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When having photographs of events influences the visual perspective of autobiographical memories

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Abstract

Photographs are frequently taken to preserve memories of events from the personal past, but they can also bias how we remember. For example, photographs often capture events from a novel visual perspective (e.g., seeing ourselves in the image). Here, we examined how the presence of the self in photographs influences autobiographical memories. Participants provided subjective ratings for specific autobiographical memories, and then, following the retrieval phase, they were asked to indicate whether they had photographs for these memories and the nature of these images. Across three studies ($N = 378$), we found that autobiographical memories that participants reported the presence of photographs containing the self were more likely to be remembered from an observer-like perspective than memories with photographs in which the self was not visible. These findings have important implications for understanding how the growing number of photographs taken in everyday life biases the perspective of our memories.

KEYWORDS

autobiographical memory, memory retrieval, visual perspective, memory distortion

1 | INTRODUCTION

Photographs are a fundamental aspect of daily life that help us to capture memories of our experiences. We take photographs not only to document memories of our experiences so that we can review them later, but also with the intention to share these photographs of our experiences with others (for review see Henkel & Milliken, 2020). Photographs are not merely passive records that help to preserve the past but can also influence *how* we remember. While photographs can serve as an effective retrieval cue to elicit memories they can also contribute to errors and other distortions (e.g., Koutstaal et al., 1999; Nash et al., 2009; St. Jacques & Schacter, 2013). One reason is that photographs often depict the past in a way that differs from our original experience of events. For example, photographs can show an alternative vantage point of an event, such as when the self is present in the image of the event. Thus, photographs portray observer-like perspectives of our experiences,

in which we see ourselves, rather than mimicking the own eyes perspective we typically see the world from. Prior research has demonstrated that the viewpoint people adopt during retrieval can reshape the phenomenology and content of memories (St. Jacques, 2023). Although photographs are frequently used to elicit autobiographical memories (e.g., Burt et al., 2003; St. Jacques et al., 2008), much less is known regarding how having photographs of events influences the way in which people remember. Given how prominent photographs are in daily life and their potential impact on memories, understanding this relationship is relevant in many applied settings such as eyewitness testimony. In the current study, we examined how memories that people report having photographs of and the self-reported nature of these images (i.e., taken by the individual, self-visibility, intention to share) differ in subjective characteristics of autobiographical memories.

Taking photographs of events and the intention to share these photographs with others can impact memory in several ways. On one

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hand, taking photographs can benefit memory. The act of taking a photograph may improve memory by creating self-generated cues (Slamecka & Graf, 1978; Tullis & Finley, 2018) and/or shifting memory encoding from a passive to a more active process (Markant et al., 2014; Voss et al., 2011). Supporting this idea, Pathman et al. (2011) found that participants who took photographs during a museum tour had better recognition memory for these experiences than if they were shown photographs they had not taken. The act of taking a photograph can also focus attention to specific visual details that are contained in the image of these events, thereby improving memory for this information. For example, Barasch et al. (2017) found that volitional photo taking during a museum tour increased memory for visual information that was captured in the image, but not for other visual details during the tour which were not photographed. Similarly, Henkel (2014) found that memory accuracy for visual information during a museum tour was improved when participants took photographs in which they zoomed in on specific object features in the exhibit. Taking photographs may also increase the sense of enjoyment and engagement people experience during events (but see Tamir et al., 2018), potentially leading to emotional enhancement effects in memory (Talmi, 2013). For example, Diehl et al. (2016) found that taking photographs increased subjective ratings of enjoyment and the sense of immersion in events but had the opposite effect when taking photographs interfered with the ongoing task. However, taking photographs with the intention to share can sometimes decrease enjoyment during experiences when it leads to concerns regarding how the self is portrayed to others, although such effects are lessened when people intend to share photographs only with close others (Barasch et al., 2018). Recent research has also demonstrated that when people report taking photographs to serve as mementos it can increase recollective qualities of events such as the vividness and emotional intensity of remembering (Soares & Storm, 2022).

On the other hand, taking photographs during events can sometimes have negative consequences on memory, known as the photo-taking impairment effect (Henkel, 2014). For example, Henkel (2014) asked participants to take photographs of exhibits during a museum tour and found that it impaired visual details for the objects in the exhibits along with their spatial location, when compared to participants who did not take photographs. Similarly, Tamir et al. (2018) found that participants who took photographs during an outdoor tour, either with the intention to share or not, had less accurate memories when compared to participants who did not take photographs. There are several reasons that might explain why the photo-taking impairment effect occurs. The act of taking a photograph can interrupt ongoing experience, leading to the division of attention across multiple tasks and negatively impacting memory encoding (Soares & Storm, 2018). Taking photographs can also lead to selective encoding of some aspects of memories over others. For example, while taking photographs may increase visual details it can decrease auditory details for these same events (Barasch et al., 2017). Additionally, photographs might lead people to engage in more shallow memory encoding as they offload their memories to this external record (Sparrow et al., 2011).

