses. *Journal of Experimental Psychology: General*, *114*(1), 1-16. https://doi.org/10.1037/0096-3445.114.1.1

McConkey, K. M., Labelle, L., Bibb, B. C., & Bryant, R. A. (1990). Hypnosis and suggested pseudomemory: The relevance of test context. *Australian Journal of Psychology*, *42*(2), 197-205. https://doi.org/10.1080/00049539008260118

McDaniel, M. A., Lyle, K. B., Butler, K. A., & Dornburg, C. C. (2008). Age-related deficits in reality monitoring of action memories. *Psychology and Aging*, *23*(3), 646-656. https://doi.org/10.1037/a0013083

McNally, R. J. (2003). *Remembering trauma*. Harvard University Press.

*Meckling, H. I., Nauta, M. H., van Hout, W., & Wessel, I. (2024). The effects of eye movements on the content and characteristics of unpleasant autobiographical memories: an extended replication study. *Memory*, *32*(6), 738-756. https://doi.org/10.1080/09658211.2024.2307925

*Memon, A., Hope, L., Bartlett, J., & Bull, R. (2002). Eyewitness recognition errors: The effects of mugshot viewing and choosing in young and old adults. *Memory & Cognition*, *30*(8), 1219-1227. https://doi.org/10.3758/bf03213404

Miles, K. L., Powell, M. B., & Stokes, M. A. (2004). A comparison of the effectiveness of two suggestibility paradigms in predicting preschoolers' tendency to report a non-experienced event. *Applied Cognitive Psychology*, *18*(8), 1021-1036. https://doi.org/10.1002/acp.1074

Mitchell, K. J., & Johnson, M. K. (2000). Source Monitoring: Attributing Mental Experiences. In E. Tulving & F. I. M. Craik (Eds.), *The Oxford handbook of memory* (pp. 179-195). Oxford University Press.

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

Morrison, T. (2004). *Beloved*. Vintage. (Original work published 1987)

Moscovitch, M., Rosenbaum, R. S., Gilboa, A., Addis, D. R., Westmacott, R., Grady, C., McAndrews, M. P., Levine, B., Black, S., & Winocur, G. (2005). Functional neuroanatomy of remote episodic, semantic and spatial memory: a unified account based on multiple trace theory. *Journal of Anatomy*, *207*(1), 35-66. https://doi.org/10.1111/j.1469-7580.2005.00421.x.

Muschalla, B., & Schönborn, F. (2021). Induction of False Beliefs and False Memories in Laboratory Studies–A Systematic Review. *Clinical Psychology & Psychotherapy*. https://doi.org/10.1002/cpp.2567

Nader, K., & Hardt, O. (2009). A single standard for memory: the case for reconsolidation. *Nature Reviews Neuroscience*, *10*(3), 224-234. https://doi.org/10.1038/nrn2590

Nader, K., Schafe, G. E., & Le Doux, J. E. (2000). Fear memories require protein synthesis in the amygdala for reconsolidation after retrieval. *Nature*, *406*(6797), 722-726. https://doi.org/10.1038/35021052

*Nash, R. A., Wade, K. A., & Lindsay, D. S. (2009). Digitally manipulating memory: Effects of doctored videos and imagination in distorting beliefs and memories. *Memory & Cognition*, *37*(4), 414-424. https://doi.org/10.3758/MC.37.4.414

National Institute for Health and Care Excellence. (2018). *Post-traumatic stress disorder. NICE guideline [NG116]*. Retrieved June 9 from https://www.nice.org.uk/guidance/ng116

Noé, G. (2002). *Irréversible* [Film]. StudioCanal.

Nori, R., Bensi, L., Gambetti, E., & Giusberti, F. (2014). Individual differences in the Enhanced Cognitive Interview: the role of imagery. *Psychology, Crime & Law*, *20*(9), 833-851. https://doi.org/10.1080/1068316X.2014.885968

*Nourkova, V. V., & Vasilenko, D. A. (2018). On the advantage of autobiographical memory pliability: Implantation of positive self-defining memories reduces trait anxiety. *Memory*, *26*(7), 869-881. https://doi.org/10.1080/09658211.2017.1420195

*O'Connor, M. K., Deason, R. G., Reynolds, E., Tat, M. J., Flannery, S., Solomon, P. R., Vassey, E. A., & Budson, A. E. (2015). The imagination inflation effect in healthy older adults and patients with mild Alzheimer’s disease. *Neuropsychology*, *29*(4), 550-560. https://doi.org/10.1037/neu0000195

Ost, J., Wright, D. B., Easton, S., Hope, L., & French, C. C. (2013). Recovered memories, satanic abuse, dissociative identity disorder and false memories in the United Kingdom: A survey of Clinical Psychologists and Hypnotherapists. *Psychology, Crime & Law*, *19*(1), 1-19. https://doi.org/10.1080/1068316X.2011.598157

Otgaar, H., Candel, I., Merckelbach, H., & Wade, K. A. (2009). Abducted by a UFO: Prevalence information affects young children's false memories for an implausible event. *Applied Cognitive Psychology: The Official Journal of the Society for Applied Research in Memory and Cognition*, *23*(1), 115-125. https://doi.org/10.1002/acp.1445

Otgaar, H., Curci, A., Mangiulli, I., Battista, F., Rizzotti, E., & Sartori, G. (2022). A court ruled case on therapy-induced false memories. *Journal of Forensic Sciences*, *67*(5), 2122-2129. https://doi.org/10.1111/1556-4029.15073

Otgaar, H., de Ruiter, C., Howe, M. L., Hoetmer, L., & van Reekum, P. (2017). A case concerning children's false memories of abuse: Recommendations regarding expert witness work. *Psychiatry, Psychology and Law*, *24*(3), 365-378. https://doi.org/10.1080/13218719.2016.1230924

Otgaar, H., Houben, S. T. L., Rassin, E., & Merckelbach, H. (2021). Memory and eye movement desensitization and reprocessing therapy: A potentially risky combination in the courtroom. *Memory*, 1254-1262. https://doi.org/10.1080/09658211.2021.1966043

Otgaar, H., Howe, M. L., Muris, P., & Merckelbach, H. (2019). Dealing with false memories in children and adults: recommendations for the legal arena. *Policy Insights from the Behavioral and Brain Sciences*, *6*(1), 87-93. https://doi.org/10.1177/2372732218818584

Otgaar, H., Howe, M. L., Patihis, L., Merckelbach, H., Lynn, S. J., Lilienfeld, S. O., & Loftus, E. F. (2019). The return of the repressed: The persistent and problematic claims of long-forgotten trauma. *Perspectives on Psychological Science*, *14*(6), 1072-1095. https://doi.org/10.1177/1745691619862306

Otgaar, H., Muris, P., Howe, M. L., & Merckelbach, H. (2017). What Drives False Memories in Psychopathology? A Case for Associative Activation. *Clinical Psychological Science*, *5*(6), 1048-1069. https://doi.org/10.1177/2167702617724424

Oulton, J. M., Strange, D., Nixon, R. D. V., & Takarangi, M. K. T. (2018). Imagining trauma: Memory amplification and the role of elaborative cognitions. *Journal of Behavior*

*Therapy and Experimental Psychiatry*, *60*, 78-86. https://doi.org/10.1016/j.jbtep.2018.04.003

*Paddock, J. R., Joseph, A. L., Chan, F. M., Terranova, S., Manning, C., & Loftus, E. F. (1998). When guided visualization procedures may backfire: Imagination inflation and predicting individual differences in suggestibility. *Applied Cognitive Psychology*, *12*(7), S63-S75. https://doi.org/10.1002/(SICI)1099-0720(199812)12:7<S63::AID-ACP600>3.0.CO;2-S

*Paddock, J. R., Noel, M., Terranova, S., Eber, H. W., Manning, C., & Loftus, E. F. (1999). Imagination inflation and the perils of guided visualization. *The Journal of Psychology: Interdisciplinary and Applied*, *133*(6), 581-595. https://doi.org/10.1080/00223989909599764

*Paddock, J. R., & Terranova, S. (2001). Guided visualization and suggestibility: Effect of perceived authority on recall of autobiographical memories. *Journal of Genetic Psychology*, *162*(3), 347-356. https://doi.org/10.1080/00221320109597488

*Paddock, J. R., Terranova, S., Kwok, R., & Halpern, D. V. (2000). When knowing becomes remembering: Individual differences in susceptibility to suggestion. *Journal of Genetic Psychology*, *161*(4), 453-468. https://doi.org/10.1080/00221320009596724

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., . . . Moher, D. (2021). The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*, *372*, n71. https://doi.org/10.1136/bmj.n71

Pansky, A., Tenenboim, E., & Bar, S. K. (2011). The misinformation effect revisited: Interactions between spontaneous memory processes and misleading suggestions.

*Journal of Memory and Language*, *64*(3), 270-287. https://doi.org/10.1016/j.jml.2010.12.003

*Parker, A., Buckley, S., & Dagnall, N. (2009). Reduced misinformation effects following saccadic bilateral eye movements. *Brain and Cognition*, *69*(1), 89-97. https://doi.org/10.1016/j.bandc.2008.05.009

*Parker, A., & Dagnall, N. (2019). Reduced impact of imagery processing on false autobiographical recollection: The effects of dynamic visual noise. *Memory*, *27*(2), 163-173. https://doi.org/10.1080/09658211.2018.1495236

Patihis, L., Frenda, S. J., & Loftus, E. F. (2018). False memory tasks do not reliably predict other false memories. *Psychology of Consciousness: Theory, Research, and Practice*, *5*(2), 140-160. https://doi.org/10.1037/cns0000147

Patihis, L., Ho, L. Y., Tingen, I. W., Lilienfeld, S. O., & Loftus, E. F. (2014). Are the "Memory Wars" Over? A Scientist-Practitioner Gap in Beliefs About Repressed Memory. *Psychological Science*, *25*(2), 519-530. https://doi.org/10.1177/0956797613510718

Patihis, L., & Pendergrast, M. H. (2019). Reports of recovered memories of abuse in therapy in a large age-representative US national sample: Therapy type and decade comparisons. *Clinical Psychological Science*, *7*(1), 3-21. https://doi.org/10.1177/2167702618773315

Peace, K. A., & Porter, S. (2004). A longitudinal investigation of the reliability of memories for trauma and other emotional experiences. *Applied Cognitive Psychology*, *18*(9), 1143-1159. https://doi.org/10.1002/acp.1046

Pearson, D. G. (2012). Contextual representations increase analogue traumatic intrusions: Evidence against a dual-representation account of peri-traumatic processing. *Journal* *of Behavior Therapy and Experimental Psychiatry*, *43*(4), 1026-1031. https://doi.org/10.1016/j.jbtep.2012.04.002

Pearson, D. G., Ross, F. D. C., & Webster, V. L. (2012). The importance of context: Evidence that contextual representations increase intrusive memories. *Journal of Behavior Therapy and Experimental Psychiatry*, *43*(1), 573-580. https://doi.org/10.1016/j.jbtep.2011.07.009

*Pezdek, K., Blandon-Gitlin, I., & Gabbay, P. (2006). Imagination and memory: Does imagining implausible events lead to false autobiographical memories? *Psychonomic Bulletin & Review*, *13*(5), 764-769. https://doi.org/10.3758/BF03193994

Pezdek, K., Blandon-Gitlin, I., Lam, S., Hart, R. E., & Schooler, J. W. (2006). Is knowing believing? The role of event plausibility and background knowledge in planting false beliefs about the personal past. *Memory & Cognition*, *34*(8), 1628-1635. https://doi.org/10.3758/BF03195925

*Pezdek, K., & Eddy, R. M. (2001). Imagination inflation: A statistical artifact of regression toward the mean. *Memory & Cognition*, *29*(5), 707-718. https://doi.org/10.3758/BF03200473

Pezdek, K., Finger, K., & Hodge, D. (1997). Planting False Childhood Memories: The Role of Event Plausibility. *Psychological Science*, *8*(6), 437-441. https://doi.org/10.1111/j.1467-9280.1997.tb00457.x

Poole, D. A., Lindsay, D. S., Memon, A., & Bull, R. (1995). Psychotherapy and the recovery of memories of childhood sexual abuse: U.S. and British practitioners' opinions, practices, and experiences. *Journal of Consulting and Clinical Psychology*, *63*(3), 426-437. https://doi.org/10.1037/0022-006X.63.3.426

Porter, S., Peace, K. A., Douglas, R. L., & Doucette, N. L. (2012). Recovered memory evidence in the courtroom: Facts and fallacies. In D. Faust (Ed.), *Ziskin's Coping with*

*Psychiatric and Psychological Testimony* (6 ed., pp. 668-684). Oxford University Press. https://doi.org/10.1093/med:psych/9780195174113.003.0030

Porter, S., Yuille, J. C., & Lehman, D. R. (1999). The nature of real, implanted, and fabricated memories for emotional childhood events: implications for the recovered memory debate. *Law and Human Behavior*, *23*(5), 517-537. https://doi.org/10.1023/A:1022344128649

Powers, P. A., Andriks, J. L., & Loftus, E. F. (1979). Eyewitness accounts of females and males. *Journal of Applied Psychology*, *64*(3), 339-347. https://doi.org/10.1037/0021-9010.64.3.339

*Qin, J. J., Ogle, C. A., & Goodman, G. S. (2008). Adults' Memories of Childhood: True and False Reports. *Journal of Experimental Psychology-Applied*, *14*(4), 373-391. https://doi.org/10.1037/a0014309

Qin, X.-j., Yang, H.-x., Cui, J.-f., Ye, J.-y., & Wang, Y. (2021). Horizontal but not vertical saccades enhance memory retrieval: A meta-analysis and systematic review. *Quarterly Journal of Experimental Psychology*, *74*(5), 801-811. https://doi.org/10.1177/1747021821992276

Ramirez, S., Liu, X., Lin, P. A., Suh, J., Pignatelli, M., Redondo, R. L., Ryan, T. J., & Tonegawa, S. (2013). Creating a false memory in the hippocampus. *Science*, *341*(6144), 387-391. https://doi.org/10.1126/science.1239073

*Ready, D. J., Bothwell, R. K., & Brigham, J. C. (1997). The effects of hypnosis, context reinstatement, and anxiety on eyewitness memory. *International Journal of Clinical and Experimental Hypnosis*, *45*(1), 55-68. https://doi.org/10.1080/00207149708416106

Ridley, A. M., Gabbert, F., & La Rooy, D. J. (2012). *Suggestibility in legal contexts: Psychological research and forensic implications*. John Wiley & Sons.

Rijkeboer, M. M., Daemen, J. J., Flipse, A., Bouwman, V., & Hagenaars, M. A. (2020). Rescripting experimental trauma: Effects of imagery and writing as a way to reduce the development of intrusive memories. *Journal of Behavior Therapy and Experimental Psychiatry*, *67*, 101478. https://doi.org/10.1016/j.jbtep.2019.04.004

Roberts, N. P., Kitchiner, N. J., Kenardy, J., Lewis, C. E., & Bisson, J. I. (2019). Early psychological intervention following recent trauma: A systematic review and meta-analysis. *European Journal of Psychotraumatology*, *10*(1), 1695486. https://doi.org/10.1080/20008198.2019.1695486

Rock, P. L., Roiser, J. P., Riedel, W. J., & Blackwell, A. (2014). Cognitive impairment in depression: a systematic review and meta-analysis. *Psychological Medicine*, *44*(10), 2029-2040. https://doi.org/10.1017/S0033291713002535

Roediger, H., Wixted, J., & DeSoto, K. (2012). The curious complexity between confidence and accuracy in reports from memory. In L. Nadel & W. P. Sinnott-Armstrong (Eds.), *Memory and Law* (pp. 84-115). Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199920754.003.0004

Roediger, H. L., & Butler, A. C. (2011). The critical role of retrieval practice in long-term retention. *Trends in cognitive sciences*, *15*(1), 20-27. https://doi.org/10.1016/j.tics.2010.09.003

*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

Rowland, C. A. (2014). The effect of testing versus restudy on retention: a meta-analytic review of the testing effect. *Psychological Bulletin*, *140*(6), 1432-1463. https://doi.org/10.1037/a0037559

Rubin, D. C., & Schulkind, M. D. (1997). The distribution of autobiographical memories across the lifespan. *Memory & Cognition*, *25*(6), 859-866. https://doi.org/10.3758/BF03211330

Rubin, D. C., & Wenzel, A. E. (1996). One hundred years of forgetting: A quantitative description of retention. *Psychological Review*, *103*(4), 734. https://doi.org/10.1037/0033-295X.103.4.734

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

Schemmel, J., Datschewski-Verch, L., & Volbert, R. (2024). Recovered memories in psychotherapy: a survey of practicing psychotherapists in Germany. *Memory*, *32*(2), 176-196. https://doi.org/10.1080/09658211.2024.2305870

Schienle, A., Dietmaier, G., Ille, R., & Leutgeb, V. (2010). Eine Skala zur Erfassung der Ekelsensitivität (SEE). *Zeitschrift für Klinische Psychologie und Psychotherapie*, *39*(2), 80-86. https://doi.org/10.1026/1616-3443/a000016

Schienle, A., Walter, B., Stark, R., & Vaitl, D. (2002). Ein Fragebogen zur Erfassung der Ekelempfindlichkeit (FEE). *Zeitschrift für Klinische Psychologie und Psychotherapie*, *31*(2), 110-120. https://doi.org/10.1026/0084-5345.31.2.110

Schiller, D., Monfils, M. H., Raio, C. M., Johnson, D. C., Ledoux, J. E., & Phelps, E. A. (2010). Preventing the return of fear in humans using reconsolidation update mechanisms. *Nature*, *463*(7277), 49-53. https://doi.org/10.1038/nature08637

Schmucker, M., & Köster, R. (2015). Narrative Um-Schreibung: Imagery Rescripting & Reprocessing Therapy (IRRT). In *Verhaltenstherapiemanual* (pp. 379-382). Springer.

Scoboria, A., Jackson, D. L., Talarico, J., Hanczakowski, M., Wysman, L., & Mazzoni, G. (2014). The role of belief in occurrence within autobiographical memory. *Journal of Experimental Psychology: General*, *143*(3), 1242-1258. https://doi.org/10.1037/a0034110

Scoboria, A., Mazzoni, G., Jarry, J. L., & Bernstein, D. M. (2012). Personalized and not general suggestion produces false autobiographical memories and suggestion-consistent behavior. *Acta Psychologica*, *139*(1), 225-232. https://doi.org/10.1016/j.actpsy.2011.10.008

Scoboria, A., Mazzoni, G., & Kirsch, I. (2008). "Don't know" responding to answerable and unanswerable questions during misleading and hypnotic interviews. *Journal of Experimental Psychology-Applied*, *14*(3), 255-265. https://doi.org/10.1037/1076-898x.14.3.255

Scoboria, A., Mazzoni, G., Kirsch, I., & Relyea, M. (2004). Plausibility and belief in autobiographical memory. *Applied Cognitive Psychology: The Official Journal of the Society for Applied Research in Memory and Cognition*, *18*(7), 791-807. https://doi.org/10.1002/acp.1062

Scoboria, A., Otgaar, H., & Mazzoni, G. (2018). Defending and reducing belief in memories: An experimental laboratory analogue. *Memory & Cognition*, *46*(5), 770-786. https://doi.org/10.3758/s13421-018-0800-1

Scoboria, A., Wade, K. A., Lindsay, D. S., Azad, T., Strange, D., Ost, J., & Hyman, I. (2016). A mega-analysis of memory reports from eight peer-reviewed false memory implantation studies. *Memory*, *25*(2), 146-163. https://doi.org/10.1080/09658211.2016.1260747

Scott, J. C., Matt, G. E., Wrocklage, K. M., Crnich, C., Jordan, J., Southwick, S. M., Krystal, J. H., & Schweinsburg, B. C. (2015). A quantitative meta-analysis of neurocognitive functioning in posttraumatic stress disorder. *Psychological Bulletin*, *141*(1), 105-140. https://doi.org/10.1037/a0038039

Scully, I. D., Napper, L. E., & Hupbach, A. (2017). Does reactivation trigger episodic memory change? A meta-analysis. *Neurobiology of Learning and Memory*, *142*, 99-107. https://doi.org/10.1016/j.nlm.2016.12.012

*Seamon, J. G., Blumenson, C. N., Karp, S. R., Perl, J. J., Rindlaub, L. A., & Speisman, B. B. (2009). Did we see someone shake hands with a fire hydrant?: Collaborative recall affects false recollections from a campus walk. *The American Journal of Psychology*, *122*(2), 235-247. https://doi.org/10.2307/27784394

*Seamon, J. G., Philbin, M. M., & Harrison, L. G. (2006). Do you remember proposing marriage to the Pepsi machine? False recollections from a campus walk. *Psychonomic Bulletin & Review*, *13*(5), 752-756. https://doi.org/10.3758/BF03193992

*Segovia, K. Y., & Bailenson, J. N. (2009). Virtually True: Children's Acquisition of False Memories in Virtual Reality. *Media Psychology*, *12*(4), 371-393. https://doi.org/10.1080/15213260903287267

Shalev, A. Y., Ankri, Y., Israeli-Shalev, Y., Peleg, T., Adessky, R., & Freedman, S. (2012). Prevention of posttraumatic stress disorder by early treatment: results from the Jerusalem Trauma Outreach And Prevention study. *Archives of general psychiatry*, *69*(2), 166-176. https://doi.org/10.1001/archgenpsychiatry.2011.127

Shapiro, F. (2018). *Eye movement desensitization and reprocessing (EMDR) therapy: Basic principles, protocols, and procedures* (3rd ed.). Guilford Publications.

*Sharman, S. J., & Barnier, A. J. (2008). Imagining nice and nasty events in childhood or adulthood: Recent positive events show the most imagination inflation. *Acta Psychologica*, *129*(2), 228-233. https://doi.org/10.1016/j.actpsy.2008.06.003

*Sharman, S. J., & Calacouris, S. (2010). Do people's motives influence their susceptibility to imagination inflation? *Experimental Psychology*, *57*(1), 77-82. https://doi.org/10.1027/1618-3169/a000010

*Sharman, S. J., Garry, M., & Beuke, C. J. (2004). Imagination or exposure causes imagination inflation. *The American Journal of Psychology*, *117*(2), 157-168. https://doi.org/10.2307/4149020

*Sharman, S. J., Garry, M., & Hunt, M. (2005). Using source cues and familiarity cues to resist imagination inflation. *Acta Psychologica*, *120*(3), 227-242. https://doi.org/10.1016/j.actpsy.2005.04.002

*Sharman, S. J., & Powell, M. B. (2013). Do Cognitive Interview Instructions Contribute to False Beliefs and Memories? *Journal of Investigative Psychology and Offender Profiling*, *10*(1), 114-124. https://doi.org/10.1002/jip.1371

*Sharman, S. J., & Scoboria, A. (2009). Imagination equally influences false memories of high and low plausibility events. *Applied Cognitive Psychology*, *23*(6), 813-827. https://doi.org/10.1002/acp.1515

*Sheehan, P. W., Green, V., & Truesdale, P. (1992). Influence of rapport on hypnotically induced pseudomemory. *Journal of Abnormal Psychology*, *101*(4), 690-700. https://doi.org/10.1037/0021-843X.101.4.690

*Sheehan, P. W., & Statham, D. (1989). Hypnosis, the timing of its introduction, and acceptance of misleading information. *Journal of Abnormal Psychology*, *98*(2), 170-176. https://doi.org/10.1037/0021-843X.98.2.170

*Sheehan, P. W., Statham, D., & Jamieson, G. A. (1991a). Pseudomemory effects and their relationship to level of susceptibility to hypnosis and state instruction. *Journal of Personality and Social Psychology*, *60*(1), 130-137. https://doi.org/10.1037/0022-3514.60.1.130

*Sheehan, P. W., Statham, D., & Jamieson, G. A. (1991b). Pseudomemory effects over time in the hypnotic setting. *Journal of Abnormal Psychology*, *100*(1), 39-44. https://doi.org/10.1037/0021-843X.100.1.39

*Sheehan, P. W., & Tilden, J. (1983). Effects of suggestibility and hypnosis on accurate and distorted retrieval from memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *9*(2), 283-293. https://doi.org/10.1037/0278-7393.9.2.283

*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

Smucker, M. R., Dancu, C., Foa, E. B., & Niederee, J. L. (1995). Imagery rescripting: A new treatment for survivors of childhood sexual abuse suffering from posttraumatic stress. *Journal of Cognitive Psychotherapy*, *9*(1), 3-17. https://doi.org/10.1891/0889-8391.9.1.3

Soeter, M., & Kindt, M. (2010). Dissociating response systems: erasing fear from memory. *Neurobiology of Learning and Memory*, *94*(1), 30-41. https://doi.org/10.1016/j.nlm.2010.03.004

Spanos, N. P., & Bures, E. (1994). Pseudomemory Responding in Hypnotic, Task-Motivated and Simulating Subjects: Memory Distortion or Reporting Bias? *Imagination, Cognition and Personality*, *13*(4), 303-310. https://doi.org/10.2190/IC13.4.c

Spanos, N. P., Burgess, C. A., Burgess, M. F., Samuels, C., & Blois, W. O. (1999). Creating false memories of infancy with hypnotic and non-hypnotic procedures. *Applied Cognitive Psychology*, *13*(3), 201-218. https://doi.org/10.1002/(sici)1099-0720(199906)13:3<201::Aid-acp565>3.0.Co;2-x

Spanos, N. P., Gwynn, M. I., Comer, S. L., Baltruweit, W. J., & de Groh, M. (1989). Are hypnotically induced pseudomemories resistant to cross-examination? *Law and Human Behavior*, *13*(3), 271-289. https://doi.org/10.1007/BF01067030

Squire, L. R. (2004). Memory systems of the brain: a brief history and current perspective. *Neurobiology of Learning and Memory*, *82*(3), 171-177. https://doi.org/10.1016/j.nlm.2004.06.005

Stangier, U., Heidenreich, T., Berardi, A., Golbs, U., & Hoyer, J. (1999). Die Erfassung sozialer Phobie durch Social Interaction Anxiety Scale (SIAS) und die Social Phobia Scale (SPS). *Zeitschrift für Klinische Psychologie*, *28*, 28-36. https://doi.org/10.1026//0084-5345.28.1.28

Stanley, M. L., Stewart, G. W., & De Brigard, F. (2017). Counterfactual plausibility and comparative similarity. *Cognitive Science*, *41*(Suppl 5), 1216-1228. https://doi.org/10.1111/cogs.12451

Stark, L.-J., & Perfect, T. J. (2007). Whose idea was that? Source monitoring for idea ownership following elaboration. *Memory*, *15*(7), 776-783. https://doi.org/10.1080/09658210701643042

Stark, L. J., & Perfect, T. J. (2006). Elaboration inflation: How your ideas become mine. *Applied Cognitive Psychology*, *20*(5), 641-648. https://doi.org/10.1002/acp.1216

Steil, R. (1996). *Posttraumatische Intrusionen nach Verkehrsunfällen – Faktoren der Aufrechterhaltung. [Posttraumatic intrusions after road traffic accidents – Maintenance factors]* [Unpublished doctoral dissertation]. Georg-August-Universität Göttingen.

Sterne, J. A., Savović, J., Page, M. J., Elbers, R. G., Blencowe, N. S., Boutron, I., Cates, C. J., Cheng, H.-Y., Corbett, M. S., & Eldridge, S. M. (2019). RoB 2: a revised tool for assessing risk of bias in randomised trials. *BMJ*, *366*, Article l4898. https://doi.org/10.1136/bmj.l4898

Steyer, R., Schwenkmezger, P., Notz, P., & Eid, M. (1997). *Der Mehrdimensionale Befindlichkeitsfragebogen (MDBF)*. Hogrefe.

Strange, D., & Takarangi, M. K. T. (2012). False memories for missing aspects of traumatic events. *Acta Psychologica*, *141*(3), 322-326. https://doi.org/10.1016/j.actpsy.2012.08.005

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*(6), 1005-1017. https://doi.org/10.1007/s10608-019-10021-2

*Stróżak, P. (2008). Mindfulness/mindlessness as a new factor influencing false memories: Evidence from imagination inflation and modified premature cognitive commitment study. *Polish Psychological Bulletin*, *39*(4), 202-208. https://doi.org/10.2478/v10059-008-0015-6

Sugimori, E., & Kusumi, T. (2008). Output monitoring error: Effects of previously encoded action phrases. *Psychologia*, *51*(1), 76-88. https://doi.org/10.2117/psysoc.2008.76

Symons, C. S., & Johnson, B. T. (1997). The self-reference effect in memory: A meta-analysis. *Psychological Bulletin*, *121*(3), 371-394. https://doi.org/10.1037/0033-2909.121.3.371

*Takarangi, M. K. T., Strange, D., Shortland, A. E., & James, H. E. (2013). Source confusion influences the effectiveness of the autobiographical IAT. *Psychonomic Bulletin & Review*, *20*(6), 1232-1238. https://doi.org/10.3758/s13423-013-0430-3

Talarico, J. M., LaBar, K. S., & Rubin, D. C. (2004). Emotional intensity predicts autobiographical memory experience. *Memory & cognition*, *32*(7), 1118-1132. https://doi.org/10.3758/BF03196886

*Thomas, A. K., & Bulevich, J. B. (2006). Effective cue utilization reduces memory errors in older adults. *Psychology and Aging*, *21*(2), 379-389. https://doi.org/10.1037/0882-7974.21.2.379

*Thomas, A. K., Bulevich, J. B., & Loftus, E. F. (2003). Exploring the role of repetition and sensory elaboration in the imagination inflation effect. *Memory & Cognition*, *31*(4), 630-640. https://doi.org/10.3758/BF03196103

Thomas, A. K., Hannula, D. E., & Loftus, E. F. (2007). How Self-Relevant Imagination Affects Memory for Behaviour. *Applied Cognitive Psychology*, *21*(1), 69-86. https://doi.org/10.1002/acp.1270

*Thomas, A. K., & Loftus, E. F. (2002). Creating bizarre false memories through imagination. *Memory & Cognition*, *30*(3), 423-431. https://doi.org/10.3758/bf03194942

van der Zweerde, T. (2014). *Introducing the Trier Social Stress Test in a new experimental paradigm enabling complex emotional learning and unlearning* University of Amsterdam]. Amsterdam.

