The Influence of Visual Perspective on the Emotional Aspects of Autobiographical Memories

by

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Abstract

Remembering autobiographical memories (AMs) entails the visualization of events from a particular visual perspective. Own eyes perspectives, in which one visualizes the event through their own eyes, are associated with higher emotionality compared to observer-like perspectives, in which one visualizes the event by adopting an observer perspective as they could see themselves and their surroundings. Moreover, during AM retrieval, people can shift across these two visual perspectives. The current thesis focuses on the impact of visual perspectives during AM retrieval on the emotional aspects of events. Following a general literature review overviewing behavioral and functional neuroimaging studies focusing on the impact of visual perspective on emotion (Chapter 1), I conducted three studies investigating the role of visual perspective on AM retrieval. Chapter 2 reports a comprehensive meta-analysis that quantifies the impact of shifts in visual perspective on emotion and analyzes the moderators contributing to this effect. The results showed that shifting from an own eyes to an observer-like perspective decreased emotion, which was related to the reductions in the vividness of visual imagery. However, shifting in the reverse direction was ineffective in modifying emotional experiences. Chapter 2 also showed that the visibility of the self in an observer-like perspective determined the impact of the shifts in visual perspective on emotion, such that emotion decreased to a greater degree if the self was not visible when the rememberer visualized the event from an observer-like perspective. Chapter 3 investigates the impact of the shifts in visual perspective with an experimental paradigm in which maintaining the initial perspective was compared with shifting to an alternative visual perspective during retrieval. The results demonstrated that shifting visual perspectives –irrespective of shifting from an own eyes to an observer or vice versa- decreased vividness, reflecting that updating the initial perspective of an event with an alternative one

reshapes AMs. Chapter 3 also showed that decreases in vividness predicted the reduction in emotional intensity while shifting from an observer-like to an own eyes perspective, but there was no relationship when shifting in the opposite direction or maintaining the initial perspective, highlighting the role of targeting AMs initially recalled from an observer-like perspectives. Finally, Chapter 4 examines whether visual perspective is a distinct retrieval orientation that influences pre-retrieval processes. In a functional neuroimaging study, I presented visual perspective cues prior to the onset of AM retrieval to investigate neural recruitment during the pre-retrieval phase. The results showed common angular gyrus recruitment when participants were presented with own eyes or observer cues before AM retrieval. Additionally, I demonstrated greater angular gyrus and precuneus recruitment when remembering the events from an observer, compared to an own eyes perspective. The results in Chapter 4 reflect that visual perspective orients retrieval by having people engage in a preparation phase before AM retrieval, thereby locating themselves in a potential scene layout to remember the events in a particular way. Limitations and implications for each study are discussed in the relevant chapters. Chapter 5 provides a general summary of the findings and discusses their importance and implications in the context of event memory and mnemonic emotion regulation. Overall, the findings reported in the current thesis provide insights regarding the role of visual perspective during the retrieval of emotional aspects of events. Importantly, the present findings shed light on the cognitive mechanisms supporting changes in emotion due to visual perspective and the neural basis of visual perspective that biases AM retrieval.

Preface

This thesis is the original work by Selen Kucuktas (Küçüktaş). The research projects in Chapters 3 and 4 received research ethics approval from the University of Alberta Research Ethics Board, Project Name "Visual Imagery in Autobiographical Memory", No. Pro00083964, July 23, 2018, and Project Name "Brain Regions in Autobiographical Memory Retrieval", No. Pro00122284, August 26, 2022, respectively.

A version of Chapter 1 of this thesis has been published as S. Küçüktaş and P. L. St. Jacques, "How Shifting Visual Perspective During Autobiographical Memory Retrieval Influences Emotion: A Change in Retrieval Orientation," *Frontiers in Human Neuroscience*, vol.16, 928583. I was responsible for the concept formation and the manuscript composition. P. L. St. Jacques was the supervisory author and was involved with concept formation and manuscript composition. Shanela David and Elly Smith, undergraduate students, assisted with data collection in the research project in Chapter 2. Several undergraduates in the Memory for Events Lab assisted with data collection in Chapter 3, and in particular, I would like to highlight the involvement of Aiden Lorincz-Bowman and Sarah Beeby. Anna Cuff, an undergraduate student, and Chloe King, a former lab manager, assisted with data collection in Chapter 4. P. L. St. Jacques contributed to the manuscript composition in Chapter 2 and designed the experiments in Chapters 3 and 4. Data analyses and manuscript composition in Chapter 3 are my original work. The preparation of testing scripts, data organization and analyses, and manuscript compositions in Chapters 2 and 4 are my original work.

To my dear parents, İnci and Yükselen Küçüktaş,

for their endless love and support

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List of Abbreviations

AG: Angular gyrus

AM: Autobiographical memory

BOLD: Blood oxygen level dependent

EPI: Echoplanar imaging

fMRI: Functional magnetic resonance imaging

GLM: General Linear Model

HPC: Hippocampus

HRF: Hemodynamic response function

IPL: Inferior parietal lobule

MTL: Medial temporal lobe

MPRAGE: Magnetization-prepared rapid gradient echo sequence

OB: Observer

OE: Own eyes

PCC: Posterior cingulate cortex

PFC: Prefrontal cortex

PTSD: Post-traumatic stress disorder

ROI: Region of interest

RSFC: Resting-state functional connectivity

TE: Echo time

TI: Inversion time

TR: Repetition time

Chapter 1: General Introduction

Autobiographical memories (AM) are often remembered with strong emotional reactions, particularly when emotional events are elicited. Depending upon the emotional nature of the remembered event, AMs can lead us to experience either positive (e.g., remembering a fun birthday party) or negative (e.g., remembering a severe injury) affective states (Holland & Kensinger, 2010). Although retrieving AMs may trigger intense emotional reactions, we are able to control our emotional responses and regulate them to alter their intensity and valence (Gross, 1998a; 2014). One way of changing the emotional impact of AMs is by shifting visual perspective during retrieval, which is also considered one of the most effective cognitive reappraisal strategies in emotional regulation research (McRae et al., 2012; Wallace-Hadrill & Kamboj, 2016; Webb et al., 2012). That is, visual perspective involves a cognitive change that alters how people experience emotions (Gross, 1998b; Ochsner & Gross, 2008). People can retrieve their AMs either from an own eyes perspective, visualizing events from where they were originally located while experiencing the event, or from an observer-like perspective, visualizing from an external point of view (Nigro & Neisser, 1983). Although own eyes perspectives are considered the dominant imagery perspective in AMs (Radvansky & Svob, 2019), most people can also flexibly shift to an observer-like perspective during retrieval (Rice & Rubin, 2009; Robinson & Swanson, 1993). Previous research has shown that shifting from an own eyes to an observer-like perspective during retrieval reduces subjective reports of emotional intensity during memory retrieval (e.g., Berntsen & Rubin, 2006; Marcotti & St. Jacques, 2021; St. Jacques et al., 2017). However, some theoretical models propose that shifting from an own eyes to an observer-like perspective might instead have no effect or even increase emotional reactions in some contexts (Libby & Eibach, 2011; Sutin & Robins, 2008; Trope & Liberman, 2010). In contrast, cognitive reappraisal research suggests that adopting an impartial observer's perspective while pursuing an emotion regulation goal decreases negative emotion for various events (e.g., Buhle et al., 2014; Ochsner et al., 2012; also see Kross & Ayduk, 2017). Here in Chapter 1, I review research on how shifting visual perspective influences the emotional aspects of AMs by including findings from event memory and cognitive reappraisal studies. I will first give an overview of the main theoretical models proposed to explain why shifting to an observer-like perspective influences the emotional aspects of AMs. Then, I describe evidence regarding how shifting perspective influences emotional intensity in AMs, which is the particular focus of the current chapter, as well as the role of emotional valence and discrete emotional categories when there is a goal to regulate emotions or not. I will next highlight the brain mechanisms supporting how shifts in perspective during retrieval impact emotional aspects of memory. I will summarize the findings by presenting a new theory to explain why visual perspective impacts emotions and other characteristics of AMs based on retrieval orientation and end with a discussion of the implications of this research.

Theoretical Explanations of the Role of Visual Perspective on Emotion in AM

Four main theories have been proposed to explain why adopting a particular visual perspective or shifting across multiple viewpoints influences emotional aspects of AM retrieval (see Table 1.1). Some theories suggest that visual perspective impacts emotional aspects of AM by altering the appraisal processes people engage in during memory retrieval (Wallace-Hadrill & Kamboj, 2016), while others suggest that shifting perspective influences emotional experiences by increasing psychological distance and the level of abstraction people engage in during memory retrieval (Moran & Eyal, 2022).

Table 1.1.

Variables Proposed to Explain the Impact of an Observer-like Perspective on Emotion

Variables	Self-Processes Model	Social-Cognitive Model	Construal Level Theory	Self-Reflection Model	Retrieval Orientation
Evaluation of self-related information	↓ Emotion for the AMs incongruent with the self-concept ↑ Emotion for the AMs congruent with the self-concept	—	—	—	—
Visibility of self	↑ Emotion	—	—	—	—
Meaning making	—	↓ Emotion for abstract appraisal ↑ Emotion for concrete appraisal	—	↓ Emotion via reconstruing ↑ Emotion via recounting	— —
Psychological distancing	—	—	↓ Emotion in a higher construal level	↓ Emotion by detaching from the event	—
The nature of emotion	↓ Basic emotions ↑ Self-conscious emotions	↓ Emotions leading to abstract appraisals ↑ Emotions leading to concrete appraisals	↓ Emotions with lower construal level ↑ Emotions with higher construal level	—	—
Differential retrieval processes	—	—	—	—	The visual perspective cue orients retrieval to decrease or increase in emotion.

Note. A dash represents that the given variable is not emphasized by the particular model. A downwards (upwards) arrow indicates a decrease (an increase) in emotional experience due to adopting an observer-like perspective.

If we consider shifts in visual perspective as an exclusive emotion regulation sub-strategy in the process model of emotion regulation (Ochsner & Gross, 2008), it could serve to alter the emotional impact of the event via cognitive change since people focus on the "internal environment" that provokes the emotional experience (e.g., memories, thoughts; Gross, 1998a; 2014; 2015). Apart from this, some theories have suggested that one function of AM retrieval is to regulate emotions (e.g., Harris et al., 2014; Pasupathi, 2003; also see Holland & Kensinger, 2010). Explicit emotion regulation goals can influence which AMs are more accessible (e.g., recalling positive AMs to up-regulate emotions when feeling down) and how they are remembered (Pascuzzi & Smorti, 2017). The qualitative features of AMs (e.g., spontaneous own eyes and observer perspectives) emerge due to the natural characteristics of those memories. Then, manipulating these AM characteristics, such as shifting from an own eyes to an observer-like perspective, can impact various aspects of the memory (e.g., decreasing emotional intensity) and, thus, lead to an emotional regulation outcome. This does not need to be a controlled and effortful process; instead, it aligns with the idea that people can regulate their emotions automatically, without conscious effort, while thinking about the emotion-provoking event (Mauss et al., 2007; see Figure 1.1). Thus, I acknowledge that the theories reviewed below do not always scrutinize the effortful attempt at emotional regulation, as opposed to the process model of emotion regulation.

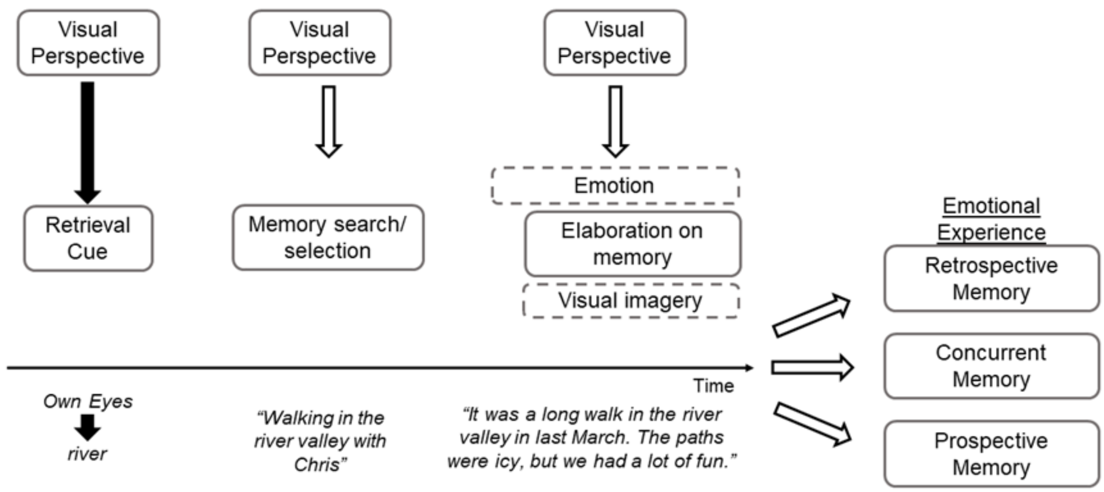

Figure 1.1 The impact of visual perspective shifts on emotional experiences during AM retrieval. Specifically, the model emphasizes that the presentation of a visual perspective cue (own eyes/observer) influences how the retrieval cue is processed, which biases later stages of retrieval, namely, the memory search/selection process and elaboration on memory details. Shifting to a novel perspective influences emotional experiences attached to the encoding context (retrospective memory), during retrieval (concurrent memory), and during subsequent retrieval (prospective memory).

Self-Processes Model

The self-processes model (Sutin & Robins, 2008) proposes that visual perspective can attenuate or amplify emotions depending upon how people evaluate self-relevant information during AM retrieval. Relying on the Self-Memory System (Conway & Pleydell-Pearce, 2000), this model argues that during retrieval, the content of AM is evaluated in terms of its congruency and consistency with the self. Adopting a particular visual perspective then impacts how these self-evaluative processes alter the experience of subjective emotionality of the event. Sutin and Robins (2008) proposed two competing views to explain how this process occurs. First, the Dispassionate Observer view suggests that if an AM is incongruent with the self-concept or triggers a negative feeling, then adopting an observer-like perspective leads to an objective evaluation of events that reduces the affective feeling linked to the AM (e.g., Nigro & Neisser, 1983; Robinson & Swanson, 1993). Second, the Salient Self view suggests if an AM is congruent with the self-concept or elicits a positive feeling, then adopting an observer-like perspective amplifies emotional experiences associated with an AM by enhancing self-focused attention and making the self-relevant information more *salient*. Supporting this idea, Kinley et al. (2021) recently showed that the visibility of the self in an observer-like perspective is linked to the emotional intensity of future episodic thoughts. Specifically, when the self becomes more visible or *salient* during mental imagery, the experience of the emotional aspects of the event is heightened. Consequently, in both views, adopting an observer-like perspective entails a retrieval process that dampens or boosts the emotional experience as a result of engaging in a self-related evaluation about the memory content. The self-processes model also hypothesizes that the nature of the emotion linked to the memory influences the impact of the Dispassionate Observer and Salient Self views. In particular, adopting an observer perspective when retrieving AMs associated with self-conscious emotions (e.g., shame, pride) focuses attention on the self; thus, invokes a stronger self-evaluative process relative to basic emotions (e.g., sadness, happiness), which can amplify emotion for the former (e.g., Tracy & Robins, 2007a).

Social-Cognitive Model

The social-cognitive model (Libby & Eibach, 2011; also see Niese et al., 2021) proposes that visual perspective leads to different processing styles in appraising events. In particular, adopting an own eyes perspective leads people to reflect on the concrete details of events (i.e., sensory-perceptual information), whereas adopting an observer-like perspective leads to greater reflection on the abstract or contextualized details of the memory. According to this model, adopting an observer-like perspective reduces the emotions related to the event by enabling people to detach from sensory-perceptual details in order to consider the event in a more abstract way. However, in some circumstances, adopting an observer-like perspective might lead people to think about the broader meaning of the memory in their lives. That is, if thinking about the broader meaning of an event to one's life reduces (or *increases*) the emotional impact of the memory, then adopting an observer-like perspective also decreases (or *increases*) the emotional experiences. For example, Valenti et al. (2011) examined the impact of adopting an observer-like perspective on the feeling of regret. They found that adopting an observer-like compared to an own eyes perspective enhanced emotion for memories in which participants felt regret due to inaction, but diminished emotion for the memories in which participants felt regret due to their actions. Valenti and colleagues suggested that adopting an observer-like perspective increases the propensity to reflect on how regret for inactions fits into the broader meaning of one's life, thereby boosting the emotions associated with these events.

Construal Level Theory

Construal Level Theory (Trope & Liberman, 2010) proposes that people experience the "here and now" from an egocentric reference point, but can also engage in a process of psychological distancing by representing events at a spatiotemporally distant point in relation to the self. Psychological distancing in Construal Level Theory does not specifically refer to the shifts in visual perspective, but instead considers visual perspective as a component of social distancing where an event could be represented from an egocentric point-of-view or from the perspective of an external observer (Tausen et al., 2020). According to Construal Level Theory, adopting an observer-like perspective leads events to be construed in a more abstract and psychologically distanced manner. This distancing results in appraising events and objects with a higher mental construal that corresponds to a more abstract representation of the event; thus, attenuating the emotional intensity of remembering. Similarly, other theories suggest that adopting an observer-like perspective regulates emotion through psychological distancing (Powers & LaBar, 2019). Supporting these ideas, a number of studies have demonstrated that adopting an observer-like perspective increases subjective ratings of psychological distancing (e.g., Gu & Tse, 2016; Pronin & Ross, 2006; Van Boven et al., 2010). The nature of the emotion elicited can also interact with how visual perspectives influence psychological distance. For example, emotions that lead people to contemplate what other agents might think about them, such as shame or guilt, are linked to a higher construal level. In contrast, emotions such as anger or sadness do not require considering another agent's perspective; thus, they are associated with a lower construal level (Trope & Liberman, 2010). A recent meta-analysis examining psychological distance and emotional experiences showed that psychological distancing had stronger effects on low-level than high-level emotions, such that adopting an observer-like perspective might amplify the experiences for high-level emotions (e.g., guilt, shame), in contrast to low-level emotions (e.g., sadness, anger; Moran & Eyal, 2022). Additionally, a specific emotional category might be high- or low-level depending on whether people focus on more abstract versus concrete features of the event during retrieval (e.g., Doré et al., 2015; Valenti et al., 2011).

Self-Reflection Model

The self-reflection model (Kross & Ayduk, 2017) proposes that visual perspective influences whether people reflect on their feelings in an adaptive or maladaptive way. This model suggests that adopting an own eyes or *self-immersed* perspective leads people to focus more on what happened to them and how they felt, which induces people to engage in a ruminative process that intensifies the emotional impact of the event (Nolen-Hoeksema et al.,

2008) and can be maladaptive when involving more negative experiences. In contrast, adopting an observer-like perspective or *self-distancing*, allows people to psychologically remove themselves from the event to interpret it more objectively and make sense of the experience, which diminishes emotions. The self-reflection model resembles Construal Level Theory, in highlighting the role of psychological distance, as well as the social-cognitive model, by emphasizing meaning-making when adopting an observer-like perspective. However, it is unique in its approach to examining how visual perspective influences recounting and reconstruing aspects of thought during AM retrieval (e.g., Kross & Ayduk, 2008; Kross et al., 2005). For example, Kross and Ayduk (2008) asked participants to describe their thought contents while retrieving a sad and depressive AM from an own eyes or an observer-like perspective. They found that own eyes perspectives were associated with greater recounting (focusing more on what happened and how they felt; e.g., "I went to the top of the stairwell and cried for a long time"), which led to a greater emotional response during retrieval. In contrast, adopting an observer-like perspective was associated with greater reconstruing (psychologically removing from the event to interpret it more objectively and make sense of the experience; e.g., "I thought about how foolish it seems in retrospect") and less emotional experience during retrieval.

Taken together, the proposed models have different emphases regarding how visual perspective impacts emotional experience. The self-processes model mainly focuses on the role of self-evaluation when adopting an observer-like perspective in which people interpret the congruency of an AM with their self-concept. The social-cognitive model proposes that alternative visual perspectives lead to concrete versus abstract ways of thinking about the event during retrieval. Construal Level Theory considers observer-like perspective as a particular example of psychological distancing that leads events to be recalled with a higher construal level. Finally, the self-reflection model highlights the processes people engage in to make sense of their feelings by adopting a particular visual perspective. Additionally, the first three models emphasize that the impact of adopting an alternative visual perspective depends upon the nature of the emotion associated with the event, and the last model underlines how memory content specifically changes due to visual perspective.

The Impact of Shifting Visual Perspective on the Emotional Intensity of Memories

Evidence from event memory research has revealed that the link between visual perspective and the emotional intensity of memories is bidirectional (Rice, 2010). On the one hand, the emotional intensity of an event influences the visual perspective that people spontaneously adopt during retrieval (Nigro & Neisser, 1983). For example, emotional events are more likely to be recalled from an own eyes than an observer perspective (e.g., D'Argembeau et al., 2003; Talarico et al., 2004; but see Libby & Eibach, 2011). On the other hand, the visual perspective adopted during retrieval can also alter how we experience the emotional intensity of memories, such that memories associated with own eyes perspectives are higher in emotional intensity than memories associated with observer perspectives (e.g., McIsaac & Eich, 2002). In this section, I review findings that reveal how spontaneously adopting an own eyes or observer perspective and shifts in perspective influence the emotional intensity of memories.

The viewpoint that people naturally adopt when recalling memories influences the emotional intensity they experience during retrieval (e.g., Berntsen & Rubin, 2006; Nigro & Neisser, 1983). In their seminal study, Nigro and Neisser (1983) instructed participants to recall AMs and then select the visual perspective they naturally adopted among dichotomous options and to provide subjective ratings of emotional intensity. They found that AMs naturally retrieved from an own eyes compared to an observer-like perspective were higher in emotional intensity.

Later studies confirmed that people are more likely to naturally adopt an own eyes rather than an observer-like perspective during the retrieval of emotional events (e.g., D'Argembeau et al., 2003; Talarico et al., 2004). Other research has shown that adopting an own eyes perspective led to an increase in the emotional intensity and affective details in memory descriptions for lab-based mini-events and fictional stories (Bagri & Jones, 2009; Eich et al., 2009; McIsaac & Eich, 2002), suggesting that the relationship between viewpoint and emotion extends to other types of event memories irrespective of their personal relevance or emotional significance. A few studies have also shown that visual perspective not only impacts subjective feeling but can also cause physiological measures of emotional arousal, such that adopting an observer-like perspective is associated with less cardiovascular (Ray et al., 2008) and blood pressure reactivity (Ayduk & Kross, 2008). These findings indicate that self-reported reductions in emotional intensity when adopting an observer-like perspective are also evident by parallel changes in objective emotional experience. Given that remote memories are more likely to be recalled from an observer-like perspective and with reduced emotional experience than recent memories (e.g., Rice & Rubin, 2009; Sutin & Robins, 2007; Talarico et al., 2004), a critical question is whether similar mnemonic changes in emotion occur when visual perspective is manipulated during retrieval.

Several studies have shown that shifting from an own eyes to an observer-like perspective influences emotional intensity (e.g., Berntsen & Rubin, 2006; Robinson & Swanson, 1993; St. Jacques et al., 2017). For example, St. Jacques and colleagues (2017) investigated how shifting from a dominant own eyes to an alternative observer-like perspective influenced subjective reports of emotional intensity during retrieval. Participants were asked to generate AMs from their natural visual perspective and then rate visual perspective and emotional intensity. The experimenters then selected a subset of memories strongly associated with a natural own eyes perspective based on the participant ratings. In Session 2, one week later, the retrieval of these memories was directly manipulated by asking participants to either maintain the same own eyes perspective or shift to an alternative observer-like perspective. St. Jacques et al. found that shifting from a dominant own eyes to an alternative observer-like perspective during retrieval decreased the emotional intensity of AMs, compared to maintaining a dominant own eyes perspective. Similarly, some studies have shown that shifting from an own eyes to an observer-like perspective can also reduce the emotional valence of AMs (e.g., Speed et al., 2020; Vella & Moulds, 2014). Other research has shown that shifting perspective influences emotional aspects of how memories are described (Akhtar et al., 2017; Crawley et al., 2010; Gu & Tse, 2016; King et al., 2022). For example, Akhtar et al. (2017) asked participants to retrieve AMs from their natural perspective and then shift to the opposite visual perspective while providing a narrative describing their memory. They found that emotional intensity was reduced when shifting from an own eyes to an observer-like perspective and that participants also described their memories using fewer affective details. Similarly, Gu and Tse (2016) asked participants to provide narrative descriptions of emotional AMs, while either shifting from first-person to third-person pronouns or vice versa. They found that a shift from first-person to third-person pronouns when writing AMs reduced subjective ratings of emotional intensity. Importantly, the direction of the shift predicted the changes in psychological distance ratings such that shifting from first-person to third-person pronouns was associated with increased psychological distance, which also mediated the effect of shifting from first- to third-person pronouns on emotional intensity. Adopting an observer-like perspective during memory retrieval can also influence retrospective reports of the emotions people thought they experienced during memory encoding. For example, Crawley (2010) asked participants to rate their remembered emotional intensity experienced at the time of the event following a shift from an own eyes to an observer perspective during AM recall and found a reduction in the remembered emotional intensity across repeated retrievals. Taken together, prior research indicates that manipulating visual perspective influences multiple aspects of the emotional experience of remembering, including the emotional intensity experienced during retrieval, the affective information used to describe the narrative of these events, and how people remember the emotional intensity attached to the original event.

Only a couple of studies have examined whether the proximate effects of shifting perspective on emotional experience during remembering impact how memories are later recalled from their natural perspective (King et al. 2022; Sekiguchi & Nonaka, 2014). In one study, Sekiguchi and Nonaka (2014) examined whether the proximate reductions in emotional intensity persisted when memories were tested a few weeks after the visual perspective manipulation. In Session 1, they asked participants to retrieve emotional AMs from their natural visual perspective and rate emotional intensity. In Session 2, a few days later, participants were asked to shift to the opposite perspective of what they naturally adopted in Session 1. A final memory test took place a few weeks later, in which participants recalled the same events from their natural visual perspective and rated emotional intensity. The results showed that shifting to an observer perspective caused a reduction in the emotional intensity during Session 2, and that these effects persisted even when memories were retrieved from their natural perspective a few weeks later. In another study, King et al. (2022) found a similar reduction in emotional intensity as the result of shifting from an own eyes to an observer-like perspective when memories were recalled from their natural point-of-view two days later. Additionally, this study also examined how shifting perspective influenced the emotion/thoughts participants used when describing autobiographical narratives. They found proximate effects of shifting from an own eyes to an observer-like perspective on emotion/thoughts, as reflected by a reduction in these details compared to the original narratives. However, these changes in emotion/thought details did not persist during later recall of the same memories from their natural point-of-view. Although participants reported less subjective feeling in memories in which they had previously shifted to an observer perspective, there were no changes in the amount of emotion/thought details they provided in their narratives. This dissociation between subjective and objective measures of emotionality suggests that shifting to an observer-like perspective might impact how people re-experience the subjective emotional intensity, but not objective changes in how these events are described. Similarly, other research has shown that retrieving AMs from a different perspective than how they were initially recalled can lead to long-lasting changes in other characteristics of memories, such as subjective vividness and the natural viewpoint adopted (Butler et al., 2016; St. Jacques et al., 2017), as well as the accuracy of memories (Marcotti & St. Jacques, 2018; 2021).

A consistent finding in the literature is that the changes in emotional intensity due to shifting perspectives occur unidirectionally (Robinson & Swanson, 1993). While shifting from an own eyes to an observer-like perspective reduces the emotional intensity, there is not a similar *increase* when shifting in the reverse direction (e.g., Akhtar et al., 2017; Berntsen & Rubin, 2006; Gu & Tse, 2016; Sekiguchi & Nonaka, 2014; Vella & Moulds, 2014). Few studies have reported a lack of reduction in emotional intensity when shifting from an own eyes to an observer-like perspective (e.g., Marcotti & St. Jacques, 2018; St. Jacques et al., 2018). However, in these studies, participants engaged in non-emotional lab-based mini-events (Marcotti & St. Jacques, 2018) or were explicitly instructed not to change the emotional aspects of the events in specific conditions (St. Jacques et al., 2018). To explain the unidirectionality, some theories suggest that asymmetrical effects are due to the loss of experiential information when adopting an observer-like perspective, such that shifting to an own eyes viewpoint is not effective in recovering emotional information associated with the memory (Robinson & Swanson, 1993). Berntsen and Rubin (2006) proposed that increasing the recollective experiences during retrieval might be cognitively more demanding than decreasing them, thus impeding the ability to generate emotional aspects of remembering when shifting from an observer to an own eyes perspective. Other proposals suggest that repeated retrieval from an observer-like perspective leads to the loss of visual information over time, such that reinstating recollective experiences when shifting back to an own eyes perspective may not be possible (Butler et al., 2016). One potential issue with these ideas is that they assume that observer memories were originally encoded from an own eyes perspective, and then emerge as the result of shifting to an observer-like perspective during retrieval. Thus, shifting from an observer to own eyes perspective is not the same as shifting in the reverse direction, since in the former people are shifting back to the original point-of-view during encoding, whereas in the latter they are shifting to a novel perspective. Some theories argue that memories can also be encoded from an observer-like perspective (e.g., McCarroll, 2017; 2018; Nigro & Neisser, 1983), consistent with a growing number of studies have shown that it is possible to form memories from an observer-like perspective (Bergouignan et al., 2014; Iriye & St. Jacques, 2021; also see Mooren et al., 2016). Examining shifts from observer to own eyes perspectives in memories originally formed from an observer-like perspective would help to better understand the pattern of asymmetrical effects on emotion. Moreover, shifting to a visual perspective that differs from perception during encoding of emotionally laden events would impact how the emotional aspects of the event will be formed in the memory (McCarroll, 2018). In other words, shifting across alternative visual perspectives during encoding can be beneficial by facilitating the down-regulation of the intensity of a negative emotion even before the event is completely formed in the memory.

In sum, the flexible nature of memories enables us to adopt alternative visual perspectives and actively shift across them during retrieval, which reduces subjective and objective measures of emotional experience in memories when shifting from an own eyes to an observer-like perspective. These mnemonic changes that occur due to shifting visual perspective are consistent with theory indicating that retrieval is an active process that can reshape and update memories (Hardt et al., 2010; McDermott et al., 2016; Schacter et al., 2011; St. Jacques, 2019), which might have beneficial long-term impacts for well-being and mental health by modifying the emotional aspects of negative AMs as an adaptive emotional regulation strategy (Kross & Ayduk, 2008). Current evidence does not strongly favor existing theories of visual perspective. The reduction in emotional intensity in the studies in which emotional memories were not exclusively targeted draws into question whether the nature of the triggered emotion modulates the impact of shifting perspective on emotion as the self-processes model would predict. Likewise, instructing participants to watch themselves from an observer-like perspective, which possibly increases the visibility of the self, did not prevent the decrease in emotional intensity (e.g., Akhtar et al., 2017; St. Jacques et al., 2017), as also predicted from this model. Only Gu and Tse (2016), supporting Construal Level Theory, have shown that the direction of shifting perspective predicted the ratings of psychological distance such that shifting from first-person to third-person pronouns was related to increased psychological distance. Therefore, alternative explanations are required to clarify why shifts in visual perspective influence emotional intensity.

The Impact of Visual Perspective on Emotional Valence and Discrete Emotional Categories

The influence of visual perspective on memory might differ depending upon the nature of the emotions elicited. Emotions in AMs can be categorized based on their valence (i.e., positive, negative, or neutral; Russell & Carroll, 1999) or whether they involve discrete emotional categories (e.g., sadness, shame; Tracy & Robins, 2007a). In particular, a number of studies have focused on the impact of visual perspective during AM retrieval on emotional experiences that rely on self-evaluative processes that elicit self-conscious and basic emotions (Tracy & Robins, 2007b). This section examines the relationship between visual perspective during AM retrieval for emotional valence and discrete emotional categories.

Prior research has revealed inconsistent findings regarding the relationship between visual perspective and emotional valence (for review see Rice, 2010). Despite earlier findings suggesting that positive and negative events, relative to the neutral ones, are more likely to be recalled from an own eyes perspective (e.g., D'Argembeau et al., 2003), later studies showed that this relationship might not be as robust with some studies showing differences for negative but not positive valence (McFadden & Siedlecki, 2020) or failing to show any causal differences or an association between emotional valence and visual perspective (e.g., Berntsen & Rubin, 2006; Siedlecki, 2015). Similarly, studies manipulating visual perspective during AM retrieval have also not found differences in the impact of shifting perspective on positive versus negative AMs (Berntsen & Rubin, 2006). Research targeting more highly negative and stressful events have shown more robust effects of visual perspective, such that traumatic memories are frequently recalled from an observer-like perspective compared to positive and neutral memories (e.g., Berntsen et al., 2003; Kenny & Bryant, 2007; McIsaac & Eich, 2004; Porter & Birt, 2001). However, some of these effects might be due to the arousing nature of these events rather than their particular valence. Overall, the inconsistent relationship between emotional valence and visual perspective supports other research indicating that emotional valence is not as strong a determinant of the characteristics of AMs, including perspective, when compared to emotional intensity (e.g., Talarico et al., 2004).

Visual perspective does seem to have an impact on AM retrieval for events involving self-conscious versus basic emotions. For example, self-conscious emotions are associated with higher naturally occurring observer-like perspectives during AM retrieval (D'Argembeau & Van der Linden, 2008; but see Terry & Horton, 2007). Similarly, several studies have shown that manipulating visual perspective during retrieval differentially impacts self-conscious and basic emotions (e.g., Cândea & Szentágotai-Tătar, 2020; Hung & Mukhopadhyay, 2012; Katzir & Eyal, 2013; Valenti et al., 2011). For example, Katzir and Eyal (2013) experimentally manipulated how adopting own eyes or observer-like perspectives during retrieval of self-conscious (i.e., guilt, shame) and basic (i.e., anger, sadness) emotions. They found that adopting an observer-like compared to an own eyes perspective decreased the intensity of anger and sadness, but did not affect guilt and shame. Other research, however, has demonstrated that adopting an observer-like perspective can amplify self-conscious emotions in some contexts (e.g., Hung & Mukhopadhyay, 2012; Krishnamoorthy et al., 2021; Libby et al., 2011; Valenti et al., 2011; for a meta-analysis see Moran & Eyal, 2022). For example, Hung and Mukhopadhyay (2012) showed that adopting an observer perspective when visualizing hypothetical events increased the intensity of self-conscious emotions, whereas adopting an own eyes perspective increased the intensity of hedonic based emotions related to the situation itself (e.g., joy, excitement). In fact, prior research indicates that adopting an observer-like perspective requires an additional emotion regulation goal in order to effectively reduce self-conscious emotions

(Cândea & Szentágotai-Tătar, 2020; Hung & Mukhopadhyay, 2012; Katzir & Eyal, 2013; Powers & LaBar, 2019; Valenti et al., 2011). For example, Krishnamoorthy and colleagues (2021) examined how adopting own eyes or observer-like perspectives when recalling AMs associated with shame influenced the intensity of feelings of shame in individuals who were categorized as high-shame or low-shame prone. They found that adopting an observer-like perspective compared to an own eyes perspective led to higher feelings of shame in the high-shame group, but there were no differences in feelings of shame due to perspective in the low-shame group. However, when the shift in perspective was combined with an emotional regulation goal to decrease emotion (through positive reappraisal), feelings of shame were also reduced in the high-shame group. Downregulating emotional experiences that elicit self-conscious emotions by adopting an observer perspective might be more challenging due to increased attention focused on the self that triggers negative self-evaluations (e.g., “I feel incapable”; Cândea & Szentágotai-Tătar, 2020) or lead individuals to focus on how other people might think about them (e.g., “I saw she was disappointed in me”; Katzir & Eyal, 2013). Thus, in contrast to basic emotions, adopting an observer-like perspective might be ineffective in dampening self-conscious emotions due to salient negative self-evaluations. Overall, the evidence supports both the self-processes and social-cognitive models, regarding the differential effects of alternative visual perspectives depending on the nature of triggered emotion (e.g., Katzir & Eyal, 2013) and the appraisals that are possibly generated while thinking about the event (e.g., Cândea & Szentágotai-Tătar, 2020; Krishnamoorthy et al., 2021; Valenti et al., 2011). These findings also raise the question of whether an explicit positive reappraisal is required for visual perspective shifts to serve as an emotion regulation strategy for certain types of events, which is important for understanding the impact of shifting perspective to regulate emotions in mental disorders such as social anxiety (Spurr & Stopa, 2003) and PTSD (McIsaac & Eich, 2004).

Taken together, prior research has not revealed a strong relationship between visual perspective and emotional valence. In contrast, visual perspective does differentially impact self-conscious and basic emotions. The research reviewed here indicates that adopting an observer-like perspective might reduce basic emotions, but amplify self-conscious emotions. Thus, for self-conscious emotions, adopting an observer-like perspective might only be an effective emotional regulation strategy when coupled with an emotional regulation goal. These findings also highlight the importance of isolating self-conscious from basic emotional cues when examining potential differences in the impact of visual perspective on emotional valence during AM retrieval, as blurring these different types of emotional experiences might contribute to inconsistencies in the literature.