Photographs can also powerfully impact how memories are retrieved. Unlike verbal based cues, photographs are particularly effective retrieval cues because they often include rich visual and scene-

related details that support remembering (Rubin & Umanath, 2015), and reviewing these cues can help to improve memory due to the strengthening effects of rehearsal on memory. For example, in a case study, Talarico (2022) demonstrated that photographs taken from social media were more powerful cues to elicit remembering than verbal posts. Several studies have demonstrated that photographic review can serve as a highly effective memory aid (for review see Chow & Rissman, 2017; Silva et al., 2013). Loveday and Conway (2011) reported that an amnesic patient who reviewed photographs of their daily life taken from wearable cameras recalled more detailed episodic memories for these experiences. Martin et al. (2022) demonstrated that repeatedly reactivating memories for real-world events using photos taken using smartphone app called the Hippocamera increased the number of episodic details older adults included in their memories, which they linked to more distinct representations of memories in the hippocampus. Other research has supported these findings by demonstrating that reviewing photographs can increase memory accuracy (Finley et al., 2011; Koutstaal et al., 1998; St. Jacques & Schacter, 2013).

Photographs can sometimes introduce biases and other distortions in memories during memory retrieval, consistent with the constructive nature of memory retrieval (Schacter, 2012). One reason is that retrieval is an active process that reactivates dormant memory traces, making them vulnerable to modification (e.g., Nadel et al., 2012; Schacter et al., 2011). Several studies have shown that reviewing photographs of events can create false memories for these experiences (e.g. Cinel et al., 2018; Lindsay et al., 2004; St. Jacques & Schacter, 2013; Strange et al., 2008; Wade et al., 2002). For example, St. Jacques and Schacter (2013) asked participants to walk around a museum with a wearable camera. Participants later reviewed photographs from their camera that were coupled with photographs taken from museum exhibits they had never visited. Then, they were given a recognition memory test in which they had to identify whether a photograph showed an exhibit they had visited or not. As expected, reviewing photographs enhanced true memories for exhibits that had been visited during the museum tour. However, reviewing photographs of real exhibits also increased the likelihood of endorsing the novel photograph it was paired with, thereby creating false memories for the museum tour. Although photographs are thought to perfectly encapsulate a moment, they do not always portray the past in the same way that it occurred. Yet, the visual richness of these images can make it difficult to determine whether the source of this information is related to memory for a past event or merely from photographs of these experiences (e.g., Johnson et al., 1993).

Despite the important role that visual perspective plays in the nature of the photographs (e.g., Niese et al., 2023) few studies have examined how it influences memory. Barasch et al. (2018) found that when individuals took photographs with the intention to share, they were more likely to recall these events from an observer-like perspective. One reason might be that the intention to share led participants to take more photos that contained the self. For example, Marcotti and St. Jacques (2022) found that reviewing photographs of events that depicted an observer-like perspective increased the likelihood of adopting the same viewpoint shown in the photograph when later recalling these memories. Participants were asked to encode lab based mini-

events and wore a wearable camera that automatically took photographs of their experience mimicking their own eyes perspective, while a similar camera was propped in front of them on a tripod to capture an observer-like perspective. A couple days later, they rehearsed memories for these events while viewing photographs taken from their own camera (i.e., first-person perspective). While the increased attention on the self could lead people to alter the viewpoint they used during remembering, it could also reduce other properties of the memory. For example, adopting an observer-like perspective has been shown to decrease the emotional intensity (Kücüktaş & St Jacques, 2022) and vividness (St. Jacques, 2022) of memories.

It has been well established that photographs of events can influence the memory of the captured event itself. However, to our knowledge no studies have examined how the nature of photographs potentially influences the visual perspective of autobiographical memories along with other phenomenological aspects of remembering. The goal of the current study was to examine how differences in memories people report having photographs of and the self-reported nature of these photographs influences subjective characteristics of autobiographical memory retrieval. In three experiments we asked participants to recall autobiographical memories and to provide subjective ratings for key phenomenological characteristics (emotional intensity, vividness, visual perspective, importance, and rehearsal). Following the recall of all the memories, participants were then asked to indicate whether the events they had recalled had photographs, and if so, the nature of these photographs. Specifically, whether they had taken any of the photos, if they were present in any of the photos, and if the photos were taken with the intention to share with others. In the first two experiments we assessed the effects of having photographs on recent autobiographical memories, while in experiment three we included both recent and remote memories. Given that having photographs of events could support the beneficial effects of rehearsal on memory, we hypothesized that memories people report having photographs of compared to memories without photographs would generally be associated with richer phenomenology (e.g., higher ratings of vividness, emotional intensity, and visual perspective), and that such events would also be associated with greater rehearsal. We also explored whether memories that people reported having photographs of would be evaluated as being more important, given this factor is one of the multiple reasons why photographs are taken (Tullis & Finley, 2018). However, the nature of the photograph should also lead to differences in memory phenomenology. First, given that taking photographs has been shown to increase the objective recall of visual information in memory (e.g., Barasch et al., 2017; Henkel, 2014), we predicted that subjective ratings of vividness would be higher in memories that people report having photographs they took compared to memories with photographs they report they did not take. Recent research has also indicated that taking photographs can also influence the emotional intensity of memories when they serve memento goals (Soares & Storm, 2022); thus, we also explored whether there were potential differences in the affect associated with retrieving events that

people reported having photographs of. Second, the intention to share photographs with others (e.g., Barasch et al., 2018) and self-visibility in photographs (St. Jacques, 2022) have both been shown to influence observer-like perspectives, thus, we predicted that memories that people report having photographs they intended to share or in which they were visible would be associated with higher observer-like ratings and lower own eyes ratings than memories with photographs people report without these characteristics.