*van Schie, K., & Leer, A. (2019). Lateral Eye Movements Do Not Increase False-Memory Rates: A Failed Direct-Replication Study. *Clinical Psychological Science*, *7*(5), 1159-1167, Article 2167702619859335. https://doi.org/10.1177/2167702619859335

Vervliet, B., & Raes, F. (2013). Criteria of validity in experimental psychopathology: application to models of anxiety and depression. *Psychological Medicine*, *43*(11), 2241-2244. https://doi.org/10.1017/S0033291712002267

Visser, R. M., Lau-Zhu, A., Henson, R. N., & Holmes, E. A. (2018). Multiple memory systems, multiple time points: how science can inform treatment to control the expression of unwanted emotional memories. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *373*(1742), 1-15. https://doi.org/10.1098/rstb.2017.0209

Volbert, R., & Steller, M. (2014). Is This Testimony Truthful, Fabricated, or Based on False Memory? Credibility assessment 25 years after Steller and Köhnken (1989). *European Psychologist*, *19*(3), 207-220. https://doi.org/10.1027/1016-9040/a000200

von Glahn, N. R., Otani, H., Migita, M., Langford, S. J., & Hillard, E. E. (2012). What is the cause of confidence inflation in the Life Events Inventory (LEI) paradigm? *Journal of General Psychology*, *139*(3), 134-154. https://doi.org/10.1080/00221309.2012.672938

Wade, K. A., Garry, M., Read, D. J., & Lindsay, D. S. (2002). A picture is worth a thousand lies: Using false photographs to create false childhood memories. *Psychonomic Bulletin & Review*, *9*(3), 597-603. https://doi.org/10.3758/BF03196318

*Wagstaff, G. F., Cole, J., Wheatcroft, J., Anderton, A., & Madden, H. (2008). Reducing and reversing pseudomemories with hypnosis. *Contemporary Hypnosis*, *25*(3-4), 178-191. https://doi.org/10.1002/ch.366

*Wagstaff, G. F., Cole, J., Wheatcroft, J., Marshall, M., & Barsby, I. (2007). A componential approach to hypnotic memory facilitation: Focused meditation, context reinstatement and eye movements. *Contemporary Hypnosis*, *24*(3), 97-108. https://doi.org/10.1002/ch.334

Weber, M., Schumacher, S., Hannig, W., Barth, J., Lotzin, A., Schäfer, I., Ehring, T., & Kleim, B. (2021). Long-term outcomes of psychological treatment for posttraumatic stress disorder: a systematic review and meta-analysis. *Psychological Medicine*, *51*(9), 1420-1430. https://doi.org/10.1017/S003329172100163X

Weekes, J. R., Lynn, S. J., Green, J. P., & Brentar, J. T. (1992). Pseudomemory in hypnotized and task-motivated subjects. *Journal of Abnormal Psychology*, *101*(2), 356-360. https://doi.org/10.1037/0021-843x.101.2.356

Weike, A. I., Hamm, A. O., Schupp, H. T., Runge, U., Schroeder, H. W., & Kessler, C. (2005). Fear conditioning following unilateral temporal lobectomy: dissociation of conditioned startle potentiation and autonomic learning. *Journal of Neuroscience*, *25*(48), 11117-11124. https://doi.org/10.1523/JNEUROSCI.2032-05.2005

Weitzenhoffer, A. M., & Hilgard, E. R. (1962). *Stanford hypnotic susceptibility scale, form C* (Vol. 27). Consulting Psychologists Press.

Whitehouse, W. G., Dinges, D. F., Orne, E. C., & Orne, M. T. (1988). Hypnotic hypermnesia: Enhanced memory accessibility or report bias? *Journal of Abnormal Psychology*, *97*(3), 289-295. https://doi.org/10.1037/0021-843X.97.3.289

Whitehouse, W. G., Orne, E. C., Orne, M. T., & Dinges, D. F. (1991). Distinguishing the source of memories reported during prior waking and hypnotic recall attempts. *Applied Cognitive Psychology*, *5*(1), 51-59. https://doi.org/10.1002/acp.2350050105

Wiglusz, M. S., Landowski, J., & Cubała, W. J. (2019). Psychometric properties and diagnostic utility of the State–Trait Anxiety Inventory in epilepsy with and without comorbid anxiety disorder. *Epilepsy & Behavior*, *92*, 221-225. https://doi.org/10.1016/j.yebeh.2019.01.005

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

Wixted, J. T. (2004). The psychology and neuroscience of forgetting. *Annual Review of Psychology*, *55*(1), 235-269. https://doi.org/10.1146/annurev.psych.55.090902.141555

Wolf, A.-K., & Werner, M. (2021). Victims’ Rights Looking Good on Paper – How Criminal Prosecution in Germany Fails Victims of Sexual Violence. *German Law Journal*, *22*(5), 800-816. https://doi.org/10.1017/glj.2021.43

*Worthen, J. B., & Wood, V. V. (2001). Memory discrimination for self-performed and imagined acts: Bizarreness effects in false recognition. *The Quarterly Journal of Experimental Psychology A: Human Experimental Psychology*, *54*(1), 49-67. https://doi.org/10.1080/02724980042000020

*Wright, D. B., Loftus, E. F., & Hall, M. (2001). Now you see it; Now you don't: Inhibiting recall and recognition of scenes. *Applied Cognitive Psychology*, *15*(5), 471-482. https://doi.org/10.1002/acp.719

*Xu, Z. J., Hu, J., & Wang, Y. Y. (2023). Bilateral eye movements disrupt the involuntary perceptual representation of trauma-related memories. *Behaviour Research and Therapy*, *165*, Article 104311. https://doi.org/10.1016/j.brat.2023.104311

Yamamoto, K., & Masumoto, K. (2023). Memory for actions and reality monitoring in adults with autism spectrum disorder. *Memory*, *31*(4), 482-490. https://doi.org/10.1080/09658211.2023.2171064

Yuille, J. (1982). *Video as a medium for eyewitness research*. University of British Columbia.

# Appendix

# Appendix A: Supplementary Materials Study I

## S1. Free Recall (Memory Reactivation) – Instructions (English Translation)

"*The following will, once again, be about the event that took place two days ago. I will ask you to talk about it and audio record this sequence of your narration.*

*Can you remember the situation from the day before yesterday? You made a presentation to a committee the day before yesterday and performed other tasks. In the next step, we will once again go over the experience you had the day before yesterday in your imagination - that is, in your mind's eye. I'll ask you to retell your experience as vividly as possible right away. In order to see this new course of the experience as vividly as possible in front of you and to experience it with all the bodily sensations, feelings that arise, and with as many details as possible, you should close your eyes and speak in the first person and in the present tense. It is also important to pay attention to all sensory channels while doing this. So, let's discuss what you see, what you hear, what you smell, what you feel, etc.*

*I would like to demonstrate this with a small example: For example, if I want to experience my breakfast from this morning as vividly as possible, I do it in the following way.* [experimenter closes eyes (be sure to do this!), please recite next part by heart, participants will feel less weird when they keep their eyes closed themselves]: *'I'm in the kitchen now, thinking about what I want to eat. It's eight o'clock in the morning. I'm still in my pajamas and a little tired, but I'm also looking forward to the day. I go to the refrigerator and open it with my left hand. The air coming out of the fridge is cold and the fridge makes a whirring sound. It smells like fresh coffee. My eyes fall on a jam jar and I realize I'm in the mood for a jam sandwich. I take the jar out of the fridge and close the door again...'* [open your eyes]. *And so on...*

*I ask you to imagine the course of your experience from the day before yesterday as vividly as possible in this way as well. So, in the present tense, as if you were there at this moment, and from your perspective, tell me what you see, feel, hear, etc. in the moment.*

*Please describe the event as detailed and as accurately as possible. Please start at the point where the committee enters the room and end at the point where the committee leaves the room. It is important that you describe everything you can remember in such a way that a listener unfamiliar with the event can imagine the scene as accurately as possible. I will not interrupt you while you are speaking but will simply listen until you decide to finish your narrative. If you forget to narrate in the present tense, I might briefly correct you. Please don't be irritated by this and please continue describing the event in the present tense. While doing so, please remember to actually describe the event and all the details as completely and accurately as possible. Please report what was done and said and what you saw. Now make yourself comfortable in the chair and close your eyes. You may begin.*“

[Use audio device for free recall, start audio recording, speak participant code on tape]

[Participant reports recollection; min. 3 min.]

[If respondent falters] “*And what happens next?*“

**ATTENTION:** Respondent should always report in the first person (correct: “*Please remember to describe the event in the first person*”) and in the present tense (gently correct: repeat what was said in the present tense) (e.g., “*So the commission is taking a seat at the table right now. What happens now?*”)

[If the participant digresses into his or her report from the TSST and reports events from Session 1 that happened before or after the TSST]: “*For our study, it is important that we focus on the presentation from the day before yesterday. That's why I'd like you to come* *back to the situation with the committee in terms of content. You said* [insert here the last aspect of the scene described by the participant]. *What's next?*"

[Have participant narrate until the time the commission leaves the room again. If participant stops before this then ask]: "*Does this conclude the situation? Please continue telling the story until the commission leaves the room*."

**S2. Imagery Rescripting – Instructions (English Translation)**

"*In the situation with the committee, what was the most uncomfortable moment for you? Can you describe this very briefly*?" [note hotspot].

"*In the next step, we will go through the experience again in your imagination. So right now, I'm going to ask you to imagine the situation again as vividly as possible and describe to me what you're experiencing. Please describe your experience again in the first person and in the present tense, as if it were happening right now. It is important to pay attention to all sensory channels. So: What do I see? What do I hear? What do I smell? What do I taste? What do I feel? Let the image of the beginning of the scene arise before your inner eyes and then describe the course of the scene. The point is not that I understand everything exactly, but that you imagine the scene vividly and share what you experience. In a moment, I will help you to create the image of the beginning of the scene in your mind's eye, and then you will first describe the beginning of the scene again. At a certain point we will change the script of the scene – I will let you know at which point and how exactly we will do this. I will accompany you in the imagination exercise by asking you questions from time to time. Throughout the exercise, please keep your eyes closed. The exercise will take about 10-20 minutes. I will then signal you when the exercise is over, and you can open your eyes again. Do you have any questions before we start?*" [Answer questions, but nothing about the purpose of the study or imagery rescripting]

"*All right, I will now help you recall the experience again as vividly as possible. For this, I will first repeat what happened. I ask you then to imagine it as vividly and in as much detail as possible. You do not need to do anything else yet. Now make yourself comfortable in the chair and close your eyes.*" [display on the audio recording device serves as a stopwatch, note the duration of the recording after you have finished] [use second audio device that participant takes home; start audio recording]. "*You have just prepared for your presentation and are sitting in the chair across from the table. ("Do you see this in front of you?") The investigator is just getting the application committee. You are sitting alone in the examination room. The door opens. The two members of the application committee come in. They sit down at the table. There are many documents on the table in front of them. Directly across from you is a video camera. One of the committee members turns on the video camera and says, 'Start recording' and the participant code. The committee members look at you. One of them tells you that you can start the presentation. What happens now?*"

[If participant falters] "*And what happens next?*", "*What's happening now?*"

**NOTA BENE:** Participant should always report in the first person (correct: "*Please remember to describe things using the first person*", and in the present tense (correct: repeat what was said in the present tense) (e.g., "*So the commission is taking a seat at the table right now. Where do we go from here?*").

[Questions to explore]: "*Where are you?, What are you doing?, Who else is present?, What are they doing?, What can you see?, What can you hear?, Can you smell or taste anything?, What are you thinking?, How do you feel?, What physical sensations do you have? (have them describe things in detail), Where are you feeling this?, How does it feel?*"

[Let the participant tell until they reach the hotspot, then]: "*You may now change the script of the scene to make it less stressful. The change can be something that could really happen or something that would be impossible in reality. Anything is possible, we just can't undo the event. It is important that you change the course of the scene so that it is less stressful for you. So, you are now* [insert hotspot point of view]. *What would you like to do or say now to change the situation? Can you visualize yourself doing that now? What happens next?"*

*"Please imagine this as vividly as you can, as if this is really happening right now! And please tell me exactly what is happening.*"

[Questions to deepen or if very global, e.g., "*I want everything to be fine*."]: "*What might that look like specifically if...?, Can you imagine exactly how you would do this?, What do you need to do this?, What exactly are you doing?, What happens now?, How does the commission respond?, What exactly does* [the helper] say/do*?, Imagine exactly how he says/does this, Is there anything else you need* [the helper] *to do or anything you want* [the helper] *to do?, How does it feel when you ...?, What do you think?, Is there anything else you need?, Is there anything else you would like to change?"*

*"Does this feel completely good to you now, or is there anything else you would like to change about the story so that it feels completely good to you?"* [Repeat until participant is satisfied. Ideally about 10-20 minutes].

*"Well, if this feels completely good to you now, then you can let this picture sink in for a moment. And when you're ready, we'll end the imagination session with that, and you can open your eyes again.*"

[End Audio Recording]

[Read duration of rescripting from audio recording device. Log time of rescripting in checklist.]

## S3. Free recall – Summary Rating Manual

### *Internal and External Details Based on Levine et al. (2002)*

#### Categories of Internal Details.

*Event*: Activities and actions of one person and reactions of others (jury) (*subject + verb*) are evaluated as an event: actions of the participants (presentation, arithmetic task, singing, also the attempt at a visible behavior) (e.g., "*I notice*", "*I wait*", "*I lean*") and actions and reactions by the jury (e.g., camera on, comments). In addition, clothing, physical appearance and any adjective that describes a person in more detail will be counted as an event when first mentioned (e.g., "*lady with the red dress and the brown, long, curly hair*").

*Place*: As a place, all location information (room, building, cross on the floor) and prepositions (right, opposite, I stand in front of the table etc.) are evaluated. Each preposition is scored separately with one point.

*Time:* All temporal adverbs (then, after, next, etc.), information about the order (first, last, at the end, at the beginning, as the second, etc.) and the duration (5 min, finished with speech before time runs out), as well as the time, day or date, are coded as time.

*Perception*: All auditory, tactile (including pain), visual, and olfactory details (what the participants see, hear, etc.), as well as object characteristics (shape and color of e.g., the blackboard), additional information on body position / posture ("*I stand upright/bent*") and indirect speech ("*the commission says I should speak louder"*) are considered perception. Each object property/descriptive adjective (white, large, square board) is scored separately with one point. (Adjectives describing persons are coded as an event.) Each statement / detail in indirect speech (in accordance with TSST protocol) is scored separately with one point.

*Emotion / cognition*: All expressions concerning the emotional state, thoughts, evaluations, or expectations are evaluated as emotion or cognition (e.g., "*what is actually not a problem*", "*I find it difficult*", "*the commission seems very professional*", "*even if it doesn't* *work out quite as well with the arithmetic*", "*I am curious about what is coming*", "*I try*"). Indications of emotions are "*I think, feel*". Thoughts that are specified in more detail, or thoughts and feelings that fit together conceptually, are evaluated as one point.

**Categories of External Details.**

*Metacognition, semantic knowledge*: Semantic knowledge, self-concept, evaluations in retrospect, additional explanations from the present, and explanations of feelings are evaluated as metacognitions (e.g., "*When I think about it now, ...*", "*but I already knew that from a seminar*", "*I know that I'm not a super singer* ", "*the task is difficult for me because mental arithmetic was so long ago*", *"a blackboard which you can write on*", "*which doesn't even fit to these first, serious tasks*". One indication of metacognition is, for example, the statement "*at this time I have...*").

*Repetitions:* Details that do not supply any new information and whose information was already mentioned analogously are not scored for a second time.

*Others:* Other elements are not considered or evaluated, including filler words (okay, so, exact, etc.), corrections or muddling

***Correctness Ratings Based on Jack et al. (2014)***

*Correct:* Everything the jury does according to TSST protocol will be rated as correct. In addition, everything that happens within a task, no matter whether the chronology is correct or not, will be rated as correct. If the time is not correct, the time detail will be rated as incorrect.

*Incorrect:* Everything that is wrong according to TSST protocol will be rated as incorrect.

*Possible*: Everything the participant says, perceives and does is considered possible if verification is not possible.

**S4. Cued recall – Questions and Rating Manual**

| | Question | Number of correct answers | Correct answers | Answers not to be scored | Incorrect answers |
|---|---|---|---|---|---|
| | | | Questions about the location | | |
| 1 | Please name all pieces of furniture, furnishings and home accessories that you remember. | 7 | Table, chairs, lamp, picture, plant, curtain, flipchart | Trash can, watering can, colors & number of features, things in room, folders, carpet | All other mentions (things that were not in the room, such as folders) |
| 2 | Was there something on the windowsill? If yes, what? | 2 | Yes, Watering can | Color & quantity | No, all other mentions |
| 3 | Were there pictures hanging on the wall? If so, how many? | 2 | Yes, 1 | Content of the pictures | No, all other mentions |
| 4 | Was the room illuminated? If so, which light sources were there? | 3 | Yes, floor lamp, ceiling lamp | Windows, daylight | No, all other mentions |
| 5 | Was there a shelf in the room? If so, what color was it? | 1 | No | | Yes, all other mentions |
| 6 | What was on the jury table in the room? | 7 | Coffee cups / glasses, water bottle, clipboards, water carafe, stopwatch, pens, papers | Quantity, folders | All other mentions |
| 7 | Was there a trash can in the room? If yes, what color was it? | 2 | Yes, blue | White sticker | No, all other mentions |
| 8 | Were there any folders in the room? If so, how many? | 1 | No | | Yes, all other mentions |
| 9 | Did the jurors have clipboards? If so, what color were the jurors' clipboards? | 2 | Yes, blue | Exact blue tone | No, all other mentions |
| 10 | Was there a watering can in the room? If so, what color was the watering can? | 2 | Yes, pink | | No, all other mentions |
| | | | Questions about the person | | |

| | | | | | |
|---|---|---|---|---|---|
| 11 | What color(s) were the jury members' tops? | 2 | Black, red | | All other mentions |
| 12 | What hairstyle did the juror on your left wear? | 1 | Hair was down | | All other mentions |
| 13 | What hairstyle did the juror on your right wear? | 1 | Ponytail | | All other mentions |
| 14 | What color(s) were the jury members' shoes? | 1 | Black | | All other mentions |
| 15 | Were any of the jurors wearing glasses? If so, what color were they? | 1 | No | | Yes, all other mentions |
| 16 | Which juror first gave you instructions? | 1 | Left | | Right |
| 17 | Which juror gave you the last task? | 1 | Left | | Right |
| 18 | Which juror operated the camera? | 1 | Right | | Left |
| | Questions about the situation | | | | |
| 19 | What color was the camera? | 1 | Black | | All other mentions |
| 20 | What color was the marking where you had to stand? | 1 | Brown | | All other mentions |
| 21 | What was your first task? | 1 | Hold presentation / strengths & weaknesses | More detailed content about the presentation | All other mentions |
| 22 | How long did the presentation last (in minutes)? | 1 | 5 | | All other mentions |
| 23 | What were you asked to talk about during the presentation? | 1 | Strengths & weaknesses / character traits | Job interview, more details | All other mentions |
| 24 | Were you interrupted during your speech? If so, how often were you interrupted? | 2 | Yes, 5 | | No |
| 25 | Did you have to perform another task? If so, what was your task? | 2 | Yes, arithmetic task | More specific information about the arithmetic task, singing | No, all other mentions |

| | | | | |
|---|---|---|---|---|
| 26 At the beginning you were given a number. What was it? | 1 | 1310 | | All other mentions |
| 27 What exactly did you have to do with this figure? | 2 | Always subtract 13 | Loudly | All other mentions |
| 28 What did you have to do if you made a mistake? | 1 | Start again from the beginning | 1310 | All other mentions |
| 29 Did you have to perform another task? If so, which task did you get? | 2 | Yes, sing a song | All my little ducklings | No, all other mentions |
| 30 Which song did you have to sing? | 1 | All my little ducklings | A children's song | All other mentions |
| 31 How many verses did the song have? | 1 | 4 | | All other mentions |
| 32 Were there animals in the song? If so, which animals appeared? | 5 | Yes: ducks, geese, chicken, pigeons | | No |
| 33 Did you have to perform another task? If so, what was your task? | 1 | No | | Yes, all other mentions |

*Note.* The 10 questions about the location include 29 answers about the location; the 8 questions about the persons include 9 answers about the persons, and the 15 questions about the situation include 23 answers about the situation.

# Appendix B: Supplementary Materials Study II

## S.1 Free Recall (Memory Reactivation) – Instructions (English Translation)

"*The following will, once again, be about the film clip from yesterday. I will ask you to talk about it and audio record this sequence of your narration.*

*Can you remember the film from yesterday? You watched a film clip yesterday. In the next step, we will once again go through the experience you saw in your imagination - that is, in your mind's eye. I'll ask you to retell your experience as vividly and as accurately as possible right away. In order to see this course of events as vividly as possible in front of you and to experience it with all the bodily sensations, feelings that arise, and with as many details as possible, you should close your eyes and speak in the first person and in the present tense. So, imagine again that you are witnessing the situation at that moment. It is also important to pay attention to all sensory channels while doing this. So, let's discuss what you see, what you hear, what you smell, what you feel, etc.*

*I would like to demonstrate this with a small example: For example, if I want to experience my breakfast from this morning as vividly as possible, I do it in the following way.* [experimenter closes eyes (be sure to do this!), please recite the next part by heart, participants will feel less weird when they keep their eyes closed themselves]: *'I'm in the kitchen now, thinking about what I want to eat. It's eight o'clock in the morning. I'm still in my pajamas and a little tired, but I'm also looking forward to the day. I go to the refrigerator and open it with my left hand. The air coming out of the fridge is cold and the fridge makes a whirring sound. It smells like fresh coffee. My eyes fall on a jam jar and I realize I'm in the mood for a jam sandwich. I take the jar out of the fridge and close the door again...'* [open your eyes]. *And so on...*

*I ask you to imagine the course of what you saw yesterday as vividly as possible in this way as well. So, in the present tense, as if you were there at this moment, and from your perspective, tell me what you see, feel, hear, etc. in the moment.*

*Please describe the event as detailed and as accurately as possible. Please report what was done and said and what you saw. Please start at the beginning of the film clip and report what happened until the end. It is important that you describe everything you can remember in such a way that a listener unfamiliar with the event can imagine the scene as accurately as possible. I will not interrupt you while you are speaking but will simply listen until you decide to finish your narrative. If you forget to narrate in the present tense, I might briefly correct you. Please don't be irritated by this and please continue describing the event in the present tense. While doing so, please remember to actually describe the event and all the details as completely and accurately as possible. Please report what was done and said and what you saw. Now make yourself comfortable in the chair and close your eyes. You may begin.*"

[Use audio device for free recall, start audio recording, speak participant code on tape]

[Participant reports recollection; min. 3 min.]

[If participant falters] "*And what happens next?*"

**ATTENTION:** Participant should always report in the first person (correct: "*Please remember to tell in the first person*"; correct also when participant says "In the movie, it happens...") and in the present tense (gently correct: repeat what was said in the present tense)

[If the participant digresses into his or her report from the trauma film and reports events from Session 1 that happened before or after the trauma film]: "*For our study, it is important that we focus on what happened in the film clip from yesterday. That's why I'd like* *you to come back to the situation in terms of content. You said* [insert here the last aspect of the scene described by the participant]. *What's next?*"

[Let the participant tell the story until the end of the film. If the participant stops before this then ask]: "*Does this conclude the situation? Please continue telling the story until the end of the film clip*."

**S2. Imagery Rescripting – Instructions (English Translation)**

"*In the next step, we will go through the experience again in your imagination. We will record this sequence again, preferably on your smartphone. If you do not want to do this or if this does not work, we will use a voice recorder again, which you will take home."*

[Place recording device on the table] / [Have the participant open the recording app on their smartphone, do not start recording yet].

*"So right now, I'm going to ask you to imagine the situation again as vividly as possible and describe what you're experiencing to me. Please describe your experience again in the first person and in the present tense, as if it were happening right now. It is important to pay attention to all sensory channels. So: What do I see? What do I hear? What do I feel? Let the image of the beginning of the scene arise in front of your inner eyes and then describe the course of the scene. The point is not that I understand everything exactly, but that you imagine the scene vividly and share what you experience. In a moment, I will help you to create the image of the beginning of the scene in your mind's eye, and then you will first describe the beginning of the scene again. At a certain point we will change the script of the scene – I will let you know at which point and how exactly we will do this. I will accompany you in the imagination exercise by asking you questions from time to time. Throughout the exercise, please keep your eyes closed. The exercise will take about 10-20 minutes. I will then signal you when the exercise is over, and you can open your eyes again. Do you have any questions before we start?*" [Answer questions, but nothing about the purpose of the study or imagery rescripting]

"*All right, I will now help you recall the experience again as vividly as possible. For this, I will first repeat what happened. I will then ask you to imagine it as vividly and in as much detail as possible. You do not need to do anything else yet."* [If recording on participant 's smartphone, participant should start audio recording on smartphone now]

*"Now make yourself comfortable in the chair and close your eyes and keep them closed until I tell you that you can open your eyes again.*" [If recording not on participant 's smartphone, start recording on audio device that participant takes home]

[Display on the audio recording device serves as a stopwatch, note the duration of the recording after it has ended]

"*You see the young woman about to leave the party; you hear a man trying to persuade her to stay a little longer; you then see her kiss the man on the cheek and leave the apartment. She takes the elevator downstairs and walks out of the building. On the side of the road, she calls for a cab, but none stops. You see a woman who says to her, 'It's dangerous here. You'd better go through the underpass!'. You then see the young woman walking along the sidewalk toward the underpass. You see her walking down the underpass. It is a bit dark in the underpass and a light flickers."*

*"Please stay with this image for now and continue to keep your eyes closed."*

[Remain in imagination, ask the following questions, record results in checklist]:

"*On a scale of 0-100, how vivid is the scene in your mind's eye right now?"*

*"And on a scale of 0-100, how distressed do you feel right now?"*

*"And from 0-100, how controllable do you experience the scene to be in your mind's eye right now?"*

*"What is the strongest feeling you are experiencing right now?"*

*"And on a scale of 0-100, how strong is this feeling right now?"*

[Emphasize the underlined words here as you read]:

"It is now your task to continue the scene as <u>vividly</u> as possible in your mind's eye <u>with as much detail as possible</u>. You will do this for several minutes; I will tell you when to stop. Imagine the progression of the scene in your mind's eye, <u>with as much detail as possible</u>. Imagine everything as <u>vividly as possible</u>, as if it were <u>really</u> happening right now.

With your eyes closed, in the present tense, and from your perspective, tell me everything that is happening."

"So, you see the young woman walking along the sidewalk towards the underpass. You see her walking down the underpass. It's a little dark in the underpass and a light flickers..."

"Where do you go from here? What do you see now?"

[If participant falters] "*And what happens next?*", "*What's happening now?*"

[Dealing with difficulties]:

- correct when participant says "...in the movie...": e.g., "You see how just now, ... happens"
- if participant avoids and comes to the end quickly: rewind and ask questions!
- re-experiencing little vividly: ask questions about sensory stimuli and details

**NOTA BENE:** Participant should always report in the first person (correct: "*Please remember to describe things using the first person*", and in the present tense (correct: repeat what was said in the present tense).

[Questions to explore]: "*Where are you?, Who else is present?, What are they doing?, What can you see?, What can you hear?, What are you thinking?, How do you feel?, What physical sensations do you have? (have them describe things in detail), Where are you feeling this?, How does it feel?*"

[happens in the meantime, is reported by participants, does not have to be complete, only serves as orientation for experimenter: In the underpass, a man comes towards her with a Spanish-speaking woman in a red dress. The man pushes the Spanish-speaking woman against the wall, hits her in the face with his hand, kicks her in the stomach with his knee and continues to hit her. The woman goes down, the man grabs her by the hair. The young woman with the white dress observes the scene, seems indecisive about what to do and hesitates to move on at the height of the other two. Then the man notices the young woman in the white dress; she turns around and tries to run away, he calls after her, ‘Hey, wait, stop!’. She turns again and tries to run away in the other direction].

[only interrupt and ask if the following events are not experienced]:

- 2 people approach her in the underpass – *“Do you see any other people in the underpass?”*
- The man becomes aware of the young woman, she tries to run away, he runs after her – *“What happens when the woman meets the other two people?”*
- The man pushes the woman against the wall and threatens her with a knife – “What happens next?”

[add if necessary, if not reported by participant]: „*You see the man pushing the woman against the wall and she screams. The man pulls out a knife and he holds it to the woman's face.“*

“*What happens next? What do you see now?*”

[Questions to explore]: “*Where are you?, Who else is present?, What are they doing?, What can you see?, What can you hear?, What are you thinking?, How do you feel?, What physical sensations do you have? (have them describe things in detail), Where are you feeling this?, How does it feel?*”

[happens in the meantime, is reported by participants, does not have to be complete, only serves as orientation for experimenter: He threatens her and says “shut up!” several times. He says to her “pull up your dress”. He kisses her on the neck and asks her to “kneel down”. The man holds the knife to the woman's neck and now pushes her to the ground. There is trash lying around on the floor]

[if narrative gets to this point, have it reported, then gently interrupt and insert or repeat like a summary; if not reported, gently interrupt and insert]:

*"You see (so) that the woman is lying on her stomach and the man is lying on top of her. You see that she tries to scream and fight back, but the man covers her mouth and holds her down. You see that the perpetrator starts to pull down the young woman's thong and opens his pants. They see a man appear at the end of the underpass; they see him stop briefly and observe the scene, but then abruptly turn around and quickly disappear."* (Hotspot)

[Remain in imagination, ask the following questions, record results in checklist]:

*"On a scale of 0-100, how vivid is the scene in your mind's eye right now?"*

*"And on a scale of 0-100, how distressed do you feel right now?"*

*"And from 0-100, how controllable do you experience the scene to be in your mind's eye right now?"*

*"What is the strongest feeling you are experiencing right now?"*

*"And on a scale of 0-100, how strong is this feeling right now?"*

*"Now we change the course of the scene."*

*"You see how the man who was recently seen at the end of the underpass suddenly comes back running. With him is the man who was also at the party earlier. The two men run to the woman and the perpetrator before the perpetrator begins to rape the woman."*

*"What do you wish the two men would do or say to the perpetrator now?"*

*"Can you imagine them doing/saying that now?"*

*"How does the perpetrator react to that?"*

*"And what should the two men do or say now?"*

[Continue until the perpetrator is deprived of power].

[when participant imagines perpetrator overpowering the two helpers with knife]: *"Let's rewind a bit. You see that the two men are able to overpower the perpetrator in pairs. What happens now?"*

[Questions to explore]: "*Where are you?, Who else is present?, What are they doing?, What can you see?, What can you hear?, What are you thinking?, How do you feel?, What physical sensations do you have? (have them describe things in detail), Where are you feeling this?, How does it feel?*"

[possible rescripting: The two push the perpetrator, who is sitting on the floor, against the wall and the man from the party punches the rapist in the face with his fist. He then jumps to the young woman and helps her sit up. She cries and whimpers, he says, "it's over, you're safe, we're here! The police are coming!" The second man pushes the rapist to the ground, causing him to fall on his stomach and shouts, "you motherfucker." He sits on the man's back and takes his hands behind his back. The rapist tries to wriggle out of the hold.

[if perpetrator overpowered, gently interrupt and insert like a summary]:

*"So the perpetrator is now no longer a danger to the woman. You now see two police officers come into the underpass and handcuff the offender. They drag him up and take him away."*

*"Can you see how this is happening right now? Please describe what you see and hear!"*

[Now follows caring for the woman.]

*"Did the young woman witness what the two men did to the perpetrator?"*

[The young woman must have seen it. If not, one of the men must report it to her].

*"What happens now? What do you see now?"*

*"How does she react to that? What can you see when you look at the young woman now? How does she feel now?"*

[If the young woman feels safe and okay, the imagination can end. If she still does not feel safe, it is necessary to continue]:

*"What else does the young woman need right now to feel safe again? Can you imagine this happening? How does the young woman respond?"*

[Repeat until the young woman feels safe and needs nothing more].

[Wait until participant reaches the end and stops reporting].

*"Does this feel completely good to you now, or would you like to change anything else about the story so that it feels completely good to you?"*

[Rescripted until participant is satisfied. Ideally about 10-20 minutes].

*"Please stay with the picture for now and continue to keep your eyes closed."*

"*On a scale of 0-100, how vivid is the scene in your mind's eye right now?"*

*"And on a scale of 0-100, how distressed do you feel right now?"*

*"And from 0-100, how controllable do you experience the scene to be in your mind's eye right now?"*

*"What is the strongest feeling you are experiencing right now?"*

*"And on a scale of 0-100, how strong is this feeling right now?"*

*"Good, we are coming to the end of the imagination. If you would like, you can let this image sink in for a moment. And when you are ready, then you can open your eyes again. Look around at where you are. Get your bearings. Shake out your hands and legs if you want."*

[End audio recording]

[Read duration of intervention from audio recording device! Log time of intervention in checklist]

Imaginal Exposure – Instructions (English Translation)

“*In the next step, we will go through the experience again in your imagination. We will record this sequence again, preferably on your smartphone. If you do not want to do this or if this does not work, we will use a voice recorder again, which you will take home.”*

[Place recording device on the table] / [Have the participant open the recording app on their smartphone, do not start recording yet].