Neural Mechanisms of During Shifting Visual Perspective on Emotional Intensity

AM retrieval is supported by neural recruitment in brain regions overlapping with the default and frontoparietal networks (Cabeza & St. Jacques, 2007; Spreng et al., 2009; Svoboda et al., 2006), including regions in the medial and lateral temporal lobe, posterior parietal cortices, and medial and lateral prefrontal cortex (PFC). Visual perspective during AM retrieval is supported by neural recruitment of the precuneus and angular gyrus (St. Jacques, 2022). Virtual lesions to either the precuneus or angular gyrus (AG) alter visual perspective during AM retrieval (e.g., Bonnici et al. 2018; Hebscher et al., 2020), and these regions are also recruited when participants are asked to shift from an own eyes to an observer-like visual perspective when compared to maintaining an own eyes perspective (Faul et al., 2020; Iriye & St. Jacques, 2020; St. Jacques et al., 2017; 2018). Emotional aspects of AM retrieval elicit additional activity in the amygdala (Daselaar et al., 2008; Fink et al., 1996; Ford & Kensinger, 2019; Greenberg et al., 2005; Markowitsch et al., 2000), which through its interactions with the hippocampus (HPC) contribute to better remembering of emotional experiences (Holland & Kensinger, 2010). Functional neuroimaging studies of emotional regulation research have further revealed that lateral and medial PFC (e.g., Doré et al., 2018; Fabiansson et al., 2012; Holland & Kensinger, 2013; but see Kross et al.,2009) contribute to the down-regulation of emotional responses in the amygdala when regulating emotions during retrieval (Denkova et al., 2013; 2015; for a review see Dolcos et al., 2017). However, some studies have also implicated the role of the precuneus in emotional regulation of AMs (Holland & Kensinger, 2013; St. Jacques et al., 2017; also see Dörfel et al., 2014 for non-AM stimuli) and have suggested that altering the visual imagery of AMs can serve to reduce emotional responses during remembering (e.g., Holland & Kensinger, 2010). In their neurocognitive model, Powers and LaBar (2019) proposed that the temporal parietal junction, which encompasses the AG, might further contribute to emotional regulation due to distancing through its role in perspective taking.

Only a handful of studies have directly examined the neural mechanisms by which shifting visual perspective impacts emotional aspects of AM (Doré et al., 2018; Grol et al., 2017; St. Jacques et al., 2017; also see Eich et al., 2009). In one fMRI study, St. Jacques et al. (2017) asked participants to maintain an own eyes perspective or shift to an observer-like perspective during AM retrieval. They found greater neural recruitment in the precuneus, AG, and lateral PFC when shifting to an observer perspective. Additionally, reductions in emotional intensity ratings as the result of shifting perspective were predicted by neural recruitment of the precuneus, consistent with the suggestion that neural recruitment of visual imagery regions might also contribute to emotional regulation. Similarly, Grol and colleagues (2017) found greater recruitment of both precuneus and angular gyrus when adopting an observer compared to an own eyes perspective during recall of positive and neutral AMs. There were also no significant differences when shifting perspective in positive or neutral AMs, which dovetails with the behavioral research reviewed above. In another study, Doré et al. (2018) investigated how adopting a particular visual perspective while pursuing an emotion regulation goal impacts neural recruitment during AM retrieval. Participants were asked to retrieve negative AMs by adopting an own eyes perspective (visualizing the event as if they were immersed in it and letting their emotions unfold) or an observer-like perspective (visualizing the event from a distance and an external observer's perspective focusing on the facts related to the event). They found that relative to an own eyes perspective, retrieving negative AMs from an observer-like perspective was associated with greater neural recruitment in posterior parietal cortices and dorsolateral PFC, coupled with less neural recruitment in both the amygdala and hippocampus. The behavioral findings further revealed that adopting an observer-like perspective reduced both negative affect and vividness, which is consistent with the idea that changes in visual imagery are related to similar changes in emotional experience during AM retrieval.

In sum, shifting to a novel visual perspective is supported by the regions within the posterior parietal cortex, which might impact emotional aspects of AM retrieval by altering visual imagery during remembering (see Figure 1.2). Additional recruitment of PFC could further contribute to changes in emotional experience when adopting an observer perspective, and, when this shift in perspective is in the pursuit of an emotional regulation goal, dampen emotional responses in the amygdala (Doré et al., 2018). These findings also highlight that AMs can be remembered in multiple ways that serve different adaptive functions (e.g., Sheldon et al., 2019). Shifting to a novel perspective can lead to changes in perceptual aspects of remembering that alter emotion, as well as conceptual aspects of remembering, when the goal is to re-evaluate the emotional outcome of events from this new perspective.

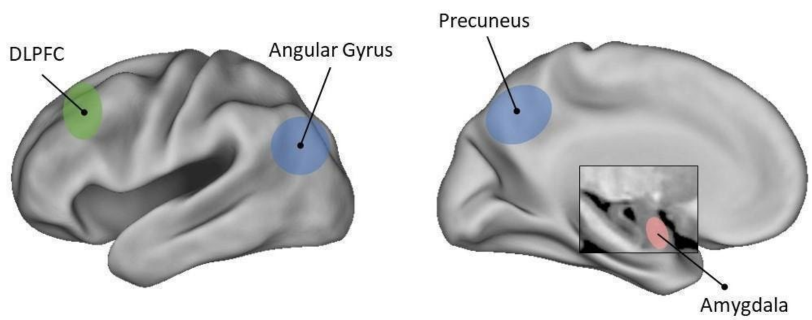

Figure 1.2 Brain regions that support changes in emotion when shifting visual perspective during AM retrieval. Precuneus and angular gyrus (blue-colored) support the representation and updating of memories from a particular visual perspective. When emotional regulation goals are present, additional recruitment of the dorsolateral prefrontal cortex (DLPFC; green-colored) helps further attenuate emotional arousal in the amygdala (red-colored).

Discussion

Visual perspective in AM is closely linked to how people experience the emotional aspects of events during retrieval. Naturally adopting a particular visual perspective or actively shifting perspective influences both subjective and objective measures of emotionality. In particular, prior research shows that observer-like perspectives are frequently associated with a decreased emotional intensity when shifting from an own eyes to an observer-like perspective. However, the impact of shifting on emotionality is unidirectional, with no predicted increase when shifting from an observer-like to an own eyes perspective. Earlier theories proposed that the reduction in emotional intensity due to shifting perspective was linked to meaning-making about the event by reappraising it more objectively in an observer perspective (Libby & Eibach, 2011; Niese et al., 2021) or increasing psychological distance to a higher construal level (Trope

& Liberman, 2010) which allows people to analyze their feelings more objectively to regulate their affect (Kross & Ayduk, 2017). While these findings seem to hold for basic emotions, a different pattern of effects is evident for self-conscious emotions, such that observer perspectives do not influence the self-conscious emotions or might even heighten them in some contexts (Sutin & Robins, 2008). Although only a few studies have examined the neural mechanisms by which visual perspective impacts emotional experience during AM remembering, this work demonstrates the involvement of the precuneus and angular gyrus in supporting the reduction in emotional intensity due to shifting from an own eyes to an observer-like perspective. Yet, there are remaining questions regarding the mechanisms by which shifts in visual perspective influence emotional aspects of memories.

Current theories suggest that the changes in emotional experience due to shifting perspective are linked to factors such as self-evaluative processes (Sutin & Robins, 2008), abstract versus concrete thinking while appraising the broader meaning of the event (Libby & Eibach, 2011; Niese et al., 2021), increased psychological distance (Trope & Liberman, 2010), and self-reflective processes (Kross & Ayduk, 2017). These theories have contributed to understanding why shifting visual perspective impacts emotional experiences, particularly when there are explicit emotion regulation goals (e.g., Krishnamoorthy et al., 2021), meaning-making (Valenti et al., 2011), or active consideration of negative self-evaluations (e.g., Cândea & Szentágotai-Tătar, 2020; Hung & Mukhopadhyay, 2012). However, shifts in perspectives can alter the emotional characteristics of events even when emotional AMs are not specifically targeted and there are no specific emotional regulation goals (e.g., Berntsen & Rubin, 2006; King et al., 2022; Sekiguchi & Nonaka, 2014; St. Jacques et al., 2017). Moreover, prior theories do not consider episodic memory retrieval processes that might contribute to changes due to visual perspective during remembering. For example, as reviewed above, changes in visual imagery due to shifts in perspectives during retrieval might also contribute to changes in emotional aspects of AMs, but the critical role of visual imagery in AM has largely been neglected by prior theories of visual perspective in memory. Another important aspect of episodic retrieval that might contribute to changes in AM due to visual perspective is retrieval effort. For example, several studies have found that shifting from an own eyes to an observer perspective is more effortful than maintaining an own eyes perspective (Iriye & St. Jacques, 2020; St. Jacques et al., 2018; 2017). While differences in retrieval effort account might explain reported decreases in memory retrieval, it cannot easily account for increases in memory retrieval due to shifting perspective (e.g., King et al., 2022). Nonetheless, additional research could aim to better control for these differences in retrieval demands when comparing different visual perspective conditions (e.g., Iriye & St. Jacques, 2021).

Here, I propose that own eyes and observer-like perspectives represent two distinct retrieval orientations during AM retrieval that bias emotional and other recollective aspects of remembering. Retrieval orientation refers to differences in how retrieval cues are processed and can impact the effectiveness of memory retrieval depending upon whether this processing overlaps with similar processes engaged during memory encoding (Herron & Rugg, 2003; Rugg & Wilding, 2000). Prior research has shown that changes in how retrieval cues are processed can bias neural activity prior to and during episodic memory retrieval (e.g., Herron & Rugg, 2003; Hornberger et al., 2006; Morcom & Rugg, 2012). Recent research has also shown that retrieval orientation can lead to similar biases in AM retrieval by influencing the underlying brain networks that contribute to remembering (Gurguryan & Sheldon, 2019) and has linked these retrieval orientations to different functions of AM remembering (Sheldon et al., 2019). Similarly, adopting an own eyes or observer-like perspective also influences how underlying memory representations are prioritized during AM retrieval. For example, in an fMRI study, Iriye and St. Jacques (2020) demonstrated that adopting a particular perspective biased pre-retrieval processes that guided how particular AMs were initially constructed and later elaborated upon. Participants were asked to retrieve AMs cued by familiar spatial locations while adopting own eyes and observer-like perspectives. They found that when participants were cued to adopt an observer-like perspective during AM retrieval, there was greater functional connectivity between the hippocampus and posterior parietal cortices during a pre-retrieval phase when participants were asked to search for and select a particular AM. Additionally, adopting an observer-like perspective was also associated with less engagement of the AM retrieval network once a particular memory was recovered, and participants were asked to elaborate upon the retrieval of the memory in as much detail as possible. Thus, adopting a particular perspective influenced pre-retrieval processes and contributed to the effectiveness of memory retrieval (also see Hebscher et al., 2020). In other words, the impact of adopting a particular visual perspective on memory could be determined starting from the early phases of AM retrieval, even before later retrieval stages in which people would engage in complex self-evaluative or meaning-making processes, as suggested by prior theories.

Considering shifts in visual perspective in the context of retrieval orientation is fruitful for better understanding how it interacts with emotional regulation. For example, active emotional regulation goals might bias how some individuals process retrieval cues in a way that prioritizes adopting an own eyes or observer-like perspective during memory recall. This might explain why there is a higher frequency of observer-like perspectives reported in AMs in certain populations, such as post-traumatic stress disorder (PTSD), who might avoid eliciting strong emotional responses during voluntary retrieval of AMs by emphasizing some features of memories over others (e.g., Berntsen et al., 2003; McIsaac & Eich, 2004). Another aspect of constantly adopting a certain visual perspective (and avoiding the other one) might be linked to implicit emotion regulation in which people modify their emotional experiences unintentionally (Koole & Rothermund, 2011; Mauss et al., 2007). One potential implication is whether the prioritization of an observer-like perspectives for some memories (e.g., traumatic events) could turn into habitual use of an emotional regulation strategy, without exerted control, over time (Gyurak et al., 2011; also see Braunstein et al., 2017) that leads memory details to be represented less salient in the long term (Koole & Rothermund, 2011). In this case, shifting to a novel visual perspective that is initially avoided might impair the functioning of the implicit emotional regulation and influence how memory details, including emotional aspects, are retrieved. Another critical question is how explicit (i.e., intentional) emotion regulation goals accompanying visual perspective shifts during retrieval might differentially influence the emotional aspects of AMs. Earlier theories have suggested that the time when the explicit emotion regulation goals are activated, following the presentation of an emotional stimulus, determines the effectiveness of the emotion regulation strategy. For example, Sheppes and Meiran (2007) showed that when people were instructed to employ cognitive reappraisal long after they started to watch emotional films, they had difficulty diminishing the negative affect triggered by the stimuli. In contrast, when cognitive reappraisal was initiated shortly after the presentation of emotional stimuli, it was more effective in down-regulating negative affect. Related to this idea, one question is how the temporal sequence of emotion regulation instructions and visual perspective cues could impact emotional experiences. For example, orienting retrieval with a visual perspective cue before setting the emotion regulation goal might help event details to be reconstructed earlier and facilitate the generation of the desired emotional response in contexts where the intentional emotion regulation goal may not be as effective, such as traumatic losses or extremely negative events.

The idea that own eyes and observer-like perspectives reflect different retrieval orientations could also explain reported differences in subjective and objective characteristics of memories due to visual perspective. If we assume that most memories are encoded from an own eyes perspective, then a retrieval orientation matching this viewpoint (i.e., own eyes) should be more effective than one that mismatches (i.e., observer). Prior research has primarily investigated how shifting from a dominant own eyes perspective to a novel observer-like perspective during retrieval influences remembering (e.g., Akhtar et al., 2017; Berntsen & Rubin, 2006; King et al., 2022; Robinson & Swanson, 1993; Sekiguchi & Nonaka, 2014; St. Jacques et al., 2017; Vella & Moulds, 2014). Thus, changes in emotional and other recollective aspects due to shifting perspective could be explained by how retrieval orientation processes lead to a mismatch from encoding (also see Marcotti & St. Jacques, 2018). This leads to the novel prediction that shifting from an observer-like to an own eyes perspective would be similarly ineffective in eliciting successful retrieval for memories that were initially encoded from an observer-like perspective, as this scenario would involve a similar mismatch in retrieval orientation and encoding processes. Prior research has further suggested that events involving self-conscious emotions are more likely to be encoded from a natural observer perspective (McCarroll, 2017; 2018; Nigro & Neisser, 1983), which leads to the intriguing possibility that adopting an observer-like perspective during retrieval of these events might better recapitulate the same processes engaged during encoding—thus, explaining why subjective emotionality and other recollective properties in such events may not change unless there is an explicit effort to regulate the experienced emotions. That is, the ineffectiveness of shifting from an observer-like to an own eyes perspective for these events can be relatable to retrieval orientation processes rather than self-evaluations (Sutin & Robins, 2008) or meaning-making (Libby & Eibach, 2011). Importantly, this does not entirely eliminate the idea that a particular visual perspective may cause people to evaluate themselves or appraise the memory content in alternative ways. Instead, the proposed theory suggests that focusing on the changes in basic retrieval processes due to perspective shift would give an essential understanding of why a presented visual perspective cue influences recollection even in the early stages of retrieval. An important step for future research will be to manipulate the encoding of memories from an observer-like perspective (e.g., Iriye & St. Jacques, 2020) in order to examine how orienting retrieval towards own eyes or observer-like perspectives prioritize different characteristics of memory retrieval. Shifting from a dominant perspective to a novel one, regardless of its direction, would be re-orienting retrieval processes to a viewpoint that does not recapitulate the original one, which biases the way that AMs are retrieved and specifically impacts emotional aspects of memory.

In conclusion, the flexible nature of memory enables people to adopt multiple visual perspectives during retrieval. The studies reviewed here demonstrate that updating the original visual perspective of AMs contributes to the reconstructive nature of retrieval and reshapes the subjective and objective measures of emotionality (St. Jacques, 2019; 2022), thereby serving as an effective emotion regulation tactic (Powers & LaBar, 2019; Wallace-Hadrill & Kamboj, 2016; Webb et al., 2012). Here I also propose that own eyes and observer-like perspectives are two distinct retrieval orientations that bias the way memories are retrieved. According to this theory, changes in the subjective sense of emotionality that emerged from visual perspective manipulation are the consequence of various factors related to both encoding and retrieval.

Overview of the Present Dissertation

The main goal of the present dissertation is to examine the influence of visual perspective on the emotional aspects of event memories and address questions regarding how visual perspective functions to impact retrieval. To pursue this goal, I have conducted three main studies in which I investigated cognitive and neural mechanisms supporting changes in emotionality and other AM characteristics due to visual perspective taking. In Chapter 2, I first ran a meta-analysis examining the overall effect of perspective shift on emotionality. Specifically, I aimed to include studies in the literature investigating shifts in perspective to quantify the impact of visual perspective shifts on emotion and investigate the moderators determining the strength and direction of this effect. In Chapter 3, I conducted a study to examine shifts in visual perspective (i.e., own eyes to observer, and vice versa) and pursued a detailed investigation on the changes in emotional intensity and other AM phenomenology, in addition to the nature of visual perspective. In Chapter 4, I investigated own eyes and observer-like perspectives as two distinct retrieval orientations and ran an fMRI study to examine the neural mechanisms supporting the changes in pre-retrieval processes due to visual perspective taking. In Chapter 5, I provide a general discussion to summarize and overview the contributions of the present findings to broader literature in terms of how visual perspective plays a role in the retrieval of event memories, as well as the applications in emotion regulation context in which visual perspective is involved as a particular emotional regulation strategy.

Chapter 2: The influence of shifts in visual perspective on emotion in event memories: A meta-analytical review

Introduction

Remember a specific event from your personal past, for example, the first time you went to the concert of your favorite band. Visualize the location of the stage, your location, and the excitement you feel when the band shows up. As you recreate the mental scenario of this event, from which point-of-view do you see it? Event memories, including autobiographical memories (AMs) from the personal past and episodic mental simulations, such as imagining future events and other hypothetical scenarios, require the construction of a scene from a particular visual perspective (Rubin & Umanath, 2015). People can adopt an own eyes perspective, in which they visualize events from a viewpoint where they were or would be located in the event, and an observer-like perspective, in which they could see themselves and their environment (Nigro & Neisser, 1983). Visual perspective influences the characteristics of remembering and imagining (e.g., for review see St. Jacques, 2022). For example, viewpoint influences how mental scenarios are constructed, such as the emotions that people attribute to events (for review, see Küçüktaş & St. Jacques, 2022). Moreover, a growing body of research has shown that shifting visual perspective by adopting a novel vantage point that differs from the initial perspective of the event (e.g., shifting from an own eyes to an observer-like perspective) also alters the characteristics of remembering and imagining (e.g., St. Jacques, 2019; Wardell et al., 2023). Returning to the example above, if you remember the concert memory from an own eyes perspective, you would likely have experienced more intense emotions than if you had taken an observer-like perspective. However, if you then shifted to an observer-like perspective such that you mentally visualize yourself and your surroundings in the same concert event, you would potentially experience a reduction in emotionality. The decrease in emotion due to shifting from an own eyes to an observer-like perspective is frequently reported (e.g., Akhtar et al., 2017; Berntsen & Rubin, 2006; King et al., 2022; Robinson & Swanson, 1993; St. Jacques et al., 2017). However, some studies have also shown that this effect is asymmetrical, such that shifting from an observer-like to an own eyes perspective does not impact the emotion associated with the events (e.g., Akhtar et al., 2017; Berntsen & Rubin, 2006; Robinson & Swanson, 1993; Vella & Moulds, 2014). Understanding the relationship between shifts in visual perspectives and emotion is critical given that visual perspective is frequently used as an emotional regulation strategy (Wallace-Hadrill & Kamboj, 2016; see also Powers & LaBar, 2019; Webb et al., 2012), and certain emotional disorders such as post-traumatic stress disorder (PTSD) are related to impairments in visual perspectives of memories (e.g., Berntsen et al., 2003; Kenny & Bryant, 2007; McIsaac & Eich, 2004). The present meta-analysis aims to elucidate how shifts in visual perspectives influence emotionality during the construction of event memories.

Shifting from an own eyes to an observer-like perspective generally reduces the emotionality of events (e.g., Akhtar et al., 2017; Berntsen & Rubin, 2006; King et al., 2022; Robinson & Swanson, 1993; St. Jacques et al., 2017; Vella & Moulds, 2014). For example, Berntsen and Rubin (2006) asked participants to remember events they initially recalled from an own eyes perspective by shifting to an observer-like perspective, which diminished the initial emotional intensity of the events. One reason for the reduced emotions experienced is that observer-like perspective, by nature, involves distancing ourselves from events as we step back from the center of these experiences. In contrast, own eyes perspectives mimic our typical and embodied experience of the world, thus supporting the experiential aspects of mental scenarios. These findings are consistent with theories of visual perspective and emotional regulation that highlight the role that viewpoint plays in the sense of immersion or distancing from events (e.g., Kross & Ayduk, 2017; Tausen et al., 2020; Trope & Liberman, 2010) as well as the sense of agency (Peeters et al., 2023).

Although people are also able to shift from an observer-like to an own eyes perspective, prior research has shown that shifting perspective in this direction has little to no impact on emotion (for review, see Küçüktaş & St. Jacques, 2022). For example, Sekiguchi and Nonaka (2014) asked participants to recall AMs from their naturally occurring visual perspective. Then, participants were asked to adopt the opposite perspective in the memory compared to their original viewpoint, either shifting from an own eyes to an observer-like perspective or vice versa. The authors found a reduction in the reported emotional intensity of memories when participants shifted from an own eyes to an observer-like perspective, but no changes when they shifted from an observer-like to an own eyes perspective. This asymmetrical pattern of effects of visual perspective on emotion has been consistently found in the literature (e.g., Berntsen & Rubin, 2006; Robinson & Swanson, 1993; Vella & Moulds, 2014). However, it is still unclear why shifting from an own eyes to an observer-like perspective is effective in altering emotions, but shifting in the reverse direction is not.

Shifting to a novel visual perspective is a mnemonic intervention that changes how people reconstruct events (St. Jacques, 2019; 2022; St. Jacques, 2023a), and therefore, its impact on emotion can be understood by examining how memory content is reassembled when adopting a novel viewpoint. Recent models argue that emotions triggered by mnemonic materials, such as AMs, can be diminished by modifying the accessibility of event details (Engen & Anderson, 2018; Samide & Ritchey, 2021). Specifically, new appraisals generated during affective regulation introduce a new source of information into memory (e.g., a new interpretation or meaning of the event in the big picture, thinking about the silver lining in the experience), which decreases emotion by reshaping the nature of event details (e.g., Holland & Kensinger, 2013). This aligns with visual perspective theories, which propose that people reframe events within the broader meaning of their lives when they shift to an observer-like perspective with a resulting impact on the recall of episodic details and other event characteristics (Libby & Eibach, 2011; Niese et al., 2021). Supporting these ideas, prior research has shown that shifting from an own eyes to an observer-like perspective decreases episodic details during narrative recall, as well as the vividness of visual imagery associated with remembering (e.g., Akhtar et al., 2017; Berntsen & Rubin, 2006; see also Butler et al., 2016). These findings have contributed to the hypothesis that observer-like perspectives emerge due to a loss of visual and/or other episodic detail that supports the emotional aspects of event memories (e.g., for review, see St. Jacques, 2023a). Additionally, functional neuroimaging findings have also shown that regulating emotions through memory interventions, such as shifting to a novel visual perspective, recruits posterior parietal regions, including precuneus and angular gyrus (e.g., Doré et al., 2018; St. Jacques et al., 2017), which are linked to visual imagery and integration of episodic details during AM retrieval (Fletcher et al., 1995; Fulford et al., 2018; Ramanan et al., 2018). Together, these findings point to the critical question of whether changing AM characteristics (e.g., vividness and other episodic details) as a result of recombining event details is a key factor in diminishing emotions via perspective shifts. However, the loss of visual details influences the ability to recombine episodic details in a novel way when shifting from an observer-like perspective to own eyes perspective, thereby mitigating emotional regulation. In other words, shifting from an observer-like to an own eyes perspective does not up-regulate the emotionality of events because the visual information that supports this recollective aspect of event memories is forgotten.

Despite evidence that a shift in visual perspective is an effective emotion regulation strategy (Powers & LaBar, 2019; Wallace-Hadrill & Kamboj, 2016; Webb et al., 2012), many questions remain regarding the relationship between visual perspective and emotion. A critical but understudied question concerns the shifts in visual perspective itself. As reviewed above, prior studies have suggested that shifting to an alternative perspective changes emotions linked to the events, although this effect has consistently been shown in one direction. Previous research has been limited in addressing the causes of this asymmetrical pattern because capturing events in which an observer-like perspective is initially adopted is challenging unless certain types of events are specifically targeted (e.g., giving a public speech; Nigro & Neisser, 1983). Additionally, neither empirical studies nor systematic reviews have thoroughly compared shifts in perspective in both directions by examining the underlying memory mechanisms causing the reduction in emotion. This is potentially related to the fact that research has primarily focused on distancing from an emotionally triggering event as an emotional regulation strategy (e.g., Kross et al., 2005; Ray et al., 2008) and approaching an emotionally arousing event or contra-hedonic emotional regulation would not be desired or adaptive within this context. Thus, a primary goal of the current meta-analysis was to examine how shifts in perspective influence event memories and the moderating effect of the direction of shift on differences in emotionality.

Factors Determining the Impact of Visual Perspective on Emotion

Although the effect of shifts in visual perspectives on emotion is a robust finding, several factors can influence the strength of the relationship and its direction. Therefore, a meta-analytic approach to investigate this relationship requires scrutinizing these potential moderators. I identified several potential moderators derived from prior studies in the literature, accounting for the sample characteristics, design-related details, measurement of emotion, event characteristics, and variations regarding how visual perspective manipulations were employed.

Sample Characteristics

Prior studies have shown that certain demographic characteristics might be linked to the visual perspective people adopt. For example, Rice and Rubin (2009) found that observer-like perspectives were more prevalent among women than men (but see Siedlecki & Falzarano, 2016), which has been linked to greater feelings of objectification in women (Huebner & Fredrickson, 1999). In line with this, shifting to an observer-like perspective would not be a novel or unusual retrieval process for women, such that it would decrease emotion to a lower degree when compared to men. Prior research has also reported age-related differences due to visual perspective (e.g., Piolino et al., 2006). Thus, I included both the percentage of women/females and mean age as moderators to account for potential variation among the studies.

Design Factors

Repetition during Retrieval/Mental Simulation. Prior studies have asked participants to shift perspective on a single trial (e.g., Akhtar et al., 2017; Faul et al., 2020; Gu & Tse, 2016) or across multiple repetitions (e.g., Crawley, 2010; King et al., 2022; St. Jacques et al., 2017; 2018). Multiple repetitions could boost the potential impact of shifting perspective on emotionality, leading to stronger effect sizes than studies using single repetitions. Thus, the number of repetitions was included as a potential moderator.

Duration of Retrieval/Mental Simulation. Studies vary in the duration of memory retrieval and mental simulation from seconds (e.g., Faul et al., 2020; St. Jacques et al., 2017; 2018) to several minutes (e.g., Gu & Tse, 2016). Differences in duration may influence whether visual perspective impacts the early or late stages of retrieval/simulation (e.g., Iriye & St.

Jacques, 2020) and/or the strength to which shifting impacts emotion. Thus, I included the retrieval or mental simulation duration as a potential moderator.

Emotional Outcome Measurement

Emotional Intensity and Emotional Valence. Emotional experiences vary in two dimensions: intensity (lower vs. higher arousal) and valence (pleasantness; positive vs. negative; Bradley et al., 1992; 2001). Previous research has suggested that the impact of visual perspectives is more robust on emotional intensity than emotional valence (for review, see Küçüktaş & St. Jacques, 2022). For example, Berntsen and Rubin (2006) found that shifting from an own eyes to an observer-like perspective decreased ratings of the emotional intensity of AMs but had no impact on emotional valence. Thus, I included outcome measures (i.e., valence versus intensity) as a potential moderator.

Event Characteristics

Event Emotionality. Studies examining the role of visual perspective shifts on emotion have specifically targeted the retrieval or simulation of an emotional event (e.g., Vella & Moulds, 2014) as well as more neutral events (e.g., St. Jacques et al., 2017). When participants were not specifically asked to remember emotionally laden events, shifting from an own eyes to an observer-like perspective still decreases emotional intensity and emotion/thought details in the event narratives (e.g., King et al., 2022; St. Jacques et al., 2017). Critically, in these studies, participants were asked to remember numerous events by free recall; thus, there was no restriction in terms of the emotional valence category. That is, although participants were not presented with emotional cues to generate events, there would still be variability in the emotionality of the retrieved events due to free recall. Therefore, shifting from an own eyes to an observer-like perspective could have an impact on emotion for the events in the non-emotional category. However, the effect size of visual perspective shift on emotion might be larger when emotional events are specifically targeted because there is a greater range with which perspective manipulations could affect emotion. Thus, I included the event emotionality as a moderator here.

Apart from that, events initially recalled from an own eyes, compared to an observer-like perspective, are associated with higher emotional arousal (D'Argembeau et al., 2003; Talarico et al., 2004). However, certain events triggering extreme emotional arousal, such as trauma memories, are associated with observer-like perspectives (McIsaac & Eich, 2004). Considering this, decreasing emotions by shifting to an observer-like perspective might be more difficult for the events that are emotionally more arousing.

Event Remoteness. Prior research examining visual perspective and emotion has elicited events that vary in remoteness. Remote events are more likely to be associated with adopting an observer-like perspective (e.g., D'Argembeau & Van der Linden, 2004; Rice & Rubin, 2009). At the same time, remote events also tend to be associated with fading of affect and vividness (Sutin & Robins, 2007; Talarico et al., 2004), which might further mitigate the impact of shifting perspective on emotion.

Visual Perspective Factors

Self-Visibility in Observer-like Perspectives. Self-visibility in an observer-like perspective refers to seeing oneself in the event when visualizing the event from an observer-like perspective (Kinley et al., 2021). Although the general assumption is that people see themselves in the event when they adopt an observer-like perspective, earlier research showed that self-visibility and an observer-like perspective are independent concepts, such that adopting an observer-like perspective does not guarantee one to see themselves in the event during retrieval or mental simulation (e.g., Kinley et al., 2021). Additionally, an observer-like perspective can emerge at various distances, heights, and locations (Rice & Rubin, 2011), which might impact the visibility of the self. Studies have varied in terms of whether observer-like instructions are associated with self-visibility. Theories propose that emotion would be higher when adopting an observer-like perspective if the self is more salient or visible than non-visible (Sutin & Robins, 2008). Indeed, ensuring the visibility of the self in an observer-like perspective influences the change in emotional aspects of the events, such that higher self-visibility in an observer-like perspective is related to increased emotion (Kinley et al., 2021). Given that prior studies do not typically manipulate the visibility of the self when adopting an observer-like perspective, I instead examined whether emphasizing the visibility of the self when describing observer-like perspectives in the participant instructions (i.e., seeing yourself in the event) would influence the impact of shifting perspective on emotion. Specifically, I predicted that instructions emphasizing self-visibility would attenuate the effect size.

Initial Perspective of Event Memories. Event memories can differ in the dominant or preferred perspective that people adopt (e.g., Rice & Rubin, 2011), and prior studies have differed in whether they control for the dominant perspective of events before manipulating shifts in perspective. Some studies have elicited event memories and then used subjective perspective ratings to categorize them as initially associated with an own eyes or observer-like perspective (e.g., Sekiguchi & Nonaka, 2014; St. Jacques et al., 2017; Vella & Moulds, 2014). Thus, in these studies, the initial perspective reflects the spontaneous or naturally occurring (or dominant) viewpoint of the event memory, and then shifts in perspective reflect a novel viewpoint that differs from the dominant perspective of the event. In other words, when people are asked to shift to the opposite perspective, there would be a more drastic deviation from the naturally occurring perspective of the event, which could lead to greater reconstruction demands and distortion in event characteristics. In contrast, other studies have elicited events by instructing participants to adopt either an own eyes or observer-like perspective during the initial recall (e.g., Gu & Tse, 2016; St. Jacques et al., 2018). Then, in these studies, the initial perspective is “forced” as researchers might ignore the spontaneous perspective of an event (e.g., Berntsen & Rubin, 2006), and the novelty of the perspective shift manipulation could vary with respect to the dominant perspective of the event. For example, if one remembers an event from a spontaneous own eyes perspective, but in a study, they are asked to initially adopt an observer-like perspective (i.e., in a forced perspective context), they would already shift from the spontaneous perspective of the event. Then, during a retrieval manipulation, shifting to an own eyes perspective would be switching back to the original perspective of the event; thus, it might require less reconstruction demands and memory distortions. I included whether the initial perspective was spontaneous or forced as a potential moderator here, predicting that shifting from the former (i.e., spontaneous perspective) would lead to a stronger effect size given that shifting from a spontaneous perspective would involve adopting a more novel viewpoint.

Direction of Perspective Shift. Shifts in perspectives can occur from an own eyes to an observer-like perspective or in the opposite direction. Accordingly, I identified each effect based on the direction of the shift in perspective (i.e., own eyes to observer or observer to own eyes). Given the asymmetrical pattern in the literature (Berntsen & Rubin, 2006; Robinson & Swanson, 1993; Vella & Moulds, 2014), I predicted a larger effect size when shifting from an own eyes to an observer-like perspective compared to the opposite direction.

As reviewed above, mnemonic interventions that modify event characteristics decrease emotionality. To better understand the asymmetrical pattern of shifts in perspective and contributing mechanisms, I aimed to investigate potential changes in other aspects of the events.

I focused on vividness in visual imagery for two main reasons. First, shifts in perspective lead to a similar asymmetrical pattern on vividness (for review, see St. Jacques, 2022), and vividness is strongly associated with emotion (e.g., Talarico et al., 2004). Second, many AMs include vividness as a dependent variable, while few studies directly examine the objective content of other types of memory details. Altered vividness, when shifting to a novel observer-like perspective, could be one factor that facilitates the downregulation of emotions (i.e., decreasing/alleviating emotional experiences by employing emotion regulation strategies; Doré et al., 2018). However, failure to recover or modify visual details when shifting from an observer-like to an own eyes perspective could be linked to ineffective emotional regulation. Thus, I included the difference in vividness between initial and shifted perspectives as a potential moderator to account for the altered event properties due to shifting perspectives, which underpins the reduction in emotion due to shifting. I predicted that the decrease in emotionality due to shifting from an own eyes to an observer-like perspective would be larger when there is a greater decrease in vividness.

The Present Research

The present study provides critical and novel approaches to understand *how* and *why* updating the initial perspective of an event by shifting to the opposite perspective decreases emotion. The role of visual perspective taking, or more generally self-distancing, on emotion has also been the focus of several previous meta-analyses. However, first, prior studies did not provide a causal explanation why an observer-like perspective decreases emotion. Second, here I aim to understand the cognitive mechanisms that reshape memories via the manipulations in visual imagery. The role of the changes in visual imagery on the impact of visual perspective on emotion has been mostly neglected in the previous studies. Also, the scope of those studies involved comparing own eyes and observer-like perspectives (Guo, 2022; Moran & Eyal, 2022; Murdoch et al., 2022) or various emotional regulation strategies (Webb et al., 2012). For example, Moran and Eyal (2022) examined the impact of psychological distance and level of abstraction on emotional experiences based on self-distancing aspects of construal level theory (Trope & Liberman, 2010). They reported a medium effect size (Hedges' $g = .52$), reflecting reduced emotional experiences due to self-distancing. Similarly, Guo (2022) investigated the impact of self-distancing, specifically visual perspective taking, on emotional experiences elicited by a wide variety of stimuli and found a small effect of visual perspective on emotion (Hedges' $g = .26$), also suggesting a lower emotionality due to adopting a self-distanced perspective. Murdoch et al. (2022) examined how self-distanced reflections of stressful and adverse life experiences, including lifetime stressors, influenced the emotionality linked to these events. They reported a small effect size (Hedges' $g = .19$), indicating a reduced emotionality in a self-distanced versus a self-immersed perspective. In contrast, Webb et al. (2012) investigated the effectiveness of components of the process model of emotion regulation (Gross, 1998), of which visual perspective taking was one of the examined strategies. They reported a medium effect size of visual perspective taking on down-regulating affect (Cohen's $d = .45$). Thus, prior meta-analyses have found a small to medium effect size when comparing differences in emotionality when adopting an own eyes compared to an observer-like perspective but have not directly examined the role of shifting perspective on event memories.