2 | EXPERIMENT 1: METHODS

2.1 | Participants

Participants consisted of 128 young adults with normal or corrected to normal vision. We excluded 24 participants from the data set (3 because they did not have any photos and 24 for failing the instructional manipulation check). The final sample size was 101 participants (73 women; mean age in years (M) = 18.8, SD = 2.05). We based our sample size on Brysbaert (2019), which estimated that 52 participants would be sufficient to detect a small effect size in within-group analyses with 80% power. Given the online nature of the study and the post-hoc nature of binning our main photograph condition, we aimed to double the sample size. Participants were recruited through the University of Alberta's Psychology Department's Research Participation Pool and were compensated with course credit. Ethics approval was obtained from the University of Alberta Research Ethics Board.

2.2 | Procedure

The study was administered online using Qualtrics (<https://www.qualtrics.com>) and consisted of two parts. In part one, participants were presented with 20 event cues in a random order and asked to recall a specific autobiographical memory that had occurred in the last 5 years associated with each cue. Our aim was to elicit memories associated with and without photographs, thus we employed cues that targeted events that varied in the frequency with which photographs are taken (e.g., *a vacation vs. starting a new job*; see Appendix for full list). Participants were instructed to click a button once they had a memory in mind associated with the cue, and then answered subjective ratings based on their memory. Subjective ratings were based on the Autobiographical Memory Questionnaire (AMQ; Rubin et al., 2003). Ratings were done on a 7-point Likert-type scale from 1 (*Low*) to 7 (*High*) and included: own-eyes visual perspective, *I remember this event through my own eyes, roughly from the same viewpoint or perspective that it was originally experienced*; observer visual perspective, *I remember this event as if I were an observer, where I can see myself in the memory*; vividness, *the vividness or visual resolution of this memory is as clear as if watching a high-definition (HD) show in front of me*; emotional intensity, while remembering, the emotions that I feel are extremely intense, regardless of whether it was positive or negative; rehearsal,

since it happened, I have thought or talked about this event; importance, this event is an important part of my life. Additionally, participants were asked to indicate the specific time-period of the event by choosing one of the following: 1 day ago, 1 week ago, 1 month ago, 1 year ago, 3 years ago, <5 years ago, >5 years ago.

In part two, immediately following autobiographical memory retrieval, participants were presented with the same event cues and instructed to answer the questions based on the same memory retrieved in part one. The event cues were presented in a randomized order. After each event cue, participants were asked if they had a photograph of the event. If the participants answered no, they would continue to the next event cue. If the participant answered yes, they then proceeded to answer a series of yes/no questions pertaining to the photographs (*are you in any of the photos of this event? did you personally take photos of this event? at the time of this event, did you intend to share these photos?*). Additionally, participants were asked to rate on a 7-point Likert-type scale from 1 (*Never*) to 7 (*Daily*) how frequently they reviewed their photographs for this event. We then used these responses to categorize the memories elicited in part one based on the presence or absence of photographs, and the self-reported nature of these images. Finally, participants were asked demographic questions pertaining to their age, gender identity, and ethnic background.

At the end of the survey, we asked instructional manipulation check questions to confirm that participants understood the difference between own eyes and observer visual perspectives. Participants were shown two images of the same scene from either an own eyes or observer perspective and told to imagine they were the person in the scene. Then they were asked to identify whether the image depicted an own eyes or observer perspective. These questions were counterbalanced. If the participant answered incorrectly, their data was excluded from analysis.

2.3 | Data analysis

We used SPSS (version 28.0.1.1) to run all statistical analyses. We excluded memories from our analysis in which participants did not complete the rating scales (1.3% of total number of memories), memories reported as older than 5 years (8.3%) or with no reported time frame (1.4%), and/or the presence of the photo was not indicated (0.4%). As a first step, we examined the number of photographs present in memories based on participant responses. A paired samples t-test indicated that there were fewer memories in the Photo ($M = 8.21$, $SD = 3.14$) than the NoPhoto ($M = 9.76$, $SD = 2.94$) conditions, $t(100) = 2.70$, $p = .008$, $d = .27$.

To examine how differences in the self-reported nature of photographs influenced remembering, we divided the Photo condition based on self-presence (Self, NoSelf), photo taking (Took, NoTook), and intention to share (Share, NoShare). Three separate one-way repeated measures MANOVAs were conducted to examine differences among the subjective ratings based on self-presence,

photo taking, and intention to share. An alpha level of .05 was used to determine statistical significance.

3 | EXPERIMENT 1: RESULTS

As a first step, we examined differences in the self-reported presence of photographs on subjective ratings during autobiographical memory retrieval (see Table 1 for means and SD). The overall MANOVA was significant, *Wilks' Lambda* = .527, $F(6, 95) = 14.19$, $p < .001$, $\eta^2_p = .47$. Follow-up univariate tests indicated that own eyes, $F(1, 100) = 15.89$, $p < .001$, $\eta^2_p = .14$, observer, $F(1, 100) = 30.81$, $p < .001$, $\eta^2_p = .24$, vividness, $F(1, 100) = 47.79$, $p < .001$, $\eta^2_p = .32$, emotional intensity, $F(1, 100) = 42.39$, $p < .001$, $\eta^2_p = .30$, importance, $F(1, 100) = 28.50$, $p < .001$, $\eta^2_p = .22$, and rehearsal, $F(1, 100) = 71.14$, $p < .001$, $\eta^2_p = .42$, were all higher in memories that participants reported they had photographs of (Photo condition) compared to memories they did not report having photographs of (NoPhoto condition). Thus, as expected, events that participants reported they had photographs of were associated with richer phenomenology during memory retrieval. Next, we examined how the unique properties of photographs differentially impacted remembering.