*“So right now, I'm going to ask you to imagine the situation again as vividly as possible and describe what you’re experiencing to me. Please describe your experience again in the first person and in the present tense, as if it were happening right now. It is important to pay attention to all sensory channels. So: What do I see? What do I hear? What do I feel? Let the image of the beginning of the scene arise in front of your inner eyes and then describe the course of the scene. The point is not that I understand everything exactly, but that you imagine the scene vividly and share what you experience. In a moment, I will help you to create the image of the beginning of the scene in your mind's eye, and then you will describe the course of the scene again. I will accompany you in the imagination exercise by asking you questions from time to time. Throughout the exercise, please keep your eyes closed. The exercise will take about 10-20 minutes. I will then signal you when the exercise is over, and you can open your eyes again. Do you have any questions before we start?*” [Answer questions, but nothing about the purpose of the study or imagery rescripting]

“*All right, I will now help you recall the experience again as vividly as possible. For this, I will first repeat what happened. I will then ask you to imagine it as vividly and in as much detail as possible. You do not need to do anything else yet.”* [If recording on participant's smartphone, participant should start audio recording on smartphone now]

*"Now make yourself comfortable in the chair and close your eyes and keep them closed until I tell you that you can open your eyes again.*" [If recording not on participant 's smartphone, start recording on audio device that participant takes home]

[Display on the audio recording device serves as a stopwatch, note the duration of the recording after it has ended]

"*You see the young woman about to leave the party; you hear a man trying to persuade her to stay a little longer; you then see her kiss the man on the cheek and leave the apartment. She takes the elevator downstairs and walks out of the building. On the side of the road, she calls for a cab, but none stops. You see a woman who says to her, 'It's dangerous here. You'd better go through the underpass!'. You then see the young woman walking along the sidewalk toward the underpass. You see her walking down the underpass. It is a bit dark in the underpass and a light flickers."*

*"Please stay with this image for now and continue to keep your eyes closed."*

[Remain in imagination, ask the following questions, record results in checklist]:

"*On a scale of 0-100, how vivid is the scene in your mind's eye right now?"*

*"And on a scale of 0-100, how distressed do you feel right now?"*

*"And from 0-100, how controllable do you experience the scene to be in your mind's eye right now?"*

*"What is the strongest feeling you are experiencing right now?"*

*"And on a scale of 0-100, how strong is this feeling right now?"*

[Emphasize the underlined words here as you read]:

*"It is now your task to continue the scene as <u>vividly</u> as possible in your mind's eye <u>with as much detail as possible</u>. You will do this for several minutes; I will tell you when to stop. Imagine the progression of the scene in your mind's eye, <u>with as much detail as possible</u>. Imagine everything as <u>vividly as possible</u>, as if it were <u>really</u> happening right now.*

*With your eyes closed, in the present tense, and from your perspective, tell me everything that is happening."*

*"So you see the young woman walking along the sidewalk towards the underpass. You see her walking down the underpass. It's a little dark in the underpass and a light flickers..."*

*"Where do you go from here? What do you see now?"*

[If participant falters] "*And what happens next?*", "*What's happening now?*"

[Dealing with difficulties]:

- correct when participant says *"...in the movie..."*: e.g., *"You see how just now, ... happens"*
- if participant avoids and comes to the end quickly: rewind and ask questions!
- re-experiencing little vividly: ask questions about sensory stimuli and details

**NOTA BENE:** Participant should always report in the first person (correct: "*Please remember to describe things using the first person*", and in the present tense (correct: repeat what was said in the present tense).

[Questions to explore]: "*Where are you?, Who else is present?, What are they doing?, What can you see?, What can you hear?, What are you thinking?, How do you feel?, What physical sensations do you have? (have them describe things in detail), Where are you feeling this?, How does it feel?*"

[happens in the meantime, is reported by participants, does not have to be complete, only serves as orientation for participants: In the underpass, a man comes towards her with a Spanish-speaking woman in a red dress. The man pushes the Spanish-speaking woman against the wall, hits her in the face with his hand, kicks her in the stomach with his knee and continues to hit her. The woman goes down, the man grabs her by the hair. The young woman with the white dress observes the scene, seems indecisive about what to do and hesitates to move on at the height of the other two. Then the man notices the young woman in the white dress; she turns around and tries to run away, he calls after her, ‘Hey, wait, stop!’. She turns again and tries to run away in the other direction].

[only interrupt and ask if the following events are not experienced]:

- 2 people approach her in the underpass – *“Do you see any other people in the underpass?”*
- The man becomes aware of the young woman, she tries to run away, he runs after her – *“What happens when the woman meets the other two people?”*
- The man pushes the woman against the wall and threatens her with a knife

“What happens next?”

[add if necessary, if not reported by participant]: „*You see the man pushing the woman against the wall and she screams. The man pulls out a knife and he holds it to the woman's face.“*

“*What happens next? What do you see now?*”

[Questions to explore]: “*Where are you?, Who else is present?, What are they doing?, What can you see?, What can you hear?, What are you thinking?, How do you feel?, What physical sensations do you have? (have them describe things in detail), Where are you feeling this?, How does it feel?*”

[happens in the meantime, is reported by female participants, does not have to be complete, only serves as orientation for experimenter: He threatens her and says “shut up!” several times. He says to her “pull up your dress”. He kisses her on the neck and asks her to “kneel down”. The man holds the knife to the woman's neck and now pushes her to the ground. There is trash lying around on the floor]

[if narrative gets to this point, have it reported, then gently interrupt and insert or repeat like a summary; if not reported, gently interrupt and insert]:

*"You see (so) that the woman is lying on her stomach and the man is lying on top of her. You see that she tries to scream and fight back, but the man covers her mouth and holds her down. You see that the perpetrator starts to pull down the young woman's thong and opens his pants. They see a man appear at the end of the underpass; they see him stop briefly and observe the scene, but then abruptly turn around and quickly disappear."* (Hotspot)

[Remain in imagination, ask the following questions, record results in checklist]:

"*On a scale of 0-100, how vivid is the scene in your mind's eye right now?"*

*"And on a scale of 0-100, how distressed do you feel right now?"*

*"And from 0-100, how controllable do you experience the scene to be in your mind's eye right now?"*

*"What is the strongest feeling you are experiencing right now?"*

*"And on a scale of 0-100, how strong is this feeling right now?"*

*"What's the next step? What do you see now?"*

[Questions to explore]: "*Where are you?, Who else is present?, What are they doing?, What can you see?, What can you hear?, What are you thinking?, How do you feel?, What physical sensations do you have? (have them describe things in detail), Where are you feeling this?, How does it feel?*"

[happens in the meantime, is reported by participants, does not have to be complete, only serves as orientation for experimenter: The man begins to rape the woman anally. The woman screams, but he covers her mouth. She tries to resist, but she has no chance. With fear-filled eyes and whimpering, she has to endure what the man does. In between, the man inhales something from a small brown bottle into her nose. The woman whimpers. The man repeatedly demands that the woman calls him "Papa". The man comes anal in the woman and gets off her. He lies next to her on the floor and takes deep breaths in and out. He repeatedly says, “Damn, that's good”. She breaks down crying with her face on the floor; she chokes and coughs].

[only interrupt and ask if the following events are not experienced]:

- Man anally rapes woman – *“What does the man do to the woman?”*
- Woman tries to crawl away after being raped – *“What happens after that?”*
- He kicks her violently in the face with his foot. – *“What happens next?”*

[interrupt and add if necessary if not reported by participant, otherwise briefly summarize]:

*“After the rape, the woman tries to crawl away on all fours; the man is lying on the ground next to her and swearing at her. He stands up and kicks her violently in the face with his foot.”*

*“What happens now? What do you see now?”*

[Questions to explore]: “*Where are you?, Who else is present?, What are they doing?, What can you see?, What can you hear?, What are you thinking?, How do you feel?, What physical sensations do you have? (have them describe things in detail), Where are you feeling this?, How does it feel?*”

[happens in the meantime, is to be reported by female participants: She is bleeding from the face and turns on her side on the floor, he kicks her in the back, she continues to roll until she is on her back again. He berates her. She whimpers on the floor, he kicks her in the face again. He grabs her, sits on her chest and punches her face several times with his fist. The woman looks increasingly lifeless. He turns the woman onto her stomach, grabs her by the hair and hits her head hard against the floor several times. At the end he says, “So now I'm done with you, fucking shit whore,” and spits on her].

[Waiting until participant reaches the end and stops reporting].

*“Please stay with the picture for now and continue to keep your eyes closed.”*

"*On a scale of 0-100, how vivid is the scene in your mind's eye right now?*"

*"And on a scale of 0-100, how distressed do you feel right now?"*

*"And from 0-100, how controllable do you experience the scene to be in your mind's eye right now?"*

*"What is the strongest feeling you are experiencing right now?"*

*"And on a scale of 0-100, how strong is this feeling right now?"*

*"Now we have reached the end of the imagination. When you are ready, you may open your eyes again. Look around at where you are. Get your bearings. Shake out your hands and legs if you want."*

[End audio recording]

[Read duration of intervention from audio recording device! Log time of intervention in checklist]

## S3. Free Recall – Summary Rating Manual (English Translation)

***Internal and External Details Based on Levine et al. (2002)***

**Categories of Internal Details (specific to time and place).**

*Event*: Activities and actions of the characters presented in the film (*subject + verb*) are evaluated as an event (e.g., "*woman says", "man threatens", "woman defends herself"*. In addition, clothing, physical appearance and any adjective that describes a person in more detail will be counted as an event when first mentioned (e.g., "*the lady with the red dress and the brown, long, curly hair*").

*Place*: As a place, all location information (*"underpass", "on the ground"*) and prepositions (*"right", "next to it", "above her")* are evaluated. Each preposition is scored separately with one point.

*Time:* All temporal adverbs *("then", "after", "next"*, etc.), information about the order *("first", "last", "at the end", "at the beginning"*, etc.) and the duration (*"5-10 min"*), as well as the time of the day (*"at night"*) are coded as time. Each time information is scored individually with one point (*"then at the end"*).

*Perception*: All auditory, tactile (including pain), visual, and olfactory details (what the participants see, hear, etc.), as well as object characteristics (shape and color of e.g., underpass, wall, etc), additional information on body position / posture (*"woman lying bent over"*) and indirect speech ("*the man says she likes it/you like it after all"*) are considered perception. Each object property/descriptive adjective (*"white, thin top"*) is scored separately with one point. (adjectives describing persons are coded as an event.) Each statement / detail in indirect speech (in accordance with trauma film) is scored separately with one point.

*Emotion / cognition*: All expressions concerning the emotional state, thoughts, evaluations, or expectations are evaluated as emotion or cognition (e.g., *"I have a bad feeling", "I hope he doesn't rape her"*). Indications of emotions are "*I consider / think / feel*".

Thoughts that are specified in more detail, or thoughts and feelings that fit together conceptually, are evaluated as one point.

**Categories of External Details (not specific to time and place).**

*Metacognition, semantic knowledge*: Semantic knowledge, self-concept, evaluations in retrospect, additional explanations from the present, and explanations of feelings are evaluated as metacognitions (e.g., "*When I think about it now, ...*", "*I know that's just a movie", "You don't do that because that's dangerous").* One indication of metacognition is, for example, the statement "*at this time I have...*".

*Repetitions:* Details that do not supply any new information and whose information was already mentioned analogously are not scored for a second time (analogous means that the repetition does not have to be word-for-word identical).

*Others:* Other elements are not considered or evaluated, including filler words (*"okay", "so", "exact",* etc.), corrections or muddling

***Correctness Ratings Based on Jack et al. (2014)***

*Correct:* Everything that can be verified unambiguously (in agreement between several raters) in the film; everything that happens within the presented scene, regardless of whether the temporal sequence fits. Here, if given, the temporal detail is then rated as incorrect. Also rated as correct are statements that do not contain the exact wording but do contain a synonym (examples of synonyms: *"you like that", "you're into that"*).

*Incorrect:* Everything that is definitely wrong according to the film will be rated as incorrect.

*Possible*: Everything that cannot be explicitly verified or falsified. (e.g., *"a prostitute at the roadside", "woman's boyfriend"*).

## S4. Cued Recall – Instructions, Questions and Correct Answers (English Translation)

*In the following, we ask you to answer some questions about the film clip you saw a week ago [Session 3] / two weeks ago [Session 4].*

*There are different types of questions:*

- ***Single Choice Questions [SC]****: Choose the correct answer alternative! Only one alternative is correct at a time.*

- ***Multiple Choice Questions [MC]****: Select the correct answer alternatives! Multiple answers are possible.*

***Now please try to answer the following questions as precisely and correctly as possible.***

***Thank you for your participation!***

1. For what reason did the woman leave the club? [SC]
   - She did not give a reason.
   - She said she wanted to sleep.
   - She said she was not feeling well.
   - **She gave another reason.**
   - I do not know.

2. How did the woman originally plan to get home? [SC]
   - **She planned to take a cab.**
   - She planned to take the subway.
   - She was planning to walk.
   - She was going to drive her own car.
   - I do not know.

3. Which statement best describes the way to the underpass? [SC]
   - The entrance to the underpass was right next to the club.
   - The way to the underpass led past a park.
   - **The way to the underpass led past a street.**
   - I do not know.

4. What color were the walls in the underpass? [SC]
   - **red**
   - white
   - gray
   - black
   - I do not know.

5. Describe what happened between the two people who were approaching from the other side of the underpass at the beginning. [MC]
   - The man spat at the woman.
   - **The man hit the woman.**
   - The woman kicked the man.
   - **The woman spoke to the man.**
   - None of the above answers.
   - I do not know.

6. Describe what the woman looked like who was seen in the underpass with the rapist at the beginning. [MC]
   - short hair
   - **brown hair**
   - **long hair**
   - **red dress**
   - **short dress**
   - **with jacket**
   - without jacket
   - I do not know.

7. What did the woman who is raped in the movie scene have with her? [MC]
   - a cigarette
   - a cell phone
   - **a handbag**
   - **a jacket**
   - I do not know.

8. What hairstyle was this woman wearing? [SC]
   - open hair
   - **a ponytail**
   - a chignon
   - a braided hairstyle
   - I do not know.

9. What color was the perpetrator's hair? [SC]
   - black
   - **brown**
   - gray
   - The perpetrator was bald.
   - I do not know.

10. What did the woman's handbag look like? [SC]
    - silver with short handles
    - brown with long handles
    - **black with short handles**
    - black with long handles
    - I do not know.

11. What did the perpetrator order the victim to do at the beginning of the scene? [SC]
    - “Be quiet!”
    - “Stop moving!”
    - **“I want you to stand still!”**
    - “I told you to shut up!”
    - I do not know.

12. With what did the perpetrator threaten the victim? [SC]
    - with a kitchen knife
    - **with a switchblade knife**
    - with a pocket knife
    - I do not know.

13. What did the perpetrator first ask the victim to do? [SC]
    - to lie down on his stomach
    - to kneel down and then lie down
    - to spread her legs
    - **to pull up the dress**
    - I do not know.

14. What kind of shoes was the victim wearing? [SC]
    - ballerinas
    - **open shoes**
    - boots
    - I do not know.

15. How did the perpetrator prevent the victim from screaming? [SC]
- He did not prevent the victim from screaming.
- He kept the knife in his hand all the time and threatened to stab the victim if he screamed.
- He gagged the victim.
- **He kept a tight grip on the victim so that she could not scream.**
- I do not know.

16. How many people were there in the underpass in the whole scene? [SC]
- 3 people
- 2 people
- **4 people**
- 5 people
- I do not know.

17. Did the rapist wear jewelry on his hands? [SC]
- No, the rapist did not wear jewelry.
- Yes, the rapist wore a ring on his left hand.
- **Yes, the rapist wore a ring on his right hand.**
- I do not know.

18. What color was the woman's underwear? [SC]
- **white**
- black
- red
- I do not know.

19. Did other people come into the underpass during the rape? [SC]
- Yes, a couple who turned back.
- **Yes, a man who watched the scene briefly.**
- No, no other person came into the underpass.
- Yes, a man who was walking through the underpass.
- I do not know.

20. What was in the background of the picture during the rape? [SC]
- **a flickering light**
- a staircase leading out of the underpass
- graffiti writing
- I do not know.

21. Did the perpetrator ingest anything during the rape and if so, how? [SC]
- Yes, he drank something.
- Yes, he inhaled something.
- **Yes, he snorted something.**
- No, he did not ingest anything.
- I do not know.

22. How did the woman behave while she was being raped? [MC]
- **She screamed.**
- She was flailing.
- She coughed.
- She tried to push the perpetrator away from her.
- **She whimpered.**
- She did not fight back.
- I do not know.

23. What was NOT visible on the floor in the underpass? [SC]
- handkerchiefs
- a light brown jacket
- a handbag
- **crumpled drink cans**
- I do not know.

24. What did the perpetrator want to be called by the victim? [SC]
- daddy
- **papa**
- dad
- I do not know.

25. How was the perpetrator dressed? [SC]
- **with a shirt and a brown suit**
- with a shirt and black pants
- with a shirt and a black suit
- I do not know.

26. How did the victim behave immediately after the rape? [SC]
- It crawled away from the perpetrator.
- She stayed on the ground and screamed.
- **She stayed on the ground and coughed.**
- I do not know.

27. How did the perpetrator hurt the woman first after raping her? [SC]
- He hit her head on the floor.
- He hit her in the face.
- **He kicked her in the face.**
- He kicked her in the stomach.
- I do not know.

28. What were the perpetrator's last words before the end of the scene? [SC]
- “You deserve this, fucking shit whore!”
- “I'll decide when I'm done with you, fucking shit whore!”
- **“There, I'm done with you now, fucking shit whore!”**
- I do not know.

29. How many times did the perpetrator kick his victim in the face? [SC]
    - 1 time
    - **2 times**
    - 3 times
    - 4 times
    - I do not know.

30. What could be seen on the ceiling beam of the underpass at the end of the scene? [SC]
    - paint splatters
    - various stickers
    - **graffiti writing**
    - I do not know.

31. Which threat did NOT come from the perpetrator? [SC]
    - to strangle the victim
    - to cut the victim
    - **to stab the victim**
    - The perpetrator made all of the above threats.
    - I do not know.

32. What did the scene end with? [SC]
    - The perpetrator punched his victim in the face.
    - The perpetrator hit the victim's head on the floor.
    - **The perpetrator spat at his victim.**
    - I do not know.

## S5. Tables

### Table 2.4

*Negative and Positive Affect (PANAS) Pre- and Post-Film for the Three Conditions*

| | Condition | | | | | |
|---|---|---|---|---|---|---|
| | ImRs (*n* = 39) | | ImE (*n* = 40) | | NIC (*n* = 40) | |
| PANAS | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI |
| Negative affect | | | | | | |
| pre-film | 12.82 (4.28) | [11.43; 14.21] | 12.90 (2.99) | [11.94; 13.86] | 12.45 (2.44) | [11.67; 13.23] |
| post-film | 25.21 (9.62) | [22.09; 28.32] | 23.10 (7.55) | [20.68; 25.52] | 26.45 (9.15) | [23.52; 29.38] |
| Positive affect | | | | | | |
| pre-film | 31.46 (6.72) | [29.28; 33.64] | 30.10 (6.40) | [28.05; 32.15] | 30.50 (5.49) | [28.75; 32.25] |
| post-film | 24.59 (6.59) | [22.45; 26.73] | 22.18 (6.67) | [20.04; 24.31] | 23.15 (5.99) | [21.23; 25.07] |

*Note.* ImRs = imagery rescripting; ImE = imaginal exposure; NIC = no-intervention control; PANAS = Positive and Negative Affect Schedule.

### Table 2.5

*Event-Based Intrusion Measures for the Three Conditions*

| | Condition | | | | | |
|---|---|---|---|---|---|---|
| | ImRs (*n* = 29) | | ImE (*n* = 33) | | NIC (*n* = 35) | |
| Intrusion measures | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI |
| Number of intrusive memories | 4.86 (4.85) | [3.02; 6.71] | 4.45 (5.59) | [2.47; 6.43] | 6.26 (5.84) | [4.25; 8.26] |
| Distress of intrusive memories[a] | 2.82 (.70) | [2.55; 3.08] | 2.60 (.84) | [2.30; 2.90] | 2.93 (1.20) | [2.52; 3.35] |
| Controllability of intrusive memories[b] | 4.21 (1.17) | [3.77; 4.66] | 4.29 (1.19) | [3.87; 4.71] | 3.95 (1.23) | [3.53; 4.37] |
| Vividness of intrusive memories[c] | 2.86 (.96) | [2.50; 3.23] | 2.64 (.81) | [2.35; 2.93] | 2.70 (1.04) | [2.34; 3.05] |

*Note.* ImRs = imagery rescripting; ImE = imaginal exposure; NIC = no-intervention control; PANAS = Positive and Negative Affect Schedule.

[a] *not at all stressful* = 1 *to very stressful* = 6.

[b] *not at all controllable* = 1 *to very controllable* = 6.

[c] *not at all vivid* = 1 *to very vivid* = 6.

**Table 2.6**

*Intrusion Measures for the Three Conditions at Sessions 1, 2, 3, and 4*

| | Condition | | | | | |
|---|---|---|---|---|---|---|
| | ImRs (*n* = 40) | | ImE (*n* = 40) | | NIC (*n* = 40) | |
| Intrusion measures | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI | *M* (*SD*) | 95% CI |
| Number of intrusive memories | | | | | | |
| Session 1 (*n* = 119)[a] | 4.54 (8.04) | [1.93; 7.14] | 2.33 (2.43) | [1.55; 3.10] | 3.40 (4.21) | [2.06; 4.74] |
| Session 2 (*n* = 120) | 3.63 (3.17) | [2.61; 4.64] | 3.60 (4.39) | [2.20; 5.00] | 4.78 (4.35) | [3.38; 6.17] |
| Session 3 (*n* = 120) | 8.13 (9.14) | [5.20; 11.05] | 6.33 (6.43) | [4.27; 8.38] | 9.32 (10.61) | [5.93; 12.72] |
| Session 4 (*n* = 119)[a] | 2.00 (2.78) | [1.10; 2.90] | .93 (1.23) | [.53; 1.32] | 1.30 (1.76) | [.74; 1.86] |
| Percent of time with intrusive memories | | | | | | |
| Session 1 (*n* = 120) | 39.50 (30.80) | [29.65; 49.34] | 26.25 (27.80) | [17.36; 35.14] | 28.00 (28.84) | [18.78; 37.22] |
| Session 2 (*n* = 120) | 19.00 (16.30) | [13.79; 24.21] | 14.25 (14.30) | [9.68; 18.82] | 16.50 (18.19) | [10.68; 22.32] |
| Session 3 (*n* = 120) | 15.50 (15.68) | [10.48; 20.52] | 12.75 (13.58) | [8.41; 17.09] | 12.25 (13.49) | [7.94; 16.56] |
| Session 4 (*n* = 119)[a] | 6.41 (7.43) | [4.00; 8.82] | 2.75 (5.06) | [1.13; 4.37] | 4.50 (7.83) | [2.00; 7.00] |
| Vividness of intrusive memories | | | | | | |
| Session 1 (*n* = 91)[b] | 52.94 (27.47) | [43.36; 62.53] | 44.48 (29.35) | [33.32; 55.65] | 51.79 (29.32) | [40.42; 63.15] |
| Session 2 (*n* = 106)[c] | 39.43 (24.00) | [31.18; 47.67] | 33.78 (22.53) | [26.27; 41.30] | 33.53 (22.68) | [25.62; 41.44] |
| Session 3 (*n* = 101)[d] | 38.18 (25.30) | [29.21; 47.15] | 29.41 (19.06) | [22.76; 36.06] | 28.82 (18.71) | [22.30; 35.35] |
| Session 4 (*n* = 70)[e] | 26.40 (19.77) | [18.24; 34.56] | 19.09 (19.00) | [10.67; 27.52] | 15.65 (12.73) | [10.15; 21.16] |
| Distress of intrusive memories | | | | | | |
| Session 1 (*n* = 91)[f] | 55.00 (27.77) | [45.31; 64.69] | 42.14 (29.86) | [30.56; 53.72] | 51.72 (33.92) | [38.82; 64.63] |
| Session 2 (*n* = 107)[g] | 35.43 (23.56) | [27.34; 43.52] | 27.30 (19.24) | [20.88; 33.71] | 40.00 (29.31) | [29.93; 50.07] |
| Session 3 (*n* = 101)[d] | 33.73 (21.98) | [24.93; 40.52] | 23.82 (19.54) | [17.00; 30.64] | 31.76 (25.88) | [22.74; 40.79] |
| Session 4 (*n* = 71)[h] | 22.00 (18.93) | [14.19; 29.81] | 16.25 (15.83) | [9.57; 22.93] | 24.09 (23.84) | [13.52; 34.66] |
| Controllability of intrusive memories | | | | | | |
| Session 1 (*n* = 91)[f] | 55.29 (27.99) | [45.53; 65.06] | 61.43 (29.53) | [49.98; 72.88] | 51.72 (28.79) | [40.77; 62.68] |
| Session 2 (*n* = 107)[g] | 58.00 (25.53) | [49.23; 66.77] | 60.27 (30.87) | [49.98; 70.56] | 57.43 (31.00) | [46.78; 68.08] |
| Session 3 (*n* = 101)[d] | 62.73 (24.14) | [54.17; 71.29] | 66.18 (30.95) | [55.38; 76.97] | 64.71 (28.73) | [54.68; 74.73] |
| Session 4 (*n* = 68)[i] | 58.33 (29.14) | [46.03; 70.64] | 65.22 (39.30) | [48.22; 82.21] | 65.24 (35.16) | [49.23; 81.24] |

*Note*. ImRs = imagery rescripting; ImE = imaginal exposure; NIC = no-intervention control; PANAS = Positive and Negative Affect Schedule; Session 1: after a 10-min break after the trauma film; Session 2: 1 day after Session 1; Session 3: 6 days after Session 2; Session 4: 1 week after Session 3.

[a] ImRs (*n* = 39).

[b] ImRs (*n* = 34); ImE (*n* = 29); NIC (*n* = 28).

[c] ImRs (*n* = 35); ImE (*n* = 37); NIC (*n* = 34).

[d] ImRs (*n* = 33); ImE (*n* = 34); NIC (*n* = 34).

[e] ImRs (*n* = 25); ImE (*n* = 22); NIC (*n* = 23).

[f] ImRs (*n* = 34); ImE (*n* = 28); NIC (*n* = 29).

[g] ImRs (*n* = 35); ImE (*n* = 37); NIC (*n* = 35).

[h] ImRs (*n* = 25); ImE (*n* = 24); NIC (*n* = 22).

[i] ImRs (*n* = 24); ImE (*n* = 23); NIC (*n* = 21).

# Appendix C: Supplementary Materials Study III

## S1. References Included in the Systematic Review

*Aleksic, M., Reineck, A., Ehring, T., & Wolkenstein, L. (2024). When does imagery rescripting become a double-edged sword? - Investigating the risk of memory distortion through imagery rescripting in an online Trauma film study. *Behaviour Research and Therapy*, *174*, 14, Article 104495. https://doi.org/10.1016/j.brat.2024.104495

*Baran, B., & Niedzwienska, A. (2002). Imagination inflation and implict memory theories. *Imagination, Cognition and Personality*, *22*(3), 227-289. https://doi.org/10.2190/E4FW-3414-X5DB-EDV9

*Barnier, A. J., & McConkey, K. M. (1992). Reports of real and false memories: The relevance of hypnosis, hypnotizability, and context of memory test. *Journal of Abnormal Psychology*, *101*(3), 521-527. https://doi.org/10.1037/0021-843X.101.3.521

*Bays, R. B., Foley, M. A., & Zabrucky, K. M. (2013). Timing does matter: Examining imagery's impact on the temporal origins of false beliefs. *Acta Psychologica*, *142*(1), 30-37. https://doi.org/10.1016/j.actpsy.2012.10.004

*Bays, R. B., Zabrucky, K. M., & Foley, M. A. (2015). Imagery induction processes differentially impact imagination inflation. *Imagination, Cognition and Personality*, *35*(1), 5-25. https://doi.org/10.1177/0276236615574487

*Bays, R. B., Zabrucky, K. M., & Gagne, P. (2012). When plausibility manipulations work: An examination of their role in the development of false beliefs and memories. *Memory*, *20*(6), 638-644. https://doi.org/10.1080/09658211.2012.692797

*Calvillo, D. P., & Emami, A. S. (2019). Do lateral eye movements increase susceptibility to misinformation? A registered replication. *Psychonomic Bulletin & Review*, *26*(6), 1905-1910. https://doi.org/10.3758/s13423-019-01641-6

*Calvillo, D. P., Vasquez, A. N., & Pesavento, A. (2019). Imagination inflation effects are unrelated across two imagination inflation tasks. *Psychology of Consciousness: Theory, Research, and Practice*, *6*(1), 90-98. https://doi.org/10.1037/cns0000178

*Christman, S. D., Garvey, K. J., Propper, R. E., & Phaneuf, K. A. (2003). Bilateral eye movements enhance the retrieval of episodic memories. *Neuropsychology*, *17*(2), 221-229. https://doi.org/10.1037/0894-4105.17.2.221

*Clancy, S. A., McNally, R. J., & Schacter, D. L. (1999). Effects of guided imagery on memory distortion in women reporting recovered memories of childhood sexual abuse. *Journal of Traumatic Stress*, *12*(4), 559-569. https://doi.org/10.1023/A:1024704815234

*Clark, E. L., Daley, R. T., Deason, R. G., O'Connor, M. K., Budson, A. E., & DeCaro, R. E. (2022). Cue-utilization in the imagination inflation effect paradigm in older adults with mild cognitive impairment. *Neuropsychology*, *36*(4), 297-313. https://doi.org/10.1037/neu0000801

*Devitt, A. L., Monk-Fromont, E., Schacter, D. L., & Addis, D. R. (2016). Factors that influence the generation of autobiographical memory conjunction errors. *Memory*, *24*(2), 204-222. https://doi.org/10.1080/09658211.2014.998680

*Devitt, A. L., Tippett, L., Schacter, D. L., & Addis, D. R. (2016). Autobiographical memory conjunction errors in younger and older adults: Evidence for a role of inhibitory ability. *Psychology and Aging*, *31*(8), 927-942. https://doi.org/10.1037/pag0000129

*Dhammapeera, P., Brunskill, C., Hellerstedt, R., & Bergström, Z. M. (2024). Counterfactual imagination impairs memory for true actions: EEG and behavioural evidence.