The present study differs from prior meta-analyses in several important ways. First, I specifically focus on shifts in perspective. That is, here I directly compare emotionality when event memories are initially remembered or imagined versus following an instruction to shift perspective. Thus, I investigate the emotionality of event memories due to shifting perspective and the supporting mechanisms rather than examining differences when adopting an own eyes or observer-like without a requirement to shift perspective. Second, I focus on emotional experiences in event memories, including AMs and episodic mental simulation (i.e., imagining hypothetical scenarios and future events). Prior meta-analyses included a wider range of emotional stimuli, including normative emotional lab materials (Guo, 2022; Moran & Eyal, 2022; Webb et al., 2012) or various emotion regulation strategies (Webb et al., 2012). The targeted approach here allows for a better understanding of the impact of shifting perspective on personally relevant events, which are usually the target of emotional regulation interventions in applied settings. Additionally, I aim to account for the particular memory mechanisms, specifically the role of visual imagery during retrieval and mental simulation that leads to changes in emotional experiences, which was mostly neglected by the prior studies. Overall, the primary goal of the present meta-analysis was to quantify differences in emotionality following a shift in perspectives during the retrieval and simulation of events as well as understanding the underlying memory mechanisms leading to this emotional regulation. The main prediction is that emotionality would be lower in event memories due to shifting perspective, as reflected by a small to medium effect size. Additionally, consistent with the asymmetrical pattern of shifting (Berntsen & Rubin, 2006; Robinson & Swanson, 1993; see also Butler et al., 2016), I predicted that variability in the effect size would be related to the direction of the shift, such that shifting from an own eyes to an observer-like perspective would reduce emotion, but the reverse shift from observer-like to own eyes perspectives would not impact emotion. Finally, I predicted that the asymmetrical pattern of shifting perspective on emotion would be related to the mnemonic changes in the vividness of event memories.

Methods

Search Strategy

The literature search was conducted in four online scientific databases: PsycINFO, PubMed, EbscoHost, and Web of Science. I used a broad list of search terms representative of visual perspective in event memory and emotion regulation, including: “visual perspective”, “field perspective”, “own eyes perspective”, “egocentric perspective”, “first person perspective”, “1PP”, “observer perspective”, “allocentric perspective”, “third person perspective”, “3PP”, “vantage point”, “cognitive reappraisal”, “self immers*”, “self-distanc*”, “detachment”, “detachment AND emotion”, “detachment AND memory”, “detached perspective”, “out of body”, “mental imagery AND episodic memory”, “mental imagery AND emotion”. The formal literature search included articles published before November 10, 2020. I conducted an additional more targeted search that identified the articles published after this date and included unpublished data investigating the effects of the shifts in perspective (up to October 1, 2023). The PRISMA flowchart of the literature search and screening process based on Moher et al. (2009) guidelines is depicted in Figure 2.1. I used Covidence (Covidence, 2022) to manage the systematic review. Studies identified via the database search were imported into Covidence for abstract and title screening, full-text eligibility review, and data extraction phases. A trained research assistant and I independently conducted abstract and title screening. Conflicts were independently resolved by our supervisor. Two trained research assistants and I then independently performed the full-text review. Conflicts were resolved by discussion. The inter-rater reliability for screening and eligibility was almost perfect and substantial based on Cohen’s Kappa scores of .857 and .702, respectively (Landis & Koch, 1977).

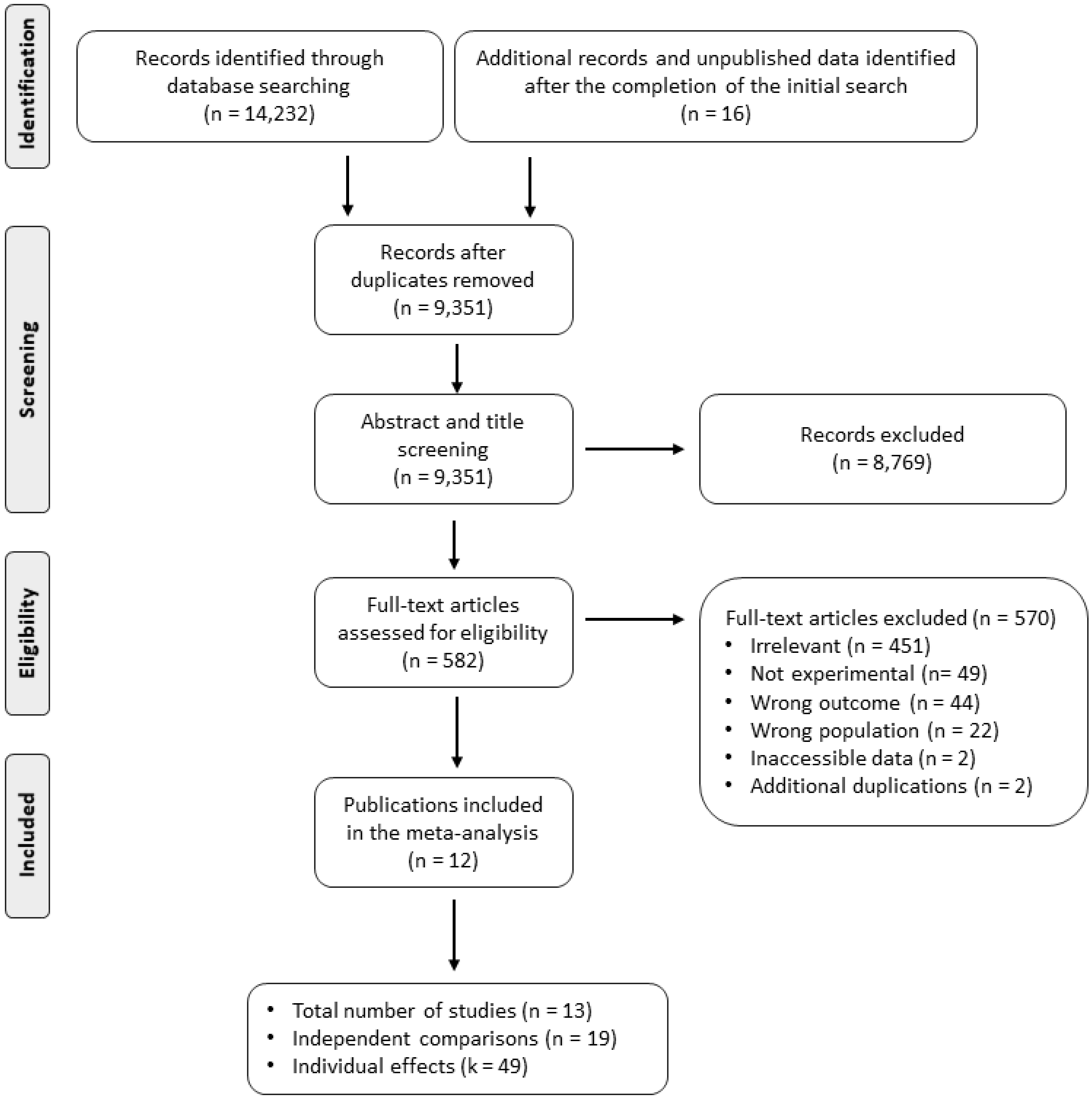

Figure 2.1. PRISMA Flowchart. PRISMA flowchart of the screening process and inclusion.

Inclusion/Exclusion Criteria

Studies recruited from databases were restricted to peer-reviewed journal articles published in English and non-clinical adult samples (the most extensive age range in the samples was between 18 to 62). Studies in which participants were recruited based on their scores on an inventory measuring mood-related clinical symptoms were omitted, given that these individuals might perform differently on memory and emotion regulation tasks (see also Webb et al., 2012). I also included unpublished studies involving shifts in perspectives based on research in our lab and by searching archives of published data for studies.

The current meta-analysis focused on the influence of shifts in perspective in event memory (Rubin & Umanath, 2015). Thus, selected studies were restricted to empirical investigation of AM and imagination of future events and other imagined scenarios. The included studies had to manipulate own eyes and observer-like perspectives by shifting. That is, I included studies that measured the initial perspective of remembered or imagined events (Initial condition) and then explicitly instructed participants to shift perspective (Shifted condition). Studies in which emotional states were triggered by normative lab materials (e.g., arousing visual images or videos) were excluded (e.g., Basso et al., 2018; Ochsner et al., 2004). Own eyes perspectives could include manipulations involving neutral instructions (i.e., visualizing the event from the viewpoint where participants were located in the event; e.g., Crawley et al., 2010; Vella & Moulds, 2014), as well as studies in which own eyes perspectives were manipulated by 1st person pronoun use during narrative recall (e.g., Gu & Tse, 2016). Likewise, observer-like perspective manipulations could include either neutral instructions (i.e., visualizing the event from an observer's viewpoint; e.g., King et al., 2022; Sekiguchi & Nonaka, 2014) or studies in which observer-like perspectives were manipulated by 3rd person pronoun use (e.g., Gu & Tse, 2016). However, I excluded studies with a distancing manipulation not directly targeting visual perspective (i.e., temporal or hypothetical; Trope & Liberman, 2010) or involving instructions that did not require participants to adopt a specific visual perspective. All included studies had to measure emotion for both the initial and shifted perspective conditions. Studies were included if they measured emotion using subjective/behavioral ratings or objective measures such as emotion/thought contents in event narratives. Finally, I excluded studies in which the effect size calculation could not be determined. I contacted the corresponding author with a data request for studies in which the required information was missing in the reported article. After these additional steps, I excluded the study if the data was still inaccessible.

Coding Procedures

I developed a coding protocol to extract information related to study characteristics and moderators in the full-text review. Two trained research assistants and I performed the coding. To assess inter-rater reliability, I performed an intra-class correlation for the continuous variables and calculated kappa for the categorical variables. The average intra-class correlation coefficient was .887, indicating good reliability (Koo & Li, 2016), and the kappa statistics were moderate, with a mean of .534 (Landis & Koch, 1977). Disagreements or conflicts were resolved by discussion. The coding of the main study characteristics is presented in Table 2.1.

The coding protocol comprised data extraction related to publication details, general study and sample characteristics, and moderator categories. The coding protocol for the publication details applied to author names, publication year, and publication status. General study characteristics include the country where the data was collected and the study design (all articles included were experimental designs). The coding of moderators is described in Table 2.2.

Table 2.1.

Characteristics and Effect Sizes for Studies Included in the Meta-analysis

	Moderators													Descriptive Statistics						Effect Sizes				
														Shifted Perspective			Initial Perspective				95% CI			
References	% Women/ Females	Age	Repetition	Duration (s)	Outcome	Event Emotionality	Initial Arousal*	Event Remoteness	Event Age (mo)	Self Visiblity in Observer	Initial Perspective	Direction of Shift**	Change in Vividness*	N	M	SD	N	M	SD	Hedges' *g*	LL	UL	Variance	*Z*
Akhtar et al. (2017) a	94.29	22	Single	-	Intensity	Non-emotional	-0.88	mixed	-	Visible	Spontaneous	OE to OB	-	33	2.7	1.01	33	3.7	1.1	-0.95	0.45	1.5	0.07	2.33
Akhtar et al. (2017) b	94.29	22	Single	-	-	Non-emotional	-0.88	mixed	-	Visible	Spontaneous	OE to OB	-	33	0.6	0.98	33	0.8	1.1	-0.21	-0.3	0.7	0.06	-0.12
Akhtar et al. (2017) c	94.29	22	Single	-	Intensity	Non-emotional	-1.63	mixed	-	Visible	Spontaneous	OB to OE	-0.92	33	2.9	1.2	33	2.9	1.2	0.00	-0.5	0.5	0.06	-0.81
Akhtar et al. (2017) d	94.29	22	Single	-	-	Non-emotional	-1.63	mixed	-	Visible	Spontaneous	OB to OE	-0.92	33	0.6	0.93	33	0.4	0.9	0.22	-0.7	0.3	0.06	-1.54
Crawley et al. (2010) S2 a	81.11	29	Multiple	-	Valence	Emotional	1.60	mixed	65.20	Visible	Spontaneous	OE to OB	-	30	5.8	1.5	30	6.2	1.1	-0.30	-0.2	0.8	0.07	0.18
Crawley et al. (2010) S2 b	81.11	29	Multiple	-	Intensity	Emotional	1.60	mixed	65.20	Visible	Spontaneous	OE to OB	-	30	5.7	1.7	30	5.7	1.8	0.00	-0.5	0.5	0.07	-0.81
Crawley et al. (2010) S2 c	81.11	29	Multiple	-	-	Emotional	1.60	mixed	65.20	Visible	Spontaneous	OE to OB	-	30	5.4	1.7	30	5.6	1.2	-0.13	-0.4	0.6	0.07	-0.37
Crawley et al. (2010) S2 d	81.11	29	Multiple	-	-	Emotional	1.60	mixed	65.20	Visible	Spontaneous	OE to OB	-	30	3.1	1.5	30	3.1	1.5	0.00	-0.5	0.5	0.07	-0.81
Crawley et al. (2010) S2 e	81.11	29	Multiple	-	Valence	Emotional	-0.75	mixed	65.20	Visible	Spontaneous	OE to OB	-	30	4.2	2	30	3.8	1.5	0.22	-0.7	0.3	0.07	-1.54
Crawley et al. (2010) S2 f	81.11	29	Multiple	-	Intensity	Emotional	-0.75	mixed	65.20	Visible	Spontaneous	OE to OB	-	30	3.8	1.9	30	4.2	1.4	-0.24	-0.3	0.7	0.07	-0.03
Crawley et al. (2010) S2 g	81.11	29	Multiple	-	-	Emotional	-0.75	mixed	65.20	Visible	Spontaneous	OE to OB	-	30	2.9	2.1	30	3.1	1.5	-0.11	-0.4	0.6	0.07	-0.45
Crawley et al. (2010) S2 h	81.11	29	Multiple	-	-	Emotional	-0.75	mixed	65.20	Visible	Spontaneous	OE to OB	-	30	2.1	1.1	30	2.1	1.6	0.00	-0.5	0.5	0.07	-0.81
Faul et al. (2020)	51.72	24	Single	10	Intensity	Emotional	-0.92	mixed	-	Visible	Spontaneous	OE to OB	0.87	28	3.4	0.84	28	3.6	0.9	-0.30	-0.2	0.8	0.07	0.17
Gu et al. (2016) a	53.92	20	Single	600	Intensity	Emotional	0.49	recent	3.41	Not Visible	Forced	OE to OB	-1.00	56	4.1	1.51	56	5.1	1.3	-0.67	0.29	1.1	0.04	1.39
Gu et al. (2016) b	53.92	20	Single	600	Intensity	Emotional	0.29	recent	3.15	Not Visible	Forced	OE to OB	-0.18	56	3.9	1.53	56	4.9	1.5	-0.63	0.25	1	0.04	1.26
Gu et al. (2016) d	53.92	20	Single	600	Intensity	Emotional	0.42	recent	3.50	Not Visible	Forced	OB to OE	0.46	46	4.8	1.48	46	5	1.4	-0.16	-0.3	0.6	0.04	-0.27
Gu et al. (2016) e	53.92	20	Single	600	Intensity	Emotional	0.26	recent	3.22	Not Visible	Forced	OB to OE	-0.44	46	4.8	1.66	46	4.8	1.5	0.00	-0.4	0.4	0.04	-0.81
King et al. (2022) a	62.5	23	Multiple	7.5	Intensity	Non-emotional	-0.87	mixed	-	Visible	Spontaneous	OE to OB	-	39	3.3	0.9	39	3.7	0.8	-0.46	0.01	0.9	0.05	0.72
King et al. (2022) b	62.5	23	Multiple	7.5	-	Non-emotional	-0.87	mixed	-	Visible	Spontaneous	OE to OB	-	39	1	0.89	39	1.5	0.8	-0.53	0.08	1	0.05	0.93

*Standardized scores

**Direction of Shift categories: OE to OB stands for shifts from Own Eyes to Observer-like perspective. OB to OE stands for shifts from Observer-like to Own Eyes perspective.

Table 2.1. ***(cont'd)***

Characteristics and Effect Sizes for Studies Included in the Meta-analysis

References	Moderators: % Women/ Females	Age	Repetition	Duration (s)	Outcome	Event Emotionality	Initial Arousal	Event Remoteness	Event Age (mo)	Self Visiblity in Observer	Initial Perspective	Direction of Shift**	Change in Vividness*	Descriptive Statistics: Shifted Perspective N	M	SD	Initial Perspective N	M	SD	Effect Sizes: Hedges 'g	95% CI LL	UL	Variance	Z
Küçüktaş et al. (2023d) S2 a	64.98	19	Multiple	7.5	Intensity	Emotional	0.68	mixed	-	Visible	Forced	OE to OB	1.02	111	5.6	1.48	111	5.3	1.7	0.21	-0.5	0.1	0.02	-1.50
Küçüktaş et al. (2023d) S2 b	64.98	19	Multiple	7.5	Valence	Emotional	0.68	mixed	-	Visible	Forced	OE to OB	1.02	111	5.6	1.48	111	5.7	1.5	-0.09	-0.2	0.4	0.02	-0.52
Küçüktaş et al. (2023d) S2 c	64.98	19	Multiple	7.5	Intensity	Emotional	0.42	mixed	-	Visible	Forced	OE to OB	1.08	111	4.9	1.63	111	5	1.5	-0.04	-0.2	0.3	0.02	-0.68
Küçüktaş et al. (2023d) S2 d	64.98	19	Multiple	7.5	Valence	Emotional	0.42	mixed	-	Visible	Forced	OE to OB	1.08	111	5.5	1.33	111	5.6	1.2	-0.07	-0.2	0.3	0.02	-0.57
Küçüktaş et al. (2023d) S2 e	64.98	19	Multiple	7.5	Intensity	Emotional	0.51	mixed	-	Not Visible	Forced	OE to OB	0.72	109	4.6	1.58	109	5.1	1.5	-0.35	0.09	0.6	0.02	0.35
Küçüktaş et al. (2023d) S2 f	64.98	19	Multiple	7.5	Valence	Emotional	0.51	mixed	-	Not Visible	Forced	OE to OB	0.72	109	5.2	1.47	109	5.6	1.5	-0.28	0.01	0.5	0.02	0.10
Küçüktaş et al. (2023d) S2 g	64.98	19	Multiple	7.5	Intensity	Emotional	0.42	mixed	-	Not Visible	Forced	OE to OB	0.46	109	4.4	1.65	109	5	1.6	-0.35	0.08	0.6	0.02	0.33
Küçüktaş et al. (2023d) S2 h	64.98	19	Multiple	7.5	Valence	Emotional	0.42	mixed	-	Not Visible	Forced	OE to OB	0.46	109	5.1	1.35	109	5.4	1.4	-0.27	0.01	0.5	0.02	0.09
Küçüktaş et al. (2023d) S3 a	46.96	24	Multiple	7.5	Intensity	Emotional	0.82	mixed	-	Visible	Forced	OE to OB	1.13	48	5.2	1.42	48	5.4	1.6	-0.11	-0.3	0.5	0.04	-0.44
Küçüktaş et al. (2023d) S3 b	46.96	24	Multiple	7.5	Valence	Emotional	0.82	mixed	-	Visible	Forced	OE to OB	1.13	48	5.8	1.23	48	6.2	1.2	-0.27	-0.1	0.7	0.04	0.07
Küçüktaş et al. (2023d) S3 c	46.96	24	Multiple	7.5	Intensity	Emotional	0.37	mixed	-	Visible	Forced	OE to OB	1.05	48	5.1	1.4	48	4.9	1.5	0.09	-0.5	0.3	0.04	-1.12
Küçüktaş et al. (2023d) S3 d	46.96	24	Multiple	7.5	Valence	Emotional	0.37	mixed	-	Visible	Forced	OE to OB	1.05	48	5.4	1.38	48	5.3	1.7	0.01	-0.4	0.4	0.04	-0.85
Küçüktaş et al. (2023d) S3 e	46.96	24	Multiple	7.5	Intensity	Emotional	1.12	mixed	-	Not Visible	Forced	OE to OB	-0.01	53	5	1.56	52	5.7	1.5	-0.47	0.08	0.9	0.04	0.75
Küçüktaş et al. (2023d) S3 f	46.96	24	Multiple	7.5	Valence	Emotional	1.12	mixed	-	Not Visible	Forced	OE to OB	-0.01	53	5.6	1.43	53	6.3	1.3	-0.51	0.12	0.9	0.04	0.87
Küçüktaş et al. (2023d) S3 g	46.96	24	Multiple	7.5	Intensity	Emotional	0.50	mixed	-	Not Visible	Forced	OE to OB	-0.01	53	4.2	1.72	53	5.1	1.6	-0.53	0.14	0.9	0.04	0.93
Küçüktaş et al. (2023d) S3 h	46.96	24	Multiple	7.5	Valence	Emotional	0.50	mixed	-	Not Visible	Forced	OE to OB	-0.01	53	4.9	1.56	53	5.7	1.5	-0.51	0.12	0.9	0.04	0.86
Sekiguchi et al. (2014) b	-	-	Single	30	Intensity	Emotional	-0.60	-	-	Visible	Spontaneous	OB to OE	0.03	24	3.2	0.78	24	3.7	0.7	-0.59	0.01	1.2	0.09	1.13

*Standardized scores

**Direction of Shift categories: OE to OB stands for shifts from Own Eyes to Observer-like perspective. OB to OE stands for shifts from Observer-like to Own Eyes perspective.

Table 2.1. *(cont'd)*

Characteristics and Effect Sizes for Studies Included in the Meta-analysis

	Moderators													Descriptive Statistics						Effect Sizes				
														Shifted Perspective			Initial Perspective				95% CI			
References	% Women/ Females	Age	Repetition	Duration (s)	Outcome	Event Emotionality	Initial Arousal	Event Remoteness	Event Age (mo)	Self Visiblity in Observer	Initial Perspective	Direction of Shift**	Change in Vividness*	N	M	SD	N	M	SD	Hedges' *g*	LL	UL	Variance	*Z*
St. Jacques (2023b) a	65.35	21	Single	-	Intensity	-	0.65	mixed	-	Visible	Spontaneous	OE to OB	-0.76	88	45	31.7	88	52	34	-0.22	-0.1	0.5	0.02	-0.08
St. Jacques (2023b) b	65.35	21	Single	-	Intensity	-	0.07	mixed	-	Visible	Spontaneous	OB to OE	0.19	88	46	28.9	88	46	31	-0.01	-0.3	0.3	0.02	-0.77
St. Jacques (2023c) a	60.53	19.0	Single	-	Intensity	-	1.21	mixed	-	Visible	Spontaneous	OE to OB	-0.35	73	48	34	73	58	32	-0.31	-0	0.6	0.03	0.21
St. Jacques (2023c) b	60.53	19.0	Single	-	Intensity	-	0.38	mixed	-	Visible	Spontaneous	OB to OE	0.75	73	45	28.9	73	50	31	-0.16	-0.2	0.5	0.03	-0.27
St. Jacques et al. (2017)	68.97	23	Multiple	7.5	Intensity	Non-emotional	-1.63	mixed	-	Visible	Spontaneous	OE to OB	-	29	2.7	0.7	29	2.9	0.7	-0.34	-0.2	0.9	0.07	0.31
St. Jacques et al. (2018) a	55.17	21	Multiple	7.5	Intensity	Non-emotional	-1.58	mixed	-	Visible	Forced	OE to OB	-	29	2.9	0.65	29	3	0.6	-0.02	-0.5	0.5	0.07	-0.76
St. Jacques et al. (2018) b	55.17	21	Multiple	7.5	Intensity	Non-emotional	-1.70	mixed	-	Visible	Forced	OB to OE	-	29	2.9	0.62	29	2.8	0.7	0.18	-0.7	0.3	0.07	-1.41
St. Jacques et al. (2018) c	55.17	21	Multiple	7.5	Intensity	Non-emotional	-1.77	mixed	-	Visible	Forced	OE to OB	-	29	2.7	0.59	29	2.8	0.6	-0.03	-0.5	0.6	0.07	-0.70
St. Jacques et al. (2018) d	55.17	21	Multiple	7.5	Intensity	Non-emotional	-1.78	mixed	-	Visible	Forced	OB to OE	-	29	2.8	0.49	29	2.7	0.6	0.09	-0.6	0.4	0.07	-1.09
Vella et al. (2014) a	66.25	20	Single	-	Valence	Emotional	-	recent	7.36	Not Visible	Spontaneous	OE to OB	-1.39	42	71	19.1	42	82	13	-0.66	0.22	1.1	0.05	1.35
Vella et al. (2014) b	66.25	20	Single	-	Valence	Emotional	-	recent	10.53	Not Visible	Spontaneous	OB to OE	-0.30	32	82	20.3	32	86	12	-0.25	-0.3	0.7	0.06	0.00
Vella et al. (2014) c	66.25	20	Single	-	Valence	Emotional	-	recent	9.17	Not Visible	Spontaneous	OE to OB	-0.71	35	74	16.2	35	82	14	-0.51	0.04	1	0.06	0.89
Vella et al. (2014) d	66.25	20	Single	-	Valence	Emotional	-	recent	9.58	Not Visible	Spontaneous	OB to OE	-0.83	36	78	17	36	82	15	-0.22	-0.2	0.7	0.06	-0.08

*Standardized scores

**Direction of Shift categories: OE to OB stands for shifts from Own Eyes to Observer-like perspective. OB to OE stands for shifts from Observer-like to Own Eyes perspective.

Table 2.2.
The List of Moderators

Moderators	Categories
Sample Characteristics	
Sex/Gender	*Continuous moderator*
Mean Age of the Sample	*Continuous moderator*
Design Factors	
Repetition	Single Multiple
Duration	*Continuous moderator*
Measurement and Outcome Factors	
Outcome Measurement	Emotional Intensity Emotional Valence
Event Characteristics	
Event Emotionality	Emotional Non-emotional
Emotional Arousal	*Continuous moderator*
Remoteness	Recent Mixed
Event Age in Months	*Continuous moderator*
Visual Perspective Factors	
Self Visibility in Observer-like Perspective	Visible Not Visible
Initial Perspective of Events	Spontaneous Forced
Direction of Perspective Shift	Own eyes to Observer Observer to Own Eyes

Note. The list includes both continuous and categorical moderators. Specific categories within each categorical moderator as well as continuous moderators are indicated in the corresponding lines.

Effect Size Calculation

In all emotion measures included in the analysis, emotional responses were measured from low to high, such that lower scores indicated less emotionality and higher scores reflected an increase in the relevant emotional experience.

To calculate effect sizes, I coded the mean and SDs of measured emotionality in the initial and shifted perspective conditions and the sample sizes in each condition. I first manually calculated the effects sizes in Cohen's *d* for within- and between-subject designs (Lakens, 2013). However, given that I included a few individual effects with smaller samples than other studies that might bias the estimate of Cohen's *d* ($n < 25$; Sekiguchi & Nonaka, 2014), I used Hedges' *g* to calculate the overall effect size to correct for potentially biased estimations (Borenstein et al., 2009; Hedges & Olkin, 1985; Lakens, 2013). Effect sizes were calculated based on the standardized mean difference (Borenstein et al., 2009) by subtracting the mean emotionality in the shifted from the initial perspective conditions; thus, positive values indicate higher emotionality for the initial perspective condition.

For studies in which a specific emotion or valence was targeted, but the authors reported more than one type of emotion or valence rating, I calculated the effect size only for the targeted emotion or valence elicited in the event. For example, Crawley (2010) asked participants to retrieve negative memories but reported the change in positive and negative valence due to shifting. In this case, I calculated the effect size of negative valence ratings but disregarded positive valence ratings given that the targeted events were negative. Finally, some studies did not target a specific category of emotion or emotional valence (e.g., King et al., 2022; St. Jacques et al., 2017), or participants were asked to recall events that might contain multiple emotions (e.g., giving a public presentation; St. Jacques, 2023b). In those instances, I calculated the effect size for each measurement of emotion reported (see also Webb et al., 2012).

Meta-analytic Procedures

A substantial number of studies reported multiple effect sizes, leading to dependent effects (Borenstein et al., 2009). For example, some studies reported both emotional intensity and valence ratings (e.g., Crawley, 2010; Küçüktaş & St. Jacques, *unpublished*). To deal with the dependent nature of the data, I followed a multilevel model approach rather than averaging the dependent effect sizes (Assink & Wibbelink, 2016; Moeyaert et al., 2017). That is, individual effect sizes obtained from the same samples were nested within the dependent comparisons investigated in the same studies and reported in the same articles. These clustering variables (i.e., individual effects, [in]dependent comparisons, studies, and articles) were included as random effects in the model.

Outlier Detection and Sensitivity Analyses

To detect possible outliers among the included effect sizes, I first calculated the z-scores for each effect size. With a conservative approach, effect sizes with z-scores larger than +2.50 or smaller than -2.50 were treated as significant outliers and excluded from the meta-analysis. I excluded one individual effect as a significant outlier. I also conducted Cook's distance and leave-one-out analyses[1] to detect potential influential cases (Borenstein et al., 2009). Cook's distance analysis revealed two potentially influential effects on the 0.04 cut-off score. However, leave-one-out analysis showed that removing any of the included studies did not substantially change the effect size (ranging from .207 to .233), and the overall effect remained significant.

[1] Leave-one-out analysis was conducted by treating the data as it had a unilevel structure due to the incompatibility of the function with multilevel models.

Thus, the final sample size includes 49 individual effects from 19 independent comparisons, reported in 13 studies in 12 articles.

Publication Bias

Publication bias was examined in two ways. First, I created a funnel plot to examine publication bias and then conducted an Egger's regression test to investigate funnel plot asymmetry (Egger et al., 1997). Second, I calculated Rosenthal's fail-safe N (Rosenthal, 1979) to examine whether the inclusion of significant results caused a publication bias.

Moderator Analyses

Moderator analyses were conducted separately for each individual moderator. Results were reported by collecting the relevant moderators under the same title as referred to in the Introduction section (i.e., sample characteristics, measurement and outcome factors, event characteristics, and visual perspective factors).

For the continuous moderators (i.e., percentage of the woman/female participants, mean age of the sample, duration of the retrieval/mental simulation, initial emotional arousal, age of event in month [event remoteness]), I first calculated the z-score of each data point. Data points in which the z-scores are larger than +2.50 or smaller than -2.50 were treated as significant outliers and excluded and reported in the relevant moderator analyses. Then, I investigated the significance of the overall moderation effect. For the categorical moderators (i.e., repetition during retrieval/mental simulation, emotional outcome, event emotionality, event remoteness, self-visibility in an observer-like perspective, the initial perspective of the event, and the direction of perspective shift), I first examined the significance of the overall moderation model. If the overall moderation was significant, then I examined the significance at each level of the moderator. That could reveal whether the effect is significantly different across the levels of the moderator.

Transparency and Openness

I adhered to the PRISMA 2020 (Page et al., 2021) and MARS (Appelbaum et al., 2018) guidelines for systematic reviews. I report all data exclusions, all manipulations, and all measures in the study. All meta-analytic data, analysis code, and research materials (including the coding scheme) are available at osf.io/veyk6.

Data were analyzed using R, version 4.2.1 (R Core Team, 2020) and the package 'metafor' (Viechtbauer, 2010). The analysis script was adapted from prior research (Moran & Eyal, 2022).

Results

Overall Effect Size and Publication Bias Analyses

Supporting the prediction, I found a significant overall effect of shifting perspective on emotion ($k = 49$, Hedges' $g = .255$, 95% CI [.151, .359], $Z = 4.83$, $p < .001$), revealing a small effect size in which shifted perspectives yielded reduced emotionality compared to the initial perspective (see Figure 2.2.A). Thus, shifting from one perspective to an alternative perspective (i.e., across perspectives) was associated with a reduction in the emotionality of event memories. The results of Egger's test showed no publication bias, $Z = .32$, $p = .750$ (see Figure 2.2.B). Similarly, the results from Rosenthal's fail-safe N test showed that 992 additional effects would be required to change the overall effect, indicating that the dataset is unlikely to have publication bias[2]. However, heterogeneity within the overall effect size, $Q(48) = 74.157$, $p = .009$, $I^2 = 43.841\%$, with $\tau^2 = 0.00$, warranted conducting moderator analyses.

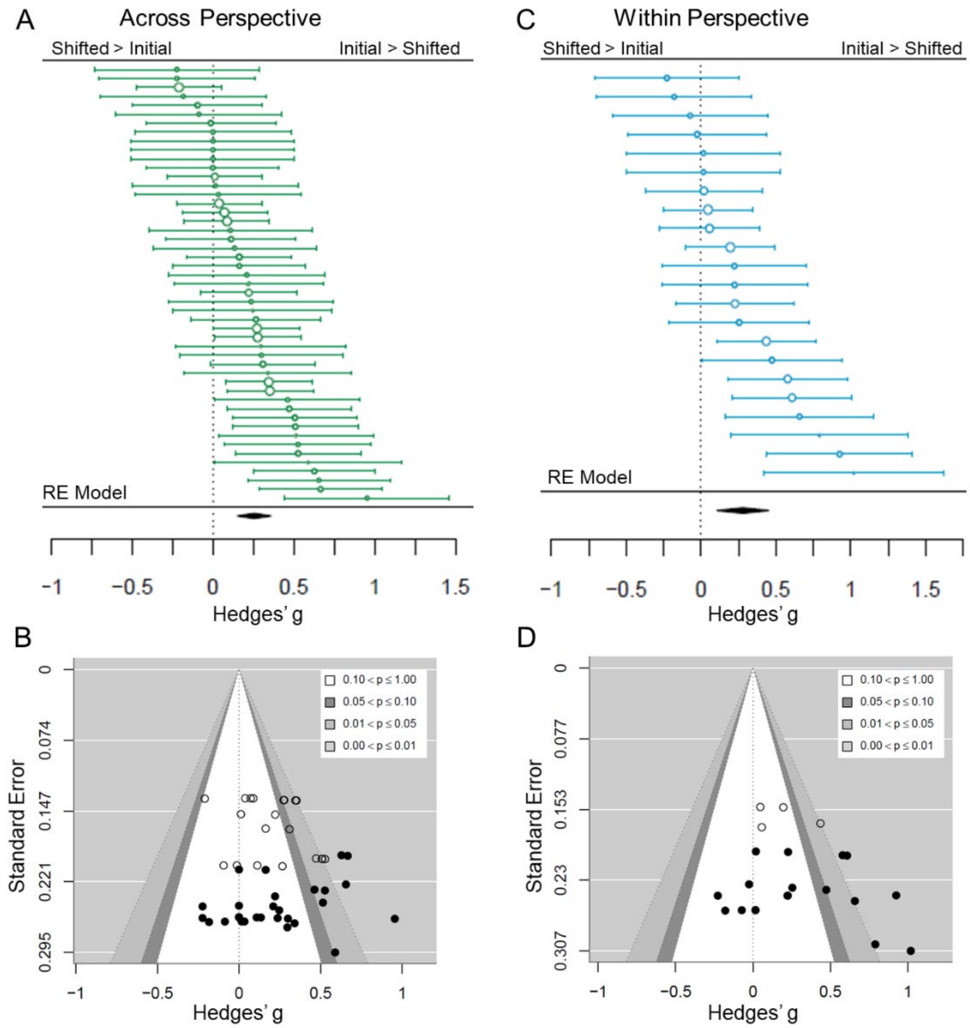

Figure 2.2. Caterpillar Plots of the Included Effects and Publication Bias Analyses. Caterpillar plots display the overall effect on emotion in (A) across perspective (primary meta-analysis) and (C) within perspective comparisons (secondary meta-analysis). Each dot represents an individual effect size, surrounded by 95% CIs. Effects on the right side of the graphs depict higher emotionality in the initial than shifted perspectives, whereas effects on the left side depict higher emotionality in the shifted than initial perspectives. Black diamonds on the X-axis represent the overall effect on emotion in Hedges' g. Color-enhanced funnel plots display the individual

[2] To further assess publication bias, I additionally aggregated the effects sizes recruited from dependent comparisons. Egger's test revealed no funnel plot asymmetry ($Z = 1.39$, $p = .164$) and Rosenthal's fail-safe N test also showed that 275 more effects would be required to change the overall effect.

effects in the effect level in (B) across perspective (main meta-analysis) and (D) within perspective comparisons (secondary meta-analysis). Solid circles depict the effects of published studies, and hollow circles depict the effects of unpublished studies. The X-axis indicates the magnitude of the effects in Hedges' g, and the Y-axis indicates the standard error of the effect sizes.

Moderator Analyses

I conducted separate moderator analyses for all the categories highlighted in the coding protocol. I employed separate analyses to prevent data and power loss due to missing data or significant outliers, given that if a moderator variable was not measured in a study, that study (data point) would be removed from all moderator analyses in a combined approach. Statistics of the moderators, including the number of individual effects in each category, average effect sizes, and their significance, are reported below. I checked whether there were significant outliers in continuous moderators. Unless otherwise stated, I found no significant outliers. Statistics of the significant categorical moderators are highlighted in Table 2.3.