3.1 | Photo taking

The overall MANOVA was significant, *Wilks' Lambda* = .588, $F(7, 76) = 7.60$, $p < .001$, $\eta^2_p = .41$. Follow-up univariate tests indicated that vividness, $F(1, 82) = 12.43$, $p < .001$, $\eta^2_p = .13$, was higher in memories that participants reported they had photographs they had taken (Took condition) compared to memories they had photographs they did not take (NoTook condition; see Figure 1a). Additionally, memories for events that participants reported they had photographs they had taken (Took condition) were also rated higher on rehearsal, $F(1, 82) = 8.09$, $p = .006$, $\eta^2_p = .09$, and photo review, $F(1, 82) = 46.29$, $p < .001$, $\eta^2_p = .36$, than memories with photographs they had not taken (NoTook condition). There were no univariate effects for own eyes, $F(1, 82) = 3.91$, $p = .051$, $\eta^2_p = .05$, observer, $F(1, 82) = 1.85$, $p = .177$, $\eta^2_p = .02$, emotional intensity, $F(1, 82) = 1.95$, $p = .167$, $\eta^2_p = .02$, or importance, $F(1, 82) = .046$, $p = .831$, $\eta^2_p = .001$.

3.2 | Intention to share

The overall MANOVA was significant, *Wilks' Lambda* = .368, $F(7, 78) = 19.10$, $p < .001$, $\eta^2_p = .63$. Follow-up univariate tests indicated that photographs taken with the intention to share with others were rated higher for observer, $F(1, 84) = 18.99$, $p < .001$, $\eta^2_p = .18$, and vividness, $F(1, 84) = 12.23$, $p < .001$, $\eta^2_p = .13$ (see Figure 1b). Additionally, emotional intensity, $F(1, 84) = 12.82$, $p < .001$, $\eta^2_p = .13$, rehearsal, $F(1, 84) = 11.15$, $p = .001$, $\eta^2_p = .12$,

TABLE 1 Subjective ratings for experiment 1.

Rating			Photo conditions					
	NoPhoto	Photo	NoTook	Took	NoShare	Share	NoSelf	Self
Own eyes	5.00 (1.07)	5.39 (1.27)	5.26 (1.33)	5.54 (1.36)	5.35 (1.16)	5.47 (1.31)	5.22 (1.66)	5.26 (1.34)
Observer	3.46 (1.65)	3.98 (1.64)	3.80 (1.68)	4.00 (1.76)	3.80 (1.64)	4.34 (1.74)	3.71 (1.84)	4.19 (1.59)
Vividness	4.44 (0.99)	5.04 (1.16)	4.69 (1.31)	5.17 (1.23)	4.88 (1.27)	5.29 (1.18)	4.88 (1.56)	4.93 (1.22)
Intensity	4.39 (1.16)	4.99 (1.22)	4.81 (1.61)	5.05 (1.28)	4.82 (1.35)	5.31 (1.22)	4.87 (1.72)	5.02 (1.20)
Rehearsal	3.86 (1.21)	4.63 (1.26)	4.32 (1.59)	4.78 (1.34)	4.38 (1.52)	4.89 (1.34)	4.38 (1.83)	4.72 (1.14)
Importance	3.81 (1.11)	4.34 (1.15)	4.81 (1.49)	4.22 (1.35)	4.24 (1.54)	4.72 (1.27)	3.86 (1.89)	4.40 (1.03)
Photo review	–	–	2.61 (0.98)	3.41 (1.15)	2.67 (1.08)	3.47 (1.08)	2.47 (1.41)	3.23 (1.09)

Note: Mean (SD).

importance, $F(1, 84) = 8.47$, $p = .005$, $\eta^2_p = .09$, and photo review, $F(1, 84) = 102.10$, $p < .001$, $\eta^2_p = .55$, were all higher in memories participants reported they had photographs that were intended to share (Share condition) compared to memories with photographs not intended to share (NoShare condition). There was no univariate effect for own eyes, $F(1, 82) = 1.44$, $p = .233$, $\eta^2_p = .02$.

3.3 | Self-presence

The overall MANOVA was significant, *Wilks' Lambda* = .626, $F(7, 56) = 4.78$, $p < .001$, $\eta^2_p = .37$. Follow-up univariate tests indicated that there was no effect of self-presence for own eyes perspectives, $F(1, 62) = .07$, $p = .80$, $\eta^2_p = .001$, but memories that participants reported they had photographs in which the self was present were rated higher on observer ratings, $F(1, 62) = 7.51$, $p = .008$, $\eta^2_p = .11$ (see Figure 1a,b). Additionally, importance, $F(1, 62) = 5.63$, $p = .021$, $\eta^2_p = .08$, and photo review, $F(1, 62) = 23.41$, $p < .001$, $\eta^2_p = .27$, were all higher in memories participants reported they had photographs in which they were present (Self condition) compared to memories with photographs that did not include themselves (NoSelf condition). There were no univariate effects for vividness, $F(1, 62) = .06$, $p = .81$, $\eta^2_p = .001$, emotional intensity, $F(1, 62) = .64$, $p = .43$, $\eta^2_p = .01$, or rehearsal, $F(1, 62) = 2.59$, $p = .11$, $\eta^2_p = .04$.