*Cognitive Neuroscience*, *15*(1), 12-23. https://doi.org/10.1080/17588928.2024.2315814

*El Haj, M., & Robin, F. (2020). The thin line between reality and imagination: The imagination inflation effect in Korsakoff's syndrome. *Neuropsychology*, *34*(5), 569-577. https://doi.org/10.1037/neu0000635

*Ganslmeier, M., Ehring, T., & Wolkenstein, L. (2023). Effects of imagery rescripting and imaginal exposure on voluntary memory. *Behaviour Research and Therapy*, *170*, 11, Article 104409. https://doi.org/10.1016/j.brat.2023.104409

*Ganslmeier, M., Kunze, A. E., Ehring, T., & Wolkenstein, L. (2023). The dilemma of trauma-focused therapy: effects of imagery rescripting on voluntary memory. *Psychological Research-Psychologische Forschung*, *87*(5), 1616-1631. https://doi.org/10.1007/s00426-022-01746-z

*Garry, M., Manning, C. G., Loftus, E. F., & Sherman, S. J. (1996). Imagination inflation: Imagining a childhood event inflates confidence that it occurred. *Psychonomic Bulletin & Review*, *3*(2), 208-214. https://doi.org/10.3758/BF03212420

*Geiselman, R. E., Fisher, R. P., MacKinnon, D. P., & Holland, H. L. (1985). Eyewitness memory enhancement in the police interview: Cognitive retrieval mnemonics versus hypnosis. *Journal of Applied Psychology*, *70*(2), 401-412. https://doi.org/10.1037/0021-9010.70.2.401

*Gerlach, K. D., Dornblaser, D. W., & Schacter, D. L. (2014). Adaptive constructive processes and memory accuracy: Consequences of counterfactual simulations in young and older adults. *Memory*, *22*(1), 145-162. https://doi.org/10.1080/09658211.2013.779381

*Goff, L. M., & Roediger, H. L., III. (1998). Imagination inflation for action events: Repeated imaginings lead to illusory recollections. *Memory & Cognition*, *26*(1), 20-33. https://doi.org/10.3758/BF03211367

*Hagenaars, M. A., & Arntz, A. (2012). Reduced intrusion development after post-trauma imagery rescripting: an experimental study. *Journal of Behavior Therapy and Experimental Psychiatry*, *43*(2), 808-814. https://doi.org/10.1016/j.jbtep.2011.09.005

*Heaps, C., & Nash, M. (1999). Individual differences in imagination inflation. *Psychonomic Bulletin & Review*, *6*(2), 313-318. https://doi.org/10.3758/BF03214120

*Herndon, P., Myers, B., Mitchell, K., Kehn, A., & Henry, S. (2014). False memories for highly aversive early childhood events: Effects of guided imagery and group influence. *Psychology of Consciousness: Theory, Research, and Practice*, *1*(1), 20-31. https://doi.org/10.1037/cns0000011

*Horselenberg, R., Merckelbach, H., Muris, P., Rassin, E., Sijsenaar, M., & Spaan, V. (2000). Imagining fictitious childhood events: The role of individual differences in imagination inflation. *Clinical Psychology & Psychotherapy*, *7*(2), 128-137. https://doi.org/10.1002/(SICI)1099-0879(200005)7:2<128::AID-CPP238>3.0.CO;2-Q

*Houben, S. T., Otgaar, H., Roelofs, J., & Merckelbach, H. (2018). Lateral eye movements increase false memory rates. *Clinical Psychological Science*, *6*(4), 610-616. https://doi.org/10.1177/2167702618757658

*Hyman, I. E., Jr., & Pentland, J. (1996). The role of mental imagery in the creation of false childhood memories. *Journal of Memory and Language*, *35*(2), 101-117. https://doi.org/10.1006/jmla.1996.0006

*Krackow, E., Lynn, S. J., & Payne, D. G. (2005). The death of Princess Diana: The effects of memory enhancement procedures on flashbulb memories. *Imagination, Cognition and Personality*, *25*(3), 197-219. https://doi.org/10.2190/FBCF-T8VG-L5LJ-N8VL

*Lampinen, J. M., Odegard, T. N., & Bullington, J. L. (2003). Qualities of memories for performed and imagined actions. *Applied Cognitive Psychology*, *17*(8), 881-893. https://doi.org/10.1002/acp.916

*Landau, J. D., & von Glahn, N. (2004). Warnings reduce the magnitude of the imagination inflation effect. *The American Journal of Psychology*, *117*(4), 579-593. https://doi.org/10.2307/4148993

*Lindner, I., & Echterhoff, G. (2015). Imagination inflation in the mirror: Can imagining others' actions induce false memories of self-performance? *Acta Psychologica*, *158*, 51-60. https://doi.org/10.1016/j.actpsy.2015.03.008

*Lindner, I., Echterhoff, G., Davidson, P. S. R., & Brand, M. (2010). Observation inflation: Your actions become mine. *Psychological Science*, *21*(9), 1291-1299. https://doi.org/10.1177/0956797610379860

*Lyle, K. B. (2018). Effects of handedness consistency and saccade execution on eyewitness memory in cued- and free-recall procedures. *Memory*, *26*(9), 1169-1180. https://doi.org/10.1080/09658211.2017.1420802

*Lyle, K. B., & Jacobs, N. E. (2010). Is saccade-induced retrieval enhancement a potential means of improving eyewitness evidence? *Memory*, *18*(6), 581-594. https://doi.org/10.1080/09658211.2017.1420802

*Marsh, B. U., Pezdek, K., & Lam, S. T. (2014). Imagination perspective affects ratings of the likelihood of occurrence of autobiographical memories. *Acta Psychologica*, *150*, 114-119. https://doi.org/10.1016/j.actpsy.2014.05.006

*Mazzoni, G., & Memon, A. (2003). Imagination can create false autobiographical memories. *Psychological Science*, *14*(2), 186-188. https://doi.org/10.1046/j.1432-1327.1999.00020.x

*Meckling, H. I., Nauta, M. H., van Hout, W., & Wessel, I. (2024). The effects of eye movements on the content and characteristics of unpleasant autobiographical memories: an extended replication study. *Memory*, *32*(6), 738-756. https://doi.org/10.1080/09658211.2024.2307925

*Memon, A., Hope, L., Bartlett, J., & Bull, R. (2002). Eyewitness recognition errors: The effects of mugshot viewing and choosing in young and old adults. *Memory & Cognition*, *30*(8), 1219-1227. https://doi.org/10.3758/bf03213404

*Nash, R. A., Wade, K. A., & Lindsay, D. S. (2009). Digitally manipulating memory: Effects of doctored videos and imagination in distorting beliefs and memories. *Memory & Cognition*, *37*(4), 414-424. https://doi.org/10.3758/MC.37.4.414

*Nourkova, V. V., & Vasilenko, D. A. (2018). On the advantage of autobiographical memory pliability: Implantation of positive self-defining memories reduces trait anxiety. *Memory*, *26*(7), 869-881. https://doi.org/10.1080/09658211.2017.1420195

*O'Connor, M. K., Deason, R. G., Reynolds, E., Tat, M. J., Flannery, S., Solomon, P. R., Vassey, E. A., & Budson, A. E. (2015). The imagination inflation effect in healthy older adults and patients with mild Alzheimer's disease. *Neuropsychology*, *29*(4), 550-560. https://doi.org/10.1037/neu0000195

*Paddock, J. R., Joseph, A. L., Chan, F. M., Terranova, S., Manning, C., & Loftus, E. F. (1998). When guided visualization procedures may backfire: Imagination inflation and predicting individual differences in suggestibility. *Applied Cognitive Psychology*, *12*(7), S63-S75. https://doi.org/10.1002/(SICI)1099-0720(199812)12:7<S63::AID-ACP600>3.0.CO;2-S

*Paddock, J. R., Noel, M., Terranova, S., Eber, H. W., Manning, C., & Loftus, E. F. (1999). Imagination inflation and the perils of guided visualization. *The Journal of*

*Psychology: Interdisciplinary and Applied*, *133*(6), 581-595. https://doi.org/10.1080/00223989909599764

*Paddock, J. R., & Terranova, S. (2001). Guided visualization and suggestibility: Effect of perceived authority on recall of autobiographical memories. *Journal of Genetic Psychology*, *162*(3), 347-356. https://doi.org/10.1080/00221320109597488

*Paddock, J. R., Terranova, S., Kwok, R., & Halpern, D. V. (2000). When knowing becomes remembering: Individual differences in susceptibility to suggestion. *Journal of Genetic Psychology*, *161*(4), 453-468. https://doi.org/10.1080/00221320009596724

*Parker, A., Buckley, S., & Dagnall, N. (2009). Reduced misinformation effects following saccadic bilateral eye movements. *Brain and Cognition*, *69*(1), 89-97. https://doi.org/10.1016/j.bandc.2008.05.009

*Parker, A., & Dagnall, N. (2019). Reduced impact of imagery processing on false autobiographical recollection: The effects of dynamic visual noise. *Memory*, *27*(2), 163-173. https://doi.org/10.1080/09658211.2018.1495236

*Pezdek, K., Blandon-Gitlin, I., & Gabbay, P. (2006). Imagination and memory: Does imagining implausible events lead to false autobiographical memories? *Psychonomic Bulletin & Review*, *13*(5), 764-769. https://doi.org/10.3758/BF03193994

*Pezdek, K., & Eddy, R. M. (2001). Imagination inflation: A statistical artifact of regression toward the mean. *Memory & Cognition*, *29*(5), 707-718. https://doi.org/10.3758/BF03200473

*Qin, J. J., Ogle, C. A., & Goodman, G. S. (2008). Adults' Memories of Childhood: True and False Reports. *Journal of Experimental Psychology-Applied*, *14*(4), 373-391. https://doi.org/10.1037/a0014309

*Ready, D. J., Bothwell, R. K., & Brigham, J. C. (1997). The effects of hypnosis, context reinstatement, and anxiety on eyewitness memory. *International Journal of Clinical* *and Experimental Hypnosis*, *45*(1), 55-68. https://doi.org/10.1080/00207149708416106

*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

*Seamon, J. G., Blumenson, C. N., Karp, S. R., Perl, J. J., Rindlaub, L. A., & Speisman, B. B. (2009). Did we see someone shake hands with a fire hydrant?: Collaborative recall affects false recollections from a campus walk. *The American Journal of Psychology*, *122*(2), 235-247. https://doi.org/10.2307/27784394

*Seamon, J. G., Philbin, M. M., & Harrison, L. G. (2006). Do you remember proposing marriage to the Pepsi machine? False recollections from a campus walk. *Psychonomic Bulletin & Review*, *13*(5), 752-756. https://doi.org/10.3758/BF03193992

*Segovia, K. Y., & Bailenson, J. N. (2009). Virtually True: Children's Acquisition of False Memories in Virtual Reality. *Media Psychology*, *12*(4), 371-393. https://doi.org/10.1080/15213260903287267

*Sharman, S. J., & Barnier, A. J. (2008). Imagining nice and nasty events in childhood or adulthood: Recent positive events show the most imagination inflation. *Acta Psychologica*, *129*(2), 228-233. https://doi.org/10.1016/j.actpsy.2008.06.003

*Sharman, S. J., & Calacouris, S. (2010). Do people's motives influence their susceptibility to imagination inflation? *Experimental Psychology*, *57*(1), 77-82. https://doi.org/10.1027/1618-3169/a000010

*Sharman, S. J., Garry, M., & Beuke, C. J. (2004). Imagination or exposure causes imagination inflation. *The American Journal of Psychology*, *117*(2), 157-168. https://doi.org/10.2307/4149020

*Sharman, S. J., Garry, M., & Hunt, M. (2005). Using source cues and familiarity cues to resist imagination inflation. *Acta Psychologica*, *120*(3), 227-242. https://doi.org/10.1016/j.actpsy.2005.04.002

*Sharman, S. J., & Powell, M. B. (2013). Do Cognitive Interview Instructions Contribute to False Beliefs and Memories? *Journal of Investigative Psychology and Offender Profiling*, *10*(1), 114-124. https://doi.org/10.1002/jip.1371

*Sharman, S. J., & Scoboria, A. (2009). Imagination equally influences false memories of high and low plausibility events. *Applied Cognitive Psychology*, *23*(6), 813-827. https://doi.org/10.1002/acp.1515

*Sheehan, P. W., Green, V., & Truesdale, P. (1992). Influence of rapport on hypnotically induced pseudomemory. *Journal of Abnormal Psychology*, *101*(4), 690-700. https://doi.org/10.1037/0021-843X.101.4.690

*Sheehan, P. W., & Statham, D. (1989). Hypnosis, the timing of its introduction, and acceptance of misleading information. *Journal of Abnormal Psychology*, *98*(2), 170-176. https://doi.org/10.1037/0021-843X.98.2.170

*Sheehan, P. W., Statham, D., & Jamieson, G. A. (1991a). Pseudomemory effects and their relationship to level of susceptibility to hypnosis and state instruction. *Journal of Personality and Social Psychology*, *60*(1), 130-137. https://doi.org/10.1037/0022-3514.60.1.130

*Sheehan, P. W., Statham, D., & Jamieson, G. A. (1991b). Pseudomemory effects over time in the hypnotic setting. *Journal of Abnormal Psychology*, *100*(1), 39-44. https://doi.org/10.1037/0021-843X.100.1.39

*Sheehan, P. W., & Tilden, J. (1983). Effects of suggestibility and hypnosis on accurate and distorted retrieval from memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *9*(2), 283-293. https://doi.org/10.1037/0278-7393.9.2.283

*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

*Stróżak, P. (2008). Mindfulness/mindlessness as a new factor influencing false memories: Evidence from imagination inflation and modified premature cognitive commitment study. *Polish Psychological Bulletin*, *39*(4), 202-208. https://doi.org/10.2478/v10059-008-0015-6

*Takarangi, M. K. T., Strange, D., Shortland, A. E., & James, H. E. (2013). Source confusion influences the effectiveness of the autobiographical IAT. *Psychonomic Bulletin & Review*, *20*(6), 1232-1238. https://doi.org/10.3758/s13423-013-0430-3

*Thomas, A. K., & Bulevich, J. B. (2006). Effective cue utilization reduces memory errors in older adults. *Psychology and Aging*, *21*(2), 379-389. https://doi.org/10.1037/0882-7974.21.2.379

*Thomas, A. K., Bulevich, J. B., & Loftus, E. F. (2003). Exploring the role of repetition and sensory elaboration in the imagination inflation effect. *Memory & Cognition*, *31*(4), 630-640. https://doi.org/10.3758/BF03196103

*Thomas, A. K., & Loftus, E. F. (2002). Creating bizarre false memories through imagination. *Memory & Cognition*, *30*(3), 423-431. https://doi.org/10.3758/bf03194942

*van Schie, K., & Leer, A. (2019). Lateral Eye Movements Do Not Increase False-Memory Rates: A Failed Direct-Replication Study. *Clinical Psychological Science*, *7*(5), 1159-1167, Article 2167702619859335. https://doi.org/10.1177/2167702619859335

*Wagstaff, G. F., Cole, J., Wheatcroft, J., Anderton, A., & Madden, H. (2008). Reducing and reversing pseudomemories with hypnosis. *Contemporary Hypnosis*, *25*(3-4), 178-191. https://doi.org/10.1002/ch.366

*Wagstaff, G. F., Cole, J., Wheatcroft, J., Marshall, M., & Barsby, I. (2007). A componential approach to hypnotic memory facilitation: Focused meditation, context reinstatement and eye movements. *Contemporary Hypnosis*, *24*(3), 97-108. https://doi.org/10.1002/ch.334

*Worthen, J. B., & Wood, V. V. (2001). Memory discrimination for self-performed and imagined acts: Bizarreness effects in false recognition. *The Quarterly Journal of Experimental Psychology A: Human Experimental Psychology*, *54*(1), 49-67. https://doi.org/10.1080/02724980042000020

*Wright, D. B., Loftus, E. F., & Hall, M. (2001). Now you see it; Now you don't: Inhibiting recall and recognition of scenes. *Applied Cognitive Psychology*, *15*(5), 471-482. https://doi.org/10.1002/acp.719

*Xu, Z. J., Hu, J., & Wang, Y. Y. (2023). Bilateral eye movements disrupt the involuntary perceptual representation of trauma-related memories. *Behaviour Research and Therapy*, *165*, 10, Article 104311. https://doi.org/10.1016/j.brat.2023.104311

## S2. Search Strategy

### *Database Search Strings*

| | | |
|---|---|---|
| | Web of Science | |
| | TS=(“false memor*” OR “distort* memor*” OR “memor* distort*” OR “illusory memor*” OR “implant* memor*” OR “memor* implantat*” OR “memor* induct*” OR “induc* memor*” OR “imagination inflation” OR “pseudo memor*” OR “pseudomemor*” OR “suggest* memor*” OR “repressed memor*” OR “recover* memor*” OR “consolidat* memor*” OR “memor* consolidat*” OR “autobiographical memor*” OR “declarative memor*” OR “episodic memor*” OR “explicit memor*” “voluntary memor*” OR “factual memor*” OR “intrusive memor*” OR “false recall” OR “false recognition” OR “false recollection” OR “illusory recollection” OR misinformation OR “source monitoring” OR “source misattribution” OR “improv* memor*” OR “memor* improv*” OR “enhanc* memor*” OR “memor* enhanc*”) AND TS=(imagination OR imagining OR imagery OR rescripting OR imaginal OR exposure OR rehearsal OR EMDR OR “Eye Movement Desensitization and Reprocessing” OR hypnosis OR “trauma-focused” OR ”trauma therapy” OR “memor* recover*” OR “suggestive interview”) AND TS=(accuracy OR confiden* OR belief* OR likelihood OR plausibility OR “memor* test” OR “memor* task” OR recall OR recognition OR recollect* OR retrieval OR ”consolidated memor*” OR remember*) | 4,015 |
| | PubMed | |
| | ("false memor*"[Title/Abstract] OR "distort* memor*"[Title/Abstract] OR "memor* distort*"[Title/Abstract] OR "illusory memor*"[Title/Abstract] OR "implant* memor*"[Title/Abstract] OR "memor* implantat*"[Title/Abstract] OR "memor* induct*"[Title/Abstract] OR "induc* memor*"[Title/Abstract] OR "imagination inflation"[Title/Abstract] OR "pseudo memor*"[Title/Abstract] OR "pseudomemor*"[Title/Abstract] OR "suggest* memor*"[Title/Abstract] OR "repressed memor*"[Title/Abstract] OR "recover* memor*"[Title/Abstract] OR "consolidat* memor*"[Title/Abstract] OR "memor* consolidat*"[Title/Abstract] OR "autobiographical memor*"[Title/Abstract] OR "declarative memor*"[Title/Abstract] OR "episodic memor*"[Title/Abstract] OR "explicit memor*" "voluntary memor*"[Title/Abstract] OR "factual memor*"[Title/Abstract] OR "intrusive memor*"[Title/Abstract] OR "false recall"[Title/Abstract] OR "false recognition"[Title/Abstract] OR "false recollection"[Title/Abstract] OR "illusory recollection"[Title/Abstract] OR misinformation[Title/Abstract] OR "source monitoring"[Title/Abstract] OR "source misattribution"[Title/Abstract] OR "improv* memor*"[Title/Abstract] OR "memor* improv*"[Title/Abstract] OR "enhanc* memor*"[Title/Abstract] OR "memor* enhanc*") (imagination[Title/Abstract] OR imagining[Title/Abstract] OR imagery[Title/Abstract] OR rescripting[Title/Abstract] OR imaginal[Title/Abstract] OR exposure[Title/Abstract] OR rehearsal[Title/Abstract] OR EMDR[Title/Abstract] OR "Eye Movement Desensitization and Reprocessing"[Title/Abstract] OR hypnosis[Title/Abstract] OR "trauma-focused"[Title/Abstract] OR "trauma therapy"[Title/Abstract] OR "memor* recover*"[Title/Abstract] OR "suggestive interview") (accuracy[Title/Abstract] OR confiden*[Title/Abstract] OR belief*[Title/Abstract] OR likelihood[Title/Abstract] OR plausibility[Title/Abstract] OR "memor* test"[Title/Abstract] OR "memor* task"[Title/Abstract] OR recall[Title/Abstract] OR recognition[Title/Abstract] OR recollect*[Title/Abstract] OR retrieval[Title/Abstract] OR "consolidated memor*"[Title/Abstract] OR remember*[Title/Abstract]) | 603 |

| | | |
|---|---|---|
| | APA PsycINFO, APA PsycArticles, PSYNDEX Literature with PSYNDEX Tests | |
| S1 | TI (“false memor*” OR “distort* memor*” OR “memor* distort*” OR “illusory memor*” OR “implant* memor*” OR “memor* implantat*” OR “memor* induct*” OR “induc* memor*” OR “imagination inflation” OR “pseudo memor*” OR “pseudomemor*” OR “suggest* memor*” OR “repressed memor*” OR “recover* memor*” OR “consolidat* memor*” OR “memor* consolidat*” OR “autobiographical memor*” OR “declarative memor*” OR “episodic memor*” OR “explicit memor*” “voluntary memor*” OR “factual memor*” OR “intrusive memor*” OR “false recall” OR “false recognition” OR “false recollection” OR “illusory recollection” OR misinformation OR “source monitoring” OR “source misattribution” OR “improv* memor*” OR “memor* improv*” OR “enhanc* memor*” OR “memor* enhanc*”) AND TI (imagination OR imagining OR imagery OR rescripting OR imaginal OR exposure OR rehearsal OR EMDR OR “Eye Movement Desensitization and Reprocessing” OR hypnosis OR “trauma-focused” OR ”trauma therapy” OR “memor* recover*” OR “suggestive interview”) AND TI (accuracy OR confiden* OR belief* OR likelihood OR plausibility OR “memor* test” OR “memor* task” OR recall OR recognition OR recollect* OR retrieval OR ”consolidated memor*” OR remember*) | 47 |
| S2 | AB (“false memor*” OR “distort* memor*” OR “memor* distort*” OR “illusory memor*” OR “implant* memor*” OR “memor* implantat*” OR “memor* induct*” OR “induc* memor*” OR “imagination inflation” OR “pseudo memor*” OR “pseudomemor*” OR “suggest* memor*” OR “repressed memor*” OR “recover* memor*” OR “consolidat* memor*” OR “memor* consolidat*” OR “autobiographical memor*” OR “declarative memor*” OR “episodic memor*” OR “explicit memor*” “voluntary memor*” OR “factual memor*” OR “intrusive memor*” OR “false recall” OR “false recognition” OR “false recollection” OR “illusory recollection” OR misinformation OR “source monitoring” OR “source misattribution” OR “improv* memor*” OR “memor* improv*” OR “enhanc* memor*” OR “memor* enhanc*”) AND AB (imagination OR imagining OR imagery OR rescripting OR imaginal OR exposure OR rehearsal OR EMDR OR “Eye Movement Desensitization and Reprocessing” OR hypnosis OR “trauma-focused” OR ”trauma therapy” OR “memor* recover*” OR “suggestive interview”) AND AB (accuracy OR confiden* OR belief* OR likelihood OR plausibility OR “memor* test” OR “memor* task” OR recall OR recognition OR recollect* OR retrieval OR ”consolidated memor*” OR remember*) | 1,992 |
| | PTSDpubs | |
| S1 | title(“false memor*” OR “distort* memor*” OR “memor* distort*” OR “illusory memor*” OR “implant* memor*” OR “memor* implantat*” OR “memor* induct*” OR “induc* memor*” OR “imagination inflation” OR “pseudo memor*” OR “pseudomemor*” OR “suggest* memor*” OR “repressed memor*” OR “recover* memor*” OR “consolidat* memor*” OR “memor* consolidat*” OR “autobiographical memor*” OR “declarative memor*” OR “episodic memor*” OR “explicit memor*” “voluntary memor*” OR “factual memor*” OR “intrusive memor*” OR “false recall” OR “false recognition” OR “false recollection” OR “illusory recollection” OR misinformation OR “source monitoring” OR “source misattribution” OR “improv* memor*” OR “memor* improv*” OR “enhanc* memor*” OR “memor* enhanc*”) AND title(imagination OR imagining OR imagery OR rescripting OR imaginal OR exposure OR rehearsal OR EMDR OR “Eye Movement Desensitization and Reprocessing” OR hypnosis OR “trauma-focused” OR ”trauma therapy” OR “memor* recover*” OR “suggestive interview”) AND title(accuracy OR confiden* OR belief* OR likelihood OR plausibility OR “memor* test” OR “memor* task” OR recall OR recognition OR recollect* OR retrieval OR ”consolidated memor*” OR remember*) | 2 |

| | | |
|---|---|---|
| S2 | abstract("false memor*" OR "distort* memor*" OR "memor* distort*" OR "illusory memor*" OR "implant* memor*" OR "memor* implantat*" OR "memor* induct*" OR "induc* memor*" OR "imagination inflation" OR "pseudo memor*" OR "pseudomemor*" OR "suggest* memor*" OR "repressed memor*" OR "recover* memor*" OR "consolidat* memor*" OR "memor* consolidat*" OR "autobiographical memor*" OR "declarative memor*" OR "episodic memor*" OR "explicit memor*" "voluntary memor*" OR "factual memor*" OR "intrusive memor*" OR "false recall" OR "false recognition" OR "false recollection" OR "illusory recollection" OR misinformation OR "source monitoring" OR "source misattribution" OR "improv* memor*" OR "memor* improv*" OR "enhanc* memor*" OR "memor* enhanc*") AND abstract(imagination OR imagining OR imagery OR rescripting OR imaginal OR exposure OR rehearsal OR EMDR OR "Eye Movement Desensitization and Reprocessing" OR hypnosis OR "trauma-focused" OR "trauma therapy" OR "memor* recover*" OR "suggestive interview") AND abstract(accuracy OR confiden* OR belief* OR likelihood OR plausibility OR "memor* test" OR "memor* task" OR recall OR recognition OR recollect* OR retrieval OR "consolidated memor*" OR remember*) | 125 |

**Overview of Search Results**

1. Web of Science: 4,015 included records
2. Pubmed: 603 included records
3. APA PsycINFO, APA PsycArticles, PSYNDEX Literature with PSYNDEX Tests:

   S1: 47 included records (43 exportable; difference due to technical limitations)

   S1: 1,992 included records (1,941 exportable; difference due to technical limitations)
4. PTSDpubs:

   S1: 2 included records

   S2: 125 included records

**Total of included studies: 6,784**

**Total of exported studies: 6,729**

**After removing duplicates: 4,767**

**Other Sources**

**Process:**

To identify additional relevant publications, we conducted backward reference searches of all included studies as well as of previously published reviews.

**Studies additionally identified: 5**

## S3. List of Excluded Studies

Table S3.1 lists the 40 studies excluded at the full-text screening stage for which specific exclusion reasons were documented. The remaining 560 studies were excluded based on clearly ineligible full-text content (e.g., stimulus material not event-related, lack of imagery, inappropriate study design or outcome) and were not recorded individually.

**Table S3.1**

*List of Excluded Studies with Specific Exclusion Reasons*

| Study | Reason for exclusion |
|---|---|
| Arbuthnott (2005) | No appropriate control group or study design |
| Beaulieu-Prévost and Zadra (2015) | No event-related imagery |
| Bernstein et al. (2005a) | No appropriate control group or study design |
| Bernstein et al. (2005b) | No imagery-based intervention |
| Bryant and Barnier (1999) | No event-related imagery (non-memory content) |
| Burgess and Kirsch (1999) | No event-related imagery |
| Castelli and Ghetti (2014) | No event-related imagery |
| Crawley and French (2005) | No appropriate control group or study design |
| Crowe et al. (2003) | No appropriate control group or study design |
| Dasgupta et al. (1995) | No imagery-based intervention |
| De Brigard et al. (2013) | No appropriate memory outcome |
| Dilevski et al. (2020) | No appropriate control group or study design |
| Ghetti et al. (2008) | No appropriate control group or study design |
| Henkel et al. (2000) | No event-related imagery |
| Henquet et al. (2005) | No imagery-based intervention |
| Lakshmanan and Krishnan (2009) | No event-related imagery |
| Laney et al. (2008) | No appropriate control group or study design |
| Li et al. (2020) | No appropriate control group or study design |
| Mammarella (2007) | No event-related imagery |
| Mammarella et al. (2010) | No event-related imagery |
| McBrien and Dagenbach (1998) | No imagery-based intervention |
| McDaniel et al. (2008) | No event-related imagery |

| Study | Reason for exclusion |
|---|---|
| Miles et al. (2004) | No imagery-based intervention |
| Oulton et al. (2018) | No event-related imagery |
| Scoboria et al. (2012) | No appropriate control group or study design |
| Scoboria et al. (2008) | No imagery-based intervention |
| Scoboria et al. (2018) | No appropriate memory outcome |
| Spanos and Bures (1994)[a] | No event-related imagery (non-memory content) |
| Spanos et al. (1999) | No event-related imagery (non-memory content) |
| Spanos et al. (1989)[a] | No appropriate control group or study design |
| Stanley et al. (2017) | No appropriate control group or study design |
| Stark and Perfect (2007) | No imagery-based intervention |
| Stark and Perfect (2006) | No event-related imagery |
| Sugimori and Kusumi (2008) | No appropriate control group or study design |
| Thomas et al. (2007) | No event-related imagery (non-memory content) |
| von Glahn et al. (2012) | No imagery-based intervention |
| Weekes et al. (1992) | No event-related imagery (non-memory content) |
| Whitehouse et al. (1988) | No imagery-based intervention |
| Whitehouse et al. (1991) | No imagery-based intervention |
| Yamamoto and Masumoto (2023) | No event-related imagery |

*Note.* None.

[a] Identified via citation searching.