Sample Characteristics

None of the sample characteristics were significant moderators. The percentage of woman/female participants ($k = 48$), $Q(1) = .306$, $\beta = -.002$, $Z = -.553$, 95% CI [-.011, .006], $p = .579$, and the mean age of participants -one significant outlier was removed; $k = 48$, $Q(1) = .170$, $\beta = -.008$, $Z = -.412$, 95% CI [-.047, .030], $p = .680$, did not significantly impact the effect size.

Design Factors

Repetition during Retrieval/Mental Simulation. I identified whether participants adopted the instructed perspective with a single repetition ($k = 18$) or multiple repetitions ($k = 31$). However, there were no significant differences in the effect size due to the number of repetitions, $Q(1) = 1.275$, $\beta = .119$, $Z = 1.129$, 95% CI [-.087, .326], $p = .258$.

Duration of Retrieval/Mental Simulation. In some studies, the duration of retrieval or mental simulation was restricted with a time frame ranging from 7.5 seconds to 10 minutes, and these individual effects ($k = 29$) were coded based on the duration in seconds. However, there were no significant differences in the effect size based on the duration of retrieval/mental simulation, $Q(1) = .361$, $\beta = .000$, $Z = .601$, 95% CI [-.0005, .0009], $p = .547$.

Emotional Outcome Measurement

I conducted moderator analyses to examine whether differences in how emotion was measured influenced the effect size. There was no significant difference in the effect sizes based on whether emotion was measured with emotional intensity (k = 28) or emotional valence (k = 14) as the outcome, $Q(1) = .396$, $\beta = .042$, $Z = .629$, 95% CI [-.090, .176], $p = .528$.

Event Characteristics

Event Emotionality. I examined whether eliciting events with emotional ($k = 34$) or non-emotional cues ($k = 11$) moderated the effect of shifting perspective on emotion. There was no significant difference based on the event emotionality, $Q(1) = .173$, $\beta = -.061$, $Z = -.416$, 95% CI [-.348, .226], $p = .676$.

I also examined whether the emotional arousal of the event moderated the effect size. After coding the initial emotional arousal for each effect, I standardized the scores because there was variability in how this was measured across the studies. However, the emotional arousal of the event ($k = 45$) was not a significant moderator, Q(1) = 1.031, $\beta = .050$, $Z = 1.015$, 95% CI [-.046, .147], $p = .309$.

Event Remoteness. I examined event remoteness in two ways. First, event remoteness is usually controlled by restricting memory age during retrieval (e.g., asking participants to recall events occurring in the last five years). However, for example, while asking participants to recall an event from the last two years would ensure the retrieval of more recent events, asking participants to recall events from the last five years may include events that range from recent to relatively more remote. Accordingly, I coded event remoteness by classifying the events as recent or mixed. Specifically, events that occurred within the last two years (will potentially occur in the next two years) were categorized as recent ($k = 8$), and events that occurred within the last three years or older (will potentially occur in the next three years or later) as mixed ($k = 40$). Results revealed that the overall moderation model did not reach significance, $Q(1) = 2.799$, $\beta = .198$, $Z = 1.673$, 95% CI [-.034, .431], $p = .094$.

Second, I coded the event age in months from the studies in which participants were asked to report how long ago the original event occurred or when the event might potentially occur in the future ($k = 16$). Then, the event age was included in the meta-regression model as the predictor variable. The overall moderation model was not significant, $Q(1) = 1.799$, $\beta = -.005$, $Z = -1.341$, 95% CI [-.013, .002], $p = .179$.

Visual Perspective Factors

Self-Visibility in Observer-like Perspective. I identified whether the instructions in the observer-like perspective conditions influenced self-visibility by asking participants to visualize themselves in the event ($k = 33$) or not ($k = 16$). The results indicated that self-visibility in observer-like perspectives was a significant moderator, $Q(1) = 8.765$, $\beta = -.251$, $Z = -2.960$, 95% CI [-.418, -.085], $p = .003$. Specifically, shifting reduced emotion in both cases; however, the effect was significantly smaller when there was an emphasis on self-visibility (see Figure 2.3.A and Table 2.3).

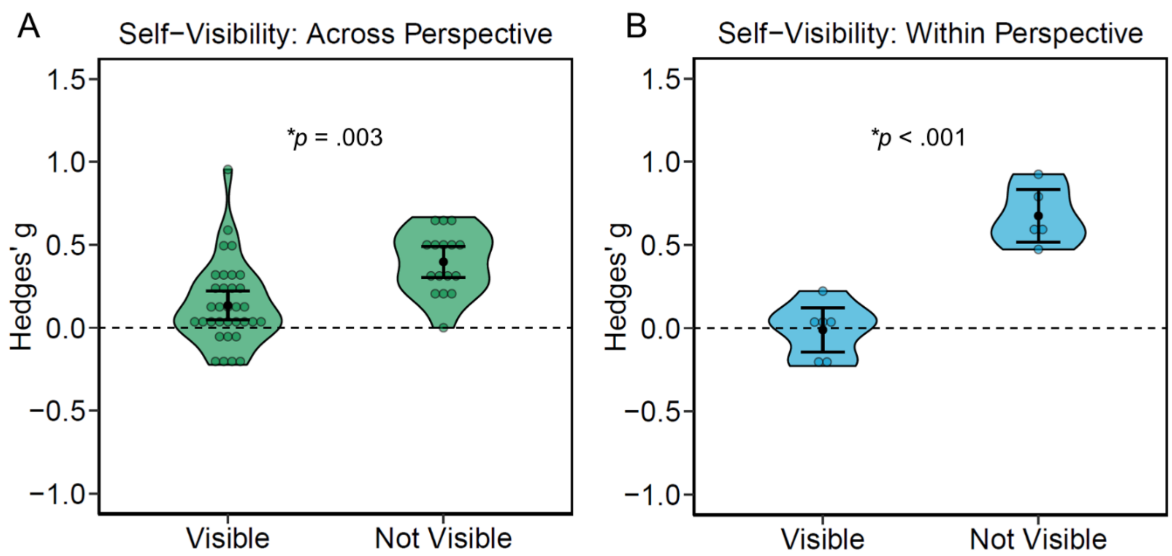

Figure 2.3. Self-Visibility in Observer-like Perspectives. Results of moderator analyses for the self-visibility in the observer-like perspectives in the (A) across and (B) within perspective meta-analyses. Each data point represents an individual effect size. Black dots depict the aggregated effect size in each moderator category, and the error bars display the 95% CIs of the mean. *p*-value indicates the significance of the overall moderation model.

Initial Perspective of Events. I examined whether instructions eliciting the initial perspective of the events influenced the effect size by comparing spontaneous ($k = 25$) and forced ($k = 24$) perspectives. There were no significant differences based on how the initial perspective of events was elicited, $Q(1) = .429$, $\beta = .071$, $Z = .655$, 95% CI [-.142, .286], $p = .512$.

Direction of Perspective Shift. I examined whether shifting from an own eyes to an observer-like perspective ($k = 38$) or from an observer-like to an own eyes perspective ($k = 11$) influenced the effect size. The results indicated that there was a significant difference in the effect size depending upon the direction of the perspective shift, $Q(1) = 7.049$, $\beta = .246$, $Z = 2.655$, 95% CI [.064, .429], $p = .007$, such that there was a greater reduction in emotionality when shifting from an own eyes to an observer-like perspective compared to shifting in the reverse direction, which did not differ from zero (see Figure 2.4.A and Table 2.3). Thus, as predicted, the direction of the shift in perspective influenced the impact on the emotionality of event memories.

To better understand why the asymmetrical pattern occurs, I examined whether changes in the vividness of events interacted with the effects of shifting perspective on emotion. Specifically, I subtracted vividness in the shifted perspectives from the initial perspectives (Initial – Shifted) to calculate the change in vividness. That is, a higher difference between the initial and shifted perspectives indicates a greater decrease in vividness due to shifting. There was variability in how vividness was measured across the studies; therefore, I standardized the ratings. I also excluded two significant outliers in which z-scores were larger than 2.50. The overall interaction model was significant, $Q(3) = 14.797$, $p = .002$. There was no significant main effect of the change in vividness ($k = 32$), $\beta = -.119$, $Z = -.904$, 95% CI [-.376, .138], $p = .365$. However, there was a significant main effect of the direction of shift, $\beta = .202$, $Z = 2.18$, 95% CI [.020, .385], $p = .028$, which qualified by a significant interaction between the change in vividness and the direction of perspective shift, $\beta = .332$, $Z = 2.212$, 95% CI [.038, .627], $p = .026$. Follow-up analyses indicated that there was a significant and positive relationship between change in vividness and the overall effect on emotion when shifting from an own eyes to an observer-like perspective, $\beta = .359$, $Z = 4.405$, 95% CI [.199, .520], $p < .001$, but not when shifting from an observer-like to an own eyes perspective, $\beta = -.064$, $Z = -.393$, 95% CI [-.383, .255], $p = .693$ (see Figure 2.4.B). Specifically, when there was a greater decrease in vividness while shifting from an own eyes to an observer-like perspective, there was also a greater decrease in emotion as reflected by higher Hedges' *g* (see Figure 2.4.B). Thus, these findings support the prediction that the asymmetrical pattern of shifting perspective on emotion can be explained by differences in the vividness of event memories that arise when people shift from an own eyes to an observer-like perspective but not when they shift from an observer-like to an own eyes perspective.

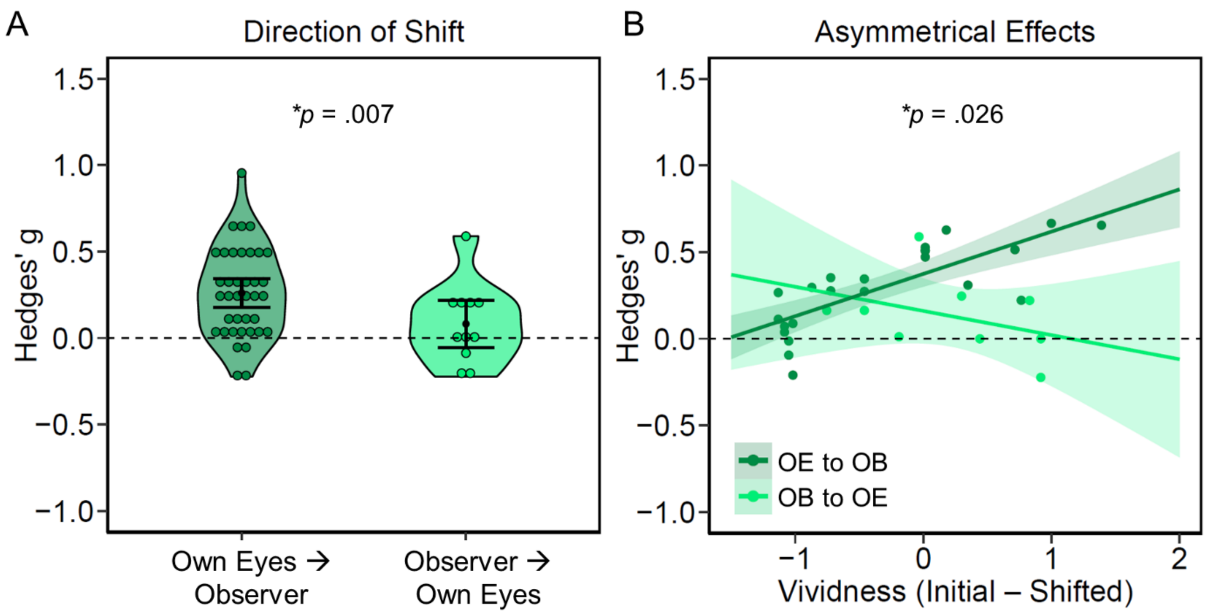

Figure 2.4. Direction of Shift and Asymmetrical Effects. (A) Results of moderator analyses for the direction of shift. Black dots depict the aggregated effect size in each moderator category, and the error bars display the 95% CIs of the mean. *p*-value indicates the significance of the overall moderation model. Own Eyes to Observer: Shift from Own Eyes to Observer-like perspective. Observer to Own Eyes: Shift from Observer-like to Own Eyes perspective. (B) A scatterplot depicting asymmetrical effects by the interaction between the difference in vividness and the direction of shift. Each data point represents an individual effect size. Shaded areas represent 95%CIs. The x-axis shows the difference in vividness between the initial and shifted perspectives (Initial – Shifted), indicating a higher value reflects that vividness decreases to a greater degree due to shifting. The y-axis shows the Hedges' *g* as the effect size or decrease in emotion when shifting from an initial to a shifted perspective. The results showed that when there was a greater decrease in vividness, there was a higher decrease in emotion when shifting from an own eyes to an observer-like perspective. This relationship was not significant when shifting from an observer-like to an own eyes perspective.

Table 2.3.
Statistics in Each Level of the Significant Moderators in the Main and Secondary Meta-analysis

			Difference from zero			
Moderators	*k*	Hedges' *g*	*β*	*Z*	95% CI	*p*
Main Meta-Analysis						
Self-Visibility in Observer**						
Visible	33	-.14	-.14	-2.76	[-.25, -.04]	< .001
Not Visible	16	-.40	-.40	-5.93	[-.53, -.27]	.005
Direction of Perspective Shift*						
Own Eyes to Observer	38	-.26	-.33	-5.13	[-.45, -.20]	< .001
Observer to Own Eyes	11	-.08	-.08	-.92	[-.25, .09]	.358
Secondary Meta-Analysis						
Event Assignment*						
Emotional	10	-.49	-.47	-3.93	[-.71, -.24]	< .001
Self-selected	8	-.08	-.08	-.60	[-.36, .19]	.550
Self Visibility in Observer**						
Visible	6	.01	-.01	-.13	[-.18, .16]	.896
Not Visible	5	-.68	-.65	-6.31	[-.86, -.45]	< .001

Note. The table depicts the significance in each category (level) of the significant moderators. Specifically, in the main meta-analysis, self-visibility in observer perspective is a significant moderator, and this effect is valid for each of the moderator levels (i.e., visible and not visible) as both *p* values are lower than .05 ($p < .001$ and $p = .005$, respectively). However, the effect is larger in the "not visible" than in the "visible" category (see Hedges' g and β columns). For other moderators, the *p* values indicate that the effect of shifting perspective on emotion significantly decreases emotion only in one of the moderator categories. The asterisk denotes the significance of the overall moderation model: * $p < .05$; ** $p < .01$. *k* = number of individual effects in the relevant moderator category; Hedges' *g* = the aggregated effect size in the moderator categories; β = the estimated effect size in the multilevel model; Z = z-score of the estimated effect size; 95% CI and p values the significance of the moderator categories.

Within Perspective Effects

The main meta-analysis focused on the differences in emotionality when people shift *across* alternative perspectives (i.e., from own eyes to observer, or vice versa). However, an equally important question is how shifting perspective impacts emotionality when people shift *within* own eyes or observer-like perspectives. That is, emotionality can differ within a particular event depending on whether the resulting vantage point occurs due to a shift in perspective. For example, if shifts in perspective reduce emotion, then I should find the same effect when comparing an event that was initially associated with an own eyes perspective versus an event involving a shift to an own eyes perspective. In this example, both events are associated with adopting an own eyes perspective but the nature of how this perspective arises differs (i.e., whether it occurs due to a shift in perspective or not). Likewise, there should also be a reduction in emotion when the initial event is associated with an observer-like perspective versus an event involving a shift to an observer-like perspective. To further understand how shifting perspective influences emotion, I conducted a secondary meta-analysis focused on differences in shifting within own eyes or observer-like perspectives. This secondary meta-analysis was based on a subset of the studies from the main analysis[3] (see Table 2.4 for the comparison of conditions in these meta-analyses) and yielded 22 individual effects recruited from seven independent comparisons, seven studies, and seven articles. I predicted that shifted perspectives would reduce emotionality and that these effects would be evident irrespective of the type of perspective

[3] Apart from the subset of the articles from the main meta-analyses, an additional literature search did not reveal any other publication that could be included.

adopted (i.e., own eyes or observer-like). Like the main meta-analysis, I adopted a multilevel approach; thus, I clustered 22 individual effects in seven dependent comparisons, studies, and articles. The procedure for outlier detection, sensitivity analyses, publication bias assessment, effect size calculation, and moderator analyses were identical to the main meta-analysis.

Table 2.4.
Comparisons in the Main and Secondary Meta-analyses

Main Meta-analysis: *Across Perspectives*	Initial Own Eyes vs. Shifted to Observer-like Initial Observer-like vs. Shifted to Own Eyes
Secondary Meta-analysis: *Within Perspectives*	Initial Own Eyes vs. Shifted to Own Eyes Initial Observer-like vs. Shifted to Observer-like

Outlier Detection and Sensitivity Analyses

There were no significant outliers. Cook's distance analysis indicated two potential influential cases that might impact the overall effect, but leave-one-out analysis showed that removing any of the included studies did not substantially change the overall effect size (ranging from .240 to .290). Therefore, the final sample included 22 individual effects from seven independent comparisons, studies, and articles.

Overall Effect Size and Publication Bias Analyses

As predicted, I found a significant overall effect of shifts in perspective on emotionality (k = 22, Hedges' g = .279, 95% CI [.106, .451], Z = 3.175, p = .001), revealing a small effect size in which shifted perspectives yielded reduced emotionality compared to initial perspectives (see Figure 2.2.C). Thus, shifting to a novel perspective reduces emotionality, even when comparing event memories associated with the same vantage point (i.e., within perspective comparison). Egger's test results showed no publication bias, Z = 1.012, p = .311 (see Figure 2.2.D). The results from Rosenthal's fail-safe N test showed that 245 additional effects would be required to change the overall effect, indicating that the dataset is unlikely to have publication bias[4]. There was also heterogeneity within the overall effect size, $Q(21) = 42.856$, $p = .003$, $I^2 = 55.475\%$, with $\tau^2 = .032$.

Moderator Analysis

As I specifically selected a subset of data, I had an inadequate number of effects for some moderator analyses, which would impair the power of the moderation models (Deeks et al., 2019). Therefore, I specifically focused on the moderators of interest that had relatively even distribution across categories.

Event Characteristics

Event Emotionality. I conducted a moderator analysis to examine whether eliciting events with emotion cues ($k = 10$) or non-emotional cues ($k = 8$) moderated the effect of shifting perspective on emotion. There was a significant difference based on the event emotionality, $Q(1) = 4.407$, $\beta = -.388$, $Z = -2.099$, 95% CI [-.750, -.025], $p = .035$, such that the decrease in emotion was larger for emotional (Hedges' $g = .49$, $\beta = .472$, $Z = 3.928$, 95% CI [.236, .707], $p < .001$) than non-emotional events (Hedges' $g = .08$, $\beta = .083$, $Z = .597$, 95% CI [-.191, .359], $p = .550$).

Initial Emotional Arousal. Similar to the main meta-analysis, I first standardized the emotional arousal scores in the initial perspectives as there was variability in how they were measured across studies. However, initial emotional arousal ($k = 18$) was not a significant moderator, Q(1) = 2.714, $\beta = .195$, $Z = 1.647$, 95% CI [-.037, .428], $p = .099$.

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[4] To further assess publication bias, I additionally aggregated the effects sizes recruited from dependent comparisons. Egger's test revealed no funnel plot asymmetry ($Z = 1.579$, $p = .114$) and Rosenthal's fail-safe N test also showed that 38 more effects are required to change the overall effect.

Visual Perspective Factors

Self-Visibility in Observer-like Perspective. Given that this secondary meta-analysis investigated *within* perspective effects, I could only examine the role of self-visibility within the observer-like perspective contrast by examining differences in whether participants were asked to visualize themselves when adopting an observer-like perspective ($k = 6$) or not ($k = 5$). The results indicated a significant difference in the effect size when observer-like descriptions emphasized self-visibility, $Q(1) = 23.023$, $\beta = -.642$, , $Z = -4.798$, 95% CI [-.904, -.379], $p < .001$. Specifically, there was a significant reduction in emotion between initial versus shifted observer-like perspectives when there was no emphasis on self-visibility, Hedges' $g = .68$, $\beta = .653$, $Z = 6.306$, 95% CI [.450, .856], $p < .001$. In contrast, there were no significant difference when the self-visibility was emphasized, Hedges' $g = -.01$, $\beta = .011$, $Z = .084$, 95% CI [-.155, .177], $p = .896$ (see Figure2.3.B).

Initial Perspective of Events. I examined whether adopting the initial perspective spontaneously ($k = 14$) or forced ($k = 8$) influenced the effect size. The results indicated that the overall effect was significant regardless of how the initial perspective was elicited, $Q(1) = .723$, $\beta = .175$, $Z = .850$, 95% CI [-.228, .578], $p = .394$.

Change in Vividness. I also similarly examined whether the change in vividness between the initial and shifted perspectives moderated the influence of shifting perspective on emotion. I excluded one significant outlier as its z-score was lower than -2.50. However, change in vividness ($k = 17$) was not a significant moderator, Q(1) = .219, $\beta = .049$, $Z = .468$, 95% CI [-.157, .255], $p = .639$.

Type of Perspective. I coded whether the type of perspective was own eyes ($k = 11$) or observer ($k = 11$). Results showed that type of perspective was not a significant moderator, suggesting that shifting perspective reduced emotion irrespective of the specific perspective elicited, $Q(1) = .083$, $\beta = -.036$, $Z = -.288$, 95% CI [-.286, .213], $p = .773$ (see Figure 2.5). Thus, shifting to a novel perspective impacts emotionality equally within events associated with either own eyes or observer-like perspectives.

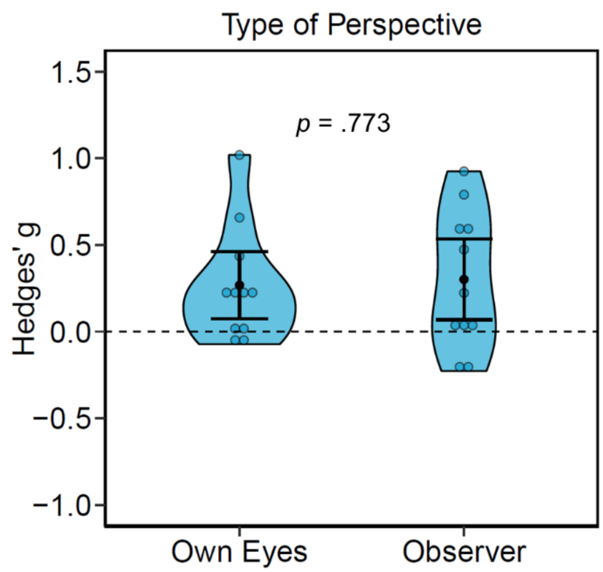

Figure 2.5. Type of Perspective. Results of moderator analyses for the type of perspective. Each data point represents an individual effect size. Black dots depict the aggregated effect size in each moderator category, and the error bars display the 95% CIs of the mean. *p*-value indicates the significance of the overall moderation model.

Discussion

In the current meta-analysis, I investigated the impact of shifts in visual perspective on emotion in event memories. I found a small overall effect reflecting a reduction in emotionality in event memories following a shift in perspective. A secondary meta-analysis further supported these findings by revealing a similar pattern of effects of shifting perspective when comparing event memories within the *same* perspective (i.e., initial own eyes compared to shifted own eyes). Consistent with the asymmetrical pattern of shifts of perspective on emotion in the literature (e.g., Berntsen & Rubin, 2006; Butler et al., 2016; Robinson & Swanson, 1993), I found that the direction of the shift moderated the strength of the across perspective effect size. Shifting from an own eyes to an observer reduced emotionality, but the opposite shift in perspective had no significant effects on emotionality. The current findings further revealed that the asymmetrical pattern of shifting was linked to differences in the vividness of event memories, suggesting that shifting across alternative perspectives reduces emotion when it leads to mnemonic changes in the quality of visual information recalled.

The current meta-analytical findings support prior empirical research indicating that shifting visual perspective during event retrieval reduces emotion, which I quantified here as a small effect size. Previous meta-analyses comparing own eyes and observer-like perspective have also shown a change in emotionality due to visual perspective (e.g., Guo, 2022; Murdoch et al., 2022) and psychological distancing in general (Moran & Eyal, 2022), but have not explicitly examined the influence of *shifting* to a novel perspective on emotion in event memories. The current findings significantly extend this research by demonstrating that adopting a novel perspective is the key driver of changes in events rather than the particular perspective adopted per se. Here, I investigated shifts in perspective by comparing differences in emotionality when participants were asked to initially recall events from a particular point-of-view and then to shift to a novel perspective. Moreover, I also found that shifting perspective reduced the emotionality of event memories even when comparing within the same type of perspective (i.e., initial own eyes to shifted own eyes; initial observer to shifted observer). These findings have important implications for understanding how visual perspective contributes to emotional regulation (e.g., Wallace-Hadrill & Kamboj, 2016; Powers & LaBar, 2019). Prior research has typically focused on how adopting an observer-like perspective serves a distancing function, which helps to dampen the intensity of emotions experienced in memories. However, the current findings indicate that it is the change in the perspective, rather than the type of perspective adopted which may be the more critical factor that influences emotion in event memories. Overall, the current meta-analysis provides a novel understanding of how and why an observer-like perspective is associated with reduced emotion by focusing on the updates in the adopted visual perspectives and inferring the underlying mechanism.

Supporting the asymmetrical pattern demonstrated in the literature (e.g., Berntsen & Rubin, 2006; Robinson & Swanson, 1993; Sekiguchi & Nonaka, 2014) I found that the direction of the shift in perspective was a key moderator of the effect size, such that shifting from an own eyes to an observer-like perspective reduced emotion but the opposite shift in perspective from observer-like to own eyes had no impact on emotion. One explanation is that shifting from an own eyes to an observer-like perspective reflects adopting a more novel viewpoint, whereas shifting from an observer-like to an own eyes perspective typically reflects re-adopting the original viewpoint memories were encoded from.[5] Thus, shifting from an own eyes to an observer-like perspective would be expected to lead to greater mnemonic changes. Supporting this idea, I found that decreases in vividness were associated with reduced emotionality when shifting from an own eyes to an observer-like perspective but not when shifting in the reverse direction. These findings are consistent with mnemonic accounts of emotional regulation that emphasize how reductions in emotion arise when the characteristics of memories are altered due to reconstructive memory processes (Nørby, 2019) and provides a causal explanation why shifting from an own eyes to an observer-like perspective alleviates emotion. I focused on vividness here because this subjective rating is frequently reported to in the literature. However,

[5] Memories can be formed from observer-like perspectives under some circumstances, but own eyes perspectives are more typical for the vast majority of memories.

changes in other characteristics of events, such as the episodic and semantic details (e.g., Akhtar et al., 2017; King et al., 2022), could also contribute to whether shifts in perspective lead to emotional regulation.

Observer-like perspectives differ in whether they emphasize self-visibility (e.g., Kinley et al., 2021), which can influence the extent of emotions people experience during remembering (Sutin & Robins, 2008). Even though an observer-like perspective is mostly considered as seeing oneself in the event during retrieval or mental simulation, the visibility of the self varies (Kinley et al., 2021), potentially due to the variation in the height, distance, and location where an observer-like vantage point was adopted from (Rice & Rubin, 2011). Prior theories have proposed that the impact of shifts in visual perspective on emotion is dependent upon the self-appraisals generated (Sutin & Robins, 2008), such that adopting an observer-like perspective can reduce emotion if it leads people to detach from the event and evaluate it objectively, but magnify emotion if it leads to greater focus of attention on the self. Supporting this idea, adopting an observer-like perspective is linked to a greater number of details associated with one's physical appearance and perceptual details related to the self-perspective (e.g., King et al., 2022; McIsaac & Eich, 2002). However, few studies have directly examined the role of the visibility or saliency of the self and its relationship to visual perspective. In one study, Kinley et al. (2021) asked participants to imagine self-relevant future events and to rate the visual perspective they adopted and the emotional intensity they felt. If they reported that they imagined events from an observer-like perspective, they were also asked to indicate how much they saw themselves in the event. Kinley and colleagues found that higher self-visibility when adopting an observer-like perspective while imagining self-relevant future events was associated with higher emotional intensity. In another study, Marcotti and St. Jacques (2021) demonstrated that the presence of the self in photo cues influenced the degree of emotional intensity people reported during memory retrieval. They found that when memories were cued with observer-like photos, the presence of the self in the photograph boosted emotional intensity ratings during remembering. The current meta-analytical findings significantly extend this research by synthesizing findings from across the literature to demonstrate that when instructions emphasize self-visibility while adopting an observer-like perspective, there is an attenuation in the reduction in emotion during shifting perspective. Notably, here I found effects of self-visibility in both the across and within-perspective meta-analytical comparisons, demonstrating the robustness of this effect in different contexts.

Future Research. The current findings can inform future research investigating the influence of visual perspectives on emotion in event memories in several ways. First, I found that instructions when initially adopting a visual perspective in events did not change the overall effect on emotion, such that both spontaneous or forced perspectives were equally likely to show a reduction in emotion when shifting perspective. Relatively fewer studies have examined shifts from observer-like to own eyes perspectives due to challenges in eliciting AMs that are spontaneously recalled from an observer-like perspective (e.g., Radvansky & Svob, 2019). For example, it can be difficult to elicit an equal number of events that are spontaneously recalled from an observer-like perspective when also controlling for the relative remoteness of events (e.g., King et al., 2022; Sekiguchi & Nonaka, 2014). It remains to be understood whether forced instructions lead people to select memories naturally associated with own eyes or observer-like perspectives or whether such instructions sometimes lead people to shift their natural perspective in the memory. Nonetheless, the current findings suggest that instructions that force observer-like perspectives when memories are initially recalled are a useful methodology for eliciting memories to understand how experimental manipulations of perspective reshape emotional and other characteristics of memories.

Second, the language used to describe visual perspective in the instructions varied across studies in terms of highlighting the immersivesness in an own eyes perspective or emphasizing the self-visibility in an observer-like perspective. For example, some studies asked participants to adopt an own eyes perspective by going back in time and reliving the experience again, and to adopt an observer-like perspectives by taking a step back and watching the event unfold (e.g., Kross et al., 2005). In contrast, other studies adopted simpler language, such as simply remembering the event from a first- or third-person perspective or using more neutral language (e.g., Vella & Moulds, 2014). Here I found that subtle differences in the language used to emphasize self-visibility can contribute to differences in the impact on emotionality during remembering. Future work directly manipulating how visual perspective is described and understood by participants would be fruitful for delineating the key factors about shifting to a novel perspective that may contribute to changes in emotional experience during remembering.

Finally, there was a lack of consistency across studies in how key features that influence visual perspective were measured. For example, prior studies showed that the same asymmetrical pattern emerges for subjective sense of reliving during recall (Berntsen & Rubin, 2006). Other findings showed that observer-like perspectives are more prevalent for remote versus recent events (Rice & Rubin, 2009), which might influence the impacts of shift in perspective. However, not all studies measured various event phenomenology or controlled for event remoteness for AMs and future events. This inconsistency challenges examining the moderator role of these variables in the present study. Future studies can include other event characteristics and control for event remoteness by including more definite temporal features for the AMs and future events (e.g., events that could happen in the next 1 to 5 versus 5 to 10 years) to further explore whether they can predict the change in emotion due to shifts in perspective.

Limitations. Despite the novelty of the current findings, there were also a few limitations in synthesizing the findings in the literature. One limitation was that the sample size was smaller than the suggested number of ten effect sizes in each category for some of the moderators in the secondary meta-analysis (Deeks et al., 2019), and the limited variability in the continuous variables due to the inclusion criteria (e.g., including studies with young adult participants only) or general sample characteristics. This restricted the possibility of examining all of the potential moderators in the analyses and might have limited the power to detect potential effects such as the event remoteness and event emotionality in the main meta-analysis. One could expect that the impact of shifts in visual perspectives on emotion would be higher when the more recent or emotional events are targeted. However, the distribution across moderator categories of these variables was relatively uneven due to the limited number of effects reported in the literature, which might also have limited the power to detect potential effects[6].

Conclusion

The present meta-analysis reveals that shifts in visual perspective are a key factor that influences the emotionality of event memories, contributing to emotional regulation of experiences from our personal past. Specifically, I found a reduction in emotionality when shifting from an initial perspective to a novel one during retrieval rather than solely adopting a specific vantage point. Supporting this interpretation, a secondary meta-analysis revealed that

[6] Note that I did not find event emotionality influences the impact of shifting on emotion in the main meta-analysis. However, this relationship was significant and in the expected direction in the secondary meta-analysis, such that emotionality was higher in the initial than shifted conditions when emotional events were targeted. However, this result should be interpreted carefully since I did not find the same effect in the main meta-analysis and there was less than ten individual effects in each moderator category.

shifts within the same perspective (i.e., comparing an initial own eyes to a shifted own eyes perspective) were similarly associated with reduced emotionality. Moreover, I also found an asymmetrical pattern of shifting, such that shifting to a novel perspective (i.e., from own eyes to observer) was associated with a reduction in emotion, whereas shifting back to a more typical perspective (i.e., from observer to own eyes) had no effect on emotion. This asymmetrical pattern of effects was linked to changes in the vividness of visual imagery associated with remembering, such that when the vividness of visual imagery reduces while shifting from an own eyes to an observer-like perspective, there is also a greater reduction in emotion, which supports mnemonic accounts of emotional regulation (Nørby, 2019). More broadly, shifts in perspective can impact our social interactions with others (Marigold et al., 2015) and how I evaluate the morality of experiences (Hu & Tao, 2021) by changing the emotionality people attribute to event memories.

Chapter 3: Change in Vividness Predicts the Decrease in Emotional Intensity When Shifting Visual Perspective during Autobiographical Memory Retrieval

Introduction

Autobiographical memories (AMs) are distinct types of memories that include different episodic details about personal experiences (time, place, what happened, etc.), which are mostly accompanied by mental imagery, a sense of reliving, and emotion (Brewer, 1986). The retrieval of AMs can be manipulated by various mnemonic changes, such that these changes influence how people retrieve events. For example, retrieval can be manipulated by asking people to think about certain details of the events (e.g., contextual versus conceptual information; Sheldon et al., 2019), retrieval cue processing (e.g., Addis et al., 2012; Harris et al., 2015; Uzer & Brown, 2017), manipulating emotional valence (e.g., D'Argembeau et al., 2003), or generating counterfactual thoughts associated with the events (e.g., De Brigard & Parikh, 2019; Stanley et al., 2017), and so on. Another critical way of interference in retrieval is manipulating visual imagery, specifically altering the visual perspective people adopt (St. Jacques & Iriye, 2022). People can adopt an own eyes perspective as they would retrieve the events through their own eyes or an observer-like perspective such that they would see themselves and their surroundings (Nigro & Neisser, 1983). Own eyes AMs are usually associated with higher emotional intensity and vividness than observer-like AMs (for a review, see St. Jacques, 2022; 2023). Moreover, shifting from an own eyes to an observer-like perspective diminishes emotional intensity; however, shifting from an observer-like to an own eyes perspective does not change it (e.g., Berntsen & Rubin, 2006; Robinson & Swanson, 1993; Sekiguchi & Nonaka, 2014). In the previous chapter, I explained these asymmetrical effects as being due to the change in vividness in visual imagery that occurs only when shifting from an own eyes to an observer-like perspective. The relationship between the change in vividness and the decrease in emotional intensity due to shifting could be related to altering the mnemonic characteristics of an event to reduce the emotion it triggers (Nørby, 2019; see also Engen & Anderson, 2018; Samide & Ritchey, 2021). Critically, prior studies in the literature considered observer-like memories a distorted version of own eyes events (for a discussion, see McCarroll, 2017) and did not particularly target the events retrieved from a stronger observer-like, relative to an own eyes, perspective. Therefore, the main goal of the present study is to investigate the shifts in visual perspectives while targeting AMs specifically retrieved from an own eyes or an observer-like perspective and predicting the reduction in emotion by the changes in vividness as a result of shifting.

Numerous studies have shown asymmetrical effects of shifting indicated a reduction in emotional intensity when shifting from an own-eyes perspective to an observer-like perspective but no change when shifting in the reverse direction (e.g., Akhtar et al., 2017; Berntsen & Rubin, 2006; Butler et al., 2016; Robinson & Swanson, 1993; Sekiguchi & Nonaka, 2014; Vella & Moulds, 2014). Asymmetrical effects of shifting perspectives on emotion were observed in subjective emotional intensity ratings as well as emotional details in AM narratives (Akhtar et al., 2017; King et al., 2022). Earlier theories have suggested that these asymmetrical effects could be explained by the accessibility of affective information (Robinson & Swanson, 1993) or increased cognitive demands when shifting from an observer-like to an own eyes perspective (Berntsen & Rubin, 2006). For instance, Robinson and Swanson (1993) argued that the affective information associated with AMs involves two components, namely, goals and beliefs related to the event and emotional experiences (i.e., arousal). When the information for both components is available, people retrieve the events from an own eyes perspective. However, an observer-like perspective emerges if the information related to emotional experiences is unavailable. Thus, when people shift from an observer-like to an own eyes perspective, they are unable to retrieve the arousal-related information; thus, recollective experiences do not increase.