4 | EXPERIMENT 1: DISCUSSION

Our results demonstrate that memories in which participants report having photographs of are associated with enhanced phenomenology during remembering, but there were subtle differences that depended upon the nature of these images. As predicted, memories that participants reported having photographs taken by them were rated higher on vividness than if photographs had not been taken by others. Additionally, as also predicted, self-presence in the photographs and the intention to share these images with others increased the degree to which participants reported adopting an observer-like perspective during autobiographical memory retrieval. Our exploratory analyses indicated that memories of events that participants reported were

photographed with the intention to share with others were also rated more highly on all the ratings except for own eyes perspectives. Additionally, photos in which the self was present, the participant had taken the photo themselves, or in which they intended to share these with others were all more likely to be reviewed than photos that did not include these properties. However, the exploratory analysis did not reveal differences in emotional intensity based on self-reported differences in whether participants indicated they had taken the photographs, which could be due to differences in the goals of capturing images from the personal past (Soares & Storm, 2022). The post-hoc categorization of the photo condition allowed us to sample memories in an unbiased way, but also led to fewer events in the photo condition. We conducted Experiment 2 to replicate these findings, as well as to include a greater number of memories for comparing the nature of photographs on memory phenomenology.

5 | EXPERIMENT 2: METHODS

5.1 | Participants

Participants consisted of 121 young adults with normal or corrected to normal vision. We excluded 25 participants from the data set (2 because they did not have any photos and 23 for failing the instructional manipulation check). Our final sample size was 96 participants (49 women; mean age in years (M) = 19.2, $SD = 1.71$). Participants were recruited through the University of Alberta's Psychology Department's Research Participation Pool and were compensated with course credit. Ethics approval was obtained from the University of Alberta Research Ethics Board.

5.2 | Procedure

The study procedure and analysis were identical to Experiment 1, except for the addition of 10 event cues designed to elicit memories with photographs (e.g., *watching a sunrise or sunset, celebrating a milestone, spending time with a significant other or close friend*; see Appendix for full list), making a total of 30 memories.