## S4. Overview and Full Table of Included Studies and Extracted Variables

### Table S4.1

*Extracted and Coded Data for Studies Using the Life Event Inventory and Similar Approaches*

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Baran and Niedzwienska (2002) | *N* = 70 healthy adults (undergraduates) | childhood | negative and positive | likely fictitious events (plausible events that may have happened before the age of 10, with low subjective probability, pre-selected based on ratings of 1–4 on LEI) | *imagery task:* imagined and non-imagined (within-subjects) | same session | one (0×, 1× imagined) | other-generated | immediately after, within the same session | significant negative effect of imagination on judged likelihood of events previously rated as unlikely, indicating imagination inflation; participants more skeptical about autobiographical memory showed greater increases in likelihood ratings following the guided visualization. | memory belief or confidence (LEI) | Imagination inflation was observed and may be influenced by individuals' beliefs about the accuracy of autobiographical memory. |
| Bays et al. (2013) | *N* = 151 healthy adults (undergraduates) | childhood | negative and positive | mixture of both (plausible events that may have happened before the age of 10) | *imagery task:* 0×, 1×, and 5× imagined (within-subjects) | same session | one (0×, 1× imagined) | other-generated | one week | no significant main effect of number of imaginations on change in confidence ratings for either low-confidence (LEI 1–4) or high-confidence (LEI 5–8) events. | memory belief or confidence (LEI) | No evidence of imagination inflation or deflation. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Bays et al. (2015) | *N* = 77 healthy adults (students; most 18–22) | childhood | negative and positive | mixture of both (plausible events that may have happened before the age of 10) | *imagery task:* imagined and non-imagined (within-subjects); instruction: guided vs. prompted (minimal) imagery (between-subjects); *other variable:* positive and negative valence (within-subjects) | same session | one (0×, 1× imagined) | other-generated | one week | significant negative main effect of imagery instruction: guided imagery led to greater confidence increases than prompted; no significant main effect of imagery (imagined vs. not imagined); significant main effect of valence of memory, indicating that positively valenced events had higher confidence rating increases independent of any imagery instruction; no significant valence × imagery × instruction type interaction effect. | memory belief or confidence (LEI) | Increases in belief ratings occurred only in the guided imagery condition; no imagination inflation was found for prompted instructions. Additionally, positively valenced memories showed greater confidence increases regardless of imagery instruction. |
| Bays et al. (2012) | *N* = 135 healthy adults (undergraduates) | childhood | negative and positive | mixture of both (plausible events that may have happened before the age of 10) | *imagery task:* 0×, 1×, and 5× imagined (within-subjects); *other variable:* high and low prevalence (within-subjects) | same session | one (0×, 1×, 5× imagined) | other-generated | one week | no significant main effects of imagination or prevalence on general or personal plausibility, belief, or memory ratings; significant prevalence × imagination interaction was found for personal plausibility: imagery increased personal plausibility only for low-prevalence events; no imagination inflation was observed for belief, memory, or general plausibility. | memory belief or confidence (ABMQ) | Imagination did not produce inflation effects overall, but it selectively increased personal plausibility for low-prevalence events, with no effects on belief or memory. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Calvillo et al. (2019) | *N* = 109 healthy adults (undergraduates) | childhood, adulthood | negative, positive, and neutral | likely fictitious but plausible events (task 1: 6 childhood events from the LEI) and personal experiences (task 2: 60 simple actions from Goff & Roediger (1998), including performed, imagined, and control actions) | *imagery task:* imagined and non-imagined (within-subjects) | same session | one (0×, 1× imagined) | other-generated | one week | significant negative main effects of condition, indicating an imagination inflation effect for both childhood events and simple actions; correlation between the imagination inflation effects in the two tasks was not significant. | memory belief or confidence (LEI), memory accuracy (recognition of simple actions) | Imagination inflation was found in both tasks: belief increased for childhood events, and false memories increased for imagined actions. However, the strength of the effects was unrelated across tasks. |
| Clancy et al. (1999) | *N* = 24 adults (n.a.); *n* = 12 with recovered memories of childhood sexual abuse, *n* = 12 without history of sexual abuse | childhood | negative and positive | likely fictitious events (plausible events that may have happened before the age of 10, with low subjective probability, pre-selected based on ratings of 1–4 on LEI) | *imagery task:* imagined and non-imagined (within-subjects) | same session | one (0×, 1× imagined) | other-generated | immediately after, within the same session | no significant main effect of guided imagery on belief ratings in either group. | memory belief or confidence (LEI) | No significant evidence of imagination inflation or deflation was found. |
| Garry et al. (1996) | *N* = 38 healthy adults (students) | childhood | negative, positive, and neutral | likely fictitious events (plausible events that may have happened before the age of 10, with low subjective probability, pre-selected based on ratings of 1–4 on LEI) | *imagery task:* imagined and non-imagined (within-subjects) | same session | one (0×, 1× imagined) | other-generated | immediately after, within the same session | significant negative main effect of imagination, with participants showing increased confidence that imagined events had occurred, compared to non-imagined events. | memory belief or confidence (LEI) | Imagination inflation was observed: confidence that an event occurred increased after imagination, but primarily for events initially judged as unlikely. |
| Heaps and Nash (1999) | *N* = 55 healthy adults (undergraduates) | childhood | negative and positive | likely fictitious events (plausible events that may have happened before the age of 10, with very low subjective | *imagery task:* imagined and non-imagined (within-subjects) | same session | one (0×, 1× imagined) | other-generated | immediately after, within the same session | significant negative main effect of imagination on judged likelihood of events; imagination inflation was significantly predicted by hypnotic suggestibility and dissociativity. | memory belief or confidence (LEI) | Imagination inflation was observed and correlated with susceptibility to hypnotic suggestion and everyday dissociative experiences. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| | | | | probability, pre-selected based on ratings on LEI) | | | | | | | | |
| Horselenberg et al. (2000) Experiment 1 | *N* = 34 healthy adolescents and adults (17–43) | childhood | not explicitly defined, assumed neutral to mildly positive and negative | likely fictitious events (plausible events that may have happened before the age of 10, with low subjective probability; pre-selected based on ratings of 2–4 on LEI) | *imagery task:* imagined and non-imagined (within-subjects) | same session | one (0×, 1× imagined) | other-generated | after a brief delay (following other questionnaires), within the same session | no significant main effect of condition or time × condition interaction effect, indicating no difference between imagined and control items; significant main effect of time indicating a robust repetition effect. | memory belief or confidence (LEI) | A repetition effect was observed (i.e., subjective probability increased over time), but imagination did not significantly affect probability or confidence ratings compared to control items. |
| Horselenberg et al. (2000) Experiment 2 | *N* = 45 healthy adolescents and adults (16–20) | childhood | not explicitly defined, assumed neutral to mildly positive and negative | likely fictitious events (plausible events that may have happened before the age of 10, with low subjective probability; pre-selected based on ratings of 2–4 on LEI) | *imagery task:* writing-based, imagined and non-imagined (within-subjects) | same session | one (0×, 1× imagined) | other-generated | after a brief delay (following other questionnaires), within the same session | significant negative main effect of imagination and significant time × condition interaction, indicating an imagination inflation effect; no significant main effect of time, indicating no repetition effect. | memory belief or confidence (LEI) | No repetition effect was found, but imagination significantly increased both probability and confidence ratings compared to control items. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Landau and von Glahn (2004) | *N* = 66 healthy adults (undergraduates) | childhood | negative, positive, and neutral | mixture of both (plausible events that may have happened before the age of 10) | *imagery task:* imagined and non-imagined (within-subjects); *other variable:* warning vs. no warning (between-subjects) | same session | one (0×, 1× imagined) | other-generated | immediately after (following a post-intervention warning within the warning condition), within the same session | significant main effect of time indicated increased confidence ratings from pre- to posttest; significant time × condition interaction confirmed imagination inflation, with greater increases for imagined vs. non-imagined events; although the three-way interaction with condition (warning vs. no warning) was not significant, planned comparisons showed the effect was substantially larger in the no-warning group, indicating that the warning reduced – but did not eliminate – the inflation effect; additional analysis of nontarget items revealed a significant time × condition interaction, ruling out a general suppression of confidence in the warning group and suggesting that the warning specifically moderated confidence in imagined events. | memory belief or confidence (LEI) | Imagination increased participants' confidence that childhood events occurred, replicating the imagination inflation effect. However, participants who were warned about the potential for imagination to distort memory showed a reduced inflation effect, suggesting that metacognitive awareness can mitigate susceptibility to memory distortion. |
| Marsh et al. (2014) Experiment 1 | *N* = 47 healthy adults (undergraduates) | childhood | negative and positive | mixture of both (plausible events that may have happened before the age of 10) | *imagery task:* first-person, third-person, and no-imagination (within-subjects) | same session | one (0×, 1× imagined) | other-generated | one week | significant negative main effect of visual perspective, with judged likelihood of childhood events increasing significantly when imagined from a third-person perspective but not from a first-person perspective; effect appears specific to visual perspective and not to qualitative features of the imagined events. | memory belief or confidence (LEI) | Imagined events are more likely to be judged as having occurred when their phenomenological properties – such as visual perspective – align with those of real memories (as childhood memories are often recalled from a third-person perspective). |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Marsh et al. (2014) Experiment 2 | *N* = 64 healthy adults (undergraduates) | childhood, adulthood | negative and positive | mixture of both (plausible events that may have happened prior to the experiment, without any age reference) | *imagery task:* first-person, third-person, and no-imagination (within-subjects); *other variable*: lifetime period of memory: childhood and recent (within-subjects) | same session | one (0×, 1× imagined) | other-generated | one week | no significant main effects of perspective or temporal distance, but a significant interaction between perspective × temporal distance: for childhood events, the third-person perspective led to greater LEI change scores than the first-person perspective; for recent events, the reverse trend was nonsignificant. | memory belief or confidence (LEI) | For childhood events, imagining from a third-person perspective led to significantly greater LEI change scores than from a first-person perspective; no significant differences were found for recent events. This suggests that imagination inflation is stronger when visual perspective matches that of typical real memories. |
| Mazzoni and Memon (2003) | *N* = 72 healthy adults (undergraduates) | childhood | not explicitly defined, assumed negative | mixture of both (one frequent event and one nonoccurring event before age 6, pre-selected based on LEI ratings) | *imagery task:* imagined one event and read about another (within-subjects); *other variable*: event type assignment: frequent vs. nonoccurring (between-subjects) | same session | one (0×, 1× imagined) | other-generated | same session (post-test 1), one week (post-test 2) | change in autobiographical beliefs: significant main effect of time indicating a repetition effect; significant time × condition interaction, indicating imagination inflation; significant condition × group interaction, with higher belief ratings for the frequent event regardless of which event was imagined or read; no condition × time × group interaction, suggesting the inflation effect did not differ by event type; memory presence: significant negative main effect of condition and a significant condition × group interaction, indicating that imagination increased false memories, particularly for the nonoccurring event; more memories were reported after imagination than after exposure for both event types. | memory belief or confidence (LEI), memory accuracy (memory presence and qualitative scoring) | Evidence for imagination inflation effect by developing both a belief and a memory of an event that definitely did not happen, after imagining its occurrence, thus producing false memories. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Paddock et al. (1998) Experiment 1 | *N* = 98 healthy adults (undergraduates) | childhood | negative and positive | mixture of both (plausible events that may have happened before the age of 10) | *imagery task:* imagined and non-imagined (within-subjects) | same session | one (0×, 1× imagined) | other-generated | immediately after, within the same session | significant negative main effect of imagination indicated that imagining a life event significantly increased subjective confidence that it had occurred; this imagination inflation effect was observed consistently across both fictitious events (LEI 1–4) and a broader item range (LEI 1–7). | memory belief or confidence (LEI) | Evidence for a robust imagination inflation effect was found: Imagining childhood events significantly increased participants' confidence that those events had occurred. The effect held across both unlikely (LEI 1–4) and broader (LEI 1–7) event ratings. |
| Paddock et al. (1998) Experiment 2 | *N* = 106 healthy adults (middle-aged manufacturing plant employees) | childhood | negative and positive | mixture of both (plausible events that may have happened before the age of 10) | *imagery task:* imagined and non-imagined (within-subjects) | same session | one (0×, 1× imagined) | other-generated | immediately after, within the same session | no significant main effect of visualization on confidence ratings regarding whether the events had occurred. | memory belief or confidence (LEI) | In a sample of middle-aged factory workers, imagining childhood events did not significantly increase participants' confidence that the events had occurred. No imagination inflation effect was found, suggesting that this effect may not generalize to non-student adult populations. |
| Paddock et al. (1999) | *N* = 94 healthy adults (undergraduates) | childhood | not explicitly defined, assumed neutral to mildly positive and negative | likely fictitious events (plausible events that may have happened before the age of 10, with low subjective probability, pre-selected based on ratings of 1–4 on LEI) | *imagery task:* imagined and non-imagined (within-subjects) | same session | one (0×, 1× imagined) | other-generated | immediately after, within the same session | significant negative main effect of visualization, with participants reporting higher confidence that visualized events had occurred, even when initially rated as unlikely (LEI 1–4), consistent with the imagination inflation effect. | memory belief or confidence (LEI) | Imagination inflation was observed for childhood events that participants had previously denied experiencing. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Pezdek, Blandon-Gitlin and Gabbay (2006) | *N* = 145 healthy adults (students) | childhood | negative and positive | mixture of both (plausible events that may have happened before the age of 10) | *imagery task:* imagined and non-imagined (within-subjects); *other variable:* high and low plausibility (within-subjects) | same session | one (0×, 1× imagined) | other-generated | immediately after, within the same session | significant negative main effect of imagination, indicating that imagining increased occurrence ratings; significant main effect of plausibility, where high-plausibility events received higher ratings than low-plausibility ones; significant imagination × plausibility effect, showing that imagining only increased occurrence ratings for high- but not for low-plausibility events; word count analysis showed more elaborate imagery for high- vs. low-plausibility events. | memory belief or confidence (LEI) | Imagining childhood events increased belief in their occurrence, but only for events presented as plausible. This suggests that imagination inflation is moderated by plausibility and is more likely when events align with prior knowledge or expectations. |
| Pezdek and Eddy (2001) | *N* = 75 healthy adults (*n* = 32 older adults from a senior citizens community center, *n* = 43 undergraduates) | childhood | negative and positive | mixture of both (plausible events that may have happened before the age of 10) | *imagery task:* imagined and non-imagined (within-subjects); *other variable:* age group: younger vs. older adults (between-subjects) | same session | one (0×, 1× imagined) | other-generated | one week | significant negative main effect of imagination condition and significant main effect of time on likelihood ratings, with ratings significantly greater for imagined events and at Time 2; however, no significant time × imagination interaction and no significant time × age × imagination interaction; residual analyses showed no evidence of imagination-specific effects beyond what would be expected from regression toward the mean. | memory belief or confidence (LEI) | In both age groups, confidence ratings increased over time, but equally for imagined and non-imagined events. Analyses showed this pattern was due to regression toward the mean, not imagination inflation. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Qin et al. (2008) Experiment 1 | *N* = 119 healthy adolescents and adults (17–37) | childhood | not explicitly defined, assumed negative and positive | mixture of both (≥1 false event before the age of 5 years and ≥1 true event confirmed by parents, pre-selected based on CEQ-ratings) | *imagery task:* visualization vs. thinking (between-subjects); *other variable:* warning vs. no warning (between-subjects) | same session | one (0×, 1× visualized) | other-generated | during Interview 1 and again approximately 6 days later during Interview 2 (range: 2–16 days) | no significant main effect of visualization on false memory; significant main effect of warning on false memory (fewer reports with warning); significant main effect of time: repeated interviews increased both true memory (positive effect) and false memory content (negative effect); significant interaction: warning × time, indicating that warnings reduced false memory inflation over repeated interviews; parental avoidant attachment was the only significant predictor of false memories. | memory belief or confidence (LEI), changes in memory content | Visualization alone did not increase false memories. Warnings reduced false memory reports but not their detail. They enhanced true memory detail in the thinking condition and helped guard against false memory formation over repeated interviews. True memories included more emotional, contextual, and action-related information than false ones. Parental avoidant attachment was the only unique predictor of false memory susceptibility. |
| Sharman and Barnier (2008) | *N* = 78 healthy adolescents and adults (17–59) | childhood, adulthood | negative and positive | likely fictitious events (plausible events from either childhood [before the age of 10] or adulthood [within the last 3 years], pre-selected based on ratings of 1–4 on LEI) | *imagery task:* imagined and non-imagined (within-subjects); *other variables:* event recency: childhood vs. adulthood (between-subjects); event valence: positive and negative (within-subjects) | same session | one (0×, 1× imagined) | other-generated | immediately after, within the same session | significant negative main effect of imagination indicated that participants who imagined either childhood or adulthood events showed imagination inflation (i.e., an increase in confidence ratings for imagined vs. non-imagined events); significant recency × valence interaction was also found: for positive events, participants who imagined adulthood events showed greater imagination inflation than those who imagined childhood events; for negative events, there was no significant difference between childhood and adulthood conditions. | memory belief or confidence (LEI) | Imagining false events increased belief in their occurrence, indicating memory distortion. This effect was moderated by event recency and valence: imagination inflation was strongest for positive events from adulthood, but not observed for negative events. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Sharman and Calacouris (2010) | *N* = 46 healthy adults (17–33) | childhood | positive | mixture of both (plausible childhood events with themes of achievement and affiliation that may have happened before the age of 10) | *imagery task:* imagined and non-imagined (within-subjects); *other variable:* event type: achievement and affiliation (within-subjects) | same session | one (0×, 1× imagined) | other-generated | immediately after, within the same session | significant negative main effect of imagination on confidence, indicating an imagination inflation; no significant main effect of event type; significant interaction between event type × imagination, for not imagined events, confidence increased more for affiliation than achievement events, but for imagined events, no difference between event types. | memory belief or confidence (LEI) | Imagination significantly increased participants' confidence in false childhood events, indicating an imagination inflation effect. This effect was not moderated by event type for imagined events, but for non-imagined events, confidence increased more for affiliation-related than achievement-related items. |
| Sharman et al. (2004) | *N* = 57 healthy adults (students) | childhood | negative, positive, and neutral | mixture of both (plausible events that may have happened before the age of 10) | *imagery task:* type of exposure: imagination and paraphrasing (within-subjects); repetitions: 0×, 1×, 3×, and 5× (within-subjects) | same session | one (0×, 1×, 3×, 5× repeated) | other-generated | one week | no significant main effect of type of exposure; significant negative main effect of repetition, driven primarily by the increase from zero to one exposure, additional repetitions did not enhance confidence further; no significant interaction between type of exposure × number of repetitions, that is, confidence increased equally for both types. | memory belief or confidence (LEI) | Exposure to fictitious childhood events – via imagination or paraphrasing – increased confidence that the events had occurred. This effect was driven by a single exposure, with no added impact from repetition or method. Shared features of both tasks, such as visual elaboration or processing fluency, appear sufficient to inflate memory confidence without explicit imagination instructions. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Sharman et al. (2005) | *N* = 128 healthy adults (undergraduates) | childhood | not explicitly defined, assumed negative and positive | likely fictitious events (plausible events that may have happened before the age of 10, with very low subjective probability, pre-selected based on ratings of LEI) | *imagery task:* imagined and non-imagined (within-subjects); perspective: first-person vs. third-person (between-subjects); *other variable:* post-test order: plausibility questionnaire first vs. LEI first (between-subjects) | same session | one (0×, 1× imagined) | other-generated | one week | no significant main effects of imagination or perspective on confidence ratings; significant main effect of post-test order: participants who completed the LEI before the plausibility questionnaire showed higher overall confidence; significant interaction between imagination and perspective showed that only participants imagining events from a third-person perspective exhibited imagination inflation; significant interaction between imagination and post-test order: imagination inflation occurred only when participants completed the LEI before the plausibility questionnaire; significant three-way interaction between imagination, perspective, and post-test order: only participants with a first-person perspective who completed the plausibility questionnaire before the LEI resisted imagination inflation and even showed imagination deflation, becoming less confident in imagined events post-intervention. | memory belief or confidence (LEI) | The study demonstrates that imagination inflation can be prevented when individuals are provided with both a source cue (first-person perspective) and a familiarity cue (plausibility ratings before memory testing). This suggests that memory distortions due to imagination can be reduced when people are better able to monitor the origin and familiarity of imagined content, highlighting the combined protective role of source monitoring and fluency awareness. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Sharman and Powell (2013) | *N* = 126 healthy adults (18–64) | childhood | negative | mixture of both (events, ranging in levels of plausibility, that may have happened before the age of 10) | *imagery task:* CI instructions: context reinstatement or report everything, context reinstatement and report everything instructions, and no instructions (within-subjects); *other variable:* plausibility: high, moderate, and low (within-subjects) | same session | one (0×, 1× imagined) | other-generated | same session | no significant main effect of imagery-related instruction (none, one, or two CI instructions) on confidence or memory ratings across plausibility conditions; being asked to mentally reinstate the context, report everything, or both did not increase belief or memory for false childhood events; the only significant effect of instruction was found for personal plausibility ratings in the moderate-plausibility event; participants who received two instructions showed a greater increase in personal plausibility compared to those who received only one, but this effect did not extend to belief or memory. | memory belief or confidence (ABMQ) | Cognitive interview instructions had minimal effect on participants' confidence or memory ratings. The only significant change was an increase in personal plausibility for a moderately plausible event when participants received two instructions. Overall, the CI instructions did not promote the development of false beliefs or false memories for childhood events. |
| Sharman and Scoboria (2009) | *N* = 60 healthy adults (18–40) | childhood | negative | mixture of both (pre-selected events that may have happened before the age of 10) | *imagery task:* imagined and non-imagined (within-subjects); *other variable:* plausibility: high, moderate, and low (within-subjects) | same session | one (0×, 1× imagined) | other-generated | one week | significant negative main effect of imagination on confidence ratings, with higher confidence for imagined than non-imagined events; no significant main effect of event plausibility on confidence ratings; no significant interaction between imagination and plausibility for confidence ratings, indicating imagination inflation occurred regardless of plausibility. | memory belief or confidence (LEI) | Imagining childhood events increased participants' confidence that the events had genuinely occurred and enhanced the clarity and completeness of their memories. This imagination inflation effect occurred regardless of the initial plausibility of the events. |

*Note.* "Mixture of both" refers to a combination of personal experiences and fictitious events. LEI = Life Events Inventory; CEQ = Childhood Event Questionnaire; × = number of times; CI = Cognitive Interview; ABMQ = Autobiographical Belief and Memory Questionnaire.