Berntsen and Rubin (2006) explained asymmetrical effects based on cognitive demands required when shifting from an observer-like to an own eyes perspective. Specifically, they argued that since observer-like AMs are naturally associated with a reduced sense of reliving, shifting to an own eyes perspective would require more effort to boost the emotional experiences compared to diminishing them when shifting from an own eyes to an observer-like perspective. In addition to these arguments, Butler et al. (2016) asked participants to remember AMs and lab-based mini-events by repeatedly maintaining an own eyes or an observer-like perspective during a 4-week period. Following the repeated retrieval period, participants were asked to retrieve the events by shifting to the opposite perspective and to give subjective ratings for vividness. The results showed the asymmetrical effects of shifting on vividness, such that shifting from an own eyes to an observer-like perspective decreased vividness, but shifting from an observer-like to an own eyes perspective did not alter it. Butler and colleagues argued that the repeated retrieval of events from an observer-like perspective might decrease the availability of visual information over time; therefore, shifting to an own eyes perspective is unsuccessful in replacing the forgotten visual details as well as other recollective experiences.

In the previous chapter, I specifically aimed to understand the asymmetrical effects of visual perspective shift on emotion based on the meta-analysis with prior studies. The findings showed that the decrease in vividness when shifting from an own eyes to an observer-like perspective is associated with the decrease in emotion. However, this relationship was not significant when shifting from an observer-like to an own eyes perspective. These results are important regarding the role of the mnemonic changes during retrieval manipulations and their impact on the emotionality we attributed to events (Nørby, 2019). Modifying the way people visualize events is critical regarding the implications of visual perspective on emotional regulation, for example, in PTSD, since an observer-like perspective is more prevalent in traumatic events (Berntsen et al., 2003; McIsaac & Eich, 2004). However, as mentioned earlier, previous studies take observer memories into account as a version of own eyes memories that emerge due to the lack of experiential details or memory distortions occurring over time. Indeed, an observer-like perspective is more frequent for remote events (e.g., Rice & Rubin, 2009), which supports the emergence of an observer-like perspective due to faded visual details (Sutin & Robins, 2007). However, other theories also argue that AMs could be encoded and initially recalled from an observer-like perspective (i.e., observer memories; McCarroll, 2017; 2018; see also Nigro & Neisser, 1983). Also, Iriye and St. Jacques (2021) showed that events experienced from an observer-like perspective in an immersive virtual reality setting increased spatial memory accuracy compared to experiencing the events from an own eyes perspective, highlighting that observer memories may not necessarily be associated with lower memory performance. Accordingly, for the memories initially recalled from an observer-like perspective, shifting to an alternative own eyes perspective would also update the initial perspective of the event, which could lead to a decrease in subjective experiences since the initial visuospatial details would be distorted. However, whether shifting to an own eyes perspective when particularly targeting memories with an initial observer-like perspective would reduce vividness and emotional intensity, or reveal an asymmetrical effect, is still understudied. Additionally, Rice and Rubin (2011) demonstrated that visual perspectives could emerge from various distances (i.e., from a closer or farther viewpoint), heights (i.e., from a lower to higher viewpoint), or locations (i.e., right, left, in front, or behind) relative to the rememberer. Interestingly, previous studies have also not investigated how shifts in visual perspectives influence the origin of the viewpoint, such that shifting across visual perspectives alters the distance, height, and location from where the event is visualized.

In parallel with this, the present study aimed to understand the impact of visual perspective shift when the AMs initially recalled from an own eyes or an observer-like perspective are targeted. Participants were asked to recall AMs from the last five years. Among these events, I selected the ones initially recalled from an own eyes and an observer-like perspective. Then, I asked participants to retrieve these events by maintaining the same perspective or shifting to the opposite one and rate AM characteristics and task difficulty. I expect that maintaining the initial own eyes and observer-like perspective would preserve subjective vividness and emotional intensity. However, shifting from an own eyes to an observer-like perspective and shifting from an observer-like to an own eyes perspective would be similar in distorting the initial perspective of the event, and both decrease vividness and emotional intensity (McCarroll, 2017; 2018). Finally, in line with the mnemonic emotion regulation accounts (Nørby, 2019), I expect that the reduction in emotional intensity when shifting perspectives would be predicted by the reduction in vividness.

Methods

Participants

To determine the sample size, I followed two approaches. First, I based the sample size on the expected 2 (Part: Initial Retrieval, Subsequent Retrieval) x 2 (Condition: Maintain, Shift) interaction in repeated measure ANOVAs for vividness and emotional intensity (see below for the data analysis plan) in which 100 participants are recommended for an 80% power (Brysbaert, 2019). Second, I ran a simulation-based power analysis. I based the power analysis on the data of the main meta-analysis in Chapter 2. I used the 'mixedpower' package in R (Kumle et al., 2021) to simulate the interaction between the direction of shift and the difference in vividness to predict the change in emotion while accounting for the individual effects as the random effects. A power simulation with 1000 repetitions revealed %100 power for 100 participants to detect the interaction between the direction of shift and the difference in vividness. However, given that there will be two additional conditions in which participants will be asked to maintain their initial perspectives in the current study, and considering potential technical issues and participant dropouts, I aimed to recruit around 45 participants in each condition. Thus, in total, 176 participants were recruited from the Department of Psychology research participation pool at the University of Alberta. The sample was restricted to healthy young adults between the ages of 18 and 30 who had no history of neurological or psychiatric disorders, were not taking medication that impacts mood or cognition, and had normal or corrected-to-normal vision. Data from 7 participants were removed due to not following the experimenter instructions about filling out the questionnaires (n = 1), providing the same event titles more than one time, and reporting a lack of a stronger visual perspective during retrieval (i.e., the difference between own eyes and observer perspective ratings equals to zero [see the procedures for details]; n = 1), reporting they did not meet the inclusion criterion about no history of neurological or psychiatric disorders (n = 1), and technical issues with the software during data collection (n = 4). The final sample included 169 participants (107 females, M_{age} = 19.02, SD = 1.59). Participants provided written consent from a study protocol approved by the University of Alberta Research Ethics Board and were compensated with course credit.

Procedure

The study took place in two parts. In Part 1 (initial retrieval), participants were first asked to remember 10 AMs that occurred within the last five years. Retrieved events did not have to be significant or important but were required to be specific and unique events that occurred in a particular place and time. For each event, participants were asked to provide a brief title that would help them distinguish the events in the later part of the experiment. Then, they were asked to rate each event in an own eyes and observer perspective on a visual analog scale from 0 (low) to 100 (high) and also categorize the origin of their visual perspective within three dimensions: distance, height, and location (Rice & Rubin, 2011). Specifically, they were asked to choose one of the following as the distance from which their visual perspective originated: from your own eyes, 3 feet away or closer (arm's length is approximately 2-3 feet), 3-6 feet away (6 feet is a wingspan of a 6-foot-tall person), 6-20 feet away (20 feet is approximately the distance from the top of the key on the basketball court to the basket), 20-100 feet away (100 feet is approximately the length of a college basketball court), 100 feet away or more.

For height, they were asked to choose one of the following to specify the height of the origin of their visual perspective: from floor level, from waist height, from own eye level, slightly above head, from ceiling height, from above ceiling height, or other.

For location, they were asked the choose one of the following to indicate the location of the origin of their visual perspective: directly in front of yourself -facing yourself, directly behind yourself, to the left and behind you, to the right and behind you, to your left and in front of you, to your right and in front of you, directly to your left, directly to your right, from your own eyes, other[7]. Participants were additionally presented with a figure representing the different

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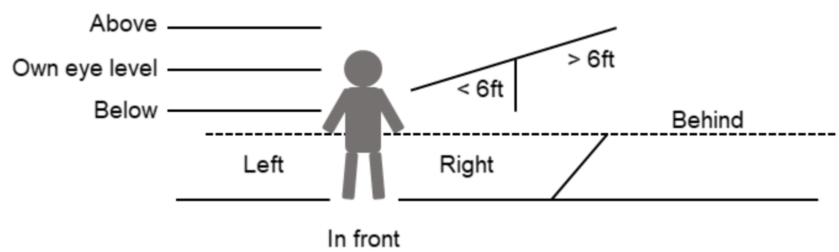
[7] For the height and location dimensions, "other" answers were removed from the relevant analyses.

dimensions from which a visual perspective can originate to help them determine their visual perspective (see Figure 3.1.). Finally, they were asked to rate their AMs on vividness and emotional intensity on a visual analog scale ranging from 0 (low) to 100 (high).



Adapted from Rice and Rubin (2011)

Figure 3.1. The example figure provided represents the height, location, and distance of the origin of the visual perspective.

In Part 2, participants were asked to remember the events they generated in Part 1, either by maintaining the visual perspective they initially adopted or shifting to the opposite perspective. I selected four AMs from Part 1 based on the strength of own eyes perspective (Part 1 observer ratings were subtracted from Part 1 own eyes ratings). Specifically, two AMs with the highest strength of own eyes perspective were selected as the Own Eyes memories. Then, one of them was assigned to the "Maintain Own Eyes" condition, in which participants were asked to remember the event from an own eyes perspective. In contrast, the other own eyes event was assigned to the "Own Eyes to Observer" condition (i.e., Shift), in which participants were asked to remember the event by shifting to an observer-like perspective. Two other events with the lowest strength of own eyes perspective were selected as the Observer memories. Similarly, one of them was assigned to the "Maintain Observer" condition, in which participants were asked to remember the event from an observer-like perspective. The other observer event was assigned to the "Observer to Own Eyes" condition (i.e., Shift), in which participants were asked to remember the event by shifting to an own eyes perspective. Selected events were randomly assigned to the Maintain or Shift conditions. Participants were instructed that they would be presented with the event title from four memories they recalled in Part 1 and asked to remember these events by adopting the visual perspective indicated. Specifically, if the visual perspective was own eyes, they were asked to "mentally reinstate the specific memory as if seeing it through their own eyes". If the visual perspective was observer, they were asked to "mentally reinstate the specific memory as if viewing it from the perspective of a spectator or observer, watching themselves in the remembered event." Participants did not know why a certain event was chosen. They were asked to press a button once they could fully visualize the event from the perspective indicated. Following each retrieval (subsequent retrieval), participants were asked to give ratings for task difficulty (i.e., how difficult they found retrieving the event from the perspective indicated), perspective maintenance (i.e., whether they were able to retrieve the memory from the perspective indicated during the entire time they were thinking about the event), number of shifts (i.e., whether the visual perspective they adopted oscillated between two or more perspectives as they were thinking of the event), own eyes perspective, observer perspective, distance, height, and location of their visual perspective. The same example figure (Figure 3.1.) was presented to help them determine the visual perspective they adopted during manipulation. Finally, participants were asked to rate their AMs in vividness and emotional intensity. All subsequent retrieval ratings were on the same scales as the initial retrieval part (i.e., task difficulty, perspective maintenance, own eyes and observer perspectives, vividness, and emotional intensity on a visual analog scale ranging from 0 [low] to 100 [high], and the number of shift, ranging from 0 [not at all] to 100 [very frequently]. The distance, height, and location of the visual perspective response options were also the same as the initial retrieval part. For study design, see

Figure 3.2). Then, participants were asked to fill out the questionnaires related to individual differences in visual imagery (Vividness in Visual Imagery Questionnaire [Marks, 1973]; Object-Spatial Imagery Questionnaire [Blajenkova et al., 2006]), perspective taking (Perspective Taking Spatial Orientation Test [Hegarty & Waller, 2004], and four questions measuring their tendency to adopt an own eyes and observer-like perspective while remembering their AMs), Behavior Identification Form (Vallacher & Wegner, 1989), and Dissociative Experiences Scale (Carlson & Putnam, 1993). These questionnaires were not analyzed in the current study as they were not of interest. Finally, participants filled out the demographics form. The experiment was written and run in MATLAB, Psychtoolbox extension (Brainard, 1997; Kleiner et al., 2007).

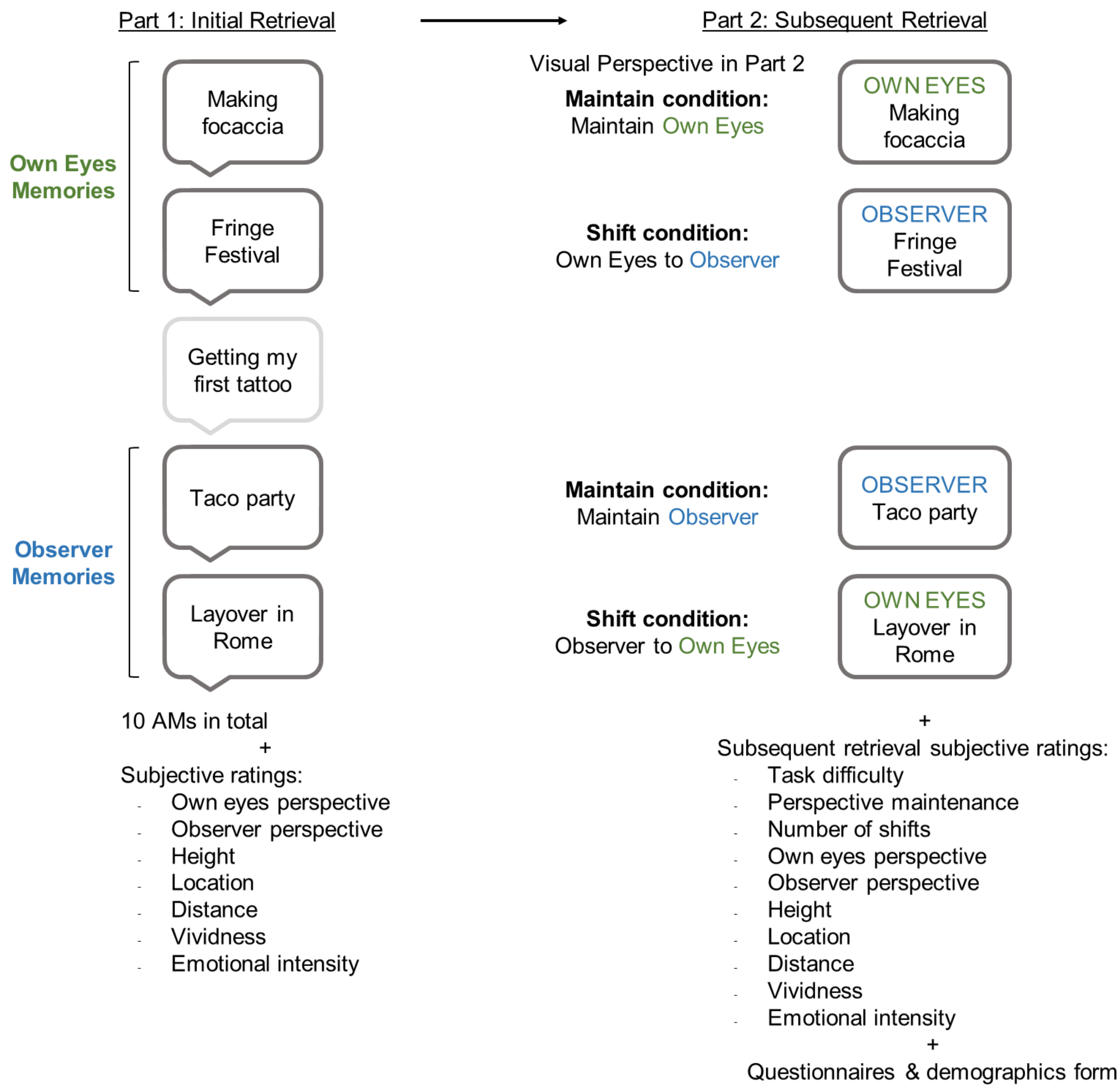


Figure 3.2. Study design. The study took place in two parts. In the initial retrieval part, participants were asked to remember ten specific AMs from the last five years and give subjective ratings for each event. I selected two AMs with the highest strength of own eyes (Own Eyes memories) and two AMs with the lowest strength of own eyes (Observer memories) from the initial retrieval part. In the retrieval manipulation part, participants were presented with the event titles of the Own Eyes and Observer memories and were asked to remember these events by either maintaining the initial own eyes or observer-like perspective (Maintain conditions) or shifting to the opposite perspective (Shift conditions). Following each retrieval, participants were

asked to give subsequent retrieval subjective ratings. Finally, they were asked to fill out the questionnaires and the demographics form.

Data Analysis

All analyses were run in Jamovi 2.3.28. I first averaged the ratings in each part and condition within each participant. Unless otherwise stated, a 2 (Part: Initial Retrieval, Subsequent Retrieval) x 2 (Perspective: Own Eyes, Observer) x 2 (Condition: Maintain, Shift) three-way repeated measure ANOVAs were run to examine the overall change in AM characteristics. Simple effects were investigated to follow up pairwise comparisons.

In line with the main goal of the present study, I adopted a linear mixed effects model approach to predict the change in emotion due to perspective taking. The linear mixed effects model enables us to investigate variability across individual AMs by clustering AMs within participants. Therefore, random effects due to individual differences would be accounted for (Wright, 1998). In the current study, the change in emotion due to retrieval manipulation (the difference in emotion from initial retrieval to subsequent retrieval) was predicted by the visual perspective adopted in the subsequent retrieval (Own Eyes, Observer), condition (Maintain, Shift), and the change in vividness from initial to subsequent retrieval, and by the interactions between these predictors while clustering the events within each participant. A representation of the model is as follows:

emotion_difference ~ 1 + perspective + condition + vividness_difference +

perspective*condition + perspective*vividness_difference +

condition*vividness_difference +

perspective*condition*vividness_difference +

(1 | participant)

Here, perspective, condition, and change in vividness (i.e., ‘vividness_difference,’ which was grand mean-centered; Kreft et al., 1995) were included in the model as fixed effects, and participants were included as random effects[8].

Results

Impact of Shifting Perspective on AM Characteristics

To investigate whether maintaining the initial perspective versus shifting to the opposite perspective influences AM characteristics, I ran a 2 (Part: Initial Retrieval, Subsequent Retrieval) x 2 (Perspective: Own Eyes, Observer) x 2 (Condition: Maintain, Shift) repeated measure ANOVAs for each subjective rating. Due to the complicated nature of three-way ANOVAs, simple effects were investigated to examine significant interactions separately for the memories initially recalled from an Own Eyes and Observer perspectives. Descriptive statistics are reported in Table 3.1.

[8] 22 individual AMs (out of 676) were excluded from the analyses due to being outlier data points (k = 9), not having an AM title (k = 5), or having the same event title more than once for the same participant (k = 2), being older than 5 years ago (k = 1), and a lack of a stronger visual perspective during initial retrieval (k = 5).

Table 3.1.

Descriptive Statistics

	Own Eyes Memories*				Observer Memories*			
	Maintain		Shift		Maintain		Shift	
	Initial Retrieval	Subsequent Retrieval	Initial Retrieval	Subsequent Retrieval	Initial Retrieval	Subsequent Retrieval	Initial Retrieval	Subsequent Retrieval
Own eyes perspective	92.89 (9.82)	80.43 (25.08)	93.92 (9.34)	69.49 (30.62)	26.09 (24.97)	38.00 (30.55)	27.78 (24.94)	53.33 (32.99)
Observer perspective	10. 81 (16.57)	31.99 (30.00)	12.11 (17.88)	48.05 (32.27)	85.19 (16.10)	74.38 (26.29)	82.17 (18.22)	59.21(31.34)
Strength of own eyes	82.37 (22.41)	48.39 (51.66)	81.72 (22.75)	21.64 (57.21)	-57.10 (37.39)	-36.41 (50.24)	-54.02 (38.43)	-5.56 (57.14)
Distance	1.39 (.79)	1.33 (.65)	1.33 (.73)	2.07 (1.15)	3.13 (1.09)	2.95 (1.23)	3.03 (1.48)	2.20 (1.24)
Height	3.09 (.57)	3.12 (.55)	3.03 (.38)	3.37 (.84)	3.45 (1.16)	3.37 (1.21)	3.49 (1.18)	3.43 (.94)
Location	2.31 (2.29)	2.60 (2.60)	2.22 (2.10)	3.93 (2.98)	5.19 (2.39)	4.70 (2.44)	5.03 (2.54)	3.91 (2.95)
Task Difficulty	-	27.36 (27.62)	-	36.21 (30.21)	-	37.27 (28.79)	-	44.28 (28.14)
Perspective Maintenance	-	63.03 (32.44)	-	52.48 (29.95)	-	57.98 (27.13)	-	53.79 (28.46)
Number of Shifts	-	28.77 (29.53)	-	40.90 (30.41)	-	36.05 (27.63)	-	47.53 (28.11)
Vividness	75.42 (23.58)	74.48 (22.35)	75.08 (24.03)	69.18 (24.44)	62.45 (25.48)	65.92 (23.97)	63.87 (26.43)	61.96 (25.60)
Emotional intensity	56.88 (31.76)	51.57 (31.57)	56.62 (32.78)	46.84 (32.01)	53.04 (28.98)	46.38 (29.33)	51.73 (31.44)	44.59 (28.95)

M (SD)

*The visual perspective adopted during the initial retrieval

First, I examined how visual perspective ratings changed as a function of retrieval manipulation. For own eyes ratings, the results revealed a significant main effect of perspective, *F* (1, 149) = 811.58, $p < .001$, $\eta_p^2 = .845$, reflecting higher own eyes ratings when remembering from an own eyes (*M* = 83.80, *SD* = 12.49) versus an observer-like perspective (*M* = 35.40, *SD* = 19.17). There was also a significant interaction between part and perspective, *F* (1, 149) = 214.71, $p < .001$, $\eta_p^2 = .590$, and perspective and condition, *F* (1, 149) = 25.04, $p < .001$, $\eta_p^2 = .144$. Importantly, these effects were qualified by a significant three-way interaction between part, perspective, and condition, *F* (1, 149) = 25.15, $p < .001$, $\eta_p^2 = .144$. Simple effects were investigated to follow up pairwise comparisons separately for the memories initially recalled from an Own Eyes and Observer perspective.

For the Own Eyes memories, there was a Part x Condition interaction on own eyes ratings, *F* (1, 160) = 17.20, $p < .001$, $\eta_p^2 = .097$. Additional paired samples t-tests showed that there was no difference in own eyes ratings between the Maintain and Shift conditions in the initial retrieval part, *t* (160) = -1.23, *p* = .222, *Cohen's d* = -.096. However, in the subsequent retrieval part, own eyes ratings were significantly higher in the Maintain than Shift condition, *t* (160) = 3.83, $p < .001$, *Cohen's d* = .301. Also, own eyes ratings decreased from initial to subsequent retrieval when maintaining the own eyes perspective, *t* (165) = 6.71, $p < .001$, *Cohen's d* = .521, as well as when shifting to an observer-like perspective, *t* (162) = 10.40, $p < .001$, *Cohen's d* = .812 (see Figure 3.3.A).

For the Observer memories, there was also a Part x Condition interaction on own eyes ratings, *F* (1, 156) = 15.30, $p < .001$, $\eta_p^2 = .089$. Additional paired samples t-tests showed that there was no difference in own eyes ratings between the Maintain and Shift conditions in the initial retrieval part, *t* (156) = -.36, *p* = .718, *Cohen's d* = -.028. However, in the subsequent retrieval part, own eyes ratings were significantly lower in the Maintain than Shift condition, t (156) = -4.55, $p < .001$, *Cohen's d* = -.363. Also, own eyes ratings increased from initial to subsequent retrieval when maintaining the observer perspective, t (160) = -4.74, $p < .001$, *Cohen's d* = -.373, as well as when shifting to an own eyes perspective, t (163) = -8.86, $p < .001$, *Cohen's d* = -.692 (see Figure 3.3.A).

Next, I examined observer ratings. I found a significant main effect of perspective, F (1, 149) = 955.72, $p < .001$, $\eta_p^2 = .865$, showing higher observer ratings when remembering from an observer-like ($M = 75.50$, $SD = 18.68$), compared to an own eyes perspective ($M = 25.60$, $SD = 16.20$). I also found a significant main effect of part, F (1, 149) = 19.66, $p < .001$, $\eta_p^2 = .117$, reflecting higher observer ratings in the initial ($M = 53.50$, $SD = 16.95$) versus subsequent retrieval ($M = 47.60$, $SD = 10.02$). There was also a significant interaction between part and perspective, F (1, 149) = 370.86, $p < .001$, $\eta_p^2 = .713$, and perspective and condition, F (1, 149) = 41.61, $p < .001$, $\eta_p^2 = .218$, which were qualified by a significant three-way part, perspective, and condition interaction, F (1, 149) = 25.51, $p < .001$, $\eta_p^2 = .146$. Simple effects were examined to follow-up pairwise comparisons separately for the memories initially recalled from an Own Eyes and Observer perspective.

For the Own Eyes memories, there was a Part x Condition interaction on observer ratings, F (1, 160) = 23.00, $p < .001$, $\eta_p^2 = .126$. Additional paired samples t-tests showed that there was no difference in observer ratings between the Maintain and Shift conditions in the initial retrieval part, t (160) = -1.31, $p = .194$, *Cohen's d* = -.103. However, in the subsequent retrieval part, observer ratings were significantly lower in the Maintain than Shift condition, t (160) = -5.22, $p < .001$, *Cohen's d* = -.412. Also, observer ratings increased from initial to subsequent retrieval when maintaining the own eyes perspective, t (165) = -9.63, $p < .001$, *Cohen's d* = -.748, as well as when shifting to an observer-like perspective, t (162) = -14.01, $p < .001$, *Cohen's d* = -1.098 (see Figure 3.3.B).

For the Observer memories, there was a Part x Condition interaction, F (1, 156) = 13.10, $p < .001$, $\eta_p^2 = .077$. Paired samples t-tests showed that observer ratings were significantly higher in the Maintain than Shift condition in the initial, t (156) = 2.51, $p = .013$, *Cohen's d* = .201, and subsequent retrieval parts, t (156) = 4.72, $p < .001$, *Cohen's d* = .376. However, observer ratings decreased from initial to subsequent retrieval when maintaining the observer perspective, t (160) = 4.77, $p < .001$, *Cohen's d* = .376, and also when shifting to an own eyes perspective, t (163) = 9.09, $p < .001$, *Cohen's d* = .710 (see Figure 3.3.B).

Finally, as I selected events from the initial retrieval part based on the strength of own eyes, I examined whether it changed as a function of visual perspective taking. There was a significant main effect of perspective, F (1, 149) = 995.85, $p < .001$, $\eta_p^2 = .870$, reflecting stronger own eyes perspective when remembering from an own eyes (M = 58.20, SD = 25.85) compared to an observer-like perspective (M = -40.10, SD = 29.32). There was also a significant main effect of part, F (1, 149) = 7.57, $p = .007$, $\eta_p^2 = .048$, revealing stronger own eyes perspective in the initial (M = 11.97, SD = 17.94) versus subsequent retrieval (M = 6.12, SD = 28.45). I also found a significant interaction between part and perspective, F (1, 149) = 349.59, $p < .001$, $\eta_p^2 = .701$, and perspective and condition, F (1, 149) = 37.66, $p < .001$, $\eta_p^2 = .202$, which were qualified by a significant three-way part, perspective, and condition interaction, F (1, 149) = 29.82, $p < .001$, $\eta_p^2 = .167$. I followed up this interaction with simple effects comparisons separately for the memories initially recalled from an Own Eyes and Observer perspective.

For the Own Eyes memories, there was a Part x Condition interaction, F (1, 160) = 23.60, $p < .001$, $\eta_p^2 = .129$. Paired samples t-tests showed that there was no difference in the strength of own eyes between the Maintain and Shift conditions in the initial retrieval part, *t* (160) = .46, *p* = .641, *Cohen's d* = .036. However, in the subsequent retrieval part, the strength of own eyes was significantly higher in the Maintain than Shift condition, *t* (160) = -4.85, *p* < .001, *Cohen's d* = .382. Also, the strength of own eyes decreased from initial to subsequent retrieval when maintaining the own eyes perspective, *t* (165) = 9.35, *p* < .001, *Cohen's d* = .726, and also when shifting to an observer-like perspective, *t* (162) = 13.54, *p* < .001, *Cohen's d* = 1.061 (see Figure 3.3.C).

For the Observer memories, there was a Part x Condition interaction, *F* (1, 156) = 17.60, *p* < .001, η_p^2 = .101. Paired samples t-tests showed that there was no significant difference between the Maintain and Shift conditions in the initial retrieval part, *t* (156) = -1.51, *p* = .134, *Cohen's d* = -.120. However, in the subsequent retrieval part, the strength of own eyes was significantly lower in the Maintain than Shift condition, *t* (156) = -5.00, *p* < .001, *Cohen's d* = -.399. Also, the strength of own eyes increased from initial to subsequent retrieval when maintaining the observer perspective, *t* (160) = -5.63, *p* < .001, *Cohen's d* = -.444, and also when shifting to an own eyes perspective, *t* (163) = -10.08, *p* < .001, *Cohen's d* = -.787 (see Figure 3.3.C).

Overall, the change in visual perspective ratings revealed that the retrieval manipulation influenced visual perspective ratings in the expected direction. In general, there was a decrease in own eyes ratings and an increase in observer ratings for the Own Eyes memories in the subsequent retrieval part. In contrast, for the Observer memories, there was an increase in own eyes ratings and a decrease in observer ratings in the subsequent retrieval part (see Figure 3.3).

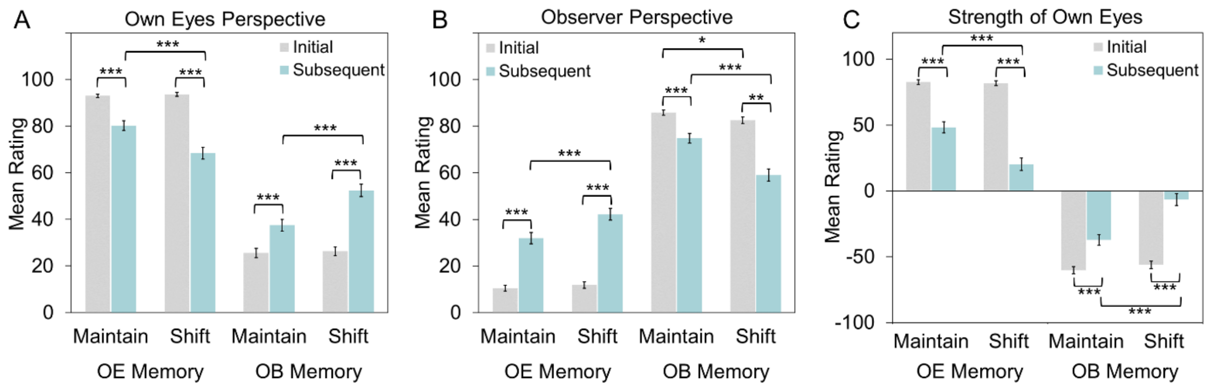


Figure 3.3. The changes in the mean (A) own eyes perspective, (B) observer perspective, and (C) the strength of own eyes ratings from initial (gray bars) to subsequent (turquoise bars) retrieval while maintaining the own eyes/observer perspective or shifting to the opposite perspective for the events initially recalled from an Own Eyes and Observer perspectives (i.e., OE Memory/OB Memory on the x-axes). The results showed a decrease in own eyes ratings and an increase in observer ratings in the subsequent retrieval for the memories initially recalled from an own eyes perspective (OE Memory). In contrast, there was an increase in own eyes ratings and a decrease in observer ratings in the subsequent retrieval for the memories initially recalled from an observer perspective (OB Memory). Error bars represent the standard error of the mean. Asterisks indicate the *p*-value of the significant pairwise comparisons. * $p < .05$; ** $p < .01$; *** $p < .001$. OE = Own Eyes; OB = Observer.

To investigate the nature of the adopted visual perspective in more detail, I examined whether the distance, height, and location of the visual perspective changed as a function of perspective taking. For distance, I first recoded responses as a continuous variable from 1 (from your own eyes) to 6 (100 feet away or more), such that lower scores indicate a closer viewpoint and higher scores indicate a more distant visual perspective. There was a significant main effect of perspective, F (1, 149) = 367.19, $p < .001$, $\eta_p^2 = .711$, showing a more distant perspective when remembering from an observer-like ($M = 2.84$, $SD = .62$) than an own eyes perspective ($M = 1.51$, $SD = .49$). There was a significant main effect of part, F (1, 149) = 4.05, $p = .046$, $\eta_p^2 =$

.026, reflecting more distant perspective in the initial (*M* = 2.21, *SD* = .49) versus subsequent retrieval (*M* = 2.13, *SD* = .49). I also found a significant interaction between part and perspective, *F* (1, 149) = 81.23, $p < .001$, η_p^2 = .353, and perspective and condition, *F* (1, 149) = 38.60, $p < .001$, η_p^2 = .206, which were qualified by a three-way part, perspective, and condition interaction, *F* (1, 149) = 46.22, $p < .001$, η_p^2 = .237.

Looking at the simple effects for the events initially recalled from an Own Eyes perspective, there was a Part x Condition interaction on distance, *F* (1, 160) = 50.60, $p < .001$, η_p^2 = .240. Paired samples t-tests showed that there was no difference in distance ratings between Maintain and Shift conditions in the initial retrieval part, *t* (160) = 1.02, *p* = .306, *Cohen's d* = .080. However, in the subsequent retrieval part, distance ratings were significantly lower in the Maintain than Shift condition, *t* (160) = -7.31, $p < .001$, *Cohen's d* = -.576. Also, there was no change in distance ratings from initial to subsequent retrieval when maintaining the own eyes perspective, *t* (165) = .953, *p* = .342, *Cohen's d* = .074. However, distance ratings significantly increased from initial to subsequent retrieval when shifting to an observer-like perspective, *t* (162) = -7.58, $p < .001$, *Cohen's d* = -.593 (see Figure 3.4.A).

For the Observer memories, there was a Part x Condition interaction on distance, *F* (1, 156) = 17.20, $p < .001$, η_p^2 = .100. Additional paired samples t-tests showed that there was no significant difference between the Maintain and Shift conditions in the initial retrieval part, *t* (156) = .917, *p* = .360, *Cohen's d* = .073. However, in the subsequent retrieval part, distance ratings were significantly higher in the Maintain than Shift condition, *t* (156) = 5.33, $p < .001$, *Cohen's d* = .425. Also, there was no change in distance ratings from initial to subsequent retrieval when maintaining the observer perspective, *t* (160) = 1.93, *p* = .055, *Cohen's d* = .152. However, distance ratings significantly decreased from initial to subsequent retrieval when shifting to an own eyes perspective, *t* (163) = 7.19, $p < .001$, *Cohen's d* = .561 (see Figure 3.4.A).

For height, I first recoded responses as a continuous variable from 1 (from floor level) to 6 (from above ceiling height), such that lower scores indicate a lower viewpoint and higher scores indicate a higher viewpoint. I found a main effect of perspective, *F* (1, 137) = 22.45, $p < .001$, $\eta_p^2 = .141$, reflecting that an observer-like perspective (*M* = 3.44, *SD* = .71) originated from a higher vantage point compared to an own eyes perspective (*M* = 3.14, *SD* = .36). I also found a significant interaction between part and perspective, *F* (1, 137) = 8.88, *p* = .003, $\eta_p^2 = .061$, and part and condition, *F* (1, 137) = 5.75, *p* = .018, $\eta_p^2 = .040$, which were qualified by a three-way part, perspective, and condition interaction, *F* (1, 137) = 4.04, *p* = .046, $\eta_p^2 = .029$.

Looking at the simple effects, for the events initially remembered from an Own Eyes perspective, there was a Part x Condition interaction on height, *F* (1, 155) = 17.13, $p < .001$, $\eta_p^2 = .100$. Additional paired samples t-tests showed that there was no difference in height ratings between Maintain and Shift conditions in the initial retrieval part, *t* (157) = 1.37, *p* = .173, *Cohen's d* = .109. However, in the subsequent retrieval part, height ratings were significantly lower in the Maintain than Shift condition, *t* (157) = -3.55, $p < .001$, *Cohen's d* = -.283. Also, there was no change in height ratings from the initial to subsequent retrieval part when maintaining the own eyes perspective, *t* (163) = -.541, *p* = .589, *Cohen's d* = -.042. However, height ratings significantly increased from initial to subsequent retrieval part when shifting to an observer-like perspective, *t* (158) = -5.04, $p < .001$, *Cohen's d* = -.400 (see Figure 3.4.B).

For the Observer memories, a simple effects follow-up test did not reveal a significant Part x Condition interaction on height, *F* (1, 148) = .012, *p* = .910, $\eta_p^2 = .000$ (see Figure 3.4.B).