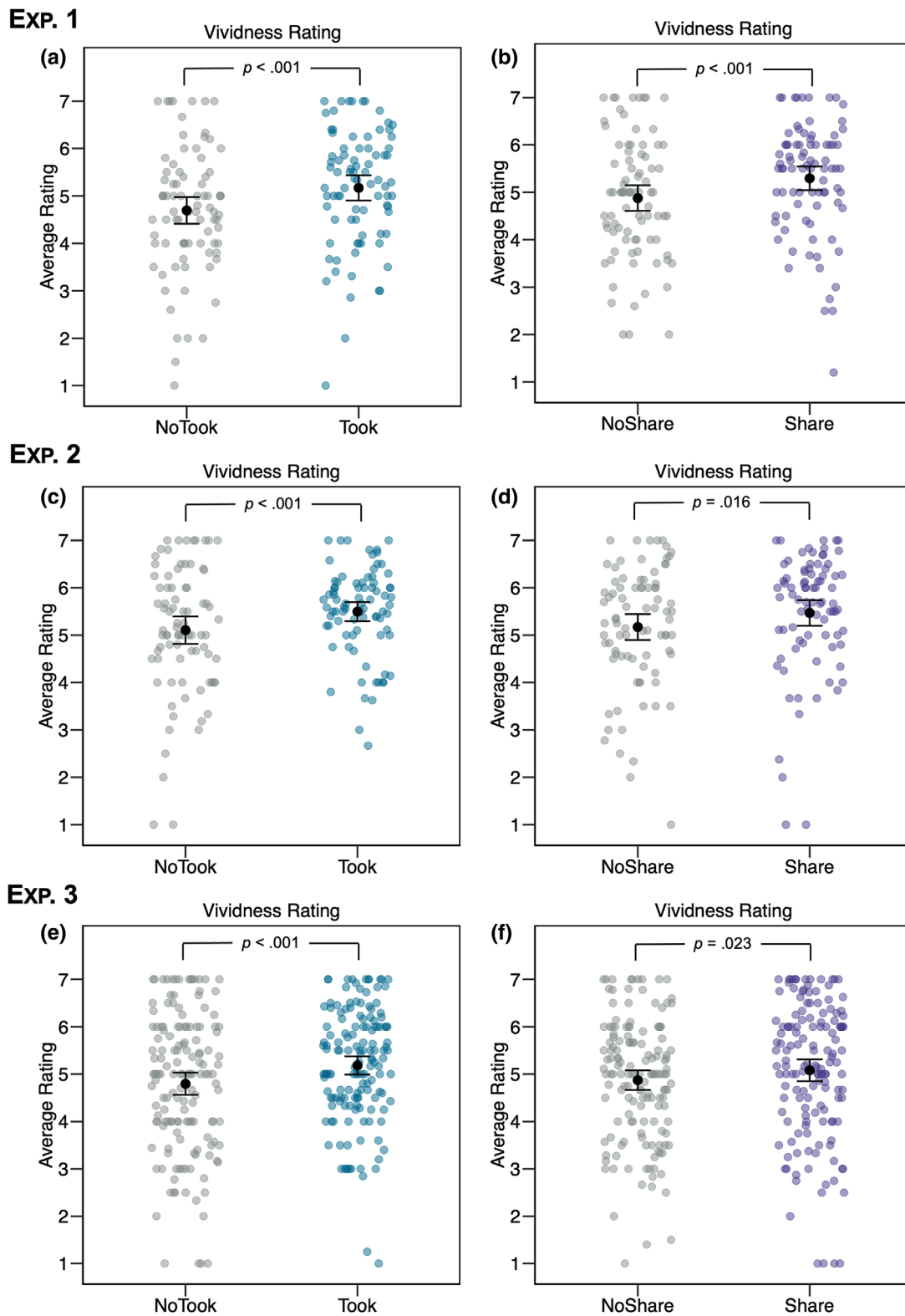


FIGURE 1 Vividness ratings were higher for memories in which a photograph was taken (left) or shared with another person (right) across the three experiments.

We excluded memories from our analysis in which participants did not complete the rating scales (1.3% of total memories), memories were reported as older than 5 years (7.2%) or with no reported time

frame (1.8%), or the presence of a photo was not indicated (.4%). Including a greater number of memories was successful in increasing the number of memories in the Photo ($M = 11.6$, $SD = 4.89$)

TABLE 2 Subjective ratings for experiment 2.

Rating			Photo conditions					
	NoPhoto	Photo	NoTook	Took	NoShare	Share	NoSelf	Self
Own eyes	5.28 (1.14)	5.68 (1.06)	5.58 (1.31)	5.74 (1.08)	5.62 (1.32)	5.66 (1.18)	6.03 (1.18)	5.66 (1.08)
Observer	3.16 (1.49)	3.52 (1.74)	3.36 (1.83)	3.34 (1.68)	3.22 (1.78)	3.55 (1.79)	2.91 (2.02)	3.50 (1.74)
Vividness	4.66 (1.38)	5.35 (1.08)	5.11 (1.34)	5.50 (0.93)	5.19 (1.27)	5.46 (1.27)	5.58 (1.25)	5.33 (1.11)
Intensity	4.18 (1.38)	4.76 (1.36)	4.64 (1.68)	4.77 (1.34)	4.59 (1.34)	4.97 (1.46)	4.69 (1.61)	4.79 (1.36)
Rehearsal	3.72 (1.28)	4.62 (1.26)	4.44 (1.61)	4.62 (1.32)	4.37 (1.54)	4.90 (1.34)	4.17 (1.70)	4.83 (1.35)
Importance	3.60 (1.15)	4.22 (1.24)	4.15 (1.67)	4.10 (1.21)	3.91 (1.33)	4.41 (1.34)	3.79 (1.63)	4.38 (1.24)
Photo review	—	—	2.74 (1.29)	3.65 (1.05)	2.65 (1.17)	3.41 (1.00)	3.06 (1.12)	3.27 (1.08)

Note: Mean (SD).

condition, but there were still fewer memories than the NoPhoto ($M = 15.4$, $SD = 5.09$) condition, $t(95) = 4.04$, $p < .001$, $d = .41$.

6 | EXPERIMENT 2: RESULTS

First, we examined the presence of photos on subjective ratings during retrieval (see Table 2 for means and SD). The overall MANOVA was significant, $Wilks' \Lambda = .437$, $F(6, 90) = 19.29$, $p < .001$, $\eta^2_p = .56$. Follow-up univariate tests indicated that own eyes, $F(1, 95) = 28.36$, $p < .001$, $\eta^2_p = .23$, observer, $F(1, 95) = 17.46$, $p < .001$, $\eta^2_p = .16$, vividness, $F(1, 95) = 64.46$, $p < .001$, $\eta^2_p = .40$, emotional intensity, $F(1, 95) = 61.83$, $p < .001$, $\eta^2_p = .39$, importance, $F(1, 95) = 99.41$, $p < .001$, $\eta^2_p = .51$, and rehearsal, $F(1, 95) = 47.13$, $p < .001$, $\eta^2_p = .33$, were all higher in memories participants reported they had photographs of (Photo condition) compared to memories they did not report having photographs of (NoPhoto condition).

6.1 | Photo taking

The overall MANOVA was significant, $Wilks' \Lambda = .538$, $F(7, 75) = 9.18$, $p < .001$, $\eta^2_p = .46$. Follow-up univariate tests indicated that vividness, $F(1, 81) = 12.13$, $p < .001$, $\eta^2_p = .13$, was higher in memories that participants reported they had photographs they had taken (Took condition) compared to memories they had photographs they did not take (NoTook condition; see Figure 1c). Additionally, memories with photographs taken by the participant were also rated higher on the amount of photo review, $F(1, 81) = 50.06$, $p < .001$, $\eta^2_p = .38$. There were no univariate effects for own eyes, $F(1, 81) = 2.26$, $p = .137$, $\eta^2_p = .03$, observer, $F(1, 81) = .033$, $p = .857$, $\eta^2_p < .001$, emotional intensity, $F(1, 81) = .997$, $p = .321$, $\eta^2_p = .01$, rehearsal, $F(1, 81) = 1.35$, $p = .249$, $\eta^2_p = .02$, or importance, $F(1, 81) = .100$, $p = .752$, $\eta^2_p = .001$.