**Table S4.2**

*Extracted and Coded Data for Studies Using Action Statements*

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Clark et al. (2022) | *N* = 57 adults (66–90); *n* = 30 healthy older adults, *n* = 27 adults with mild cognitive impairment | adulthood | neutral | mixture of both (96 critical action statements + 40 filler action statements) | *imagery task:* imagination vs. control (between-subjects); imaginings: 0×, 1×, and 3× (within-subjects); *other variables:* action: functional and nonfunctional (within-subjects); encoding (Session 1): performed, imagined, listen, and new (within-subjects); diagnosis group: healthy older adults vs. older adults with mild cognitive impairment (between-subjects) | immediately after, within the same session | one (0×, 1×, 3× imagined) | other-generated | 24 hours | significant negative main effects were found for imagination condition (higher false memory in the imagination vs. control condition) and for imagination frequency (more false memory with more repetitions); significant main effects of encoding type (true memory highest for performed, lowest for new; false memory reversed), and diagnosis group (older adults with mild cognitive impairment: lower true, higher false memory than healthy older adults); significant interactions showed increased false memory for imagined and listened items in the imagination condition, and with higher frequency for imagined items; adults with mild cognitive impairment were particularly vulnerable, showing less encoding differentiation and stronger false memory effects; in the source monitoring task (healthy older adults only), higher imagination frequency led to greater source confusion, especially for imagined items. | memory accuracy (recognition task and source monitoring task) | Repeated imagination, especially of non-performed events, increases false memory – an effect particularly pronounced in older adults with mild cognitive impairment. These findings highlight the susceptibility of memory to constructive distortions through imagination, especially when source information is weak or ambiguous. The results underscore the importance of monitoring imaginative processes in aging populations, as even brief mental simulations can blur the distinction between real and imagined experiences. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Dhammapeera et al. (2024) | *N* = 36 healthy adults (18–25) | adulthood | neutral | personal experience (120 photographs of objects + action statement) | *imagery task:* imagined (counterfactual), rehearsed (veridical imagined), and baseline (not imagined) (within-subjects); *other variables:* action type: old and new (within-subjects) | one week | one (0×, 3× imagined) | other-generated | immediately after, within the same session | significant main effect of condition was found in the cued recall test; memory accuracy was highest in the rehearsed condition (indicating a positive effect compared to baseline), followed by the baseline condition, and lowest in the imagined (counterfactual) condition (indicating a negative effect compared to baseline); significant interaction effect of condition and action type emerged in the associative recognition test; recognition accuracy for old actions was highest in the rehearsed condition, followed by baseline, and lowest in the imagined condition; for new actions, recognition was again higher in the rehearsed condition, while the imagined and baseline conditions did not differ significantly. | memory accuracy (cued recall and associative recognition task) | Mental rehearsal of previously performed actions enhances memory, while counterfactual imagination can impair memory for true events. The results suggest that imagining alternative versions of past experiences may interfere with or overwrite original memory traces. This highlights the malleable nature of memory and underscores the potential risks of counterfactual thinking for the accuracy of autobiographical recall. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| El Haj and Robin (2020) | *N* = 38 adults (n.a.); *n* = 18 participants with Korsakoff's Syndrome, *n* = 20 healthy participants | adulthood | neutral | mixture of both (136 everyday life action statements) | *imagery task:* imaginings: 0×, 1×, and 3× (within-subjects); *other variables:* encoding (Session 1): listened, enacted, and imagined (within-subjects); health status: healthy vs. Korsakoff's Syndrome (between-subjects) | immediately after, within the same session | one (0×, 1×, 3× imagined) | other-generated | 24 hours | significant negative main effect of imagination frequency was found, indicating that repeated imagination increased false memories; significant main effect of encoding showed that performed actions led to better recognition than imagined or listened actions; significant main effect of group revealed that controls outperformed Korsakoff patients across memory measures; significant interactions included encoding × group, with controls benefiting more from enactment than patients; imagination frequency × group, showing stronger imagination inflation in Korsakoff patients; and encoding × imagination frequency, where repetition improved source monitoring for previously encoded items but impaired it for new items; three-way interaction of group × encoding × imagination frequency was also found, driven by group differences in source accuracy for new items after zero imagination. | memory accuracy (recognition task and source monitoring task) | Repeated imagination can distort memory by increasing false memories, particularly in individuals with Korsakoff's syndrome. While enacted actions enhance recognition accuracy, and controls generally outperform patients, the effects of imagination vary depending on prior exposure and clinical status. The results underscore the vulnerability of source monitoring to repeated imagination and highlight the importance of distinguishing between imagined and real experiences, especially in memory-impaired populations. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Gerlach et al. (2014) Experiment 1a | *N* = 48 healthy adults; *n* = 24 younger adults (18–34), *n* = 24 older adults (62–82) | adulthood | positive and negative (moderate) | fictitious events (120 brief scenarios describing everyday situations) | *imagery task:* identical simulation, counterfactual simulation, and no simulation (within-subjects); *other variables:* valence: positive and negative (within-subjects); age group: younger adults vs. older adults (between-subjects) | 10 minutes (filler task) | one (0×, 1× imagined) | other-generated | approximately 48 hours | significant positive main effect of simulation condition on hit rates, indicating better memory for identically simulated scenarios; significant main effect of age on hit rates, with younger adults showing higher accuracy; significant age × simulation condition interaction on hit rates, reflecting greater performance decline in older adults; significant negative main effect of simulation condition on false alarms, with more errors for counterfactual than novel scenarios; significant main effect of age on false alarms, indicating higher error rates in older adults; significant age × source judgment interaction for false alarms and for correctly rejected counterfactual lures, showing better source attribution in younger adults and greater source confusion in older adults. | memory accuracy (recognition task) | Counterfactual simulation can distort memory even for recently imagined events, leading to increased false recognition. This effect was especially pronounced in older adults, who showed greater overall memory errors and significantly more source confusion. These results support the view that counterfactual thinking – despite its adaptive functions – can act as a form of internally generated misinformation, particularly in aging populations. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Gerlach et al. (2014) Experiment 1b | *N* = 48 healthy adults; *n* = 24 younger adults (18–34), *n* = 24 older adults (62–81) | adulthood | positive and negative (more intense) | fictitious events (120 brief scenarios describing everyday situations) | *imagery task:* identical simulation, counterfactual simulation, and no simulation (within-subjects); *other variables:* valence: positive and negative (within-subjects); age group: younger adults vs. older adults (between-subjects) | 10 minutes (filler task) | one (0×, 1× imagined) | other-generated | approximately 48 hours | significant positive main effect of simulation condition on hit rates, indicating better memory for identically simulated scenarios compared to counterfactual or non-simulated ones; significant main effect of age on hit rates, with younger adults showing higher recognition accuracy; significant main effect of valence on hit rates, with positive scenarios remembered more accurately than negative ones; significant negative main effect of simulation condition on false alarms, with more false recognitions for counterfactual than novel scenarios; significant main effect of age on false alarms, indicating higher false alarm rates in older adults; significant age × source judgment interaction for false alarms and for correctly rejected counterfactual lures, showing better source attribution in younger adults and greater source confusion in older adults. | memory accuracy (recognition task) | Imagining previously encountered scenarios in an identical form enhances memory accuracy, whereas counterfactual simulation increases false recognition. This effect occurred independently of age for recognition performance, but older adults showed generally reduced accuracy and a higher susceptibility to source confusion. These results suggest that counterfactual thinking can distort memory even after a single simulation and that age-related declines in source monitoring may amplify this effect. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Gerlach et al. (2014) Experiment 2 | *N* = 48 healthy adults; *n* = 24 younger adults (18–29), *n* = 24 older adults (60–93) | adulthood | positive and negative | mixture of both (50 pairs of actions) | *imagery task:* recall, counterfactual simulation, and no simulation (within-subjects); *other variables:* age: younger adults vs. older adults (between-subjects); valence of imagined content: upward (positive outcome) and downward (negative outcome) (within-subjects, only for counterfactual) | 10 minutes (filler task) | one (0×, 3× imagined) | other-generated | one week | significant age × valence × condition interaction indicated that the effects of valence and condition on memory performance differed by age group, with older adults remembering more rewarded tasks in the recall and downward simulation conditions than in the no simulation condition; significant main effect of age showed that older adults had lower overall memory performance than younger adults; no significant three-way interaction, valence × condition interaction, or main effect of valence in the analysis of false alarms; significant age × condition interaction, indicating that older adults produced more false alarms than younger adults, especially in the counterfactual simulation and control conditions compared to the novel condition; additionally, younger adults showed a counterfactual simulation effect, with higher false alarm rates for simulated counterfactuals than for control or novel items. | memory accuracy (recognition task) | Episodic counterfactual simulation can impair memory accuracy, particularly in older adults, who appear especially vulnerable to confusion between imagined alternatives and actual experiences. While imaginative recall and downward counterfactual simulation may support memory for previously performed actions in older adults, counterfactual simulation more generally increases susceptibility to false memories across age groups. The results highlight both age-related differences and the potential risks of mental simulation in distorting episodic memory. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Goff and Roediger (1998) Experiment 1 | *N* = 40 healthy adults (undergraduates) | adulthood | neutral | mixture of both (96 action statements) | *imagery task:* imaginings: 0×, 1×, 3×, and 5× (within-subjects); *other variables:* encoding (Session 1): enacted, imagined, heard only, and not presented (within-subjects); item type: object and nonobject (within-subjects) | 24 hours | one (0×, 1×, 3×, 5× imagined) | other-generated | two weeks | significant negative main effects of number of imaginings on source monitoring (reflected in increased false "did" responses to heard, imagined, or new items) and on recognition accuracy (reflected in increased hit rates and false alarm rates; discrimination accuracy dropped notably after five imaginings); significant main effect of encoding type: enacted greater than imagined greater than heard only (replicating the enactment effect); significant interaction between number of imaginings and item type: stronger decline for object items, though the overall pattern was consistent. | memory accuracy (recognition task and source monitoring task) | The number of imaginings led to higher rates of misidentifying previously imagined, heard or not presented action statements (during encoding) as performed. Accuracy for recognizing action statements as presented during encoding in the first session (in contrast to new actions) decreased with increased number of imaginings. |
| Goff and Roediger (1998) Experiment 2 | *N* = 36 healthy adults (undergraduates) | adulthood | neutral | mixture of both (96 action statements) | *imagery task:* imaginings: 0×, 1×, 3×, and 5× (within-subjects); *other variables:* encoding (Session 1): enacted, imagined, heard only, and not presented (within-subject); item type: object and nonobject (within-subjects); timing of imagination session: early vs. middle vs. late (between-subjects) | *early imagination:* immediately after, within the same session; *middle imagination:* one week; *late imagination:* two weeks | one (0×, 1×, 3×, 5× imagined) | other-generated | *early imagination:* two weeks; *middle imagination:* one week; *late imagination:* immediately after imagination, within the same session | significant negative main effects of number of imaginings on source monitoring and recognition accuracy were found in the early and middle groups, but not in the late group. These effects included increased false "did" responses, higher hit and false alarm rates, and reduced discrimination accuracy; significant interaction between timing and number of imaginings showed that imagination inflation occurred only when imagination followed shortly after encoding; encoding-type effect (enacted > imagined > heard) was replicated; no interaction with item type was found. | memory accuracy (recognition task and source monitoring task) | After early and middle imaginings, the number of imaginings led to higher rates of misidentifying previously imagined, heard, or not presented action statements as performed during encoding. In the same groups, accuracy for recognizing action statements presented during encoding (as opposed to new actions) decreased with increasing number of imaginings. No such effects were observed for late imaginings. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Lampinen et al. (2003) | *N* = 128 healthy adults (undergraduates) | adulthood | neutral | mixture of both (48 action statements) | *imagery task:* imaginings: 0×, 1×, 3×, and 5× (within-subjects); placement of imagining session: early (Session 1) vs. late (Session 2) (between-subjects); *other variable:* encoding: enacted, imagined, heard, and not presented (within-subjects) | early imagination: 10 minutes (filler task); late imagination: two weeks | one (0×, 1×, 3×, 5× imagined) | other-generated | *early imagination:* two weeks; *late imagination:* immediately after imagination, within the same session | significant negative main effect and linear trend of number of imaginings on recognition accuracy indicated that memory sensitivity decreased with repeated imagination; significant negative effects on response bias and source-monitoring errors showed that participants became more liberal and more prone to false "did" responses as imagination frequency increased; significant main effect of item type confirmed that imagined items were more susceptible to source misattributions than heard or unpresented items; results suggest that repeated imagination reduces discrimination accuracy and increases false memories, particularly for imagined events. | memory accuracy (recognition task and source monitoring task) | Repeated imagination impairs memory accuracy by reducing the ability to distinguish between real and imagined experiences. As the number of imaginings increases, individuals not only become more prone to accepting imagined events as real but also adopt a more liberal response style, leading to increased false memories. These effects are particularly pronounced for actions that were previously imagined, highlighting the role of perceptual and contextual overlap in source misattributions. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Lindner and Echterhoff (2015) Experiment 1 | *N* = 36 healthy adults (students) | adulthood | neutral | mixture of both (30 action statements) | *imagery task:* imaginings: 0×, 1×, and 5× (within-subjects); imagined agent: self vs. other (between-subjects); *other variable:* encoding: performed, read, and not presented (within-subjects) | five minutes (filler task) | one (0×, 1×, 5× imagined) | other-generated | two weeks | significant negative main effect of imagination frequency showed that increasing imagination raised false memory reports; significant positive main effect of imagination showed improved correct memory performance; significant main effect of encoding showed more false memories for read than performed actions; significant encoding × imagination frequency interaction indicated stronger inflation for read items; significant imagination frequency × imagined agent interaction showed false memories increased only for self-imagination; significant encoding × imagined agent interaction suggested better source discrimination after other-imagination; significant three-way interaction confirmed that effects varied by encoding and agent. | memory accuracy (source monitoring task) | Repeated imagination increases both the likelihood of false memories and the accuracy of true memory for performed actions. However, this inflation effect is especially pronounced for actions that were only read, and occurs primarily when individuals imagine themselves, rather than others, performing the actions. Moreover, imagining others appears to support better source discrimination. These results highlight the dual impact of imagination on memory: it can reinforce accurate recall, but also distort the source of remembered actions, particularly under self-referential conditions. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Lindner and Echterhoff (2015) Experiment 2 | *N* = 36 healthy adults (students) | adulthood | neutral | mixture of both (30 action statements) | *imagery task:* imaginings: 0×, 1×, and 5× (within-subjects); imagined agent: self vs. other (between-subjects); *other variable:* encoding: performed, read, and not presented (within-subjects) | five minutes (filler task) | one (0×, 1×, 5× imagined) | other-generated | two weeks | significant negative main effect of imagination frequency showed that increasing imagination raised false memory reports; significant interaction of imagination frequency × encoding revealed that this inflation was stronger for read items; repeated imagination significantly increased false performed-responses both when imagining oneself and when imagining another person performing the action, whereas single imagination did not; significant positive main effect of imagination frequency indicated that increasing imagination also improved correct memory performance; significant interaction of imagination frequency × encoding showed that this enhancement was more pronounced for performed actions; single and repeated imagination both led to significantly more correct performed-responses compared to baseline. | memory accuracy (source monitoring task) | Repeated imagination can distort source memory by increasing false recollections of unperformed actions, particularly when those actions were only read during encoding. However, imagination also enhanced memory accuracy for truly performed actions, with both single and repeated imagination improving correct recall. These results highlight the dual impact of imagination on memory: while it reinforces accurate memories, it simultaneously raises the risk of memory distortion. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Lindner and Echterhoff (2015) Experiment 3 | *N* = 79 healthy adults (students) | adulthood | neutral | mixture of both (30 action statements) | *imagery task:* imagined and not imagined (within-subjects); imagined agent: self vs. other (between-subjects); *other variables:* encoding: performed, read, and not presented (within-subjects); acted agent: self vs. other (between-subjects) | immediately after, within the same session | one (0×, 5× imagined) | other-generated | two weeks | significant negative main effect of imagination frequency indicated that repeatedly imagining actions increased false memories; significant positive main effect showed increased true memories; significant main effect of encoding revealed higher accuracy for actually performed actions compared to read or unpresented ones; significant main effect of actor showed that actions performed by another person were more often classified as performed, regardless of accuracy; significant three-way interaction of imagination frequency, imagined agent, and actor showed that false memories increased most when imagined agent and original actor matched, but only in other-imagination; no significant interaction with encoding indicated that source discrimination was unaffected by imagined agent or frequency; results suggest that repeated imagination strengthens memories while increasing source confusion, particularly under actor-agent overlap. | memory accuracy (source monitoring task) | Repeated imagination improves memory for actually performed actions while simultaneously increasing false memories for actions that were only imagined or read. This dual effect suggests that repeated imagination enhances memory strength but impairs source accuracy. Critically, source misattributions were most pronounced when the imagined agent and the original actor matched, specifically in the other-imagination condition. No evidence was found that imagining another person improved source discrimination, indicating that perspective-taking alone does not protect against memory distortions. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Lindner et al. (2010) Experiment 1 | *N* = 60 healthy adults (students) | adulthood | neutral | mixture of both (60 action statements) | *imagery task:* processing: observe vs. imagine vs. generate vs. read (between-subjects); *other variables:* encoding: performed, only read, and not presented (within-subjects); presentation: presented and not presented (within-subjects) | five minutes (filler task) | one (0×, 1× imagined) | other-generated | two weeks | significant negative main effect of processing: observation and imagination increased false memories vs. generation and reading; significant main effect of encoding: higher false memories for read-only vs. performed items; significant main effect of presentation: more false memories for nonpresented vs. presented items; significant processing × presentation interaction: greater inflation for nonpresented items in observe/imagine groups; significant processing × encoding interaction: strongest inflation in observe/imagine; significant three-way interaction of processing × presentation × encoding: highest false memories for read-only, nonpresented items in observation condition. | memory accuracy (source monitoring task) | Observation and imagination significantly increased false memory formation, particularly for actions that were not actually presented or only read. The strongest distortion occurred when participants observed actions that had neither been performed nor previously presented but had only been read about. These findings demonstrate how both social observation and mental simulation can systematically distort source memory, especially when perceptual and contextual cues are weak or absent. |
| Nash et al. (2009) Experiment 1 | *N* = 47 healthy adults (undergraduates) | adulthood | neutral | fictitious experience (4 critical action statements) | *imagery task:* imagined and not imagined (within-subjects); *other variable:* video manipulation: video and no video (within-subjects) | two days | one (0×, 4× imagined) | other-generated | approximately 12 days | significant negative main effect of imagination showed imagining actions increased memory belief ratings; no significant main effect on false memory reports; significant main effect of video: viewing doctored video clips increased both memory belief and false memory reports; no significant interaction of imagination × video: the combination did not significantly amplify effects beyond either factor alone. | memory accuracy (false memory formation), memory belief or confidence | Imagination increased belief in having performed actions without producing false memories, whereas doctored video clips increased both belief and false memory reports. The absence of an interaction suggests that imagination and video exert independent, additive effects on memory-related judgments rather than amplifying each other. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Nash et al. (2009) Experiment 2 | *N* = 48 healthy adults (undergraduates) | adulthood | neutral | fictitious experience (4 critical action statements) | *imagery task:* imagined and not imagined (within-subjects); imagination warning: warning vs. no warning (between-subjects): *other variables:* video manipulation: video and no video (within-subjects); video warning: warning vs. no warning (between-subjects) | two days | one (0×, 4× imagined) | other-generated | approximately 12 days | significant negative main effects of imagination showed that imagining actions increased both false memory reports and memory belief ratings; significant main effects of video showed that viewing doctored video clips increased both false memory reports and memory belief ratings; no significant main effects of video warning or imagination warning were found; no significant interactions emerged among any of the factors. | memory accuracy (false memory formation), memory belief or confidence | Imagining actions and viewing doctored video clips each independently increased false memory reports and belief in having performed non-executed actions. Warnings about the potential misleading nature of imagination or video evidence did not reduce these effects, and no interaction emerged between the manipulations. These findings highlight the robustness of memory distortions induced by both internal imagery and external visual misinformation, even when individuals are explicitly cautioned. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| O'Connor et al. (2015) | *N* = 32 adults (n.a.); *n* = 15 healthy older adults, *n* = 17 adults with Alzheimer’s disease | adulthood | neutral | mixture of both (96 action statements) | *imagery task:* imaginings: 0×, 1×, and 3× (within-subjects); *other variable:* encoding: imagined, performed, and listened (within-subjects); healthy older adults vs. adults with Alzheimer’s disease (between-subjects) | immediately after, within the same session | one (0×, 1×, 3× imagined) | other-generated | 24 hours | significant negative main effects of imagination: more imaginings increased false alarms and hit rates; significant main effect of encoding condition: imagined items produced more false alarms than listened items; no significant difference between imagined and performed items or between performed and listened items; significant main effects of group: healthy older adults showed fewer false alarms, higher hit rates, and better source memory than individuals with very mild Alzheimer’s disease; significant interaction of encoding condition × imagination: imagination improved source accuracy for old items but impaired it for new items; significant three-way interaction of group × encoding condition × imagination: healthy older adults outperformed individuals with very mild Alzheimer’s disease on source accuracy for new items only when not imagined; this advantage disappeared after imagination. | memory accuracy (recognition task and source monitoring task) | Repeated imagination can both enhance and distort memory: while it improves recognition of previously performed actions, it also increases false memories – especially for actions that were only imagined, heard, or entirely new. The imagination inflation effect occurred similarly in healthy older adults and individuals with very mild Alzheimer’s disease. However, source memory accuracy was more robust in healthy older adults – particularly for new items that had not been imagined – highlighting that individuals with Alzheimer’s disease may be especially vulnerable to confusion between imagined and real events when imagination is involved. These results underscore the dual role of imagination in memory: as a tool for reinforcement and a risk factor for distortion. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Seamon et al. (2009) | *N* = 24 healthy adults (17–23) | adolescence, adulthood | neutral | mixture of both (36 bizarre and 36 familiar action statements) | *imagery task:* imagined and not imagined (within-subjects); *other variables:* encoding: observed and imagined-other (within-subjects); item type: familiar and bizarre (within-subjects) | one day | one (0×, 1× imagined) | other-generated | two weeks | significant positive main effects showed that repetition of actions across sessions increased true recognition and source monitoring, with repeated performed or imagined actions more likely to be correctly recognized than those encountered only once; significant negative main effects showed that imagining new actions inflated false recognition and led to source confusion, with participants misattributing new actions as previously imagined or even performed; bizarre actions were recognized more frequently than familiar ones; no significant interaction with action type was found. | memory accuracy (recognition task and source monitoring task) | Repeated imagination strengthens memory for genuinely experienced events but also increases the risk of false memories. Imagining events that never occurred can lead individuals to mistakenly believe they actually witnessed or performed them. This highlights the powerful role of mental imagery in shaping both accurate and distorted recollections – independently of how plausible or bizarre the imagined actions are. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Seamon et al. (2006) | *N* = 40 healthy adults (students) | adulthood | neutral | mixture of both (36 bizarre and 36 familiar action statements) | *imagery task:* imagined and not imagined (within-subjects); self vs. other (between-subjects); *other variable:* encoding: performed and imagined (within-subjects); item type: familiar and bizarre (within-subjects) | one day | one (0×, 1× imagined) | other-generated | approximately two weeks | significant negative main effect of imagination repetition indicated that repeatedly imagined actions (i.e., imagined in both Session 1 and Session 2) led to higher false recognition rates and greater source confusion than actions imagined only once or not at all; significant main effect of action type showed that familiar actions were more susceptible to false recognition and source misattribution than bizarre actions; additionally, significant main effect of item condition revealed that actions previously imagined or performed were more likely to be falsely recognized or misattributed than entirely new actions; no significant interactions involving imagination repetition, action type, or self/other encoding condition were found; the effects of repetition and action type were additive rather than interactive. | memory accuracy (recognition task and source monitoring task) | Repeated imagination increases false memories by boosting both false recognition and source misattribution, particularly for familiar actions and previously encountered items, while these effects occur independently of action type or encoding perspective. |
| Stróżak (2008) | *N* = 24 healthy adults (18–24) | adulthood | neutral | mixture of both (68 action statements) | *imagery task:* imagined, not imagined (within-subjects); *other variable:* encoding: heard + performed, heard + imagined, heard only, and not presented (within-subjects) | 10 minutes (filler task) | one (0×, 3× imagined) | other-generated | one week | no significant main or interaction effects of imagination on falsely identifying non-presented actions as performed, imagined or heard during encoding. | memory accuracy (recognition task and source monitoring task) | Imagination had no effect on source monitoring. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Takarangi et al. (2013) | *N* = 79 healthy adults (16–33) | adolescence, adulthood | neutral | mixture of both (36 action statements) | *imagery task:* imagined vs. not imagined (between-subjects); *other variable:* encoding: performed and not performed (within-subjects) | 10 minutes (filler task) | one (0×, 5× imagined) | other-generated | two weeks | significant negative main effect of imagination on belief ratings: imagined actions were more likely to be falsely believed as having been performed compared to non-imagined actions, indicating source confusion. | memory belief or confidence | Imagination increased false beliefs in having performed actions that were never executed, demonstrating that internally generated experiences can lead to source confusion and memory distortion. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Thomas and Bulevich (2006) Experiment 1 | *N* = 108 healthy adults (n.a.); *n* = 54 younger adults, *n* = 54 older adults | adulthood | neutral | mixture of both (45 bizarre action statements) | *imagery task:* imaginings: 0×, 1×, and 5× (within-subjects); retention interval: 2 days vs. 2 weeks (between-subjects); *other variables:* encoding (Session 1): performed, imagined, and not presented (within-subjects); item type: familiar and bizarre (within-subjects); age group: younger vs. older (between-subjects) | 24 hours | one (0×, 1×, 5× imagined) | other-generated | two days or two weeks (depending on retention interval) | significant negative effects of imagery on recognition accuracy were observed: increasing the number of imaginings (0×, 1×, 5×) led to more false "did" responses and lower recognition performance, particularly in older adults; significant positive main effect of number of imaginings also showed enhanced correct identification of performed actions, with this effect more pronounced after the two-week interval; a significant interaction between presentation type (performed vs. imagined) and number of imaginings revealed a steeper decline in recognition for performed actions among older adults; significant interaction between number of imaginings, age group, and retention interval showed greater memory distortion in older adults after 2 weeks than after 2 days; shorter retention intervals reduced false memories, suggesting that older adults can effectively use contextual cues when memory is accessible. | memory accuracy (recognition task and source monitoring task) | Imagination has both impairing and enhancing effects on memory: it increases source confusion for non-presented and imagined actions, but also strengthens source memory for truly performed actions. These effects are amplified in older adults and over longer retention intervals. However, when memory accessibility is preserved – e.g., through shorter delays – older adults can effectively use contextual cues to support accurate remembering, suggesting that age-related deficits in source monitoring may be largely driven by retrieval limitations rather than encoding failure. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Thomas and Bulevich (2006) Experiment 2 | *N* = 324 healthy adults (n.a.); *n* = 108 younger adults, *n* = 216 older adults | adulthood | neutral | mixture of both (45 bizarre action statements) | *imagery task:* imaginings: 0×, 1×, and 5× (within-subjects); type of instructions: standard and retrieval support (within-subjects); retention interval: 2 days (only for older adults) vs. 2 weeks (between-subjects); *other variables:* encoding (Session 1): performed, imagined, and not presented (within-subjects); age group: younger vs. older (between-subjects) | 24 hours | one (0×, 1×, 5× imagined) | other-generated | two days or two weeks (depending on retention interval) | significant negative main effects of number of imaginings on false memories and significant positive main effect on correct memories; significant interactions of imaginings × age with larger false memory increases in older adults and larger correct memory increases in younger adults; significant interaction of imaginings × instruction reducing false memories; significant three-way interaction of imaginings × age × instruction with retrieval support reducing false memories in older adults; significant main effects of age with older adults showing more false and fewer correct memories; significant main effect of instruction reducing false memories; no significant effects of instruction on correct memories or higher-order interactions; significant main effect of retention interval, indicating fewer false “did” responses after 2 days than after 2 weeks; significant retention interval × number of imaginings interaction, indicating reduced imagination inflation at shorter delays; no significant age difference between older adults at 2 days and younger adults at 2 weeks, indicating that a short delay mitigates age-related deficits. | memory accuracy (source monitoring task) | Repeated imagination increases both false and correct memories, but older adults are more prone to imagination-induced false memories. Importantly, providing explicit retrieval support instructions helps older adults to reduce these false memories after multiple imaginings. This indicates that while imagination can distort memory, strategic retrieval guidance can mitigate these effects, improving memory accuracy especially in older adults. Moreover, memory distortions due to imagination are time-dependent and can be substantially reduced by minimizing the retention interval, particularly in older adults. Thus, imagination has complex effects on memory, with potential for both enhancement and distortion depending on retrieval conditions. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Thomas et al. (2003) Experiment 1 | *N* = 145 healthy adults (undergraduates) | adulthood | neutral | mixture of both (72 action statements) | *imagery task:* imaginings: 0×, 1×, and 5× (within-subjects); imagery type: simple vs. elaborate (between-subjects); *other variables:* encoding (Session 1): performed, imagined, and not presented (within-subjects); item type: familiar and bizarre (within-subjects) | 24 hours | one (0×, 1×, 5× imagined) | other-generated | two weeks | significant negative main effects of number of imaginings was found for both novel and imagined actions, with false memory rates increasing as participants imagined actions more frequently; significant main effects of type of imagination also emerged in both cases, such that elaborate imagination led to more false memories than simple imagination; for novel actions, a significant main effect of action type was observed, with familiar actions producing more false memories than bizarre actions; finally, both analyses revealed a significant interaction between type of imagination and number of imaginings, indicating that the increase in false memories across repetitions was stronger in the elaborate imagination condition than in the simple condition. | memory accuracy (source monitoring task) | Repeated imagination increases the likelihood of false memories, particularly when the imagination process is elaborated with sensory detail. Familiar actions were more susceptible to false memory formation than bizarre actions, suggesting that semantic plausibility facilitates memory distortion. The interaction between repetition and imagination type indicates that detailed, perceptually rich imagination exerts a stronger influence on memory distortion than simple imagination alone. These results support the source monitoring framework by showing that false memories are more likely when imagined events contain specific features typically associated with real experiences. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Thomas et al. (2003) Experiment 2 | *N* = 303 healthy adults (undergraduates) | adulthood | neutral | mixture of both (72 action statements) | *imagery task:* imaginings: 0×, 1×, and 5× (within-subjects); imagery format: elaborate vs. individual vs. or text (between-subjects); *other variable:* encoding (Session 1): performed, imagined, and not presented (within-subjects) | 24 hours | one (0×, 1×, 5× imagined) | *elaborate:* other-generated; *individual:* mixture of both | two weeks | significant negative main effect of number of presentations was found for both novel and imagined actions, with false memory rates increasing as the number of imaginings increased; significant main effect of imagery typ also emerged in both cases: participants in the elaborate and individual imagination conditions reported more false memories than those in the text presentation control condition; significant interactions between number of imaginings and type of activity were observed for both types of actions, indicating that the increase in false memories across repetitions was strongest in the imagination conditions compared to text. | memory accuracy (source monitoring task) | Both the frequency and format of imagination significantly influence the formation of false memories. Repeated imaginings increased false memory rates for both novel and previously imagined actions, with the strongest effects observed in the elaborate and individual imagery conditions. The findings suggest that not only repetition, but also the richness and self-relevance of mental imagery, amplify memory distortion. These results provide further support for source-monitoring accounts, highlighting how internally generated details can blur the line between imagined and experienced events. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Thomas and Loftus (2002) | *N* = 210 healthy adults (undergraduates) | adulthood | neutral | mixture of both (27 bizarre and 27 familiar action statements) | *imagery task:* imaginings: 0×, 1×, and 5× (within-subjects); *other variables:* encoding (Session 1): enacted, imagined, and not presented (within-subjects); item type: familiar and bizarre (within-subjects) | 24 hours | one (0×, 1×, 5× imagined) | other-generated | two weeks | significant negative main effect of repetition showed that false recognition rose with number of imaginings; significant repetition × encoding interaction showed this effect was limited to actions imagined at encoding, with performed actions unaffected; significant repetition × item type interaction showed stronger inflation for familiar than bizarre actions; significant three-way interaction (repetition × encoding × item type) showed the highest false recognition for familiar actions that had been imagined and then repeatedly imagined; significant main effect of encoding showed higher false recognition for imagined than performed actions, especially for familiar ones (encoding × item type interaction); significant main effect of item type showed that familiar actions elicited more false recognition than bizarre ones. | memory accuracy (recognition task and source monitoring task) | Repeated imagination significantly increases false recognition, especially for actions that were imagined at encoding and familiar in content. Performed actions remain largely resistant to this inflation effect. The findings highlight the vulnerability of imagined and familiar events to memory distortion through repeated mental simulation. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Worthen and Wood (2001) Experiment 1 | *N* = 64 healthy adults (undergraduates) | adulthood | neutral | mixture of both (20 common and 20 bizarre action statements) | *imagery task:* retrieval: imagery vs. enactment testing (between-subjects); *other variables:* encoding: imaginal vs. performance (between-subject); item type: common and bizarre (within-subjects); lure type: consistent, inconsistent, and novel (within-subjects) | 48 hours | one (0×, 1× imagined) | other-generated | immediately after imagination, within the same session | no significant main effects or interactions of testing condition on response bias; significant three-way interactions between encoding, testing, and item type revealed that bizarre imagined items were both more accurately and more falsely recognized than common imagined items, but only under imaginal testing; significant encoding × testing interaction indicated that imagined actions were better discriminated under imaginal than enactment testing; main effects of encoding showed that performed actions yielded higher correct recognition, lower false recognition, and greater memory discrimination than imagined actions | memory accuracy (recognition task and source monitoring task) | The findings suggest that testing condition alone does not affect response bias, but interacts with encoding and item characteristics in shaping memory performance. Imaginal testing selectively enhances both accurate and false recognition of bizarre imagined actions, highlighting its sensitivity to internally generated content. Performed actions consistently lead to superior memory accuracy across conditions, indicating a robust enactment effect. Overall, the results underscore that the effectiveness of retrieval conditions depends on the nature of prior encoding and the distinctiveness of the memory content. |

*Note.* “Mixture of both” refers to a combination of personal experiences and fictitious events (type of event) or of self-generated and other-generated content (source of intervention script).

## Table S4.3

*Extracted and Coded Data for Studies on Imagery-Induced Autobiographical False Memories*

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Devitt, Monk-Fromont, et al. (2016) Experiment 1 | *N* = 20 healthy adults (19–27) | childhood, adolescence, adulthood | not explicitly defined | mixture of both (memory details from at least 100 specific autobiographical events from the past 10 years recombined into 162 conjunction lures; 81 partially recombined [one detail switched: person, place, or object; 27 each], 81 fully recombined [all three details drawn from different memories]) | *imagery task:* imagined and not imagined (new) lures (within-subjects) | intervention was used for memory induction | one (0×, 1× imagined) | other-generated | approximately one week | significant negative main effect of imagination on memory source judgments (imagined vs. new lures): more conjunction errors after imagination. | memory accuracy (recognition task with memory source judgments) | Consistent with the imagination inflation effect, conjunction lures for which an event was imagined resulted in more autobiographical memory conjunction errors. |
| Devitt, Monk-Fromont, et al. (2016) Experiment 2 | *N* = 20 healthy adults (18–29) | childhood, adolescence, adulthood | not explicitly defined | mixture of both (memory details from at least 100 specific autobiographical events from the past 10 years recombined into 124 conjunction lures; 62 partially recombined [one detail switched: person, place, or object; 27 each], 62 fully recombined [all three details from different memories]) | *imagery task:* imagination, associative (non-imagery), and not imagined (new) lures (within-subjects) | intervention was used for memory induction | one (0×, 1× imagined) | other-generated | approximately one week | significant negative main effect of imagination (vs. associative task) on conjunction error rates indicated by higher rate of conjunction errors; significant positive main effect of imagination on source memory accuracy, with participants being more accurate at determining the source of imagined detail sets than associative detail sets; no significant main effect of imagination on memory source judgments when comparing imagined vs. new lures. | memory accuracy (recognition task with memory source judgements) | Imagination produced two opposing effects compared to the associative control task: it significantly increased conjunction error rates, indicating higher susceptibility to false memories, while also significantly improving source memory accuracy, with participants better able to identify the origin of remembered details. However, imagination had no significant effect on source memory judgments when comparing imagined lures to new, unseen lures, |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Devitt, Tippett, et al. (2016) | *N* = 54 healthy younger and older adults (n.a.) | childhood, adolescence, adulthood | not explicitly defined | mixture of both (memory details from 40–50 autobiographical events from the past 10 years recombined into 78 conjunction lures; 39 partially recombined [one detail switched: person, place, or object; 13 of each], 39 fully recombined [all three details from different memories]) | *imagery task:* imagination, associative (non-imagery), and not imagined (new) lures (within-subjects); *other variable:* younger adults vs. older adults (between-subjects) | intervention was used for memory induction | one (0×, 1× imagined) | other-generated | approximately one week | no significant main effect of condition (imagination vs. associative); no significant condition × age interaction; significant main effect of age: older adults showed higher conjunction error rates than younger adults; significant negative main effect of prior exposure showed that lures previously encountered (via imagination or association) elicited more conjunction errors than new lures. | memory accuracy (recognition task with memory source judgements) | No effect of imagination was observed, and the pattern did not differ between age groups. Older adults showed greater susceptibility to conjunction errors than younger adults, independent of condition. Across both age groups, prior exposure to lures – whether through imagination or associative processing – led to more conjunction errors than entirely new lures, consistent with a familiarity- or fluency-based effect. |
| Herndon et al. (2014) | *N* = 99 healthy adults (n.a.) | childhood | traumatic | fictitious event (suggested experience of an early childhood medical procedure) | *imagery task:* guided imagery vs. no imagery (between-subjects); *other variable:* group influence vs. no group influence (between-subjects) | immediately after, within the same session | one (0×, 1× imagined) | other-generated | immediately after, within the same session | significant negative main effect of imagery on false memory formation, indicated by significantly increased false memory reports compared to no imagery, and significant negative main effect of group, indicated by significantly increased false memories in the group social influence condition compared to the individual condition; no significant interaction between imagery and group; no negative main effect of imagery on certainty significant negative main effect of group on certainty, indicating higher belief that the event occurred in group vs. individual conditions. | memory accuracy (false memory formation in free recall), memory belief or confidence (certainty) | Guided imagery and group social influence both increased false memory formation, with imagery significantly raising false memory reports and group influence elevating both false memories and the belief that the event actually occurred. Imagery did not significantly affect participants' certainty in the event, while group social influence led to higher certainty, indicating that social context enhances conviction in false memories. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Hyman and Pentland (1996) | *N* = 65 healthy adults (students) | childhood | positive and negative | mixture of both (recall of both true autobiographical events and suggested autobiographical events) | *imagery task:* guided imagery vs. control condition (silent thinking) (between-subjects); *other variable:* true, false events (within-subjects) | immediately following a failed recall attempt for a given event in the memory interview (whether true or false) | one (0×, 1× imagined) | other-generated | immediately after, within the same session and during two follow-up interviews on consecutive days | significant negative main effect of guided imagery on false memory formation, indicated by higher false memory rates in the imagery group compared to control; no significant main effect on true memory accuracy; significant main effect of time, with increased memory recall over repeated interviews. | memory accuracy (true and false memories) | Guided imagery significantly increased false memory formation without affecting recall of true childhood events. Participants in the imagery group were more likely to report remembering a fabricated childhood event, and this effect grew over repeated interviews. No significant differences emerged for true memory accuracy, but memory reports – both true and false – increased over time. |
| Paddock and Terranova (2001) | *N* = 359 healthy adults (undergraduates) | childhood | not specified | mixture of both (recall of a *know* event – details of which came from hearing others tell it) | *imagery task:* guided visualization by expert vs. guided visualization by nonexpert vs. visual control task vs. verbal control task (between-subjects); *other variable:* misleading questions vs. no questions (between-subjects) | immediately after, within the same session | one (0×, 1× imagined) | other-generated | immediately after, within the same session | significant negative main effect of guided visualization on memory belief, with higher know/remember scores compared to control conditions (visual and verbal); within the guided visualization group, participants exposed to an expert source showed significantly stronger belief in the false memory than those exposed to a nonexpert; no significant main effect of misleading questions. | memory belief or confidence (remember-know ratings) | Guided imagery increased participants' belief that a suggested *know* event – originally described based on secondhand information – was personally remembered. This effect was significantly stronger when the visualization was led by an expert, indicating that source credibility enhanced belief in the false memory. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Paddock et al. (2000) Experiment 1 | *N* = 125 healthy adults (undergraduates) | childhood | not explicitly defined | mixture of both (depending on the condition, participants provided a personal childhood memory from before age 10 categorized as either *remember* [experienced], *know* [known but not recalled] or *unsure*; not all events were necessarily consciously experienced) | *imagery task:* guided visualization vs. visual control task (between-subjects); *other variable:* memory type: remember vs. know vs. unsure (assigned within groups) | immediately after, within the same session | one (0×, 1× imagined) | other-generated | immediately after, within the same session | significant negative main effect of condition on memory belief, with higher know/remember ratings in the guided imagery group compared to control; significant main effect of memory type; significant condition × memory type interaction: imagery increased ratings for *know* and *unsure* memories, but not for *remember* memories. | memory belief or confidence (remember-know ratings) | Guided imagery significantly increased participants' belief in the authenticity of childhood memories, especially for events they merely *knew* about or felt unsure of. Compared to the control group, imagery led to higher know/remember ratings for these less vivid memories, but had no effect on clearly remembered events. |
| Parker and Dagnall (2019) Experiment 1 | *N* = 92 healthy adults (n.a.) | childhood | not explicitly defined | mixture of both (recall of two memories from before the age of 10; one *remember* memory and one *know* memory) | *imagery task:* imagery vs. no-imagery condition (between-subjects); *other variable:* dynamic visual noise vs. static visual noise (between-subjects) | immediately after, within the same session | one (0×, 1× imagined) | self-generated | immediately after (following a short pause), within the same session | *remember* memories: no significant main or interaction effects; *know* memories: significant main effects of imagery and noise condition, and a significant interaction; under static visual noise, the imagery task (vs. no-imagery control) led to a significant "know-to-remember" shift. Under dynamic visual noise, this shift was eliminated. | memory belief or confidence (remember-know ratings) | The imagery task led to a significant "know-to-remember" shift in belief ratings for autobiographical memories initially classified as "known." This effect was eliminated under dynamic visual noise. In contrast, belief ratings for "remember" memories were unaffected by either imagery or visual interference. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Parker and Dagnall (2019) Experiment 2 | *N* = 120 healthy adults (n.a.) | childhood | positive and negative | mixture of both (participants were exposed to event scenarios that varied in likelihood, including one that was described as "extremely unlikely to have occurred" [i.e., having a nurse remove a skin sample from the little finger] and others taken from the LEI, which were "very likely to have occurred for the majority of participants") | *imagery task:* imagination vs. listen condition (between-subjects); *other variable:* dynamic visual noise vs. static visual noise (between-subjects); event type: non-occurring event, LEI-baseline event, LEI-exposed event (within-subjects) | immediately after, within the same session | one (0×, 1× imagined) | other-generated | immediately after (following a short pause), within the same session | non-occurring and LEI-exposed events: significant main effects of noise condition, no main effects of imagination, and significant interactions; imagination increased belief ratings under static visual noise, but not under dynamic visual noise (reversed and non-significant for LEI-exposed); LEI-baseline events: no significant main or interaction effects. | memory belief or confidence | Imagination led to belief inflation for non-occurring and plausible childhood events when no visual interference was present, but this effect disappeared under dynamic visual noise. Baseline events not exposed during the intervention showed no changes, confirming that the effect was specific to actively imagined content. |
| Segovia and Bailenson (2009) | *N* = 55 healthy children (n.a.); *n* = 27 preschoolers, *n* = 28 young elementary children | childhood | neutral or positive | fictitious event (whale event: swimming with two orca whales, mouse event: shrinking to dance with a stuffed mouse) | *imagery task:* mental imagery vs. virtual reality self-simulation vs. virtual reality other-simulation vs. narrative only (between-subjects) | immediately after, within the same session | one (0×, 1× imagined) | other-generated | immediately after, within the same session and approximately five days after | preschool children: no significant main or interaction effects; false memories increased over time across all conditions.<br>elementary children: significant main effects of time and condition, and a significant interaction; mental imagery and virtual reality self conditions led to significantly more false memories than the narrative-only idle condition in both immediate and delayed interviews, while the virtual reality other condition did not differ from control. | memory accuracy (false memory formation) | In preschool children, false memories increased over time regardless of the type of memory prompt, with no significant group differences. In contrast, elementary school children were more susceptible to false memory formation following mental imagery and self-referential virtual reality prompts, compared to a narrative-only control. The virtual reality other condition, which lacked self-relevance, did not enhance false memory formation. |

*Note.* "Mixture of both" refers to a combination of personal experiences and fictitious events (type of event) or of self-generated and other-generated content (source of intervention script). LEI = Life Events Inventory.