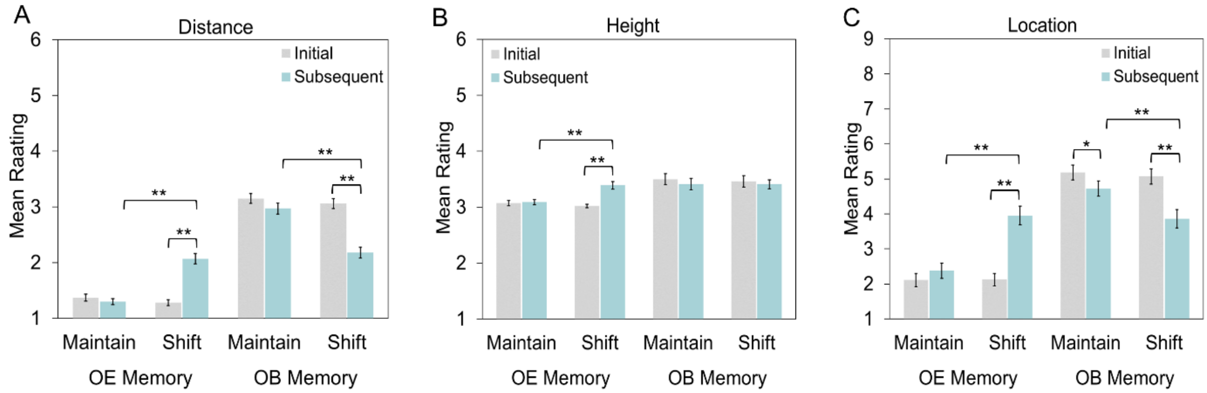


Figure 3.4. The changes in the mean (A) distance, (B) height, and (C) location ratings from initial (gray bars) to subsequent (turquoise bars) retrieval while maintaining the own eyes/observer perspective or shifting to the opposite perspective for the events initially recalled from an Own Eyes and Observer perspectives (i.e., OE Memory/OB Memory on the x-axes). The results showed that shifting from an own eyes to an observer-like perspective increased distance and height of the origin of the visual perspective, and moved it towards the front –directly facing the rememberer. Shifting from an observer-like to an own eyes perspective decreased the distance of the origin of the visual perspective but did not impact the height. It moved the origin of the visual perspective towards the front –directly facing the rememberer. Error bars represent the standard error of the mean. Asterisks indicate the *p*-value of the significant pairwise comparisons. * $p < .05$; ** $p < .001$. OE = Own Eyes; OB = Observer.

Finally, for location, I similarly recoded answers as continuous variables. Specifically, in this question, I aimed to capture all possible viewpoints in relation to the rememberer. Therefore, I recoded the answers starting from 1 (from own eyes) to 9 (to the right and behind you), such that the lowest score corresponds to an own eyes perspective. As the scores become higher, the viewpoint starts moving from the right side of the rememberer and draws a circle around them towards the front, left, and behind in order to capture all vantage points (see Figure 3.5).

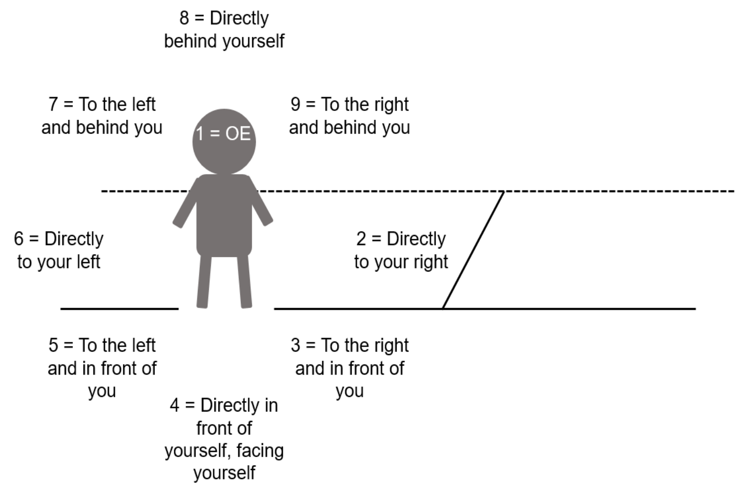


Figure 3.5. A representation of the vantage points in the location question on a continuous scale**.** OE = Own eyes.

The results showed a significant main effect of perspective, *F* (1, 131) = 112.91, $p < .001$, $\eta_p{}^2 = .463$, reflecting a higher location score when remembering from an observer-like perspective, approximately corresponding to the left and in front of the rememberer on average (*M* = 4.71, *SD* = 1.55) compared to an own eyes perspective, approximately corresponding to in between directly to their right, and to the right and in front of them on average (*M* = 2.64, *SD* = 1.68). I also found a significant interaction between part and perspective, *F* (1, 131) = 56.48, $p < .001$, $\eta_p{}^2 = .301$, and perspective and condition, *F* (1, 131) = 16.22, $p < .001$, $\eta_p{}^2 = .110$, which were qualified by a three-way part, perspective, and condition interaction, *F* (1, 131) = 17.19, $p < .001$, $\eta_p{}^2 = .116$.

Looking at the simple effects, for the Own Eyes memories, there was a Part x Condition interaction on location, *F* (1, 150) = 17.80, $p < .001$, $\eta_p{}^2 = .106$. Additional paired samples t-tests showed that there was no difference in location ratings between the Maintain and Shift conditions in the initial retrieval part, *t* (152) = -.164, *p* = .870, *Cohen's d* = -.013. However, in the subsequent retrieval part, location ratings were significantly lower in the Maintain than Shift condition, t (156) = -5.17, $p < .001$, *Cohen's d* = -.412. Also, there was no change in location ratings from initial to subsequent retrieval when maintaining the own eyes perspective, t (160) = -1.33, $p = .183$, *Cohen's d* = -.105. However, location ratings significantly increased from initial to subsequent retrieval when shifting to an observer-like perspective, t (155) = -6.24, $p < .001$, *Cohen's d* = -.500 (see Figure 3.4.C).

For the Observer memories, there was also a Part x Condition interaction on location, F (1, 144) = 4.05, $p = .046$, $\eta_p^2 = .027$. Paired samples t-tests showed that there was no significant difference between the Maintain and Shift conditions in the initial retrieval part, t (149) = .486, $p = .628$, *Cohen's d* = .039. However, in the subsequent retrieval part, location ratings were significantly higher in the Maintain than Shift condition, t (148) = 2.62, $p = .010$, *Cohen's d* = .214. Also, location ratings significantly decreased from initial to subsequent retrieval when maintaining the observer perspective, t (155) = 2.26, $p = .025$, *Cohen's d* = .181, and also when shifting to an own eyes perspective, t (154) = 3.88, $p < .001$, *Cohen's d* = .311 (see Figure 3.4.C).

Overall, shifting from an own eyes to an observer-like perspective increased the distance and height of the origin of the visual perspective and moved it towards a vantage point in the front –directly facing themselves. However, shifting from an observer-like to an own eyes perspective decreased the distance of the origin of the visual perspective but did not change the height. Additionally, it also moved the origin of the visual perspective towards a vantage point in the front –directly facing themselves (see Figures 3.4 and 3.5).

Next, I examined how participants evaluated the task difficulty, their ability to maintain the indicated perspective, and the number of shifts during retrieval in the subsequent retrieval part by running individual 2 (Perspective: Own Eyes, Observer) x 2 (Condition: Maintain, Shift) repeated measure ANOVAs. For task difficulty, there was a significant main effect of perspective, F (1, 149) = 21.80, $p < .001$, $\eta_p^2 = .128$, showing a lower task difficulty when remembering from an own eyes (M = 31.60, SD = 21.65) than observer-like perspective (M = 41.10, SD = 21.65). There was also a significant main effect of condition, F (1, 149) = 28.33, $p < .001$, $\eta_p^2 = .160$, revealing a lower task difficulty in the Maintain (M = 31.00, SD = 21.40) than in Shift condition (M = 41.70, SD = 21.52). There was no significant interaction.

Turning to perspective maintenance, I found a significant main effect of condition, F (1, 149) = 11.18, $p = .001$, $\eta_p^2 = .070$, reflecting a higher perspective maintenance in the Maintain (M = 61.00, SD = 23.13) than in Shift condition (M = 53.80, SD = 21.40). There was no other significant main effect or interaction.

For the number of shifts, there was a significant main effect of perspective, F (1, 149) = 14.36, $p < .001$, $\eta_p^2 = .088$, showing a lower number of shifts when remembering from an own eyes (M = 35.30, SD = 21.40) than observer-like perspective (M = 42.40, SD = 20.16). There was also a significant main effect of condition, F (1, 149) = 27.82, $p < .001$, $\eta_p^2 = .157$, revealing a lower number of shifts in the Maintain (M = 32.40, SD = 23.63) than in Shift condition (M = 45.30, SD = 22.51). There was no significant interaction.

In sum, participants reported that adopting an own eyes perspective and maintaining the initial perspective is less difficult, and they oscillated less between perspectives than when adopting an observer-like perspective and shifting. However, they also reported that once they adopted the indicated perspective, they could maintain the own eyes and observer-like perspectives similarly.

Finally, for vividness and emotional intensity, I also ran separate 2 (Part: Initial Retrieval, Subsequent Retrieval) x 2 (Perspective: Own Eyes, Observer) x 2 (Condition: Maintain, Shift) repeated measure ANOVAs. For vividness, I found a significant main effect of perspective, F (1, 149) = 37.13, $p < .001$, $\eta_p^2 = .200$, reflecting higher vividness when recalling from an own eyes (M = 72.70, SD = 41.32) compared to an observer-like perspective (M = 63.50, SD = 16.69). Supporting the hypothesis that shifting perspective would decrease vividness regardless of the direction of shift, I found a significant part and condition interaction, F (1, 149) = 7.97, p = .005, $\eta_p^2 = .051$. Paired samples t-test to examine simple effects revealed that there was no difference between Maintain (M = 68.88, SD = 18.31) and Shift conditions (M = 69.54, SD = 19.88) in the initial retrieval part, t (149) = .96, p = .967, *Cohen's d* = -.003. However, in the subsequent retrieval part, vividness ratings were significantly higher in the Maintain (M = 69.77, SD = 17.95) than in the Shift conditions (M = 65.09, SD = 19.41), t (149) = 3.13, p = .002, *Cohen's d* = .256. Also, vividness ratings did not change from initial to subsequent retrieval in the Maintain conditions, t (157) = -.65, p = .513, *Cohen's d* = -.052. However, it significantly decreased from initial to subsequent retrieval in the Shift conditions, t (157) = 2.71, p = .007, *Cohen's d* = .216, reflecting a decrease in vividness when shifting perspectives (see Figure 3.6.A). There were no other main effects or interactions.

Turning to emotional intensity, I found a significant main effect of part, F (1, 149) = 28.41, $p < .001$, $\eta_p^2 = .160$, reflecting a decrease in emotional intensity from initial (M = 54.40, SD = 19.54) to subsequent retrieval (M = 47.30, SD = 19.05). There was also a significant interaction between part and condition, F (1, 149) = 4.73, p = .031, $\eta_p^2 = .031$. Additional paired samples t-tests to examine simple effects revealed that there was no difference between the Maintain (M = 54.58, SD = 23.70) and Shift conditions (M = 54.29, SD = 24.79) in the initial retrieval part, t (149) = .26, p = .793, *Cohen's d* = .021. Emotional intensity ratings were significantly higher in the Maintain (M = 48.77, SD = 22.80) than in the Shift conditions (M =

45.43, *SD* = 22.56) in the subsequent retrieval part, *t* (149) = 2.30, *p* = .022, *Cohen's d* = .188. However, there was a decrease in emotional intensity from initial to subsequent retrieval part both in the Maintain, *t* (157) = 3.68, *p* < .001, *Cohen's d* = .292, and in the Shift conditions, *t* (157) = 5.85, *p* < .001, *Cohen's d* = .465, indicating that emotional intensity decreased from initial to subsequent retrieval part regardless of the condition (see Figure 3.6.B).

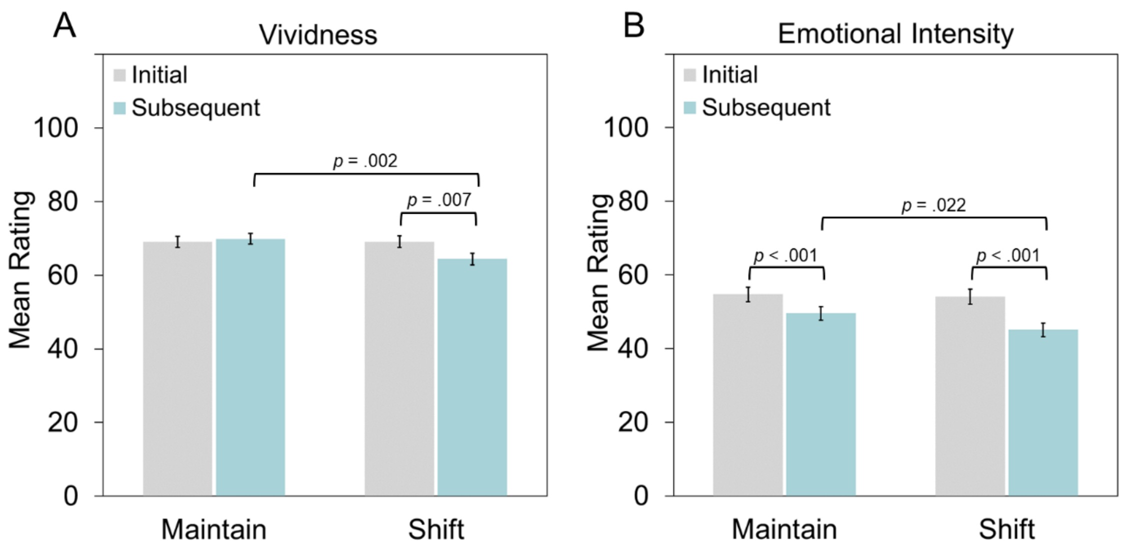


Figure 3.6. The changes in the mean (A) vividness and (B) emotional intensity ratings from initial (gray bars) to subsequent (turquoise bars) retrieval while maintaining the initial perspective or shifting to the opposite perspective. The results showed that maintaining the initial perspective preserved vividness. However, there was a decrease in vividness from initial to subsequent retrieval when shifting perspectives, regardless of the direction of the shift. Emotional intensity decreased from initial to subsequent retrieval in both Maintain and Shift conditions. Error bars represent the standard error of the mean. Asterisks indicate the *p*-value of the significant pairwise comparisons.

Change in Vividness

As one of the main goals of the current study, I ran a linear mixed effects model to examine whether the change in vividness due to shifting perspective predicts the change in emotional intensity. Both the change in vividness and the change in emotional intensity were calculated by subtracting the subsequent retrieval ratings from the initial retrieval ratings. Specifically, I included condition, perspective in the subsequent retrieval (i.e., perspective adopted as a result of retrieval manipulation), and change in vividness as fixed effects and participants as random effects in the model. The findings revealed that the change in vividness significantly predicted the change in emotional intensity, $\beta = .171$, t (631) = 4.60, $p < .001$, 95% CI [.098, .243], such that when there was a greater decrease in vividness, there was also a greater decrease in emotional intensity. Critically, there was a three-way condition, perspective, and change in vividness interaction, $\beta = -.326$, t (618) = -2.22, $p = .027$, 95% CI [-.614, -.038]. Simple effects were investigated by running follow-up tests on how the variation in the change in vividness predicts the change in emotional intensity in the Maintain and Shift conditions, separately for the events remembered from an own eyes and observer perspectives in the subsequent retrieval. For this reason, the change in vividness, a continuous covariate in the model, was conditioned to the 'Mean – 1 SD,' 'Mean,' and 'Mean + 1 SD.' In this way, the model would be able to categorize the variation in the change in vividness as lower, average, and higher decrease, respectively, and examine how the emotional intensity differs in the Maintain and Shift conditions as the decrease in vividness varies.

For the memories remembered from an own eyes perspective in the subsequent retrieval, the results showed that there was a significant difference between the Maintain and Shift conditions. Specifically, when there was a higher decrease in vividness (i.e., Mean + 1 SD), there was also a greater decrease in emotional intensity in the Shifted condition (i.e., an own eyes perspective was adopted due to shifting from an observer-like perspective), compared to the Maintain condition (i.e., maintaining an own eyes perspective). However, there was no significant difference between the Maintain and Shift conditions when there was an average (i.e., Mean) or a lower decrease in vividness from initial to subsequent retrieval (i.e., Mean – 1 SD; see Table 3.2 and Figure 3.7).

For the memories remembered from an observer perspective in the subsequent retrieval, however, there was no significant difference between the Maintain and Shift conditions in predicting the decrease in emotional intensity by the variation in the decrease in vividness (see Table 3.2 and Figure 3.7).

Table 3.2.

Simple Effects Analyses for the Linear Mixed Effects Model

Perspective in the Subsequent Retrieval	Decrease in Vividness	Contrast	β	95% CI LL	95% CI UL	df	t	*p*
Own Eyes	Mean - 1 SD	Shift vs. Maintain	-4.49	-11.75	2.76	570	-1.21	.224
	Mean	Shift vs. Maintain	1.58	-3.24	6.40	482	.64	.520
	Mean + 1 SD	Shift vs. Maintain	7.65	.42	14.89	562	2.07	.038*
Observer	Mean - 1 SD	Shift vs. Maintain	3.84	-3.25	10.94	546	1.06	.288
	Mean	Shift vs. Maintain	1.44	-3.51	6.41	490	.57	.567
	Mean + 1 SD	Shift vs. Maintain	-.95	-8.11	6.21	550	-.26	.794

CI = Confidence Interval, LL = Lower Level, UL = Upper Level, * $p < .05$

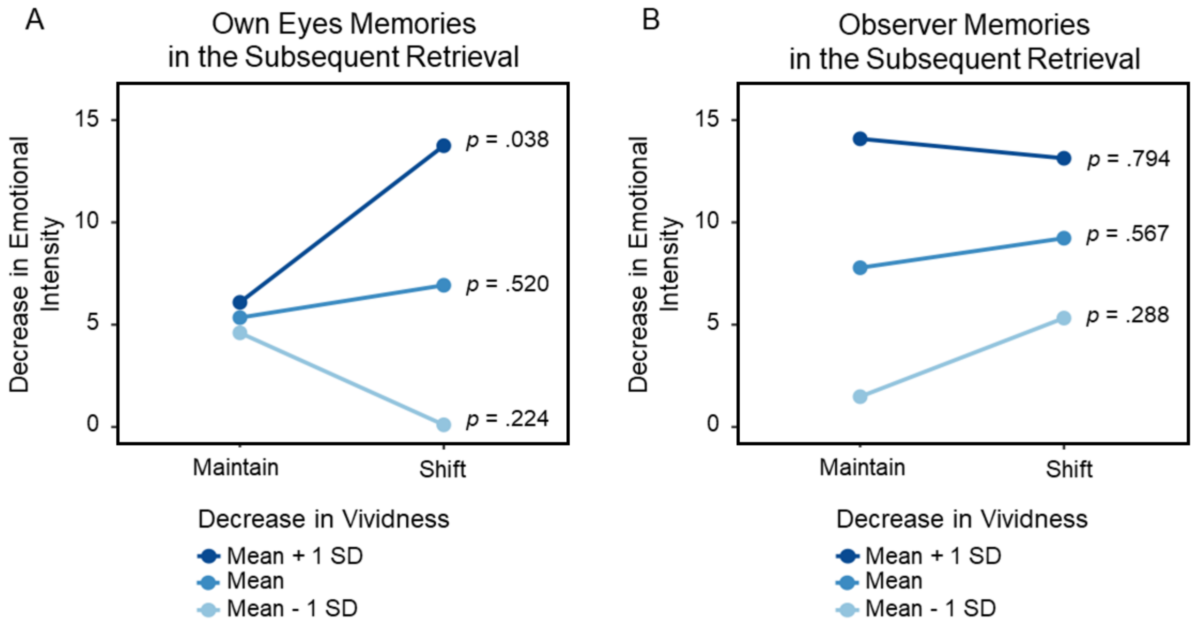


Figure 3.7. Mixed effects model for the memories remembered from an (A) Own Eyes and (B) Observer perspective in the subsequent retrieval. A greater decrease in vividness (Mean + 1 SD; the darkest blue line) was related to a greater decrease in emotional intensity when an own eyes perspective was adopted as a result of shifting (i.e., shifting from an observer-like to an own eyes perspective, $p = .038$). However, there was no relationship between the decrease in vividness and emotional intensity when maintaining the initial own eyes perspective or for the memories remembered from an observer-like perspective in the subsequent retrieval.

Discussion

The present study investigated how AM characteristics change due to the shifts in visual perspectives while retrieving own eyes and observer-like memories. The results indicated that shifting perspective reduced vividness regardless of the direction of the shift. Also, the reduction in emotional intensity was predicted by the reduction in vividness when shifting from an observer-like to own eyes perspective but not when shifting in the reverse direction or maintaining the initial perspectives. Finally, I showed that shifting from an own eyes to an observer-like perspective increased the distance and height of the origin of the visual perspective and moved it towards a point facing the rememberer. However, shifting from an observer-like to an own eyes perspective decreased the distance of the origin of the adopted visual perspective but did not affect its height. Additionally, the origin of the adopted visual perspective moved from a point in the left and in front of the rememberer to a point facing themselves. The current findings are important to better understand how shifting visual perspective occurs, the impacts of the shifts in perspectives on AM characteristics, and the underlying reasons for the asymmetrical effects on emotion.

Recent theories focusing on the cognitive processes in emotional regulation argue that mnemonic modifications during retrieval can change the emotional impacts of events by reducing the accessibility of the emotional information (e.g., Engen & Anderson, 2018; Samide & Ritchey, 2021) or altering AM characteristics (Nørby, 2019). Shifting visual perspective is a specific manipulation in retrieval that influences how people remember events and what they remember about them (St. Jacques, 2022; 2023). Accordingly, a reduction in emotion when shifting from an own eyes to an observer-like perspective would serve as an emotional regulation via facilitating the alterations in other AM characteristics (Nørby, 2019). This aligns with the role of distancing as a cognitive reappraisal strategy in which people are instructed to take a step back and adopt a distanced perspective to decrease the emotional impact of a stimulus (Powers & LaBar, 2019). However, shifting from an observer-like to an own eyes perspective was found to be ineffective in changing vividness and emotional intensity in earlier research (Berntsen & Rubin, 2006; Butler et al., 2016; Robinson & Swanson, 1993). In contrast to previous models explaining the reduction in emotional intensity when shifting from an own eyes to an observer-like perspective based on the evaluation of self-related information from an outside perspective (Sutin & Robins, 2008), generating broader appraisals about the event (Niese et al., 2021), increasing the construal level (Trope & Liberman, 2010) or detachment from the event (Kross &

Ayduk, 2017), I aimed to explain how recollective processes are impacted by shifting perspective to alter the emotions we attributed to the events.

Shifting visual perspective is a critical mnemonic manipulation in which people are asked to remember the events by altering their visuospatial characteristics in their minds' eye. In light of current findings, the asymmetrical effects reported in the literature, which were also included in the meta-analyses in Chapter 2, should be reconsidered. One important thing in these earlier accounts is that they specifically consider an own eyes perspective as the default perspective, and shifting to an observer-like perspective is distorting event characteristics that reduce emotional experiences (McCarroll, 2017; 2018). Critically, other accounts suggest that an observer-like perspective could be the initial perspective that one adopts during encoding or retrieval, depending on the event content (McCarroll, 2017; 2018; Robinson & Swanson, 1993). If an event can be initially recalled from an observer-like perspective, then shifting to an own eyes perspective would also be updating the initial perspective of an event with an alternative one rather than switching back to the default perspective. Thus, it could also diminish the subjective experiences during retrieval due to distorting event characteristics. In fact, in the present study, I demonstrated that when AMs initially recalled from an own eyes and observer-like perspectives were targeted, shifting perspectives, regardless of its direction, reduced vividness. Furthermore, the reduction in vividness predicted the decrease in emotional intensity when shifting from an observer-like to an own eyes perspective, supporting later accounts suggesting that an observer-like perspective can be the initial perspective of an event (McCarroll, 2017; 2018; see also Bergouignan et al., 2014; Iriye & St. Jacques, 2021) and modifying the initial observer-like perspective with an alternative own eyes perspective influences how we remember AMs. Additionally, I found that although participants evaluated adopting an observer-like perspective as more difficult than an own eyes perspective, they were able to maintain both perspectives similarly once they adopted them during retrieval. That also challenges the idea that the null effects when shifting from an observer-like to an own eyes perspective reported in the literature (e.g., Berntsen & Rubin, 2006; Butler et al., 2016; Robinson & Swanson, 1993) could be solely related to task difficulty. Overall, the current findings suggest that shifting from an observer-like to an own eyes perspective does not necessarily have to be related to switching back to an original own eyes perspective. Instead, a shift in visual perspective, regardless of its direction, updates/distorts the initial visuospatial features of the AMs and reduces vividness when AMs recalled from particular perspectives are targeted. Plus, the decrease in emotional intensity when shifting from an observer-like to an own eyes perspective is subject to the changes in vividness, supporting the cognitive and mnemonic emotional regulation accounts that suggest that the modifications in memory characteristics facilitate the reductions in emotional experiences (Nørby 2019; see also Engen & Anderson, 2018; Samide & Ritchey, 2021). These novel findings are important, especially in the context of the retrieval of memories in which an initial observer-like perspective is more prevalent, such as trauma events in PTSD (McIsaac & Eich, 2004). For example, a critical question is investigating whether distorting the initial perspective of these high-arousal events would result in similar reductions in vividness and emotional intensity during retrieval.

Note that in the present study, there was a decrease in emotional intensity following both maintaining and shifting manipulations when AM ratings were averaged for each participant. One difference between the current study and previous studies that reported a reduction in emotional intensity when comparing the shifts in visual perspective to maintaining perspective is that I selected the AMs from the initial retrieval part based on the difference between own eyes and observer ratings. That is, AMs were naturally associated with one of the visual perspectives, but the strength of this visual perspective was relative to the participant (i.e., in comparison to the other events they recalled). In previous studies, however, researchers selected events only if they were rated higher than a specific point on the own eyes and lower on the observer rating scale (e.g., St. Jacques et al., 2017). Therefore, in prior studies, shifting from an own eyes to an observer-like perspective might have more drastic effects on emotional intensity. Earlier studies reporting a decrease in emotional intensity also had certain methodological differences from the present study. For example, studies that showed a reduction in emotional intensity when shifting from an own eyes to an observer-like perspective asked participants to shift perspective with multiple repetitions (e.g., St. Jacques et al., 2017), remember a higher number of events (e.g., Akhtar et al., 2017; Berntsen & Rubin, 2006; King et al., 2022; St. Jacques et al., 2017) or associated with various emotion categories (e.g., Akhtar et al., 2017; Berntsen & Rubin, 2006; Sekiguchi & Nonaka, 2014). However, in the current study, participants shifted their perspectives only for one AM for each direction and with a single repetition. Additionally, I asked participants to remember neutral events that do not have to have any emotional significance. These methodological differences might also be related to the lack of significant differences in emotional intensity due to maintaining versus shifting visual perspectives and shifting from an own eyes to an observer-like perspective.

The current study also investigated the nature of the adopted visual perspective and how it changes due to shifting in more detail. Previously, Rice and Rubin (2011) demonstrated that visual perspectives can originate from various angles. For example, they reported that observer-like perspectives mostly originate from a viewpoint within the 6-foot distance to the rememberer and around an own eyes height, but the distance and height vary among individuals.

Interestingly, later studies in the literature did not follow up on whether this flexibility occurs both in an own eyes and an observer-like perspective and changes due to shifting. In the current study, I found that shifting from an own eyes to an observer-like perspective increases the distance the vantage point originates, whereas shifting in the reverse direction decreases it, which also validates the retrieval manipulation. Turning to the height of the visual perspective, I found that shifting from an own eyes to an observer-like perspective increased the height of the vantage point. However, shifting in the reverse direction did not impact height. Finally, when people shifted from an own eyes to an observer-like perspective, the origin of the visual perspective moved from a viewpoint directly on the right of the participant to facing themselves in the front. When shifting from an observer-like to an own eyes perspective, however, the origin of the visual perspective moved from a viewpoint on the left and in front of the participants to facing themselves in the front. These findings elucidate an understanding of how visual perspectives can flexibly originate in the space in relation to the rememberer rather than being static or emerging from the same point of view for everyone. Additionally, prior models argue that events associated with complex emotions (e.g., shame, guilt, pride) and certain event contents (e.g., giving a public presentation) are more likely to be remembered from an initial observer-like perspective (e.g., Nigro & Neisser, 1983; Sutin & Robins, 2008). One interesting direction for future studies could be understanding whether the distance, height, and location where the visual perspectives originate depend on the emotional characteristics or content of the event.

Limitations. One limitation of the current study is the small effect size in the analyses in which the AM ratings were averaged within each participant. Compared to prior studies, participants in the present study recalled fewer events with a single repetition. In addition to these methodological differences, targeting insignificant or emotionally neutral events might potentially decrease the impact of the shifts in visual perspective on AM characteristics. Investigating these methodological considerations could be an important avenue for future research.

Conclusion

In the present study, I investigated how shifts in visual perspective during retrieval impact AM phenomenology by targeting the AMs initially recalled from an own eyes and an observer-like perspective. Overall, I found that the decrease in emotional intensity due to shifting from an observer-like to an own eyes perspective was predicted by the reduction in vividness, supporting the models explaining the changes in emotionality due to mnemonic alterations (Nørby, 2019). The shifts in perspective also decreased vividness regardless of the direction of the shift, which would align with the idea that an observer-like perspective can be the initial perspective during retrieval (McCarroll 2017; 2018; Nigro & Neisser, 1983) and updating it with an alternative perspective decreases subjective vividness. The current findings highlight the importance of understanding memory-related interventions on recollective experiences, particularly for the incidents in which visual perspective taking facilitates emotional regulation (Powers & LaBar, 2019; Wallace-Hadrill & Kamboj, 2016).

Chapter 4: Visual Perspective Reorients How Autobiographical Memories Are Recollected

Introduction

The retrieval of autobiographical memories (AMs) that were triggered by a specific retrieval cue involves multiple processes, including processing the retrieval cue, searching for a relevant memory, accessing the memory, and elaborating on it (Cabeza & St. Jacques, 2007). Theories focusing on episodic memory argue that how people process retrieval cues influences retrieval success (Rugg & Wilding, 2000). A critical feature of AMs is the visual perspective from which they are remembered (Rubin & Umanath, 2015), and prior findings showed that visual perspectives would serve as important retrieval cues that influence how AMs are remembered (for a review, see St. Jacques, 2023). Specifically, one might adopt an own eyes perspective as visualizing the events through their own eyes or an observer-like perspective as they could see themselves and their surroundings in the event (Nigro & Neisser, 1983) and adopting particular visual perspectives during retrieval is supported by posterior parietal regions (St. Jacques, 2019; 2022). Own eyes versus observer-like memories are recalled more accurately (Marcotti & St. Jacques, 2018), vivid and emotionally intense (e.g., Berntsen & Rubin, 2006; Rice, 2010). Apart from this, AMs remembered with direct retrieval, in which people could access a specific memory without engaging in further cue generation, are associated with own eyes perspectives compared to the events recalled by generative retrieval (Harris et al., 2015), highlighting the impact of visual perspectives on the retrieval processes. However, it is still unknown whether brain regions supporting visual perspective taking are also involved in the pre-retrieval processes in which an own eyes and an observer-like perspective are processed as distinct retrieval cues. Here, I investigate neural mechanisms supporting the pre-retrieval phase in which visual perspective cues are presented prior to event recall and how the processing of visual perspective cues impacts AM retrieval.

A growing number of studies have shown that precuneus and angular gyrus (AG) in the posterior parietal cortex support visual perspective taking during retrieval (e.g., Faul et al., 2020; Iriye & St. Jacques, 2020; St. Jacques et al., 2017; 2018). Earlier theories suggest that precuneus supports mental imagery of the environment from an egocentric perspective (Byrne et al., 2007; Cavanna & Trimble, 2006). In line with this, Hebscher et al. (2018) found that remembering AMs from an egocentric perspective is associated with larger precuneus volume (but see Grol et al., 2017). Moreover, subregions within precuneus (i.e., 7A, 7M, 7P) are responsive to specific task demands (Scheperjans et al., 2008). For example, evidence from human and macaque monkeys indicates that the medial extension of the posterior precuneus (7M) has greater resting state functional connectivity (RSFC) with the visual cortex, which potentially supports visual imagery (Kosslyn & Thompson, 2003), whereas a more central area (7P) has greater RSFC with the prefrontal cortex and inferior parietal lobule (IPL), including AG, integrating multisensory information during retrieval (Margulies et al., 2009). Importantly, studies investigating the role of precuneus on visual perspective showed that it tracks the change in emotionality related to perspective taking. For example, St. Jacques and colleagues (2017) asked participants to shift from an own eyes to an observer-like perspective during AM retrieval. They found that the decrease in emotional intensity due to shifting was predicted by precuneus activation. Higher precuneus involvement during shifting was related to a greater decrease in emotional intensity in an observer-like perspective. This suggests that precuneus is involved in perspective taking and monitors the change in AM characteristics during retrieval.

Turning to AG, recent models have emphasized its role in binding multisensory information during episodic retrieval (e.g., Bonnici et al., 2016; Ramanan et al., 2018) as well as remembering from alternative visual perspectives (St. Jacques, 2019; 2022). For example, virtual lesions in AG reduced the number of remembered episodic details in AMs, and participants reported fewer AMs from an own eyes perspective (Bonnici et al., 2018; see also Berryhill et al., 2007; Yazar et al., 2017). AG activation is also positively related to subjective vividness while retrieving episodic stimuli that require integrating multimodal information (Bonnici et al., 2016). This is particularly important given that adopting different visual perspectives would require people to flexibly integrate scene details in various ways and impact how they recall AMs, for example, own eyes perspectives are related to higher vividness than observer-like perspectives (Akhtar et al., 2017; Berntsen & Rubin, 2006; Butler et al., 2016). Recent studies have shown that subjective vividness during AM recall was particularly supported by posterior AG (PGp; Humphreys et al., 2024). Together, these findings underpin the AG contribution to visual perspective taking and subjective reliving during AM recall (Simons et al., 2008; Yazar et al., 2017).

Few studies have particularly focused on the role of precuneus and AG on visual perspective. For example, St. Jacques et al. (2018) showed that the precuneus and AG support the shifts in visual perspective when shifting from an own eyes to an observer-like perspective and vice versa. However, other research has also shown that the recruitment of precuneus and AG differentiates across alternative perspectives. For instance, Iriye and St. Jacques (2020) reported that the neural recruitment in AM network that associated with own eyes and observer-like perspectives peaked around 10-12.5 s after the onset of retrieval; however, it was recruited more strongly for own eyes than observer-like perspectives. Critically, they also demonstrated stronger functional connectivity between the hippocampus and posterior parietal network, including precuneus and AG, during earlier phases of AM retrieval from an observer-like perspective. Yet, for an own eyes perspective, this connectivity was greater during later phases of retrieval, indicating a dissociative pattern in the posterior parietal cortex due to visual perspective (also see Faul et al., 2020).

In the previous studies, however, visual perspective cues were presented together with the AM title (e.g., Faul et al., 2020; Iriye & St. Jacques, 2020; St. Jacques et al., 2017; 2018). Thus, participants processed the visual perspective cue while remembering AM, which precludes teasing apart from processing the visual perspective cue to AM retrieval. That is, in order to examine a pre-retrieval phase in which own eyes and observer-like cues are processed, one needs to separate it from the AM content. In this way, we can examine visual perspectives as distinct retrieval orientations separated from AM retrieval. Retrieval orientation refers to the biases in processing various retrieval cues (Rugg & Wilding, 2000). Prior studies have specifically targeted the modality changes between retrieval cues (e.g., verbal versus visual) and revealed that these changes bias memory performance and supporting brain mechanisms (e.g., Herron & Rugg, 2003; Morcom & Rugg, 2012). In the AM literature, only one study investigated retrieval orientation. Specifically, Gurguryan and Sheldon (2019) biased AM retrieval by presenting different retrieval cues. Following an initial AM recall, the retrieval was (re)oriented by the "contextual" or "conceptual" cues such that participants thought about the space or theme details of the event, respectively. Researchers revealed that reorienting AM retrieval with contextual versus conceptual cues influenced neural recruitment. In particular, posterior parietal regions, posterior cingulate cortex (PCC) -extending to precuneus and IPL- and medial temporal lobe were more engaged in contextual remembering. However, conceptual reorientation showed more frontal cortex and lateral temporal engagement, reflecting a bias due to distinct retrieval cues. These findings are critical given that they indicate various retrieval manipulations through altering the retrieval orientation can determine how AMs are retrieved. Similarly, the changes in neural recruitment and AM performance due to adopting a particular visual perspective could be related to how visual perspective cues are processed prior to event retrieval.