6.2 | Intention to share

The overall MANOVA was significant, $Wilks' \Lambda = .552$, $F(7, 76) = 8.81$, $p < .001$, $\eta^2_p = .45$. Follow-up univariate tests indicated that

vividness, $F(1, 82) = 6.07$, $p = .016$, $\eta^2_p = .07$, was higher in memories that participants reported they had photographs that were intended to share (Share condition) compared to memories with photographs not intended to share (NoShare condition; see Figure 1d). Memories with photographs intended to share were also rated higher on observer ratings, $F(1, 82) = 6.67$, $p = .012$, $\eta^2_p = .08$, emotional intensity, $F(1, 82) = 6.99$, $p = .010$, $\eta^2_p = .08$, rehearsal, $F(1, 82) = 12.27$, $p < .001$, $\eta^2_p = .13$, importance, $F(1, 82) = 12.58$, $p < .001$, $\eta^2_p = .13$, and photo review, $F(1, 82) = 49.38$, $p < .001$, $\eta^2_p = .38$. There were no univariate effects for own eyes ratings, $F(1, 82) = .109$, $p = .742$, $\eta^2_p = .001$.

6.3 | Self-presence

The overall MANOVA was significant, $Wilks' \Lambda = .599$, $F(7, 71) = 6.80$, $p < .001$, $\eta^2_p = .40$. Follow-up univariate tests indicated that own eyes ratings were higher in memories participants reported they had photographs that did not include the self (NoSelf condition) compared to memories with photographs that included the self (Self condition), $F(1, 77) = 10.97$, $p = .001$, $\eta^2_p = .13$, whereas observer ratings were higher in the Self versus NoSelf conditions, $F(1, 77) = 14.74$, $p < .001$, $\eta^2_p = .16$ (see Figure 2c,d). Additionally, rehearsal, $F(1, 77) = 16.92$, $p < .001$, $\eta^2_p = .18$, and importance, $F(1, 77) = 12.02$, $p < .001$, $\eta^2_p = .14$, were both higher in the Self versus NoSelf conditions. In contrast, vividness, $F(1, 77) = 4.94$, $p = .029$, $\eta^2_p = .06$, was higher in the NoSelf versus Self conditions. There were no univariate effects for emotional intensity, $F(1, 77) = .491$, $p = .485$, $\eta^2_p = .006$, or photo review, $F(1, 77) = 2.58$, $p = .11$, $\eta^2_p = .03$.

7 | EXPERIMENT 2: DISCUSSION

The results of Experiment 2 replicated the main findings from Experiment 1. Memories that participants reporting having photographs of had higher subjective ratings, however, there were differences depending upon the nature of the images. Replicating Experiment 1, we found that vividness ratings were higher for memories with photographs the participant reported they had taken themselves.