**Table S4.4**

*Extracted and Coded Data for Studies on Memory Facilitation*

| Authors | Sample characteristics | Memory content | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Geiselman et al. (1985) | *N* = 89 healthy adults (undergraduates) | adulthood | negative | personally observed event (one of four films presenting a four-minute film of a violent crime, including a bank robbery, a liquor store holdup, a family dispute, or a warehouse search) | *imagery task:* cognitive interview (including context reinstatement = imagery condition) vs. hypnosis interview (without explicit event-related imagery instructions) vs. standard (control) police interview (between-subjects); *other variables:* gender (between-subjects); type of crime scenario (between-subjects) | approximately 48 hours | one (0×, 1× imagined) | self-generated | immediate recall during the interview | significant positive main effect of interview condition was found on the number of correct items recalled, indicating that both the cognitive (imagery) and hypnosis interviews led to significantly greater recall accuracy compared to the standard police interview; no significant main effect on the number of incorrect and confabulated items; significant main effect of gender on the number of incorrect items recalled, indicating that male participants produced more errors than female participants; significant interaction effect of interview condition and crime scenario was observed for correct recall, indicating that the superiority of the cognitive and hypnosis interviews was especially pronounced in high-density event scenarios such as the bank robbery and liquor store films. | memory accuracy (free recall: correct, incorrect and confabulated items) | Both the cognitive (imagery) and hypnosis interviews enhance eyewitness memory accuracy compared to standard police interviewing, without increasing memory errors or confabulations. The cognitive interview, which includes context reinstatement, appears particularly effective in complex, event-dense scenarios. Additionally, the observed gender effect indicates that female witnesses may exhibit fewer memory errors than male witnesses under these conditions. |

| Authors | Sample characteristics | Memory content | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Memon et al. (2002) | *N* = 169 healthy adults; *n* = 84 younger adults (18–30), *n* = 85 older adults (60–80) | adulthood | negative | personally observed event (one-minute film of a car theft shown as a televised crime reconstruction, including a test drive, an armed threat, and the suspect fleeing in the stolen vehicle) | *imagery task:* context reinstatement (imagery) + (false) mugshot exposure (source confusion manipulation) vs. (false) mugshot exposure (source confusion manipulation) vs. no mugshot control (between-subjects); *other variable:* age: younger vs. older adults (between-subjects) | 48 hours | one (0×, 1× imagined) | self-generated | immediately after, within the same session | significant main effect of condition indicated that critical foil choices decreased and correct rejections increased across conditions, with the mugshot exposure group showing the highest rate of critical foil errors and the lowest rate of correct rejections, followed by the context reinstatement group, and then the control group; significant main effect of age showed that younger adults made more correct rejections and fewer other foil choices than older adults; significant interaction between condition and decision revealed that the pattern of lineup decisions (correct rejection, critical foil, other foil) varied systematically across experimental conditions, with critical foil errors most frequent in the mugshot-only group and least frequent in the control group; significant interaction between age and decision indicated that older adults were more likely than younger adults to make other foil errors. | memory accuracy (rate of correct rejections in the lineup) | Prior exposure to misleading facial information can significantly distort eyewitness memory, leading to increased false identifications. While context reinstatement partially reduced these distortions, it did not fully eliminate the effects of mugshot-induced familiarity. Furthermore, age-related differences in memory performance emerged, with older adults showing greater susceptibility to lineup errors, particularly in the form of selecting incorrect foils. Together, these results highlight the vulnerability of eyewitness memory to post-event influences and suggest that both cognitive interventions and participant characteristics such as age play a critical role in shaping identification accuracy. |

| Authors | Sample characteristics | Memory content | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Ready et al. (1997) | *N* = 100 healthy adults (undergraduates) | adulthood | negative | personal experience (participants were led to believe they would give a videotaped speech to be critiqued by a psychologist, then watched a video depicting a seemingly real, stressful social situation in which another student was harshly criticized after speaking) | *imagery task:* context reinstatement (imagery) vs. hypnosis (without explicit event-related imagery instructions) vs. hypnosis + context reinstatement vs. motivational instructions vs. no-expectation control (between-subjects); line-up type: target-present vs. target-absent (within-subjects); fair vs. suggestive (within-subjects) | two days | one (0×, 1× imagined) | self-generated | immediately after, within the same session | no significant main effect of intervention on fact memory; no significant main effect on susceptibility to misleading information; significant main effect of intervention on facial recognition, indicating higher accuracy in the hypnosis + context reinstatement group (fair speaker-present lineup); significant main effect indicating better performance of the hypnosis group in the suggestive critic-present lineup; significant main effect indicating increased false identifications by the hypnosis group in the suggestive speaker-absent lineup. | memory accuracy (factual and facial recognition) | The interventions did not affect factual memory or susceptibility to misinformation, suggesting no general memory enhancement. However, facial recognition performance varied by condition: hypnosis (without explicit event-related imagery instructions) – particularly when combined with context reinstatement – led to improved identification accuracy in certain lineups, but also increased the risk of false identifications in suggestive contexts. This indicates that hypnosis may selectively enhance face recognition but also carries risks under biased conditions. |
| Wagstaff et al. (2007) Experiment 1 | *N* = 30 healthy adults (19–56) | adulthood | negative | personal experience (live televised coverage of Princess Diana's funeral) | *imagery task:* context reinstatement alone vs. context reinstatement + meditation vs. no-intervention control (between-subjects) | several years | one (0×, 1× imagined) | self-generated | immediately after, within the same session | significant main effect of experimental condition on correct responses to open-ended questions, indicating that the meditation + context reinstatement group recalled more correct information than the context reinstatement alone and control groups; significant main effect of experimental condition on correct responses to closed-ended questions, indicating that the meditation + context reinstatement group outperformed both other groups; no significant differences between context reinstatement alone and control. | memory accuracy (correct responses to open- and closed-ended questions) | The combination of focused meditation and context reinstatement enhances memory accuracy, while context reinstatement alone shows no advantage over control, suggesting that preparatory techniques like meditation may be critical to unlocking the benefits of mental context reinstatement. |

| Authors | Sample characteristics | Memory content | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Wright et al. (2001) Experiment 2 | *N* = 162 healthy adults (undergraduates) | adulthood | negative | personally observed event (video depicting a drink-driving incident. There were two versions: one included a scene where a police officer stops a drunk driver [Control Omit & Omit], and the other omitted this scene [Control Add & Add]; both versions ended with the car hitting a pedestrian) | *imagery task:* imagination (critical scene imagined – Add) vs. no imagination of critical scene (Omit) vs. no imagination task (Control Add, Control Omit) (between-subjects); *other variable:* video version: critical scene present (Omit, Control Omit) vs. critical scene absent (Add, Control Add) (between-subjects) | same session | one (0×, 1× imagined) | mixture of both (participants received no detailed content but were instructed to imagine all scenes; Add condition included a previously unseen critical scene, Omit condition excluded it; imagination was self-paced and effort was encouraged) | four minutes (filler task) | significant difference between Add and Control Add in free recall, with higher false recall in the Add condition, indicating that imagination increased false memory; significant difference between Omit and Control Omit in free recall, with lower accurate recall in the Omit condition, suggesting that imagination may have interfered with memory for actually seen events; significant difference between Add and Control Add in recognition, with higher false recognition in the Add condition, further supporting the impact of imagination on memory distortion; no significant difference between Omit and Control Omit in recognition, likely due to ceiling effects; chi-square tests were used to analyze group differences; no factorial main effects or interactions were reported. | memory accuracy (recognition test) | The findings suggest that imagination can increase the likelihood of false memories for events that did not occur, particularly when individuals are encouraged to imagine scenes they have not actually witnessed. At the same time, engaging in imagination tasks may also interfere with the accurate recall of real events. These results indicate that imagination influences memory not only by constructing plausible but false content, but also by potentially disrupting access to genuine episodic details. Overall, the study highlights both the constructive and disruptive effects of imagination on memory. |

*Note.* “Mixture of both” refers to a combination of personal experiences and fictitious events.

**Table S4.5**

*Extracted and Coded Data for Studies Examining Imagery Rescripting and Imaginal Exposure*

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Aleksic et al. (2024) | *N* = 267<br>healthy<br>adults (18–55) | adulthood | negative | personally observed event (trauma film: *Picco* [Koch, 2010], depicting a group of three prisoners torturing another inmate through both physical and psychological violence) | ImRs with sensory-perceptual focus vs. ImRs without sensory-perceptual focus vs. NIC (between-subjects); *other variable:* clear vs. unclear memory (between-subjects) | one day | one (0×, 1× imagined) | other-generated; standardized ImRs protocol, delivered via audio (based on Kunze et al., 2017, who adapted it from Arntz & Weertman, 1999) | one day | significant positive main effect of condition indicated more correct answers and fewer “I don’t know” responses after ImRs with sensory focus compared to NIC; no significant differences between ImRs without sensory focus and NIC, or between the two ImRs conditions; no significant main effect of condition was found for incorrect responses; significant main effect of memory clarity indicated more correct answers, fewer incorrect answers, and fewer “I don’t know” responses after viewing the clear (unfiltered) film version compared to the unclear (blurred) version; no interaction effects between condition and memory clarity were found. | memory accuracy (recognition task) | ImRs with a sensory-perceptual focus led to more correct answers and fewer “I don’t know” responses compared to NIC. There were no significant differences between the two ImRs conditions or in incorrect answers. Additionally, memory clarity had a significant effect, with participants in the clear memory condition showing more correct answers, fewer incorrect answers, and fewer “I don’t know” responses than those in the unclear condition. The beneficial effects of ImRs with a sensory-perceptual focus on memory accuracy were consistent across both memory clarity conditions, indicating that the effectiveness of the intervention did not depend on the initial quality of the memory. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Ganslmeier, Ehring, et al. (2023) | *N* = 120 healthy adults (18–30) with elevated trait anxiety (STAI-T >39; Laux et al., 1981) | adulthood | negative | personally observed event (trauma film: *Irréversible* [Noé, 2002], depicting sexual and physical abuse of a woman) | ImRs vs. ImE vs. NIC (between-subjects) | one day | one (0×, 1× imagined), plus homework: listening to the audio recording three times between Session 2 (intervention) and Session 3 (1 week post-intervention) | ImRs: partly self-generated; from the predefined hotspot, participants imagined a standardized, experimenter-guided rescripting scenario (e.g., intervention, police arrival; predominantly other-generated), with self-generated detail (based on Kunze et al., 2017, who adapted it from Arntz & Weertman, 1999)<br>ImE: self-generated (based on Foa et al., 2008) | six days (free recall, cued recall, recognition task), six days plus one week (cued recall, recognition task) | free recall: significant positive main effect of condition and significant main effect of time and time × condition interaction indicated that the number of correctly remembered details increased after ImE, whereas there was no significant change in ImRs and in NIC over time;<br>cued recall: no significant main effects of time, of condition and of interaction;<br>recognition task: no significant main effects of time, of condition and of interaction. | memory accuracy (free recall, cued recall, recognition task) | ImE improved the number of correctly recalled details in free recall, while ImRs had no such effect. There was no condition-specific effect on incorrectly recalled details, although these decreased slightly over time in all groups. No differences were observed in cued recall or visual recognition. Overall, no negative effects on memory accuracy were found, and ImE may enhance recall accuracy for emotionally intense scenes. |
| Ganslmeier, Kunze, et al. (2023) | *N* = 100 healthy adults (18–30) | adulthood | negative | personal experience (adapted version of the Trier Social Stress Test; Kirschbaum et al., 1993) | ImRs vs. NIC (between-subjects) | two days | one (0×, 1× imagined), plus homework: listening to the audio recording three times between Session 2 (intervention) and Session 3 (1 week post-intervention) | self-generated (based on Kunze et al., 2017, who adapted it from Arntz & Weertman, 1999) | one week (free recall, cued recall), one week plus three months (cued recall) | free recall: significant main effect of time and significant time × condition interaction indicated that the number of correctly remembered details increased over time following ImRs, but not in NIC; no significant main or interaction effects for incorrect details;<br>cued recall: no significant main effect of condition; significant main effect of time indicated that increase of incorrect answers and "not remembered" responses and decrease of correct answers over time. | memory accuracy (free recall, cued recall) | ImRs did not increase the number of incorrect details in free recall but did increase the number of correct details compared to the NIC. This suggests that ImRs may enhance the validity of voluntary autobiographical memory rather than impair it. In cued recall, no differential effects were found between conditions; however, memory performance decreased over time in both conditions, likely reflecting normal forgetting processes. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Hagenaars and Arntz (2012) | *N* = 76 healthy adults (18–38) | adulthood | negative | personally observed event (trauma film: four traumatic scenes of real-life footage of the aftermath of road traffic accidents; adapted from Steil, 1996; used in Hagenaars et al., 2008) | ImRs vs. IRE vs. positive imagery (between-subjects) | 30 minutes | one (1× imagined) | self-generated (based on Dancu & Foa, 1993) | one week | significant positive main effect of condition indicated that cued recall performance was enhanced in the ImRs and IRE groups relative to the active control condition (positive imagery), whereas ImRs and IRE did not differ significantly from each other. | memory accuracy (cued recall) | Both the IRE and ImRs groups showed enhanced cued recall performance compared to the active control condition (positive imagery). As both interventions involved recalling the original trauma film, this may have facilitated encoding of trauma-related information relative to the positive imagery condition, which was not directly linked to the film content. |
| Romano et al. (2020) | *N* = 33 adults (n.a.) with Social Anxiety Disorder | not limited to a specific lifetime period of memory | negative | personal experience (negative social memory of a specific event) | ImRs vs. ImE vs. supportive counselling (between-subjects) | not defined | one (0×, 1× imagined), plus daily homework for six days between Session 3 (1 week after intervention) and Session 4 (2 weeks after intervention); ImRs: recalling rescripted memory during anxiety-provoking situations; ImE: listening to the audio recording of their ImE | self-generated (ImRs protocol, based on Arntz & Weertman, 1999, and Wild et al., 2007; ImE protocol, based on Foa et al., 2007) | one week, two weeks and three months | internal negative details: significant main effect of time and a significant time × condition interaction indicated that the number of internal negative details increased over time after ImE, but not after ImRs or in the active control condition (supportive counselling); internal positive/neutral details: significant main effect of time and a significant time × condition interaction indicated that the number of internal positive/neutral details increased over time after both ImRs and ImE, but not in the active control condition (supportive counselling). | changes in memory content (number of positive/neutral and negative details) | ImRs significantly increased positive/neutral details but not negative details, while ImE increased both positive/neutral and negative details. Supportive Counseling did not lead to changes in either type of detail. Unlike Supportive Counseling, which did not directly target specific memories, ImRs and ImE modified memory content in distinct ways, each leaving a unique mnemonic signature. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Siegesleitner et al. (2019) | *N* = 88 healthy adults (18–30) | adulthood | negative | personally observed event (trauma film: *Irréversible* [Noé, 2002], depicting a scene of sexual and physical assault) | ImRs vs. IRE vs. NIC (between-subjects) | 24 hours (± 3 hours) | one (0×, 1× imagined) | self-generated | six days (± 3 hours) | no main effect of condition among ImRs, IRE (similar to ImE), and NIC. | memory accuracy (open-answer memory recall test) | Neither ImRs nor IRE significantly affected memory accuracy in a memory recall test with open-ended answers compared to NIC. |

*Note.* ImRs = Imagery Rescripting; ImE = Imaginal Exposure; NIC = no-intervention control; IRE = Imagery Rehearsal (similar to ImE).

**Table S4.6**

*Extracted and Coded Data for Studies Examining Eye Movements*

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Calvillo and Emami (2019) (replication with small additions of Houben et al., 2018) | *N* = 120 healthy adults (18–34) | adulthood | negative | personally observed event (trauma film, depicting an automobile accident that resulted from text messaging while driving; also used in Strange & Takarangi, 2012) | horizontal EM vs. eyes stationary (between-subjects) | immediately after, within the same session | one (four 24-second intervals separated by 10-second breaks) | not explicitly defined; standardized procedure described; however, after the intervention, all participants received misinformation (printed eyewitness narrative with 10 true and 5 false statements). | approximately 10 minutes after the intervention (two 5-minute filler tasks and reading of the eyewitness narrative with misinformation) | no significant effect of EM on correct responses, misinformation responses, or robust false memories compared to the active control condition (eyes stationary). | memory accuracy (recognition task) | EM (compared to eyes stationary) did not reduce the number of correct memory details, nor did it increase misinformation endorsement or false memory. |
| Christman et al. (2003) Experiment 2 | *N* = 40 healthy adults (undergraduates) | adulthood | not determined, “mundane or highly significant” | personal experience (participants recorded ten unusual events over six days, ranging from mundane [e.g., stubbing a toe] to significant [e.g., attending a funeral]) | horizontal saccadic EM vs. no EM (between-subjects) | up to six days (recording of events) and approximately two weeks | one (four 24-s intervals separated by 10-second breaks) | not explicitly defined; standardized procedure described | immediately after, within the same session | significant positive main effect of EM compared to the active control condition (looking at a color-changing circle without EM). | memory accuracy (recall the gist of as many events from their journals as possible) | Engaging in EM prior to memory retrieval enhanced the recall of autobiographical events, compared to a baseline condition in which participants viewed a color-changing circle without performing EM. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Houben et al. (2018) | *N* = 82 healthy adults (19–31) | adulthood | negative | personally observed event (trauma film, depicting a road accident with multiple car crashes, resulting in at least five injured people, including a baby, ending with emergency services arriving and a close-up of the driver's face; also used in Strange & Takarangi, 2012) | horizontal EM vs. eyes stationary (between-subjects) | immediately after, within the same session | one (four 24-second intervals separated by 10-second breaks) | not explicitly defined; standardized procedure described; however, after the intervention, all participants received misinformation (printed eyewitness narrative with 10 true and 5 false statements). | approximately 10 minutes after the intervention (two 5-minute filler tasks and reading of the eyewitness narrative with misinformation) | significant negative effect of EM on correct memory responses and misinformation acceptance compared to the active control condition (eyes stationary). | memory accuracy (recognition task) | EM led to a decrease in correct answers and an increase in misinformation acceptance compared to the eyes stationary condition. |
| Lyle (2018) Experiment 1 | *N* = 110 healthy adults (18–30) | adulthood | neutral to negative | personally observed event (slideshow from Lyle & Jacobs, 2010; originally developed by McCloskey & Zaragoza, 1985; 79 slides depicting a repairman stealing from a woman's office) | saccadic EM vs. fixation (between-subjects); *other variable:* handedness: inconsistent vs. consistent (between-subjects) | 10 minutes (filler task) | one (30 seconds) | not explicitly defined; standardized procedure described | immediately after, within the same session | no significant effect of EM on correct answers compared to the active control condition (fixation); however, there was a significant main effect of handedness[a], with inconsistent-handers showing higher cued-recall accuracy than consistent-handers. No interaction with EM was found, indicating that this advantage was independent of whether participants performed saccadic eye movements or fixation. | memory accuracy (cued recall) | Repetitive EM did not increase cued recall. In contrast, handedness consistency was a reliable predictor of recall accuracy, independent of EM, highlighting a stable individual difference in episodic memory performance. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Lyle (2018) Experiment 2 | *N* = 162 healthy adults (18–30) | adulthood | neutral to negative | personally observed event (slideshow from Lyle & Jacobs, 2010; originally developed by McCloskey & Zaragoza, 1985; 79 slides depicting a repairman stealing from a woman's office) | saccadic EM vs. fixation (between-subjects); *other variable:* handedness: inconsistent vs. consistent (between-subjects) | 10 minutes (filler task) | one (30 seconds) | not explicitly defined; standardized procedure described | immediately after, within the same session | significant handedness[a] × EM interaction on total recall of victim information; no significant effects on total recall of perpetrator or object information. | memory accuracy (free recall) | Of the three content areas (victim, perpetrator, and objects), only victim recall was significantly affected by handedness and EM. In the fixation condition, inconsistent-handers recalled more details than consistent-handers. EM significantly enhanced victim recall in consistent-handers, but not in inconsistent-handers. |
| Lyle and Jacobs (2010) Experiment 1 | *N* = 128 healthy adults (18–30) | adulthood | neutral to negative | personally observed event (two slideshows: one comprising 79 slides depicting a repairman stealing cash from an office [McCloskey & Zaragoza, 1985]; the other comprising 64 slides depicting a man shoplifting from a campus bookstore [Loftus, 1991]) | saccadic eye movements vs. fixation (between-subjects); *other variables:* handedness: strongly right-handed vs. not strongly right-handed (between-subjects); item type: seen (slides-only), unseen-contradictory, unseen-additive, and unseen-new (within-subjects) | after a 15-minute reading phase (reading misinformation descriptions) | one (30 seconds) | not explicitly defined; standardized procedure described | immediately after, within the same session | significant EM × Test interaction indicated that EM, compared to the active control condition (fixation), increased discrimination between seen and unseen details on Test 1 only, not on Test 2; no significant effects of EM on hit rates or false alarm rates; significant main effect of item type showed that discrimination was lower for misleading (contradictory or additive) than for entirely new unseen items; no significant EM × handedness interaction, indicating that the memory benefit was similar for participants who were strongly right-handed and those who were not. | memory accuracy (recognition test) | EM (compared to the fixation condition) enhanced the ability to discriminate seen from unseen details in a first test administered immediately after EM, but not in a second test administered immediately after the first. There were no significant effects on hit rates or false alarm rates. Discrimination was generally lower for misleading items (contradictory or additive) than for entirely new unseen items. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Lyle and Jacobs (2010) Experiment 2 | *N* = 104 healthy adults (18–30) | adulthood | neutral to negative | personally observed event (two slideshows: one comprising 79 slides depicting a repairman stealing cash from an office [McCloskey & Zaragoza, 1985]; the other comprising 64 slides depicting a man shoplifting from a campus bookstore [Loftus, 1991]) | saccadic eye movements vs. fixation (between-subjects); other variables: handedness: strongly right-handed vs. not strongly right-handed (between-subjects); item type: seen (slides-only), unseen-contradictory, unseen-additive, and unseen-new (within-subjects) | after a 15-minute reading phase (reading misinformation descriptions) | one (30 seconds) | not explicitly defined; standardized procedure described | immediately after, within the same session | significant positive main effect of EM, compared to the active control condition (fixation), on discrimination between seen and unseen details across tests, driven by a significant effect on Test 1 only, not on Test 2; significant positive main effect of EM on hit rates; no significant effect of EM on false alarm rates; significant main effect of item type on discrimination and false alarm rates, with lowest discrimination and highest false alarms for contradictory items; significant main effect of handedness on discrimination and false alarm rates, with superior performance for non-strongly right-handed participants. | memory accuracy (recognition test) | EM (compared to fixation) increased discrimination between seen and unseen items in a first test administered immediately after EM, but not in a second test administered immediately afterward. EM significantly increased hit rates, but had no significant effect on false alarm rates. Discrimination and false alarms were also significantly influenced by item type, with poorest discrimination and highest error rates for contradictory items. Non-strongly right-handed participants outperformed strongly right-handed ones in discrimination and showed fewer false alarms overall. |
| Meckling et al. (2024) Experiment 1 | *N* = 97 healthy adolescents, adults (17–27) | not defined, at least one week old | negative | personal experience (unpleasant autobiographical memory that received an unpleasantness rating of ≥60 [range: 0–100], and was at least one week old) | horizontal saccadic EM vs. recall only (between-subjects) | at least one week old, otherwise not further defined (range: 0.5–168 months) | one (12 recall sets of 24 seconds with 10-second breaks) | not explicitly defined; standardized procedure described | immediately after, within the same session | central details: significant negative main effect of time (no comparison between EM and the active control condition [recall only]); peripheral details: no significant time × condition interaction; no significant main effect of time. | changes in memory content (central and peripheral details) | Number of central details decreased from pre- to post-test across all participants. No comparison was conducted between EM and the recall-only condition; peripheral details remained stable, with no significant difference between conditions. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Meckling et al. (2024) Experiment 2 | *N* = 251 healthy adults (undergraduates) | not defined, at least one week old | negative | personal experience (unpleasant autobiographical memory that received an unpleasantness rating of ≥60 [range: 0–100], and was at least one week old) | horizontal saccadic EM vs. recall only (between-subjects) | at least one week old, otherwise not further defined (range: 0.33–216 months) | one (eight recall sets of 24 seconds with 10-second breaks) | not explicitly defined; standardized procedure described | immediately after, within the same session | both central and peripheral details: significant negative main effect of time; no significant time × condition interaction. | changes in memory content (central and peripheral details) | Central and peripheral details decreased over time, with no significant differences between EM and the recall-only conditions. |
| Parker et al. (2009) | *N* = 72 healthy adults (students) | adulthood | neutral to slightly negative | personally observed event (sequence of pictures with a verbal commentary describing the depicted events; based on McCloskey & Zaragoza, 1985) | bilateral EM vs. vertical EM vs. no EM (between-subjects) | approximately >11 minutes (filler tasks) | one (30 seconds) | not explicitly defined; standardized procedure described | immediately after, within the same session | significant positive effect of EM on correctly recognized items, reflected in a significantly higher hit rate in the bilateral EM condition compared to both active control conditions (no EM and vertical EM); no significant effect of EM on false alarms; significant effect of EM on misinformation memory, reflected in a significantly lower proportion of misattributions in the bilateral EM condition compared to both active control conditions (no EM and vertical EM). | memory accuracy (recognition task) | Bilateral EM significantly improved the correct recognition of studied items, as reflected in a higher hit rate compared to both the no EM and vertical EM conditions. No significant effect of EM was found for false alarms. However, EM had a significant effect on misinformation memory, leading to a significantly lower proportion of misattributions in the bilateral EM condition compared to both control conditions. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| van Schie and Leer (2019) (direct replication of Houben et al., 2018) | *N* = 206 healthy adults (17–55) | adulthood | negative | personally observed event (trauma film: UK public service announcement warning against texting while driving; depicts a multi-car crash with multiple fatalities, including a baby, and emergency response; also used in Strange & Takarangi, 2012) | horizontal EM vs. eyes stationary (between-subjects) | immediately after, within the same session | one (four 24-second intervals separated by 10-second breaks) | not explicitly defined; standardized procedure described; however, after the intervention, all participants received misinformation (printed eyewitness narrative with 10 true and 5 false statements). | approximately 10 minutes after the intervention (two 5-minute filler tasks and reading of the eyewitness narrative with misinformation) | no significant effect of EM on the number of correct answers or misinformation answers compared to the active control condition (eyes stationary). | memory accuracy (recognition task) | Memory recall with simultaneous EM (compared to the eyes stationary condition) did not increase misinformation endorsement or false memories, nor did it reduce correct memory details. |
| Xu et al. (2023) | *N* = 66 healthy adults (18–29) | adulthood | negative | personally observed event (trauma film: four film clips, each depicting a unique and graphic topic such as execution, slaughterhouse, killing chicken, and eating monkey brain, were played twice) | horizontal EM vs. fixation (between-subjects); *other variable:* recognition test: visual and verbal (within-subjects) | approximately 17–18 minutes (filler task) | one (24 interventions between 15–30 seconds) | not explicitly defined; standardized procedure described | immediately after the intervention, within the same session (Day 1) and one week later (Day 8) | significant EM × recognition test interaction on Day 1, suggesting different effects of the two interventions on the two types of memory; visual memory: recognition performance was significantly lower in the EM group compared to the fixation group on Day 1, indicating a selective disruption of visual (perceptual) memory. This difference was not observed on Day 8; verbal memory: no significant difference between groups was found on either Day 1 or Day 8. | memory accuracy (visual and verbal recognition task) | Bilateral eye movements temporarily impaired visual memory recognition accuracy, as evidenced by a significant interaction with memory type on Day 1. No significant effects were observed for verbal memory or for visual memory at the one-week follow-up. |

*Note.* EMDR = Eye Movement Desensitization and Reprocessing; EM = eye movements.
[a] Consistency of hand preference refers to predominantly using the same hand across tasks and is associated with episodic memory quality (Lyle, 2018).