The current study investigated how visual perspective cues influence AM recall, thereby engaging in a pre-retrieval phase before the AM retrieval. Participants were asked to recall AMs in fMRI scanning, and the retrieval was oriented by own eyes or observer visual perspective cues or neither (i.e., no visual perspective cue). A cue-probe approach was employed such that retrieval cues were presented separately from AM to tease apart the neural recruitment during the pre-retrieval (cue) and AM retrieval (probe) phase (e.g., Ollinger et al., 2001; Shulman et al., 1999). I predict that regions supporting visual perspective, precuneus, and AG (Iriye & St. Jacques, 2020; St. Jacques et al., 2018) would be commonly activated when there is a retrieval orientation in the cue phase as a preparation to adopt a particular perspective and locate oneself in the scene (Rubin & Umanath, 2015). Additionally, I expect greater involvement of these regions during the probe phase following a retrieval orientation due to visual perspective (St. Jacques, 2019) compared to AM retrieval which was not followed by a particular visual perspective cue. Finally, consistent with prior literature, I expect behavioral changes in subjective ratings due to adopting particular visual perspectives in AM recall. Specifically, I predict higher vividness and emotional intensity when remembering events from an own eyes, compared to an observer-like perspective (Akhtar et al., 2017; Berntsen & Rubin, 2006).

Methods

Participants

Thirty-one right-handed, healthy young adults between the ages of 18 and 30 were recruited for the study. The recruitment was restricted to individuals with no history of neurological or psychiatric disorders, who are not taking any medications affecting mood or cognition, and who have normal or corrected-to-normal vision. Data from one participant were excluded due to providing missing responses to 18% of the ratings during fMRI scanning. Thus, the final sample included 30 participants (20 females, $M_{age} = 23.00$, $SD = 3.48$).

Procedure

The study involved two sessions, separated by one week. Session 1 (AM generation) took place in the lab. Participants were asked to recall 90 specific AMs that occurred five years ago or older. I asked participants to remember remote events as I aimed to capture more variability in the initial visual perspectives adopted (Rice & Rubin, 2009). For each event, participants were asked to provide a brief title and the year when the event occurred and rate the events in vividness, emotional intensity, positive valence, own eyes, and observer-like perspectives on a 5-point scale (1=low; 5=high). Then, they were asked to fill out the demographics form. Among 90 events recalled in Session 1, I selected 72 to randomly assign to Own Eyes, Observer, or Retrieve conditions in Session 2 (see below for details), such that the initial event ratings and remoteness did not differ across conditions.

Session 2 (fMRI scanning) took place approximately one week later ($M = 7.35$ days, $SD = 1.14$). Each trial during the scanning consisted of a cue and a probe phase. In the cue phase (4 s), participants were presented with the retrieval cue, indicating whether the particular condition is “Own Eyes”, “Observer”, or “Retrieve”. In the Own Eyes condition, participants were asked to remember the event from an own eyes perspective, by visualizing it through their own eyes. In the Observer condition, participants were asked to remember the event from an observer-like perspective, as if they could see themselves and their surroundings. Finally, in the Retrieve condition, participants were asked to remember the same event again from their spontaneous perspective. This last condition was included as a control condition in which there was no retrieval orientation for visual perspective, but it required participants to remember the event in detail. The cue phase was followed by the probe phase (9 s), in which the event titles that participants generated in Session 1 were presented. Participants were asked to recall the event by adopting the visual perspective presented (or retrieve as it is) in the cue phase. Then, they rated each event in emotional intensity, vividness, and perspective maintenance (i.e., how well they maintained the given perspective in that specific trial) on a 5-point scale (1=low to 5=high; each rating was presented for 3 seconds). The order of the retrieval cues was counterbalanced for each participant and each event was recalled only one time. Before scanning, participants were given a training task with the event titles that were not shown during scanning. The fMRI scanning consisted of 6 functional runs with a total of 18 trials in each run, of which 12 were full trials (i.e., cue phase followed by Probe phase and ratings), and 6 were partial trials (i.e., cue phase only). Given that there was always the same time interval between the cue and probe phase onsets in full trials, partial trials were included to separate the cue phase blood oxygen level-dependent (BOLD) response from the probe phase BOLD response (e.g., Corbetta et al., 2002; Wheeler et al., 2006). Trials were separated by an active baseline involving left/right decisions to eliminate the resting state activity between trials and better contrast the recruitment in cue and probe phases (Stark & Squire, 2001), which were equally spaced across a variable length (2 to 10 seconds) and distributed exponentially such that shorter inter-trial intervals occurred more frequently than longer ones (see Figure 4.1).

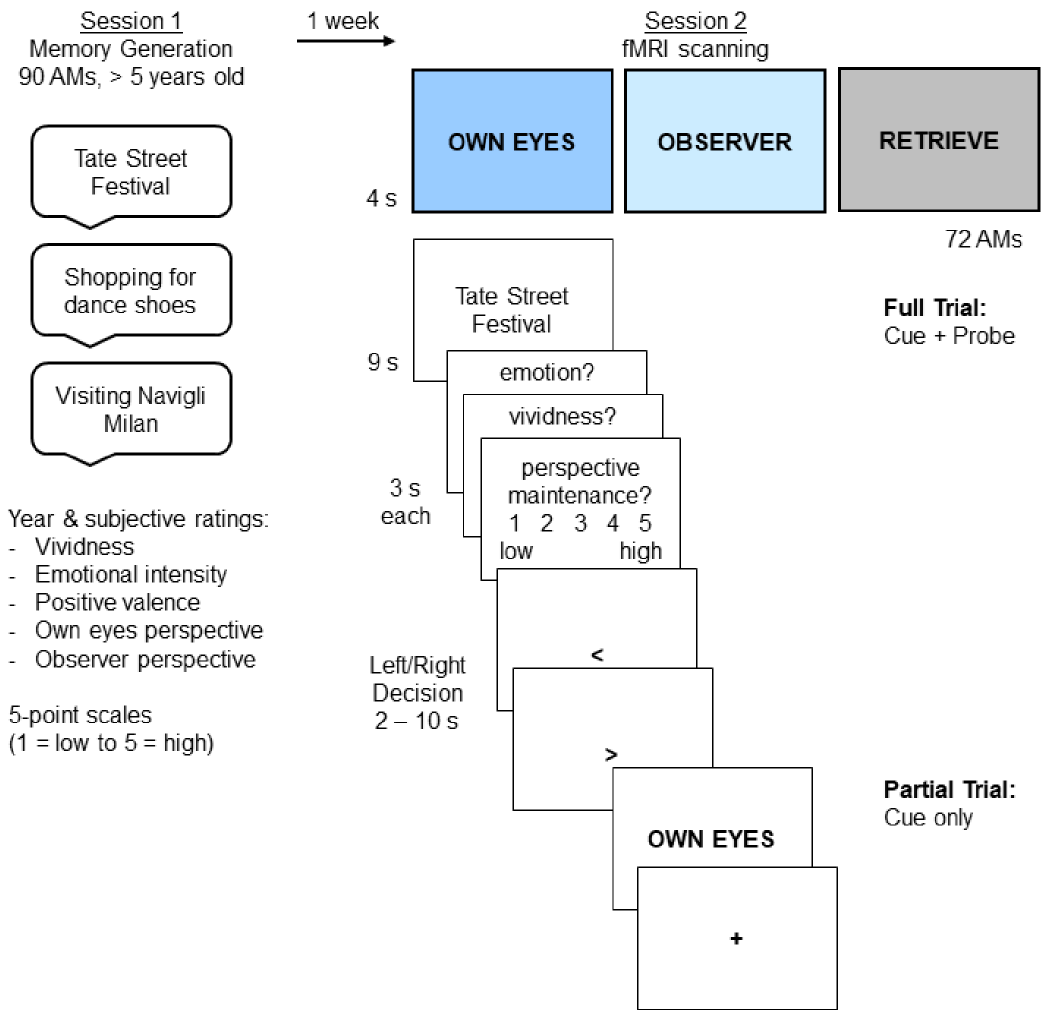


Figure 4.1. Study design. In Session 1, participants generated 90 AMs that occurred 5 years ago or older and provided a brief title, date, and subjective ratings for each event. Seventy-two of the events recalled in Session 1 were selected for Session 2 and randomly assigned to Own Eyes, Observer, and Retrieve conditions, such that event remoteness and subjective ratings would match across conditions. In Session 2, participants were asked to undergo fMRI scanning while being presented with full or partial trials. In full trials, they were presented with a cue (Own Eyes, Observer, Retrieve) and probe (AM title), as they were asked to remember selected AMs by adopting an own eyes or an observer-like perspective or retrieve them as they are. Following

each retrieval, participants gave subjective ratings in emotional intensity, vividness and perspective maintenance. In partial trials, they were presented with the cue only, without probes.

fMRI Data Acquisition and Pre-processing

Functional and structural images were acquired on a 3T Siemens Magnetom Prisma Scanner in the Peter S. Allen MR Research Centre at the University of Alberta Hospital. A desktop computer running PsychoPy (2022.2.2) software (Peirce et al., 2019) controlled stimulus display via a projector, which projects the stimuli onto a screen at the head of the scanner. Participants viewed the screen through a mirror attached to the head coil of the scanner. Cushions were used to minimize head and body movements, and earplugs were provided to attenuate the scanner noise. Participants were provided a 5-button box under their right hand to give their responses.

Anatomical images were taken using a high-resolution three-dimensional magnetization-prepared rapid gradient echo sequence (MPRAGE; 208 sagittal slices per slab, echo time [TE]=2.37 ms, repetition time [TR]=1800 ms, inversion time [TI] = 900 ms, flip angle=8 degrees, voxel size=0.9x0.9x0.9 mm). Functional images were acquired using T2* gradient echo, echoplanar imaging (EPI) sequence sensitive to BOLD contrast (TE=30 ms, TR=2000 ms, TI=900 ms, flip angle=80 degrees, voxel size=2.2x2.2x2.2 mm). Whole-brain coverage was obtained with 64 contiguous slices acquired in the coronal orientation.

Imaging data were preprocessed and statistically analyzed using SPM12 (Wellcome Department of Imaging Neuroscience, London, UK) using standard methods described in previous studies (e.g., Iriye & St. Jacques, 2020; St. Jacques et al., 2018). The data were preprocessed to remove noise and artifacts, which included slice-timing correction, realigning, co-registration to align anatomical and functional images for each participant, segmentation, normalizing for Montreal Neurological Institute (MNI) template, and smoothing using a Gaussian kernel (5 mm full-width at half maximum [FWHM]).

Behavioral Data Analysis

Jamovi (2.3.28) was used for all statistical analyses. Unless otherwise stated, all statistical analyses were run using a repeated-measures ANOVA with Retrieval Cue (Own Eyes, Observer, Retrieve) as the within-subjects factor. Separate analyses will be conducted for emotional intensity, vividness, and perspective maintenance ratings. Greenhouse-Geisser correction was reported when the assumption of sphericity was violated. Holm statistics were reported for the pairwise comparisons.

fMRI Analysis

A general linear model (GLM) approach was used to include regressors at the onset of each cue and probes. The primary regressors, cue and probe, were modeled with a canonical hemodynamic response function (HRF) with a duration of 4 s (2 TR) and 9 s (4.5 TR), respectively. In the GLM, cue phases were modeled from full and partial trials, whereas probes were modeled only from full trials due to the structure of the experimental design. An additional regressor for ratings was included at the onset of the first rating with a duration of 9 s (4.5 TR; total duration of three ratings), which was not of interest in the current study. In the whole-brain analyses, the primary voxel threshold was $p = .001$, and the minimum cluster-extent threshold was k = 60 as a more stringent threshold (Woo et al., 2014).

For the cue phase, after identifying the isolated regions for specific conditions and contrasts, a conjunction analysis was performed to identify commonly activated regions in the Own Eyes and Observer cues, in contrast to the Retrieve cue, using an ANOVA approach. An additional paired sample t-test was run to separately compare Own Eyes and Observer cues to the Retrieve cue and examine the difference between these two comparisons as follows:

i. (Own Eyes > Retrieve) > (Observer > Retrieve)

ii. (Observer > Retrieve) > (Own Eyes > Retrieve).

From here on, to be more clear within the text, I will refer to these comparisons as

i. Own Eyes > Observer and Retrieve

ii. Observer > Own Eyes and Retrieve, respectively.

Identical steps were employed to examine the probe phase.

Region of Interest (ROI) Analysis

I conducted a series of ROI analyses to examine the activation in the precuneus and AG due to retrieval orientation. First, I ran ROIs by averaging the percent signal change within 6 mm spheres centered on the peak voxels obtained from the whole-brain analyses. Second, I ran ROIs by extracting the anatomical maps of 7A, 7M, and 7P subregions within precuneus (Margulies et al., 2009) and PGa and PGp subregions within AG (Caspers et al., 2006). The anatomical maps of the targeted regions were extracted from the JuBrain Anatomy Toolbox (i.e., SPM Anatomy Toolbox Version 3.0; Eickhoff et al., 2005). Percent signal change was calculated using MarsBar (Brett et al., 2002). I focused on the left and right hemispheres for the subregions of AG and precuneus. To examine the difference in percent signal change as a function of region and condition, I conducted separate repeated measure ANOVAs for the cue and probe phases. Specifically, a 2 (Region: PGa, PGp) x 3 (Retrieval Orientation: Own Eyes, Observer, Retrieve) repeated measure ANOVA was conducted for left and right AG, and a 3 (Region: 7A, 7M, 7P) x 3 (Retrieval Orientation: Own Eyes, Observer, Retrieve) repeated measure ANOVA was run for left and right precuneus. For pairwise comparisons, simple effects were examined with repeated measure ANOVAs to investigate the predicted direction of the effect.

Results

Behavioral Results

I first ran separate repeated measure ANOVAs for each rating from Session 1 to investigate whether there was a significant difference in the initial AM ratings across conditions. As expected, there was no significant difference in Session 1 ratings across conditions (for means and SDs, see Table 4.1).

Turning to Session 2 ratings, I conducted separate repeated measure ANOVAs to investigate whether there was a difference in vividness, emotional intensity, and perspective maintenance collected during fMRI scanning as a function of retrieval orientation (for means and SDs, see Table 4.1). The results did not reach a significant difference in vividness, F (2, 58) = 2.97, p = .059, η_p^2 = .093, or emotional intensity, F (2, 58) = 1.86, p = .164, η_p^2 = .060. However, there was a significant difference in perspective maintenance as a function of retrieval orientation, F (1.32, 38.19) = 6.74, p = .008, η_p^2 = .189, such that participants were better able to maintain their perspective in the Retrieve (i.e., their spontaneous perspective), compared to the Observer condition (p = .003; see Figure 4.2). There was no significant difference in reaction time (RT) of Session 2 ratings across the conditions (all ps > .110).

Table 4.1.

Descriptive statistics in Session 1 and Session 2

	Own Eyes	Observer	Retrieve
Session 1			
Memory Age (years)	9.92 (1.77)	9.89 (1.89)	9.88 (1.92)
Vividness	3.65 (.56)	3.65 (.55)	3.61 (.54)
Emotional Intensity	3.33 (.54)	3.28 (.58)	3.28 (.56)
Positive Valence	3.41 (.38)	3.35 (.36)	3.39 (.44)
Own Eyes Perspective	3.77 (.73)	3.76 (.73)	3.80 (.72)
Observer Perspective	2.18 (.70)	2.18 (.71)	2.15 (.70)
Session 2			
Vividness	3.53 (.61)	3.49 (.59)	3.59 (.55)
Vividness RT (s)	1.26 (.25)	1.26 (.26)	1.21 (.25)
Emotional Intensity	3.31 (.66)	3.25 (.70)	3.33 (.63)
Emotional Intensity RT (s)	1.33 (.31)	1.34 (.27)	1.31 (.22)
Perspective Maintenance	3.74 (.69)	3.42 (.61)	3.86 (.60)
Perspective Maintenance RT (s)	1.18 (.33)	1.23 (.33)	1.24 (.34)

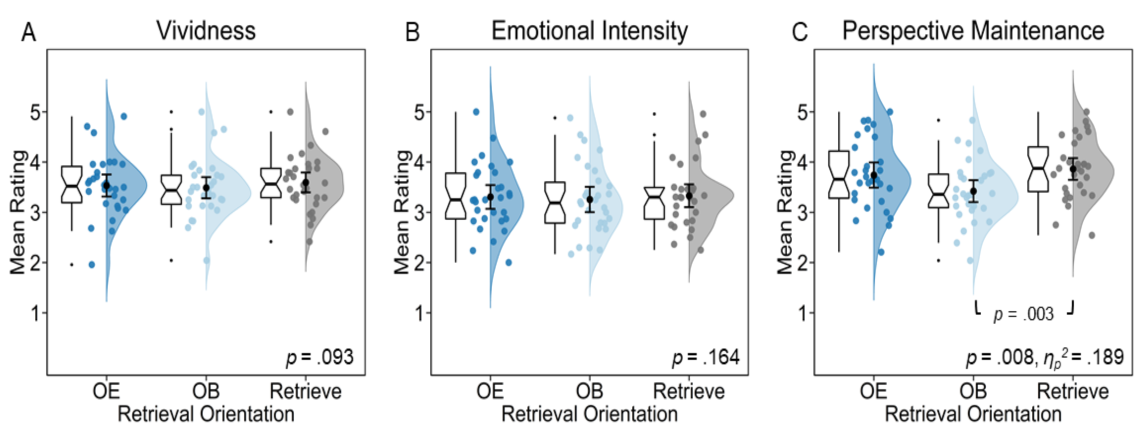


Figure 4.2. Mean (A) vividness, (B) emotional intensity, and (C) perspective maintenance ratings in Own Eyes, Observer, and Retrieve retrieval orientation conditions in Session 2. Dark blue, light blue, and gray dots represent average scores for individual participants in the Own

Eyes, Observer, and Retrieve conditions, respectively. Black dots represent the mean rating in each condition, and error bars depict the standard error of the mean. Results showed no significant difference in vividness and emotional intensity as a function of retrieval orientation. However, average perspective maintenance was significantly higher in the Retrieve than Observer condition. OE = Own Eyes; OB = Observer.

fMRI Results

Whole-brain analyses for the cue phase. In line with the main goal of the present study, I aimed to isolate the regions contributing to retrieval orientation. Thus, I conducted a whole-brain analysis by creating a conjunction to identify the regions *commonly* activated due to retrieval orientation in the cue phase for Own Eyes and Observer, compared to the Retrieve condition (i.e., Cue: Own Eyes > Retrieve ∩ Cue: Observer > Retrieve). The results revealed there was an overlap in left AG when cued by Own Eyes and Observer perspectives compared to the Retrieve condition (see Table 4.2 and Figure 4.3.A). This finding aligns with previous research highlighting the role of AG while adopting particular visual perspectives during AM retrieval (e.g., Iriye & St. Jacques, 2020; St. Jacques et al., 2017). An additional paired t-test was conducted to identify the regions showing *greater* activity during the Own Eyes, compared to Observer and Retrieve cues (Own Eyes > Observer and Retrieve), and the Observer, compared to Own Eyes and Retrieve cues (Observer > Own Eyes and Retrieve). Here I found no greater activation for Own Eyes, compared to the Observer and Retrieve cues. However, there was greater recruitment in the left and right V2 regions (BA18) for Observer, compared to the Own Eyes and Retrieve cues (see Table 4.3.).

Table 4.2.

Regions Commonly Activated in the Conjunction Analysis for the Cue and Probe Phases (Own Eyes > Retrieve ∩ Observer > Retrieve)

Region	Voxels	BA	t	MNI peak x	MNI peak y	MNI peak z
Cue						
V3	175	19	4.64	-42	-76	22
		19	3.76	-40	-80	28
AG		39	4.16	-48	-70	18
		39	4.18	-46	-70	22
Probe						
no suprathreshold clusters						

MNI = Montreal Neurological Institute; BA = Brodmann's Area;
AG = Angular Gyrus

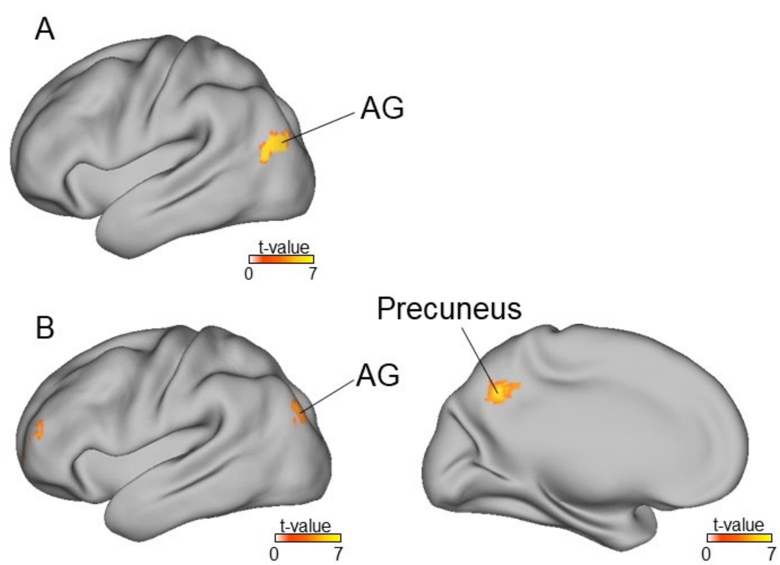


Figure 4.3. (A) Whole-brain analyses for the Cue phase, showing the common AG activation for the Own Eyes and Observer cues, compared to the Retrieve cue. (B) Whole-brain analyses for the Probe phase, showing greater AG and precuneus activation when remembering AMs from an Observer, compared to an Own Eyes perspective and the Retrieve condition.

Whole-brain analyses for the probe phase. Similar to the cue phase, I conducted a whole-brain analysis by creating a conjunction to identify the regions *commonly* activated while remembering AMs from an own eyes and observer-like perspective, compared to the Retrieve condition (i.e., Probe: Own Eyes > Retrieve ∩ Probe: Observer > Retrieve). There were no overlapping regions in the Own Eyes and Observer versus Retrieve condition.

I also conducted a paired sample t-test to examine whether neural recruitment differentiated as a function of remembering AMs with retrieval orientations. The results showed that there was greater recruitment in left PCC, precuneus, AG, anterior prefrontal cortex (PFC), V3, and dorsolateral PFC when retrieving AMs in the Observer, compared to Own Eyes and Retrieve conditions (Observer > Own Eyes and Retrieve; Grol et al., 2017; Iriye & St. Jacques, 2020; St. Jacques et al., 2017; 2018; see Figure 4.3.B, Table 4.4.).

Table 4.3.
Results of the Paired Samples T-test for the Cue Phase

				MNI peak		
Region	Voxels	BA	t	x	y	z
(Own Eyes > Retrieve) > (Observer > Retrieve)						
no suprathreshold clusters						
(Observer > Retrieve) > (Own Eyes > Retrieve)						
V2	411	18	6.53	26	-92	2
		18	5.12	32	-94	8
		18	4.33	18	-88	-6
		18	3.86	34	-90	-8
	299	18	5.47	-16	-104	-6
		18	5.46	-26	-100	4
		18	5.37	-20	-98	-6
		18	5.24	-28	-98	-6
		18	4.27	-28	-92	-12
		18	4.07	-16	-104	4

MNI = Montreal Neurological Institute; BA = Brodmann's Area

Table 4.4.
Results of the Paired Samples T-test for the Probe Phase

				MNI peak		
Region	Voxels	BA	t	x	y	z
(Own Eyes > Retrieve) > (Observer > Retrieve)						
no suprathreshold clusters						
(Observer > Retrieve) > (Own Eyes > Retrieve)						
PCC	265	31	6.59	-8	-60	44
		31	4.32	0	-54	40
		31	4.21	-6	-52	44
Precuneus		7	3.59	0	-70	50
		7	3.53	6	-68	44
anterior PFC	252	10	5.53	36	52	-4
		10	4.69	24	48	2
		10	4.3	46	50	-4
		10	4.12	26	60	-6
		10	3.58	42	56	2
	160	10	5.13	-32	52	8
		10	4.91	-30	52	-4
		10	4.5	-36	50	10
		10	4.33	-30	60	-2
		10	4.12	-38	50	16
dlPFC		46	3.77	-32	44	8
AG	95	39	4.93	-38	-80	38
		39	4.27	-36	-78	30
	63	39	4.59	-46	-60	24
		39	4.38	-48	-58	20
		39	3.51	-38	-60	26
V3		19	4.36	-40	-74	26
		19	4.15	-40	-82	30

MNI = Montreal Neurological Institute; BA = Brodmann's Area; dlPCC = Dorsolateral Posterior Cingulate Cortex; dlPFC = Dorsolateral Prefrontal Cortex; AG = Angular Gyrus

ROI analyses for the cue phase. I first ran an ROI analysis centered on the peak coordinate of the common left AG recruitment for Own Eyes and Observer cues versus Retrieve cue (-48, -70, 18). A repeated measures ANOVA revealed that there was a main effect of retrieval orientation, F (2, 58) = 18.40, $p < .001$, $\eta_p^2 = .388$. Pairwise comparisons showed that there was a greater percent signal change in the Own Eyes ($M = .03$, $SD = .10$) and Observer (M

= .02, *SD* = .10) conditions compared to the Retrieve condition (*M* = -.03, *SD* = .10, both *p*s < .001; see Figure 4.4.A.).

Next, I conducted an ROI analysis to target the subregions of left and right AG (PGa and PGp) and left precuneus (7A, 7M, 7P) to examine the percent signal change as a function of retrieval orientation during the cue phase. For the left AG, a 2 (Region: PGa, PGp) x 3 (Retrieval Orientation: Own Eyes, Observer, Retrieve) repeated measure ANOVA showed no significant main effect of region, F (1, 29) = .02, p = .899, η_p^2 = .001, or retrieval orientation, F (2, 58) = 1.39, p = .257, η_p^2 = .046. However, there was a significant region x retrieval orientation interaction, F (2, 58) = 5.63, p = .006, η_p^2 = .163. A follow-up test to investigate simple effects showed that there was no significant difference between conditions in left PGa recruitment, F (2, 58) = 1.16, p = .320, η_p^2 = .038. However, there was a significant difference in left PGp between conditions, F (2, 58) = 6.66, p = .002, η_p^2 = .187, reflecting greater left PGp recruitment in the Own Eyes (*M* = .03, *SD* = .07, p = .019) and Observer (*M* = .03, *SD* = .06, p = .007) conditions compared to the Retrieve condition (*M* = -.01, *SD* = .07; see Figure 4.5.A.). For the right AG, a 2 (Region: PGa, PGp) x 3 (Retrieval Orientation: Own Eyes, Observer, Retrieve) repeated measure ANOVA showed a significant main effect of region, F (1, 29) = 14.64, p < .001, η_p^2 = .335, reflecting higher right PGp (*M* = .02, *SD* = .07) than right PGa recruitment (*M* = -.03, *SD* = .06). There was no significant main effect of retrieval orientation, F (2, 58) = .35, p = .705, η_p^2 = .012. Although there was a significant region and retrieval orientation interaction, F (2, 58) = 6.19, p = .004, η_p^2 = .176, pairwise comparisons did not survive following the simple effects analyses for right PGa, F (2, 58) = .96, p = .388, η_p^2 = .032, or right PGp, F (2, 58) = 1.18, p = .316, η_p^2 = .039.

Turning to the left precuneus, a 3 (Region: 7A, 7M, 7P) x 3 (Retrieval Orientation: Own Eyes, Observer, Retrieve) repeated measure ANOVA showed that there was a significant main effect of retrieval orientation, F (2, 58) = 3.29, p = .044, η_p^2 = .102, reflecting greater left precuneus recruitment in the Own Eyes (M = .05, SD = .10) than Retrieve condition (M = .02, SD = .10, p = .042). There was also a significant region main effect, F (2, 58) = 53.27, p < .001, η_p^2 = .648, indicating greater left 7M recruitment (M = .17, SD = .14) compared to left 7P (M = .01, SD = .15) and left 7A (M = -.08, SD = .09), and greater left 7P than left 7A (all ps < .001). However, there was no significant interaction, F (4, 116) = 2.26, p = .067, η_p^2 = .072. Finally, for the right precuneus, a 3 (Region: 7A, 7M, 7P) x 3 (Retrieval Orientation: Own Eyes, Observer, Retrieve) repeated measure ANOVA showed a significant main effect of retrieval orientation, F (2, 58) = 5.11, p = .009, η_p^2 = .150, reflecting greater right precuneus recruitment in the Own Eyes (M = .10, SD = .12) than Retrieve condition (M = .05, SD = .10, p = .004). There was also a significant region main effect, F (2, 58) = 44.31, p < .001, η_p^2 = .604, indicating greater right 7M recruitment (M = .25, SD = .19) compared to right 7P (M = .01, SD = .14) and right 7A (M = -.05, SD = .11), both ps < .001, and greater right 7P than right 7A (p = .024). However, there was no significant interaction, F (4, 116) = 1.70, p = .155, η_p^2 = .055.

ROI analyses for the probe phase. I first conducted ROI analyses centered on the peak coordinate of left AG (-38, 80, -38) and left precuneus (-0, -70, 50) recruitment in the 'Observer > Own Eyes and Retrieve' contrast. For the left AG, a repeated measure ANOVA revealed that there was a main effect of retrieval orientation, F (2, 46.03) = 11.20, p < .001, η_p^2 = .279. Post-hoc comparisons revealed a greater percent signal change in the Observer (M = .52, SD = .44) than in Own Eyes (M = .44, SD = .42) and Retrieve conditions (M = .39, SD = .41, both ps < .001; see Figure 4.4.B.). For the left precuneus, a repeated measures ANOVA similarly revealed a significant main effect of retrieval orientation, F (2, 58) = 5.89, p = .005, η_p^2 = .169. Post-hoc comparisons showed greater percent signal change in the Observer (M = .21, SD = .47) than in Own Eyes (M = .09, SD = .41; p = .010) and Retrieve conditions (M = .10, SD = .37; p = .042; see Figure 4.4.B).

Next, I conducted a series of ROI analyses to target PGa and PGp subregions in left and right AG and 7A, 7M, and 7P subregions in left and right precuneus to investigate whether percent signal change differs across conditions during the probe phase. For the left AG, a 2 (Region: PGa, PGp) x 3 (Retrieval Orientation: Own Eyes, Observer, Retrieve) repeated measure ANOVA showed a significant region main effect, F (1, 29) = 7.93, p = .009, η_p^2 = .215, showing greater left PGp activation (M = .31, SD = .25) than left PGa (M = .19, SD = .17). There was also a significant main effect of retrieval orientation, F (2, 58) = 3.44, p = .039, η_p^2 = .106. However, none of the pairwise comparisons survived after the post-hoc tests (all ps > .052). These effects were qualified by a significant region and retrieval orientation interaction, F (2, 58) = 8.24, p < .001, η_p^2 = .221. Simple effects showed that there was no difference in left PGa recruitment between conditions, F (2, 58) = .11, p = .895, η_p^2 = .004. However, there was a significant difference in left PGp activation between conditions, F (2, 58) = 9.43, p < .001, η_p^2 = .245, reflecting greater left PGp recruitment in the Observer (M = .36, SD = .27) than Own Eyes (M = .30, SD = .25, p < .001) and Retrieve (M = .28, SD = .26, p = .001) conditions (see Figure 4.5.B). For the right AG, a 2 (Region: PGa, PGp) x 3 (Retrieval Orientation: Own Eyes, Observer, Retrieve) repeated measure ANOVA showed a significant region main effect, F (1, 29) = 72.72, p < .001, η_p^2 = .715, showing greater right PGp activation (M = .16, SD = .17) than right PGa (M = -.08, SD = .16). There was also a significant main effect of retrieval orientation, F (2, 58) = 6.85, p = .002, η_p^2 = .191, reflecting greater right AG activation in the Observer condition (M =

.07, *SD* = .16) than in the Own Eyes (*M* = .03, *SD* = .15, $p = .005$) and Retrieve (*M* = .01, *SD* = .16, $p = .012$) conditions. However, there was no significant interaction, F (2, 58) = .35, $p = .710$, $\eta_p^2 = .012$.

Turning to the left precuneus, a 3 (Region: 7A, 7M, 7P) x 3 (Retrieval Orientation: Own Eyes, Observer, Retrieve) repeated measure ANOVA showed a significant main effect of region, F (2, 58) = 22.40, $p < .001$, $\eta_p^2 = .436$, indicating greater left 7M activation (*M* = .31, *SD* = .34) than 7P (*M* = .20, *SD* = .36, $p = .049$) and 7A (*M* = -.06, *SD* = .22, $p < .001$), and greater left 7P than left 7A ($p < .001$). There was also a significant main effect of retrieval orientation, F (2, 58) = 5.22, $p = .008$, $\eta_p^2 = .153$, suggesting greater left precuneus recruitment in the Observer (*M* = .19, *SD* = .28) than Own Eyes (*M* = .13, *SD* = .27) and the Retrieve conditions (*M* = .13, *SD* = .24), both *p*s = .032. These effects were qualified by a significant region and retrieval orientation interaction, F (4, 116) = 3.49, $p = .010$, $\eta_p^2 = .107$. Simple effects showed that there was a significant difference between conditions in left 7P activation, F (2, 58) = 7.17, $p = .002$, $\eta_p^2 = .198$. Specifically, there was greater left 7P recruitment in the Observer (*M* = .27, *SD* = .39) than in the Own Eyes (*M* = .18, *SD* = .37, $p = .021$) and Retrieve conditions (*M* = .16, *SD* = .33, $p = .009$). For the left 7A, there was also a main effect of retrieval orientation, F (2, 58) = 3.65, $p = .032$, $\eta_p^2 = .112$. However, no pairwise comparison was significant following the post-hoc test (all *p*s > .054). I also did not find a significant difference between conditions for left 7M, F (2, 58) = 2.20, $p = .120$, $\eta_p^2 = .071$ (see Figure 4.5.C.), reflecting that the probe effects were mostly driven by the differences in left 7P. Finally, for the right precuneus, a 3 (Region: 7A, 7M, 7P) x 3 (Retrieval Orientation: Own Eyes, Observer, Retrieve) ANOVA showed a significant main effect of region, F (2, 58) = 42.86, $p < .001$, $\eta_p^2 = .596$, reflecting greater right 7M recruitment (*M* = .46, *SD* = .25) than right 7P (*M* = -.05, *SD* = .30, $p < .001$) and right 7A (*M* = -.19, *SD* = .24, $p <$

.001) recruitment, and also greater right 7P than right 7A, $p = .009$. However, there was no significant main effect of retrieval orientation, $F\ (2, 58) = 1.72$, $p = .188$, $\eta_p^2 = .056$, or interaction, $F\ (4, 116) = 1.63$, $p = .172$, $\eta_p^2 = .053$.

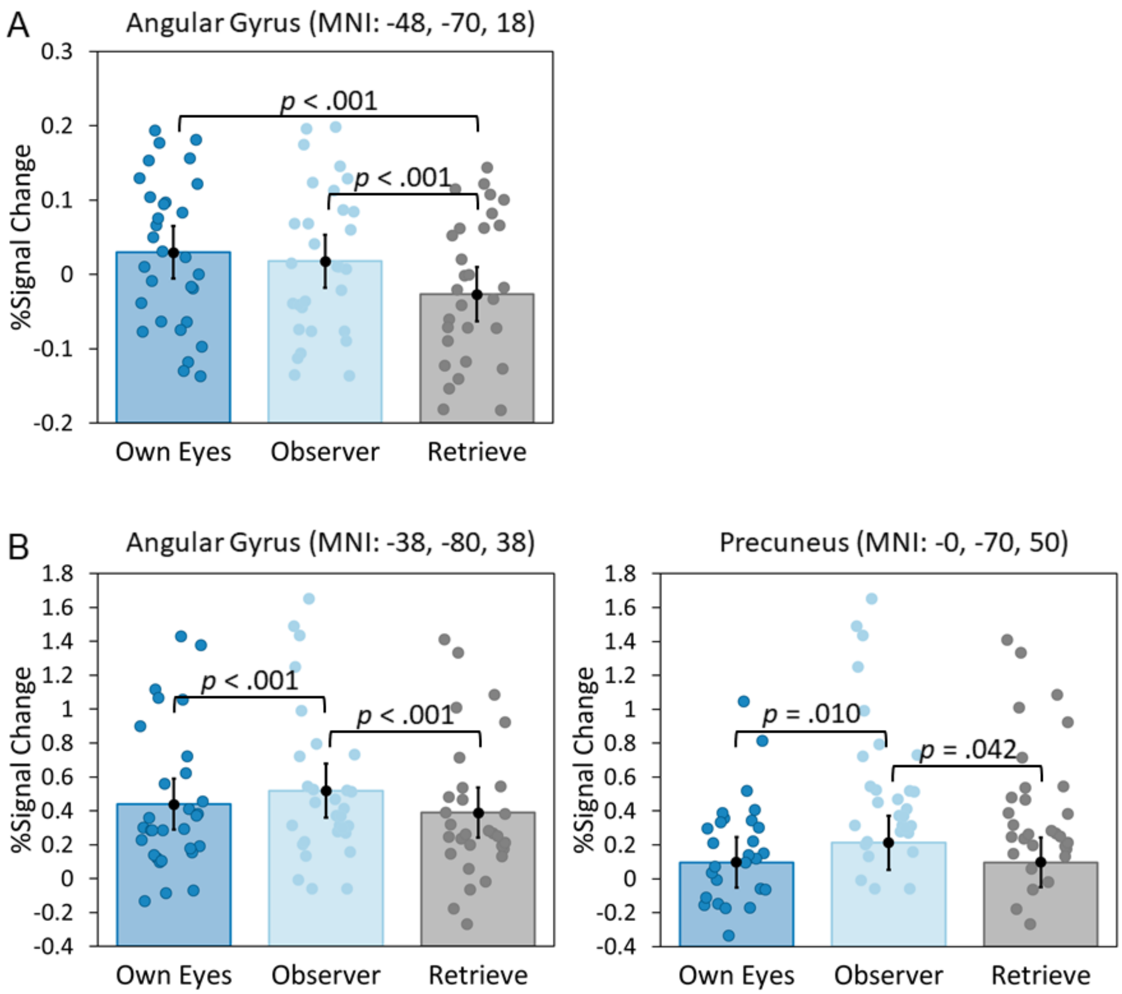


Figure 4.4. The percent signal change in the ROIs centered on the peak voxels of the (A) Cue and (B) Probe effects as a function of retrieval orientation. (A) The results showed greater activation for the Own Eyes and Observer than Retrieve cues on the peak voxel in AG (MNI: -48, -70, 18). (B) The results also indicated greater activation when remembering the AMs in the Observer, compared to Own Eyes and Retrieve conditions on the peak voxel in AG (MNI: -38, -80, 38) and precuneus (MNI: -0, -70, 50).

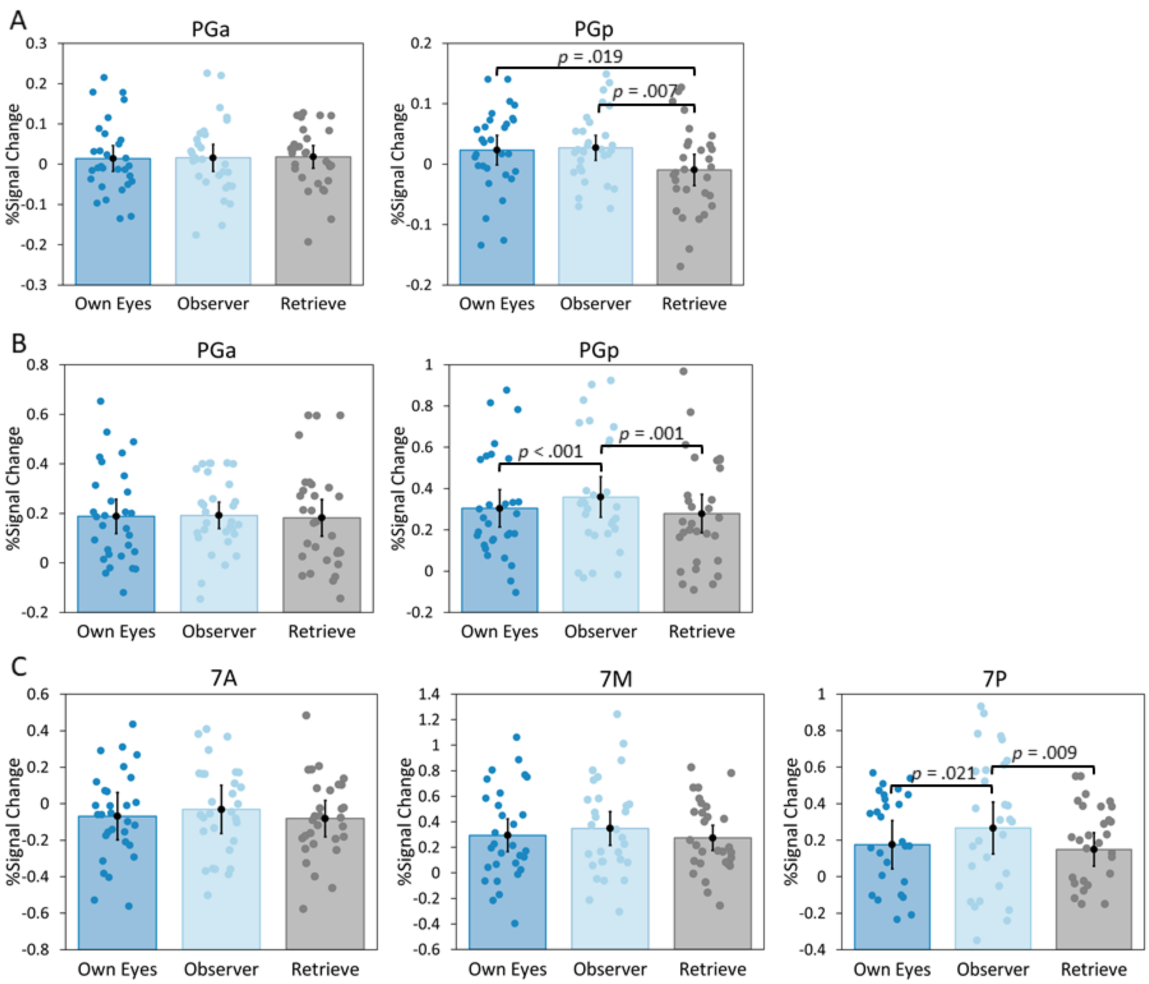


Figure 4.5. The percent signal change in the ROIs extracted from cytoarchitectonic maps as a function of retrieval orientation. (A) The percent signal change in the left AG subregions for the Cue effects. The results showed greater PGp recruitment for the Own eyes and Observer than Retrieve cues. The percent signal change in the (B) left AG and (C) left precuneus subregions for the Probe effects showed greater PGp and 7P recruitment when remembering AMs in the Observer than Own eyes and Retrieve conditions.

Discussion

The current study aimed to investigate the pre-retrieval processes in which visual perspective cues were presented as a particular retrieval orientation. Participants were asked to remember AMs while their retrieval was oriented by an own eyes or observer-like perspective, in contrast to having no visual perspective cue. The findings revealed that presenting participants with an own eyes or observer-like perspective cues commonly recruited the left PGp subregion of AG as a preparatory phase before AM retrieval, compared to presenting with a cue that does not orient the retrieval with visual perspective. However, there was also greater involvement of left PGp and precuneus, mainly driven by left 7P, during AM retrieval from an observer-like perspective (Grol et al., 2017; Iriye & St. Jacques, 2020; St. Jacques et al., 2017). The present study, for the first time in the literature, examined visual perspective cues as distinct retrieval orientation processes before the AM content is recalled. The findings emphasize that own eyes and observer-like perspective cues entail a preparatory phase before AM retrieval to remember events in a particular way and locate oneself in the scene.

A critical aspect of the present study is that I separated visual perspective cues from AM content to tease apart the neural activations in these processes. That is, although participants did not know which event they would recall in a particular trial (or whether they would be asked to recall an event in the case of partial trials), they engaged in a preparatory phase to adopt a certain visual perspective and recall an upcoming event in a specific way. The findings showed that this pre-retrieval phase is supported by left PGp, which is the posterior subregion of AG (Caspers et al., 2006). Various models have emphasized the contribution of AG to successful episodic retrieval (Vilberg & Rugg, 2008; Rugg & King, 2018), integration of multimodal information

(Bonnici et al., 2016), and higher subjective reliving (Simons et al., 2008) during episodic retrieval. Critically, other theories proposed that the functional connectivity within the posterior medial regions, which involves AG, and specifically PGp, supports constructing the spatial layout of an event and navigating in the environment (Ciaramelli et al., 2010; Ranganath & Ritchey, 2012; Seghier, 2013). More recently, studies have also shown AG recruitment when people were instructed to adopt a particular perspective during AM retrieval or have counterfactual thinking for their AMs (Iriye & St. Jacques, 2020; St. Jacques et al., 2017; 2018), suggesting that AG is responsive to remembering episodic events in various ways. Therefore, the common recruitment of PGp during the own eyes and observer cues could prepare individuals to remember an event from that particular perspective, thereby locating themselves to visualize the scene from a specific vantage point (Rubin, 2020).

I also found greater left AG and precuneus recruitment when participants remembered AM content from an observer-like compared to an own eyes perspective and when there was no visual perspective cue. The vital role of AG and precuneus in visual perspective taking have been shown in prior studies (see for a review St. Jacques, 2022). Precuneus, as another posterior parietal region, contributes to various cognitive processes, including visuospatial imagery, episodic retrieval, and imagining egocentric navigations in space (Byrne et al., 2007; Cavanna & Trimble, 2006). Importantly, I observed precuneus engagement only after participants were presented with the event title and to a greater degree while adopting an observer-like perspective (Grol et al., 2017). This suggests the unique contribution of AG, specifically PGp, in the preparation phase. However, the recruitment of precuneus requires the retrieval of event content. Critically, the results revealed that the greater precuneus activation while retrieving from an observer-like perspective was mostly driven by the 7P subregion. 7P has previously been shown to support the mental imagery of motor movements/physical actions (Hétu et al., 2013) and visual cognition (Scheperjans et al., 2008) through its functional connectivity with cortical areas (Bruner & Pereira-Pedro, 2020; Margulies et al., 2009). Together with the current behavioral findings that revealed poorer perspective maintenance in the Observer versus Retrieve condition, remembering AMs from an observer-like perspective might require individuals to position themselves in the scene in a more unusual way and visualize the unfolding event from that particular vantage point. Thus, it might require a greater update in the egocentric perspective, compared to an own eyes perspective, and when there is no visual perspective cue (Byrne et al., 2007), which could explain the greater 7P involvement when remembering from an observer-like perspective. However, when there is no visual perspective cue, people might potentially adopt a more similar perspective to an own eyes, which is often considered as the natural or default perspective (Radvansky & Svob, 2019). Therefore, the precuneus activation would be similar in the own eyes and retrieve conditions. Note that in the present study, participants were not asked to report the visual perspective they adopted in the retrieve condition during fMRI scanning as I aimed to ensure no visual perspective cue processing demands in these trials. An interesting future direction could be asking participants to report their visual perspective after remembering with no visual perspective cue (i.e., their spontaneous perspective) to investigate how the spontaneous visual perspective varies in the retrieve condition and whether a pre-retrieval or retrieval-related activation could predict it.

Previous studies reported higher vividness and emotional intensity in own eyes than observer-like perspectives (e.g., Akhtar et al., 2017; Berntsen & Rubin, 2006; Butler et al., 2016). In the current study, I found no difference in vividness and emotional intensity between conditions when AM ratings were averaged in each participant. One difference between the present study and the earlier ones is that I separated visual perspective cues from the AM content, such that participants had already processed the visual perspective cue before the AM title was presented. In contrast, visual perspective cues were presented together with the AM content in previous studies (e.g., St. Jacques et al., 2017); thus, participants did not have a preparation phase but were required to mentally construct the scene from a particular perspective while recalling the AM content. This might be potentially more demanding than retrieving the AM content once the self was already located in the scene layout, which might lead to differences in subjective ratings in the previous studies. Additionally, in earlier fMRI studies reporting a decrease in emotional intensity due to adopting an observer-like perspective (e.g., St. Jacques et al., 2017), researchers specifically chose AMs strongly recalled from an own eyes perspective and asked participants to shift to an observer-like perspective. However, in the present study, I matched initial visual perspective ratings when assigning the events across conditions, and participants were not particularly asked to shift across visual perspectives, which would lead to a greater deviation from the original perspective. In line with this, a future direction could be investigating retrieval orientation effects for the events strongly recalled from an own eyes or observer-like perspective while targeting a shift from or maintaining the original perspective.

The present findings contribute to the retrieval orientation in autobiographical and, more generally, episodic memory literature by revealing that visual perspective cues entail a pre-retrieval process in which people locate themselves in a potential scene layout and prepare to remember an event from that particular perspective. Specifically, the involvement of PGp while processing visual perspective cues indicates that adopting alternative visual perspectives requires people to recombine episodic details in different ways (Bonnici et al., 2016; Ramanan et al., 2018), and visual perspective cues could initiate and bias this process even before AM recall started.

Limitations. The current study provides novel findings regarding pre-retrieval processes oriented by visual perspective cues prior to AM recall. However, one limitation of the present study is the variability or individual differences in the initial visual perspective ratings. I specifically asked participants to remember remote events to capture more variability in the initial visual perspective ratings (Rice & Rubin, 2009) and also matched the AM ratings across conditions. However, due to individual differences in adopting visual perspectives during the AM generation session, a vast majority of the AMs of some participants were from an own eyes perspective. In contrast, some participants adopted more observer-like or mixed perspectives. Thus, participants in the former group were more likely to shift across perspectives during fMRI scanning, but the latter group would not be potentially impacted by shifting. One relevant future direction could be examining retrieval orientation effects by considering individual differences in visual perspective or restricting the sample for the participants who adopt mixed perspectives through a pre-screening process.

Conclusion

Retrieval orientation has not been commonly investigated in AM literature, although numerous studies examined its effects on episodic memory retrieval (e.g., Gao et al., 2016; Herron & Rugg, 2003; Hornberger et al., 2006; Kerrén et al., 2021; Morcom & Rugg, 2012; but see Gurguryan & Sheldon, 2019). Therefore, for the first time, the current study contributes to the AM literature by examining visual perspective cues as distinct retrieval orientation processes. The results demonstrated that the posterior parietal recruitment, specifically left PGp, promotes a preparatory phase when the retrieval is oriented via own eyes and observer-like perspective cues. The recruitment of PGp is essential given that it indicates that people engage in preparation to remember the event in a particular way, which continues with additional precuneus recruitment while retrieving the event details from an observer-like perspective. The current findings are important since they give further insight into the mechanisms supporting the pre-retrieval processes and how they help us construct events in diverse forms.

Chapter 5: General Discussion

The primary research interest of this thesis is understanding the role of visual perspectives in retrieving emotional aspects of AMs and bringing a deeper insight into the underlying mechanisms of how manipulating visual perspectives influences retrieval. In Chapter 1, I overviewed the literature focusing on the impact of adopting own eyes and observer-like perspectives on emotional aspects of the events and the neural basis of adopting a particular perspective during retrieval. Chapter 1 also provided a summary of previous theories explaining why own eyes and observer-like perspectives differentially impact emotional experiences and suggested a new proposal arguing that visual perspectives could be distinct retrieval orientations that would determine both pre-retrieval and retrieval processes. Chapter 2 specifically focused on the role of shifting visual perspective on emotion with a comprehensive meta-analysis, showing that updating the initial visual perspective with the alternative one decreased emotionality. This effect was however unique to the shifts from an own eyes to an observer-like perspective and associated with the decreases in vividness in visual imagery as a result of shifting. Chapter 3 compared maintaining the initial perspectives to the shifts in visual perspectives with an experimental design. The findings demonstrated that shifting visual perspectives decreased vividness, regardless of the direction of the shift. Further, I showed that the reductions in vividness predicted the reductions in emotional intensity when shifting from an observer-like to an own eyes perspective. Finally, Chapter 4 investigated the proposal suggested in Chapter 1 by examining the neural correlates of processing visual perspective cues as distinct retrieval orientations and showed a common posterior parietal activation in response to visual perspective cues before the onset of AM retrieval as well as remembering from an observer-like perspective.

The current and the last chapter of this thesis will summarize and utilize these findings in the context of cognitive mechanisms supporting the reduction in emotion during the shifts in visual perspective, the influences and implications of visual perspective shifts in mnemonic emotion regulation, and visual perspective as retrieval orientation and general implications in event memory research.

The Cognitive Mechanisms Supporting the Reduction in Emotion during the Shifts in Visual Perspective

A long-lasting literature on visual perspective has demonstrated that remembering events from an own eyes, compared to an observer-like perspective is related to higher emotional intensity (Küçüktaş & St. Jacques, 2022; Rice, 2010). Recently, a number of meta-analyses quantified the impact of visual perspective on emotion by specifically comparing own eyes and observer-like perspectives, and they reported greater emotionality for own eyes versus observer-like perspectives (Guo, 2022; Moran & Eyal, 2022; Murdoch et al., 2022). This particular difference in emotionality due to visual perspective is also evident when people shift from an own eyes to an observer-like perspective during retrieval (Akhtar et al., 2017; Berntsen & Rubin, 2006; Robinson & Swanson, 1993; St. Jacques et al., 2017). The decrease in emotion due to shifting to an observer-like perspective is not only interesting but also important since adopting an observer-like perspective while remembering emotional events is an effective emotion regulation tactic (Powers & LaBar, 2019; Wallace-Hadrill & Kamboj, 2016). However, neither prior meta-analyses nor theories proposed a mechanism for explaining the potential mnemonic processes causing reduced emotional intensity in observer memories. As mentioned earlier, previous models explained the reduction in emotional intensity due to adopting an observer-like perspective with the evaluation of self-related information while watching ourselves from an observer perspective (Sutin & Robins, 2008), meaning-making (Libby & Eibach, 2011; Niese et al., 2021), or detaching from the emotional component of the event (Kross & Ayduk, 2017). Although these models inform the changes due to shifting from an own eyes to an observer-like perspective, they lack touching upon what critically changes in terms of memory characteristics while shifting perspectives. Accordingly, in Chapter 2, I specifically compared initial and shifted perspectives in the meta-analyses to quantify the impact of shifts on emotion directly. I showed higher emotionality for the initial compared to the shifted perspectives. Importantly, this effect was moderated by the direction of the shift in visual perspective such that only the shifts from an own eyes to an observer-like perspective decreased emotion, but the shifts from an observer-like to an own eyes perspective did not impact emotion, reflecting that the decrease in emotion is not only adopting an observer-like perspective per se, but it is due to shifting. Then, one critical question is what causes this asymmetrical effect. Therefore, Chapter 2 aimed to explain these asymmetrical effects by focusing on the mnemonic changes emerging due to shifting. Specifically, I found that the decrease in vividness in visual imagery when shifting from an own eyes to an observer-like perspective predicted a reduction in emotion. However, there was no relationship between the changes in vividness and emotion when shifting from an observer-like to an own eyes perspective.

Earlier theories concerning the asymmetrical effects of the shifts in visual perspective argued that the asymmetrical effects could be related to the nature of the own eyes and observer-like perspectives. For example, Robinson and Swanson (1993) argued that own eyes and observer-like memories have different components, such that AMs recalled from an own eyes perspective involve information related to both goals/beliefs and emotion, whereas AMs recalled from an observer-like perspective involve only goals/beliefs related information. Thus, when people are shifting from an observer-like to an own eyes perspective, they cannot replace the emotional details as they are already absent in an observer memory. Additionally, Berntsen and Rubin (2006) argued that the asymmetrical effects might be related to the increased task difficulty in boosting recollective experiences when shifting from an observer-like to an own eyes perspective. However, neither of these proposals has direct evidence in the literature to explain asymmetrical effects. The meta-analysis findings in Chapter 2 align with a previous proposal by Butler et al. (2016), suggesting that the decreased recollective experiences in an observer-like perspective are related to fading visual details. Butler et al. reported that shifting from an own eyes to an observer-like perspective decreased vividness. However, reflecting the asymmetrical effects, shifting from an observer-like to an own eyes perspective did not increase vividness. Note that Butler and colleagues did not measure emotional intensity while shifting perspectives; thus, they did not propose a direct causal relationship between the changes in vividness and emotional intensity. However, the findings in Chapter 2 are in parallel with the idea that the asymmetrical effects of shifting on emotional intensity could be related to unrecovered vividness in visual imagery when shifting from an observer-like to an own eyes perspective. Importantly, in these theories, an observer-like perspective was considered a distorted or faded version of an own eyes perspective. This would be correct in most cases in which an own eyes perspective is more prevalent or dominant during retrieval (Radvansky & Svob, 2019). However, other accounts suggest that an observer-like perspective can also emerge as the initial perspective of an AM (McCarroll, 2017; 2018; Nigro & Neisser, 1983); thus, shifting to an own eyes perspective would be similarly distorting the initial characteristics of the event. Therefore, a critical question was whether we could see the same asymmetrical effects if we specifically target the events initially recalled from an own eyes and observer-like perspectives.

In Chapter 3, I aimed to capture memories initially recalled from an own eyes and observer-like perspective to examine the differences in memory characteristics when shifting to the alternative perspective. Supporting the proposals reflecting that an observer-like perspective can emerge as the initial perspective of an event (McCarroll, 2017; 2018; Nigro & Neisser, 1983), the results showed a reduction in vividness when shifting visual perspectives, regardless of the direction of the shift. Plus, the decrease in vividness predicted the reductions in emotion when shifting from an observer-like to an own eyes perspective. Additionally, I asked participants to rate task difficulty and perspective maintenance when remembering the events from the indicated perspectives. Although participants reported that shifting from an observer-like to an own eyes perspective was more difficult than shifting from an own eyes to an observer-like perspective, they were able to similarly maintain the indicated perspective after shifting. That is, asymmetrical effects could not be solely due to the difficulty in shifting from an observer-like to an own eyes perspective or maintaining an observer-like perspective.

In sum, the reduction in emotional intensity when shifting perspectives was related to updating the initial perspective of an event with the alternative one and the changes in how vividly one could remember the events as a result of shifting. This is particularly important considering the role of memory interventions or mnemonic changes in emotional regulation (Engen & Anderson, 2018; Nørby, 2019; Samide & Ritchey, 2021), which is discussed in more detail below.

Shifts in Visual Perspective and Mnemonic Emotion Regulation

Mnemonic emotion regulation refers to altering the access to the emotional details or event characteristics in order to change the emotional experiences during retrieval (Nørby, 2019). This is similar to cognitive change in the process model of emotion regulation proposed by Gross (1998a; 2014; 2015), in which people modify their memories or thoughts to regulate their affect. More recent theories, however, focus on what specifically changes in memories that lead to an alteration in how people remember emotional details. For example, Engen and Anderson (2018) introduced memory control in emotional regulation, in which the retrieval of an emotional event is interrupted or substituted with another memory, thereby decreasing the accessibility of the original event. Similarly, Samide and Ritchey (2021) suggested that introducing a new appraisal to regulate emotions during retrieval also updates and reconsolidates the event details in a way that the emotional impacts would change. These models propose critical ideas that would help us understand the cognitive mechanisms of emotional regulation. Additionally, Nørby (2019) argued that modifications in AM characteristics would be a part of cognitive emotion regulation, of which shifting perspective is a particular way. Accordingly, the findings reported in Chapters 2 and 3 align with the idea that modifications in visual imagery during retrieval underpin emotional regulation through shifting visual perspective.

Unfolding visual perspectives in the context of emotion regulation is important since it is considered an effective and adaptive emotion regulation tactic (Powers & LaBar, 2019; Wallace-Hadrill & Kamboj, 2106; Webb et al., 2012). Specifically, shifting from an own eyes to an observer-like perspective helps people detach from the emotional content of the event or adopt a more objective perspective to reframe the event from a broader viewpoint (Kross & Ayduk, 2017; Libby & Eibach, 2011). In fact, research investigating AM narratives showed that AMs narrated from an observer-like perspective contained more details in which people aimed to make sense of the event rather than focusing on what happened or how they felt as in the own eyes narratives (Kross & Ayduk, 2008), indicating that the changes in remembered details and event phenomenology due to the shifts in visual perspective could facilitate the reductions in emotion.

Apart from taking visual perspective into account as a particular emotion regulation, visual perspectives are also a unique feature for certain emotional memories and individual differences. For example, earlier studies showed that an observer-like perspective is a stable characteristic in trauma memories (Berntsen et al., 2003; McIsaac & Eich, 2004). It was argued that an initial observer-like perspective might be a defense or coping strategy to detach from the emotionally arousing content of the traumatic event (McIsaac & Eich, 2004). Additionally, imagining oneself from an observer-like perspective while engaging in a social performance increased negative thoughts and self-evaluations for individuals with social anxiety (Spurr & Stopa, 2003), which is in parallel with the models suggesting that increased focus on the self in an observer-like perspective might boost the emotional experiences, such as remembering the events associated with complex emotions (e.g., shame, guilt, pride; Sutin & Robins, 2008). Apart from this, events associated with certain content (e.g., giving a public presentation) also tend to be initially recalled from an observer-like perspective (Nigro & Neisser, 1983). A critical point in these circumstances is that an observer-like perspective could be the initial perspective (e.g., trauma memories) or associated with higher emotionality. In Chapter 3, I demonstrated that shifting perspective, regardless of its direction, decreased the vividness of emotionally insignificant recent events and the reduction in vividness when shifting from an initial observer-like to an alternative own eyes perspective predicted the decreases in emotional intensity.

Therefore, an important question is how shifting to an own eyes perspective influences emotionality and other memory characteristics in emotionally arousing events or particular event contents that are initially recalled from an observer-like perspective. Following the idea that some events, depending on their content or emotional characteristics, are more likely to be encoded and initially recalled from an observer-like perspective (McCarroll 2017; 2018; Nigro & Neisser, 1983), shifting to an own eyes perspective would be modifying the initial perspective of these events. However, it is still unknown whether altering the initial observer-like perspectives with an own eyes perspective in these highly arousing memories could decrease the vividness of visual imagery and whether this decrease could predict the changes in emotional experiences, which could be addressed in future studies. Additionally, given that the shifts in visual perspective also influence the objective measures of emotion, such as emotion/thought details in AM narratives (King et al., 2022; Wardell et al., 2023) and physiological responses to emotional stimuli (e.g., Ayduk & Kross, 2008; Ray et al., 2008), an interesting avenue could be examining how shifting from an initial observer-like to an alternative own eyes perspective modifies the objective measures of emotion for the events related to complex emotions or certain situations in which one is being watched or evaluated by others. These future directions would further shed light on the role of visual perspective in emotional regulation in highly arousing events and clinical settings.

Studies examining adopting an observer-like perspective as an emotion regulation tactic highlight some important details regarding the underlying mechanisms. Although adopting an observer-like perspective is considered an effective and adaptive approach (Webb et al., 2012), there are some important differences among studies. For example, emotion regulation studies instructing participants to evaluate the emotional stimuli from an observer-like perspective usually emphasize thinking about the events from an impartial observer perspective, from an objective point of view, or taking a step back and watching the event from a detached vantage point (e.g., Kross et al., 2005; Ochsner et al., 2004; Speed et al., 2020). This is a critical detail in terms of the experimental manipulations, given that the instructions could increase demand characteristics. Indeed, Krishnamoorthy et al. (2021) asked participants to remember a shame-related event by adopting own eyes and observer-like perspectives. However, in one condition, participants were asked to simply remember the event from an observer-like perspective, whereas in another condition, they were asked to generate positive appraisals about the event from an observer-like perspective. The results showed that the emotionality in shame-related events decreased only in the latter condition, in which participants were asked to pursue an emotional regulation goal. This is critical regarding the effectiveness of the shifts in visual perspective in the emotion regulation context. Specifically, for the events or emotions that adopting an observer-like perspective is less effective in regulating emotions, potential demand characteristics following the explicit emotional regulation goals should be taken into account.

Visual Perspective as Retrieval Orientation and General Implications in Event Memory Research

A growing number of studies emphasized the role of posterior parietal cortices, specifically the precuneus and angular gyrus (AG), in adopting a particular visual perspective during AM retrieval (St. Jacques, 2022). The recruitment of precuneus is critical, regarding its involvement in the egocentric representation of the environment during spatial navigation (Ciaramelli et al., 2010) and visuospatial imagery (Cavanna & Trimble, 2006). Additionally, considering the role of AG in adopting a particular visual perspective and also shifting across them in the context of episodic retrieval would be fruitful to understand the flexibility human memory. Specifically, remembering an event from a particular perspective or shifting from one perspective to another requires one to construct the event details in a specific way by adjusting scene-related details. Thus, it involves the integration of multisensory details in episodic retrieval, which is supported by AG (Bonnici et al., 2016; Ramanan et al., 2018). Accordingly, the findings in Chapter 4 are consistent with the literature as I found greater recruitment of the precuneus and AG while remembering events from an observer-like perspective compared to an own eyes perspective or having no visual perspective instruction (see also Grol et al., 2017). Overall, assuming that remembering events from an own eyes perspective is a more usual way of visualizing events (Radvansky & Svob, 2019), adopting an observer-like perspective requires greater changes or adjustments in the scene characteristics; thus, requires higher involvement of precuneus and AG.

The findings in Chapter 4 also revealed a common AG recruitment in the pre-retrieval phase when participants were presented with a particular visual perspective cue. In Chapter 1, I proposed that own eyes and observer-like perspectives could be two distinct retrieval orientations, such that processing them prior to retrieval would prepare individuals for remembering the events in a certain way. Although the recruitment of the AG and precuneus is a well-established finding in previous studies (St. Jacques, 2019; 2022), for the first time in the literature, own eyes and observer-like perspectives were examined here as distinct retrieval orientations in AM retrieval. The results demonstrated the retrieval orientation effects due to visual perspective cues in the left AG, specifically in the PGp subregion, which was also recently shown positively related to subjective vividness in AM retrieval (Humphreys et al., 2024). Together, these findings point out that own eyes and observer perspective cues bias the AM retrieval by preparing individuals to remember the events in a specific way, possibly locating themselves in a potential scene layout to reconstruct the event details from that vantage point before retrieving the AM content. Note the biases in cue processing due to retrieval orientation are reflected in memory performance as well (Rugg & Wilding, 2000). For example, earlier episodic memory studies demonstrated that when the retrieval cues were in an incongruent modality with encoding, memory performance decreased in the recognition test (e.g., Herron & Rugg, 2003; Morcom & Rugg, 2012). Therefore, a critical future direction is investigating the impact of processing visual perspective cues by directly linking the pre-retrieval phase and the retrieval of AM content. Yet, given that examining the cue processing in the retrieval orientation context is novel in AM literature (see also Gurguryan & Sheldon, 2019), the current findings are insightful to understand the constructive nature of autobiographical retrieval.

Throughout the chapters of this thesis, I also demonstrated novel findings that could shed light on certain aspects of visual perspective and would be important to consider in future event memory studies. First, in Chapter 3, I showed that shifting visual perspective decreased vividness, regardless of the direction of shift, compared to maintaining the initial perspectives, when the events particularly recalled from an own eyes and observer-like perspectives were targeted. This is a novel finding in the literature, given that earlier studies reported that shifting from an own eyes to an observer-like perspective decreases vividness, but shifting in the reverse direction does not impact it (e.g., Akhtar et al., 2017; Berntsen & Rubin, 2006; Butler et al., 2016). In line with prior theories, similar to own eyes perspectives, observer-like perspective can also be the initial perspective of an event (McCarroll, 2017; 2018; Nigro & Neisser, 1983); thus, updating this initial perspective of the event with an alternative one modifies the visuospatial aspects of the events, which might impair the vividness in visual imagery, as discussed above.

This would be a critical point for event memory studies concerning visual perspective or event formation since the initial visual perspective of an event could be informative about encoded and recalled visual and spatial details (e.g., Iriye & St. Jacques, 2021). Therefore, visual perspective manipulations in encoding (e.g., in virtual reality environments; Bergouignan et al., 2014; Iriye & St. Jacques, 2021) or targeting AMs based on their visual perspective ratings in experimental settings might determine basic visuospatial characteristics of events.

Second, in Chapter 2, I demonstrated that shifting from an own eyes to an observer-like perspective decreased emotion to a greater degree when the self was not visible due to the instructions in an observer-like perspective. Although the visibility of the self in an observer-like perspective is an understudied concept, the findings are consistent with prior models (Sutin & Robins, 2008) and a previous finding (Kinley et al., 2021). Specifically, Kinley and colleagues (2021) showed that the visibility of the self in an observer-like perspective while imagining future events was associated with higher emotionality. As mentioned earlier, Sutin and Robins (2008) argued that the increased focus on the self from an observer-like perspective could increase emotional experiences potentially by making individuals more self-conscious about their experiences (e.g., Cândea & Szentágotai-Tătar, 2020; Katzir & Eyal, 2013). Accordingly, in the meta-analysis in Chapter 2, I categorized the instruction presented in the observer conditions in the studies. Therefore, an experimental manipulation comparing the observer-like perspectives that emphasize the visibility of the self versus not is required. It is also important to understand the mnemonic mechanism that supports the impact of self-visibility. For example, a critical question is whether seeing versus not seeing oneself in the scene during retrieval from an observer-like perspective influences the episodic details or memory characteristics, such as vividness in visual imagery or difficulty in visualizing other event details.

Third, in Chapter 3, I had a detailed investigation regarding where the visual perspective originates during retrieval and how that location changes during shifting. In a prior study, Rice and Rubin (2011) showed that an own eyes and observer-like perspective have more of a dynamic nature rather than static such that when people were presented with options regarding the location, height, and distance of their visual perspective, their responses vary in these dimensions. Moreover, when people were presented with separate rating scales for own eyes and observer-like perspectives, they could rate their AMs in own eyes and observer-like perspectives independently, showing that two perspectives are not mutually exclusive (Rice & Rubin, 2009), which necessitates understanding the dynamic nature of visual perspectives. However, these specific characteristics related to the origins of visual perspectives have not been examined in detail before, specifically in the context of the shifts in visual perspectives. In Chapter 3, I showed that own eyes perspectives originate from a closer and lower viewpoint compared to observer-like perspectives. Plus, shifting from an own eyes to an observer-like perspective increases the distance and height of the viewpoint. However, shifting from an observer-like to an own eyes perspective reduces the distance but has no effect on height. Also, regarding the location of the origin of visual perspective, I found that shifts in visual perspectives, in both directions, moved the viewpoint towards the front of the rememberer –facing themselves. This could also be informative regarding the visibility of the self in both perspectives. The current findings lead to novel questions related to different manipulations of visual perspectives in event memory studies to understand whether this dynamic nature is influenced by the aforementioned parameters (e.g., emotions associated with the event or content) and their impact on AM retrieval.

Finally, a frequently used application of visual perspective taking is the Cognitive Interview, which is used in eyewitness testimony, in which people are asked to adopt an observer-like perspective while remembering the event details of an incident (Geiselman et al., 1986). Previous studies demonstrated that lab-based mini-events recalled from an own eyes, compared to observer-like perspective, were remembered more accurately (Marcotti & St. Jacques, 2018). Therefore, although the use of Cognitive Interview encompasses more significant incidents than lab-based mini-events, asking individuals to recover their memory related to an event by adopting an observer-like perspective raises some questions in real-life applications. Considering the dynamic nature, or malleability of visual perspectives, or decreased episodic details when shifting from an own eyes to an observer-like perspective (King et al., 2022) and changes in visual imagery when updating the initial perspective, one should take into account the possible modifications in the retrieved event details in the applications of adopting visual perspectives.

Conclusion

The primary purpose of the current thesis was to bring a detailed comprehension of how visual perspectives influence the retrieval of the emotional aspects of AMs. In Chapter 2, I followed a meta-analytic approach to quantify the changes in emotion due to the shifts in visual perspective and identify the moderators determining the strength and the direction of the effect. I demonstrated that shifting visual perspective decreased emotion; however, this effect was dependent on the direction of the shift and related changes in the vividness of visual imagery. Specifically, the shifts in visual perspectives decreased emotionality only when shifting from an own eyes to an observer-like perspective and this reduction is due to the weakened vividness in visual imagery while shifting. In Chapter 3, I compared preserving initial perspectives to the shifts in visual perspectives during retrieval. Here I showed a decrease in vividness due to the shifts in perspective regardless of the direction of the shift, indicating that updating the initial perspective of an event by shifting to an alternative one distorts the quality of visual imagery (McCarroll, 2017; 2018; Nigro & Neisser, 1983). Additionally, the decreases in vividness in visual imagery predicted the reductions in emotion when shifting from an observer-like to an own eyes perspective. While the meta-analysis findings in Chapter 2 are consistent with the asymmetrical effects of perspective shifts reported in previous research (e.g., Berntsen & Rubin, 2006; Robinson & Swanson, 1993), I contributed to the literature by providing a causal explanation regarding why asymmetrical effects occur and also showed that targeting AMs initially recalled from an observer-like perspective would similarly diminish event characteristics. Finally, in Chapter 4, I investigated the visual perspective cues as distinct retrieval orientations. I showed that presenting visual perspective cues prior to AM retrieval biases the neural recruitment in the posterior parietal cortex. These findings are important as I demonstrated that when visual perspective cues are available before AM retrieval, people engage in a preparation phase to adjust their memories and construct them from a specific vantage point (Rubin & Umanath, 2015). Overall, the findings of the present thesis are insightful regarding the cognitive mechanisms that support constructive processes during the retrieval of events in various forms and how these mnemonic interventions support adaptive emotional regulation.

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*Indicates the studies included in the meta-analyses in Chapter 2.

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