**Table S4.7**

*Extracted and Coded Data for Studies Examining Hypnosis*

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Barnier and McConkey (1992) | *N* = 60 healthy adults (undergraduates) | adulthood | negative | personally observed event (watching slides of a purse snatching; McConkey et al., 1990) | hypnosis vs. waking condition (puzzle task) (between-subjects); *other variable:* high vs. low hypnotizability (between-subjects) | immediately after, within the same session | one | other-generated; standardized hypnotic induction (adapted from Weitzenhoffer & Hilgard, 1962); all participants also received suggestions about non-present details (a moustache, a scarf, and flowers). | in the same session; three tests: the first during hypnosis (or control task), the second immediately after in an informal context, the third directly afterwards in a formal context | no significant differences between the hypnosis and active control condition (puzzle task) for two of three items on two tests; significant difference was found for one item on one test, with more false memories reported under hypnosis; significant effects of hypnotizability for two items on two tests, with highly hypnotizable participants reporting more false memories; no significant effect of hypnotizability for one item on one test. | memory accuracy (free recall) | The experimental condition (hypnosis vs. control) influenced participants' memory reports for only one item on one test. In general, there were no significant differences in memory reports between the hypnosis and control groups. Hypnotizability emerged as the primary predictor of false memory reports. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Krackow et al. (2005) | *N* = 58 healthy adolescents and adults (17–20) | adolescence, adulthood | negative | personal experience (Princess Diana's death) | hypnosis vs, task motivation instructions (TMI) vs. context reinstatement / reverse order recall (CR/RO) (between-subjects) | approximately 11–12 weeks | one | other-generated; standardized procedure described; all participants were not provided with any external content suggestions but were instructed that the respective intervention (hypnosis, context reinstatement, or task motivation) would enhance their memory of the circumstances surrounding Princess Diana's death. | immediately after, within the same session | significant negative main effect of condition between hypnosis and TMI (active control condition), indicating less consistent recall of episodic details in the hypnosis group; no significant difference was found between hypnosis and CR/RO (active control condition) in terms of consistency; additionally, significant negative main effect of condition for omissions was found between hypnosis and CR/RO (active control condition), indicating that hypnotized participants omitted more flashbulb memory components; no significant difference in omissions was found between hypnosis and TMI. | changes in memory content (consistency of episodic ideas and omissions) | Hypnotized participants' recall was compromised relative to task-motivated participants on measures of consistency, with the TMI group providing the most stable and coherent recollections. Additionally, both CR/RO and TMI participants produced more complete narratives than those in the hypnosis condition, indicating that hypnosis reduced both the consistency and completeness of flashbulb memory recall. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Nourkova and Vasilenko (2018) | *N* = 120 adults (20–65); no explicit differentiation between healthy participants and those with clinical anxiety (recruited via advertisement for anxiety management study) | not limited to a specific lifetime period of memory | negative | personal experience (recall of three self-defining memories specific to domains that routinely elicited anxiety about participants' self-competence) | memory implantation in hypnosis vs. memory implantation in waking discussion vs. hypnosis alone vs. passive control (between-subjects); *other variable:* memory type: original and imagined (within-subjects) | All of these memories appeared to be older than one year. | three (one per week) | self-generated (Ericksonian conversational hypnosis; Lankton, 2012; Matthews et al., 1999); plus imagination of the originally reported situation while acting in line with personal preferences and without anxiety (i.e., memory implantation in hypnosis) | approximately four months | significant interaction between condition (imagination in discussion vs. memory implantation in hypnosis) and memory type (original vs. imagined) indicated that participants in the discussion condition were more confident in their original memories than in imagined ones, whereas participants in the hypnosis condition showed no such distinction; only participants in the discussion condition were able to reliably distinguish original from imagined memories. | memory belief or confidence (acquisition of fabricated positive self-defining autobiographical memories) | Participants in the hypnosis condition became unable to distinguish the originally reported memories from those created in hypnosis, whereas those in the discussion condition were more able to. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Sheehan et al. (1992) Experiment 1 | *N* = 196 healthy adults (undergraduates) | adulthood | negative | personally observed event (videotape depicting a bank robbery; Yuille, 1982) | hypnosis vs. waking instruction (between-subjects); *other variables:* high vs. low hypnotizability (between-subjects); rapport vs. no rapport (between-subjects) | immediately after (following a brief recall and question phase about the robbery), within the same session | one | other-generated; hypnotic regression to the film with embedded false suggestions | immediately after, within the same session | free recall: significant negative main effect of hypnosis and significant main suggestibility, as well as a significant interaction between state instruction and suggestibility. Both hypnosis (vs. active control condition: waking instruction) and high suggestibility increased pseudomemory, with the highest rates in highly suggestible participants under hypnosis; no significant effects were found for rapport or its interactions; structured recall: significant negative main effect of hypnosis and significant main effects of suggestibility and rapport indicated increased pseudomemory across conditions; significant interaction between suggestibility and rapport showed the highest pseudomemory in highly suggestible participants when rapport was maintained; significant three-way interaction (hypnosis × suggestibility × rapport) revealed that suppressing rapport reduced pseudomemory in highly suggestible participants under hypnosis. | memory accuracy (free recall, structured recall) | Pseudomemory was significantly increased by hypnosis and high suggestibility, particularly in highly suggestible participants under hypnosis. In structured recall, rapport also amplified memory distortion, whereas suppressing rapport reduced pseudomemory in highly suggestible individuals under hypnosis. No effects of rapport were found in free recall. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Sheehan and Statham (1989) | *N* = 128 healthy adults (n.a.) | adulthood | neutral to negative | personally observed event (watching slides depicting an implied but ambiguous robbery) | hypnosis vs. waking instruction (between-subjects); *other variables:* misleading, nonmisleading info (between-subjects); high vs. low susceptibility (between-subjects) | immediately after, within the same session | one | other-generated; hypnotic induction followed by misleading questions prior to hypnotic regression to the slide sequence | immediately after, within the same session | recognition memory test: no significant main or interaction effects of hypnosis or suggestibility; significant main effect of misinformation indicated increased memory distortion when misleading information was presented; free recall: significant negative main effects of hypnosis and suggestibility indicated increased memory distortion; participants who received hypnotic instructions made more factual, inferential, and total errors in their recall than those in the active control condition (waking condition). | memory accuracy (recognition test, free recall) | Misinformation impaired recognition accuracy, but hypnosis and suggestibility had no effect in this task. In contrast, both factors significantly increased memory distortion in free recall, where participants under hypnosis made more factual, inferential, and total errors than those in the waking condition. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Sheehan et al. (1991a) | *N* = 168 healthy adolescents and adults (16–53) | adolescence, adulthood | negative | personally observed event (videotape depicting a bank robbery; Yuille, 1982) | hypnosis vs. waking instruction (between-subjects); *other variable:* high vs. moderate vs. low susceptibility (between-subjects) | immediately after (following a free recall, a confidence rating of memory accuracy, and a questionnaire about the video's content), within the same session | one | other-generated; hypnotic regression to the film with false suggestions introduced by the experimenter | free recall immediately after intervention followed by structured recall, within the same session | free recall: significant negative main effect of hypnosis was found on one of two false memory items, with participants in the hypnosis condition more likely to report this item than those in the active control condition (waking instruction); significant main effect of suggestibility was also found on the same item, indicating that susceptibility levels significantly influenced the likelihood of reporting this false memory; structured recall: significant main effects of suggestibility were found for both false memory items, with highly susceptible participants reporting more pseudomemories; significant negative main effect of hypnosis was also found for one item, with participants in the hypnosis condition more likely to report it than those in the active control condition (waking condition). | memory accuracy (free recall, structured recall) | In free recall, hypnosis and higher suggestibility both significantly increased the likelihood of reporting one of two false memory items. In structured recall, suggestibility was associated with more pseudomemories across both items, and hypnosis led to increased reporting of one specific false memory. Effects were item-specific and more pronounced among highly suggestible participants. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Sheehan et al. (1991b) | *N* = 110 healthy adolescents and adults (17–68) | adolescence, adulthood | negative | personally observed event (videotape depicting a bank robbery; Yuille, 1982) | hypnosis vs. waking instruction (between-subjects);<br>*other variable:*<br>high vs. moderate vs. low susceptibility (between-subjects) | immediately after (following a free recall, a confidence rating of memory accuracy, and a questionnaire about the video's content), within the same session | one | other-generated; hypnotic regression to the film with false suggestions introduced by the experimenter | two weeks | free recall: significant negative main effect of hypnosis indicated that participants under hypnosis reported more pseudomemories than those in the active control condition (waking instructions); significant main effect of suggestibility showed that highly and moderately hypnotizable participants reported significantly more pseudomemories than low-hypnotizable participants; structured recall: significant interaction between suggestibility and instruction condition indicated that highly hypnotizable participants in the hypnosis condition reported more pseudomemories than low-hypnotizable participants, whereas no such difference was observed in the active control condition (waking condition). | memory accuracy (free recall, structured recall) | Pseudomemory formation was influenced by both hypnosis and hypnotizability. In free recall, hypnosis and higher suggestibility levels (high and moderate) each significantly increased memory distortion. In structured recall, a significant interaction showed that highly hypnotizable participants under hypnosis reported more pseudomemories than low-hypnotizable individuals, while no such difference occurred in the active control condition. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size<br>Mental health status<br>Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Sheehan and Tilden (1983) | *N* = 96 healthy adults (n.a.) | adulthood | negative | personally observed event (watching slides depicting an apparent robbery; Loftus, 1979; Powers et al., 1979) | hypnosis vs. waking instruction (between-subjects); *other variable:* high vs. low hypnotizability (between-subjects); misleading vs. neutral postevent information (between-subjects) | immediately after (following false information after the slide sequence), within the same session | one | other-generated; hypnotic regression to slide sequence; false (or neutral) info given prior to induction | recognition test during hypnosis and immediately after, free recall test after awakening | recognition test: no significant effect of hypnosis on the incorporation of false information compared to the active control condition (waking condition); however, significant main effect of misleading information (vs. neutral) showed increased errors in recognition; no significant effect of hypnosis, suggestibility, or misleading information on memory enhancement; free recall: no significant main effect of hypnosis; significant main effect of suggestibility indicated more false intrusions among highly suggestible participants; significant interaction (suggestibility × information condition) showed greater memory errors in highly suggestible individuals, particularly in the neutral condition compared to the misleading condition. | memory accuracy (recognition test, free recall) | Hypnosis had no significant effect on the incorporation of false information or false intrusions compared to active control condition. No evidence of memory enhancement was observed in either free recall or recognition. However, misleading information significantly reduced recognition accuracy (misinformation effect), and high suggestibility was associated with more memory intrusions in free recall. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Wagstaff et al. (2008) Experiment 1 | *N* = 60 healthy adults (18–56) | adulthood | negative | personally listened conversation (audio recording of a conversation between two men planning to rob a woman carrying money from a shop to her bank) | hypnotic warning (pre-hypnosis misinformation [like in standard misinformation condition] followed by hypnosis including a suggestion for reduced errors and a warning about misinformation) vs. standard misinformation (misleading information without hypnosis or a warning) vs. control (no misleading misinformation or hypnosis) (between-subjects) | after the first audio, participants listened to a second audio (either with misinformation related to the first audio or unrelated in the control group), followed by the intervention | one | other-generated; hypnotic relaxation induction (adapted from Barber, 1969) and focusing on the audio, including a suggestion to distinguish between correct and incorrect information, along with a warning of misinformation | during hypnosis | significant positive main effect of condition, indicating that the standard misinformation group reported significantly more errors than the hypnotic warning and active control groups, which did not differ significantly from each other. | memory accuracy (memory test) | The results suggest that the misinformation effect can be reduced or eliminated by combining hypnosis with a suggestion to distinguish between correct and incorrect information, along with a warning of misinformation. However, since the Standard Misinformation group didn’t receive a warning, it’s possible that the warning alone (without hypnosis) contributed to the reduction in errors. |

| Authors | Sample characteristics | Memory characteristics | | | Intervention characteristics | | | | Outcomes | | | Summary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Total sample size Mental health status Age group (range) | Lifetime period of memory | Memory valence | Type of event (specification) | Treatment technique or intervention | Time between memory induction or event and intervention | Number of sessions | Source of intervention script | Time between intervention and memory test | Direction and type of effect and type of comparison | Aspect of memory (specification) | |
| Wagstaff et al. (2008) Experiment 2 | *N* = 60 healthy adults (18–24) | adulthood | negative | personally observed event (watching slides depicting a woman who is threatened with a knife, and then assaulted and robbed of her purse) | hypnosis (following a post-test warning of misinformation) including a suggestion for reduced errors vs. pre-test warned condition vs. post-test warned condition (between-subjects) | immediately after (following a first memory test including misinformation and a warning of misinformation), within the same session | one | other-generated; hypnotic relaxation induction (adapted from Barber, 1969), focusing on the slides, with a suggestion to distinguish between correct and incorrect information, following a prior pre-hypnotic warning about misinformation | before and immediately after, within the same session | significant condition × time interaction and a significant negative main effect of condition on mean errors showed that the pre-test-warned group had fewer memory errors than the hypnosis and post-test-warned groups in the initial test, with more stable errors across tests; both the hypnosis and post-test-warned groups showed significant reductions in errors after the intervention, with the hypnosis group making fewer errors than the post-test-warned group on the second test; however, the hypnosis group still had more errors than the pre-test-warned group, suggesting hypnosis did not fully overcome the effects of initial misinformation commitment; significant negative main effect of hypnosis on the total correct responses indicated that the hypnosis condition still performed significantly worse than the pre-test-warned condition. | memory accuracy (memory test) | These results suggest that posthypnotic suggestion was more effective than a warning alone in reducing or reversing misinformation errors, even after participants had committed to reporting them. However, the reversal achieved through hypnosis was not as effective as the one achieved by delivering the warning before participants made such errors. |

*Note.* TMI = task motivation instructions; CR/RO = context reinstatement/reverse order recall.

## S5. Risk of Bias Assessment (Cochrane Risk of Bias 2 Tool)

**Figure S5.1**

*Risk of Bias Across All Domains in Imagery Task Studies*

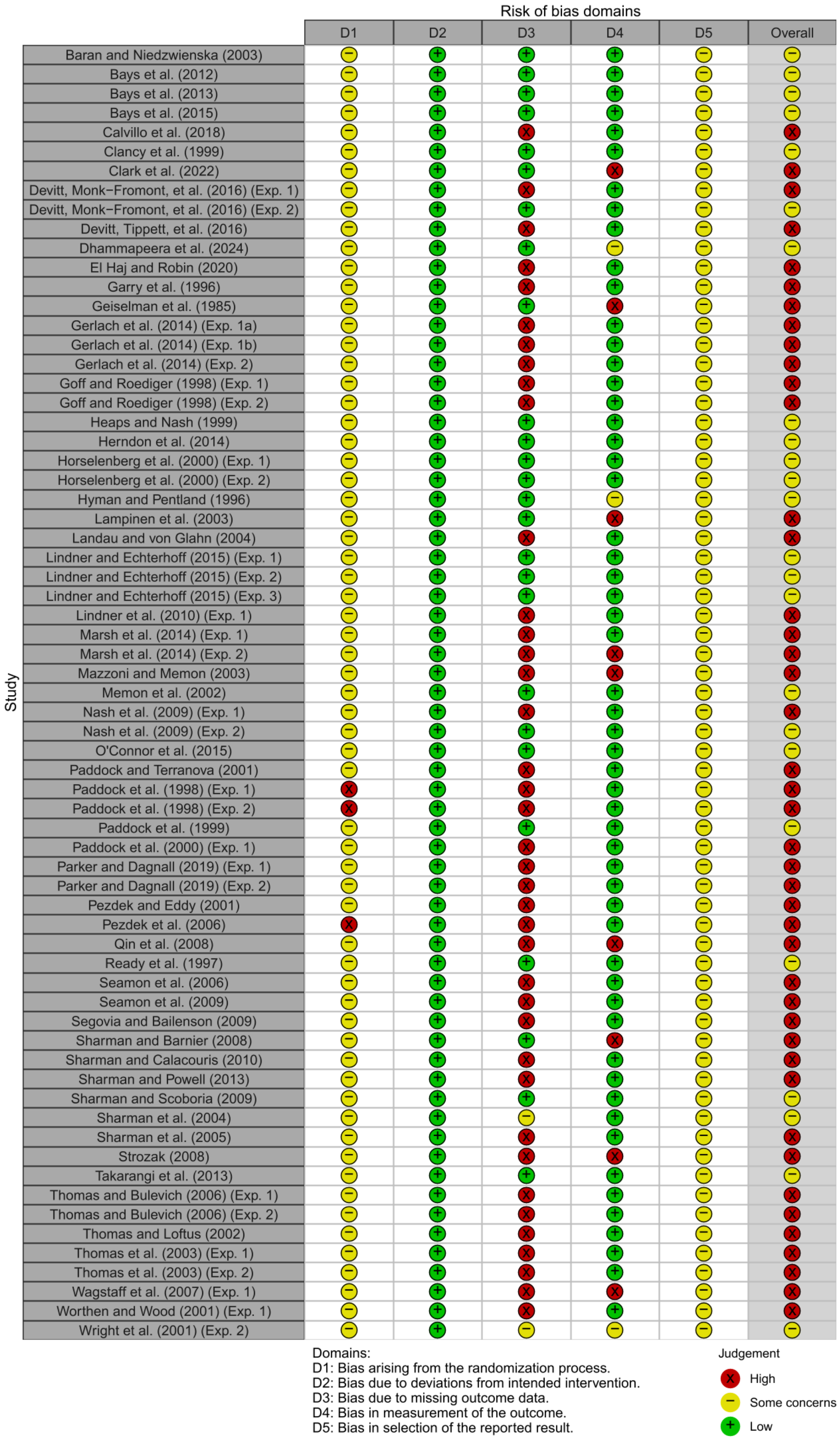


**Figure S5.2**

*Distribution of Risk of Bias Domains in Imagery Task Studies*

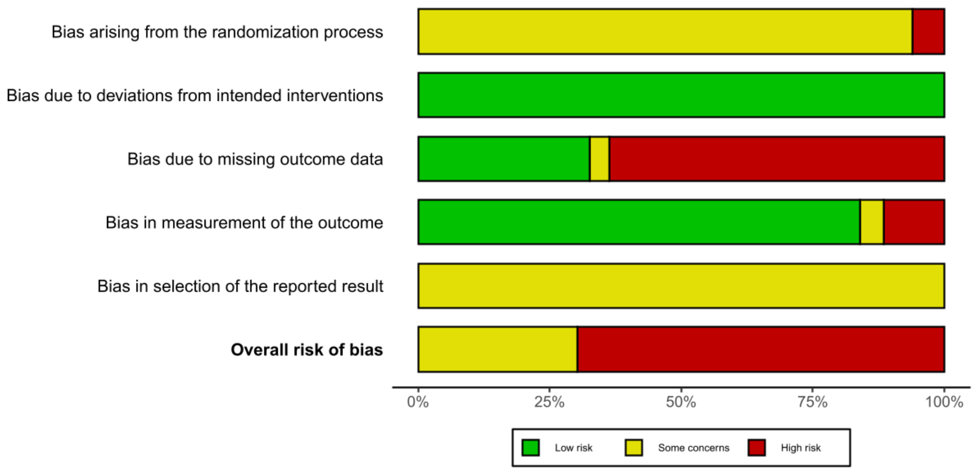



**Table S5.1**

*Risk of Bias Assessment in Imagery Task Studies*

| | Randomization process (%) | Deviation from intended intervention (%) | Missing outcome data (%) | Measurement of the outcome (%) | Selection of the reported results (%) | Overall (%) |
|---|---|---|---|---|---|---|
| Number of Studies (*k* = 67) | | | | | | |
| Low risk | 0.0 | 100.0 | 38.8 | 82.1 | 0.0 | 0.0 |
| Some concerns | 95.5 | 0.0 | 3.0 | 4.5 | 100.0 | 35.8 |
| High risk | 4.5 | 0.0 | 58.2 | 13.4 | 0.0 | 64.2 |

*Note.* Assessment of the risk of bias for the individual domains and overall. Assessment categories were: low, some concerns, high. Numbers are percentage.

**Figure S5.3**

*Risk of Bias Across All Domains in Imagery Rescripting and Imaginal Exposure Studies*

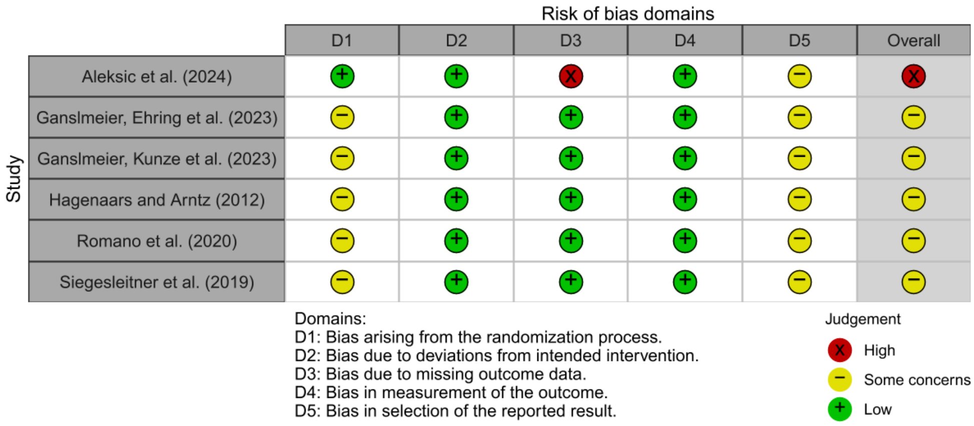



**Figure S5.4**

*Distribution of Risk of Bias Domains in Imagery Rescripting and Imaginal Exposure Studies*

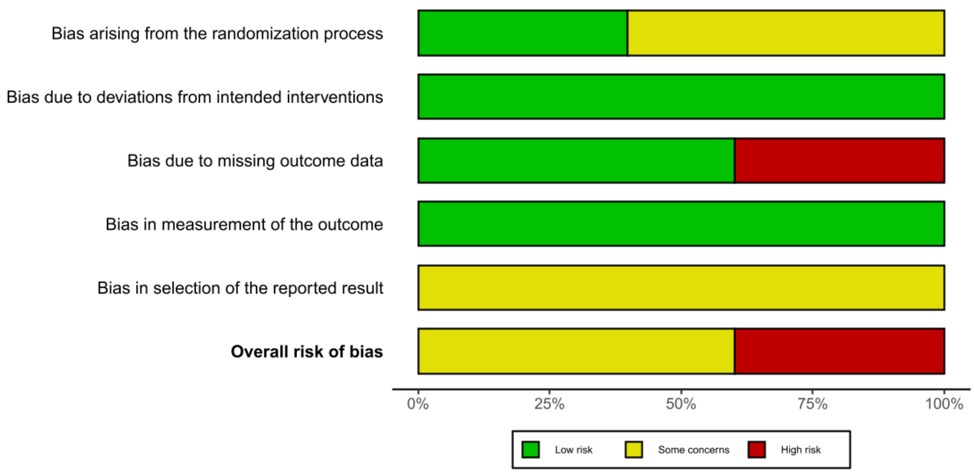



**Table S5.2**

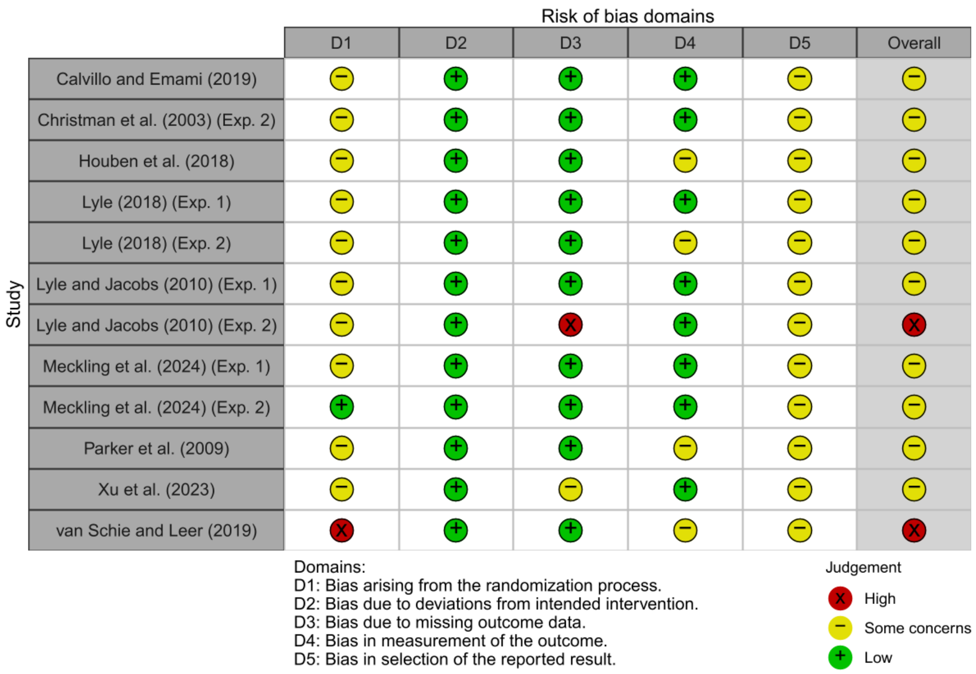
*Risk of Bias Assessment in Imagery Rescripting and Imaginal Exposure Studies*

| | Randomization process (%) | Deviation from intended intervention (%) | Missing outcome data (%) | Measurement of the outcome (%) | Selection of the reported results (%) | Overall (%) |
|---|---|---|---|---|---|---|
| Number of Studies ($k$ = 6) | | | | | | |
| Low risk | 16.7 | 100.0 | 83.3 | 100.0 | 0.0 | 0.0 |
| Some concerns | 83.3 | 0.0 | 0.0 | 0.0 | 100.0 | 83.3 |
| High risk | 0.0 | 0.0 | 16.7 | 0.0 | 0.0 | 16.7 |

*Note.* Assessment of the risk of bias for the individual domains and overall. Assessment categories were: low, some concerns, high. Numbers are percentage.

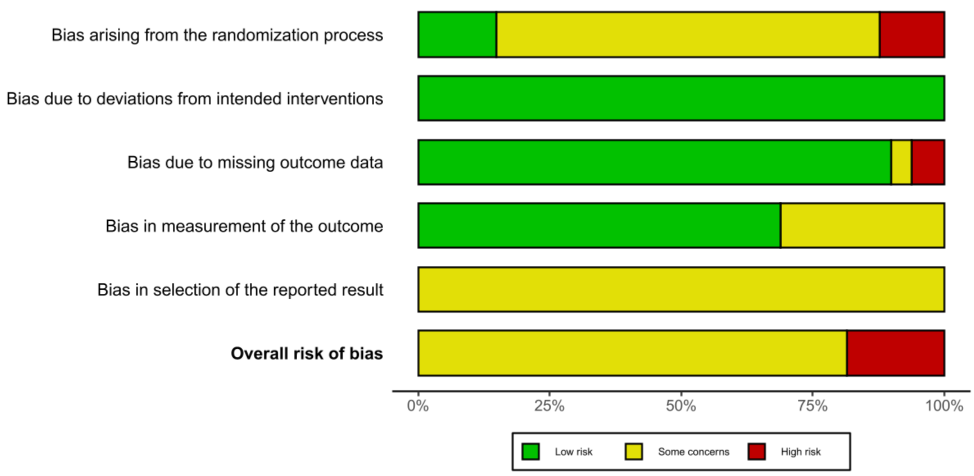
# Figure S5.5

*Risk of Bias Across All Domains in Eye Movements Studies*




# Figure S5.6

*Distribution of Risk of Bias Domains in Eye Movements Studies*



## Table S5.3

*Risk of Bias Assessment in Eye Movements Studies*

| | Randomization process (%) | Deviation from intended intervention (%) | Missing outcome data (%) | Measurement of the outcome (%) | Selection of the reported results (%) | Overall (%) |
|---|---|---|---|---|---|---|
| Number of Studies ($k$ = 12) | | | | | | |
| Low risk | 8.3 | 100.0 | 83.3 | 66.7 | 0.0 | 0.0 |
| Some concerns | 83.3 | 0.0 | 8.3 | 33.3 | 100.0 | 83.3 |
| High risk | 8.3 | 0.0 | 8.3 | 0.0 | 0.0 | 16.7 |

*Note.* Assessment of the risk of bias for the individual domains and overall. Assessment categories were: low, some concerns, high. Numbers are percentage.

## Figure S5.7

*Risk of Bias Across All Domains in Hypnosis Studies*

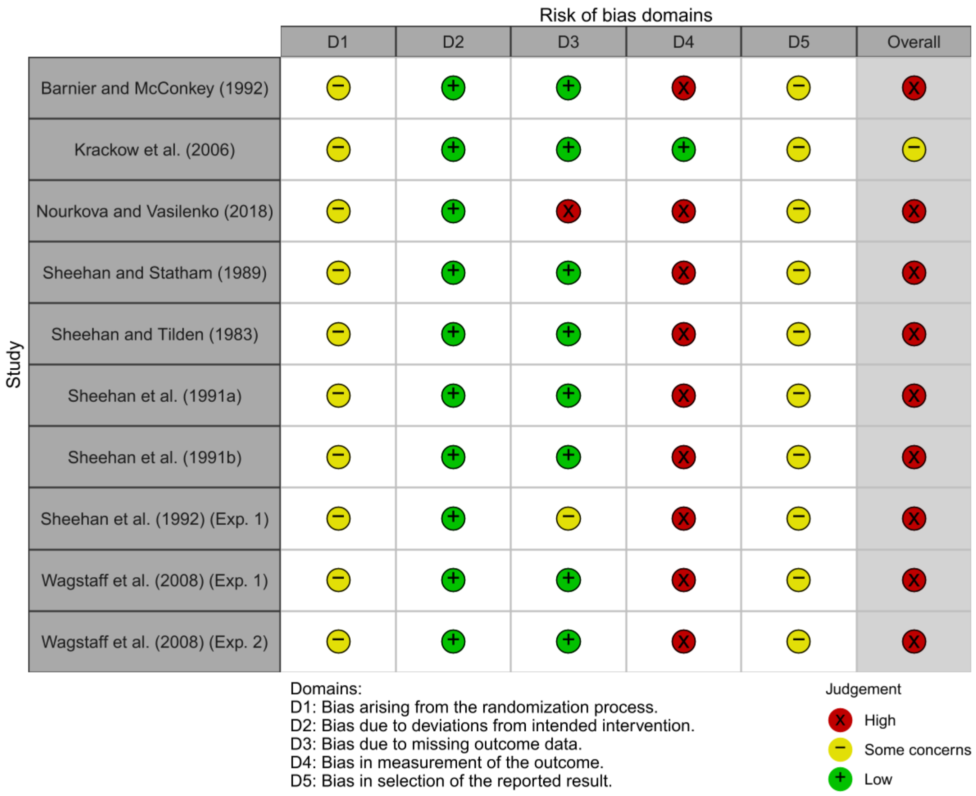


**Figure S5.8**

*Distribution of Risk of Bias Domains in Hypnosis Studies*

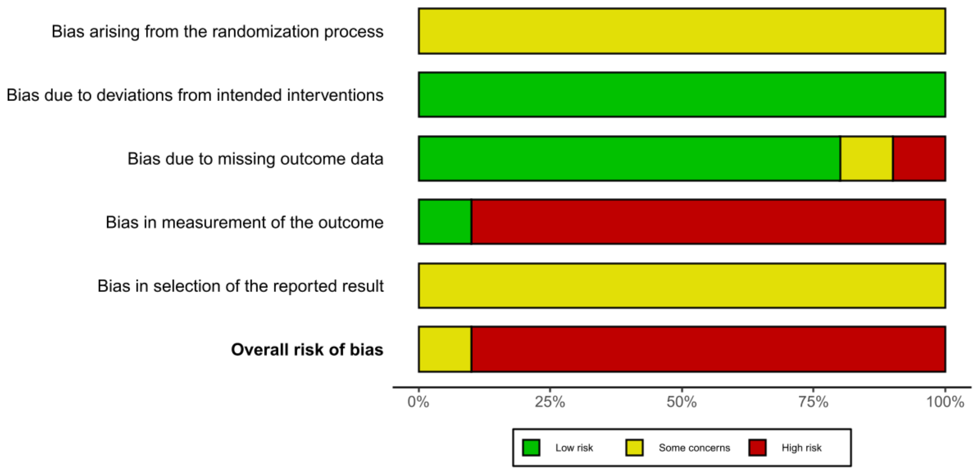



**Table S5.4**

*Risk of Bias Assessment in Hypnosis Studies*

| | Randomization process (%) | Deviation from intended intervention (%) | Missing outcome data (%) | Measurement of the outcome (%) | Selection of the reported results (%) | Overall (%) |
|---|---|---|---|---|---|---|
| Number of Studies (*k* = 10) | | | | | | |
| Low risk | 0.0 | 100.0 | 80.0 | 10.0 | 0.0 | 0.0 |
| Some concerns | 100.0 | 0.0 | 10.0 | 0.0 | 100.0 | 10.0 |
| High risk | 0.0 | 0.0 | 10.0 | 90.0 | 0.0 | 90.0 |

*Note.* Assessment of the risk of bias for the individual domains and overall. Assessment categories were: low, some concerns, high. Numbers are percentage.