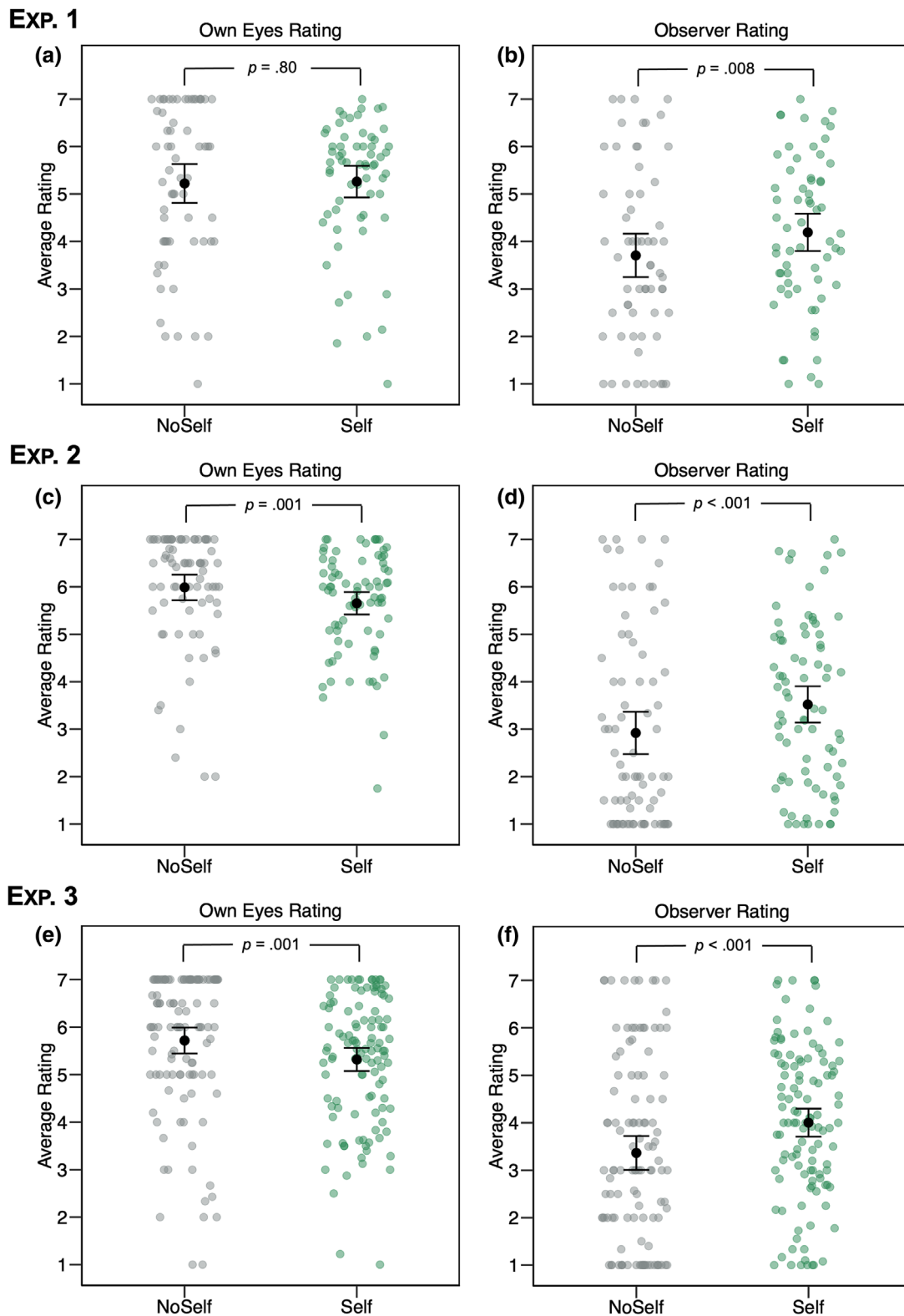


FIGURE 2 Own eyes (left) and observer (right) perspective ratings differed depending upon whether the self was present in photographs across the three experiments.

Like Experiment 1, observer ratings were also higher in memories that participants reported with photographs in which they were visible and those that were intended to share with others.

Experiment 2 additionally demonstrated that own eyes ratings were higher in memories that participants reported with photographs in which they were not visible, further supporting the

interpretation that self-visibility in photographs impacts the nature of the viewpoint used when remembering these events. Our exploratory analyses indicated that photographs that participants reported they had taken or which were taken with the intention to be shared with others were also more likely to have been reviewed, but there was no difference here based on whether photographs included the self. Additionally, like Experiment 1, we did not find differences in the emotional intensity of memories that participants reported they had photographs of that they had taken.

Experiment 1 and 2 specifically targeted recent memories from the last 5 years. On the one hand, the impact of photographs on recent memories might be more powerful because these images remain more vivid and/or they are more likely to be recently rehearsed when compared to photographs for remote memories. On the other hand, photographs for remote memories might have had more opportunities for review when compared to more recent memories. To examine the influence of remoteness on memories that participants report with photographs, we conducted a third experiment in which we manipulated the remoteness of memories using a between groups design.

8 | EXPERIMENT 3: METHODS

8.1 | Participants

The participants consisted of 223 young adults with normal or corrected to normal vision. We excluded 42 participants from the data set (34 for failing the instruction manipulation check, 2 for having no memories with photographs, 5 for not having any remote memories, 1 for not reporting memory age). Our final sample size was 181 participants (83 women; mean age in years [M] = 19.4, SD = 1.91). We aimed to roughly double our sample size compared to the previous experiments, to account for the between subject's design. Participants were recruited through the University of Alberta's Psychology Department's Research Participation Pool and were compensated with course credit. Ethics approval was obtained from the University of Alberta Research Ethics Board.

8.1.1 | Procedure

We used a between subject's design to manipulate memory remoteness. The procedure for both groups was identical to the previous experiments, except that the remote group was instructed to retrieve autobiographical memories that were older than 5 years. Additionally, we replaced some of the event cues targeted to elicit more recent memories in our university age sample (e.g., High school graduation) with cues aimed to elicit more remote memories (e.g., professional development day at school, a sleepover with friends; see Appendix for full list). We excluded memories from our analysis in which participants did not complete the rating scales (.9% of total memories), reported an incorrect age of the memory (i.e., recent group: >5 years,

remote group: <5 years; 13.8%) or did not report the memory age (1.6%), or the presence of a photo was not indicated (.3%).

To examine potential differences in the number of memories, we conducted a 2 (Condition: Photo, NoPhoto) \times 2 (Group: Recent, Remote) repeated measures ANOVA with Condition as a within-subjects variable and Group as a between-subjects variable. There was a main effect of Condition, $F(1, 179) = 114.07$, $p < .001$, $\eta^2_p = .39$, reflecting that there were fewer memories in the Photo ($M = 9.69$, $SD = 4.61$) than NoPhoto ($M = 16.07$, $SD = 4.78$) conditions. There was also a main effect of Group, $F(1, 179) = 8.123$, $p = .005$, $\eta^2_p = .04$, reflecting that there were more memories on average in the recent ($M = 26.74$, $SD = 3.17$) than remote ($M = 24.70$, $SD = 6.08$) group.¹ However, there was no Condition \times Group interaction, $F(1, 179) = 114.07$, $p < .001$, $\eta^2_p = .39$. Thus, there were an equal number of memories in the photo conditions in the recent and remote groups.

9 | EXPERIMENT 3: RESULTS

First, we examined the presence of photos on subjective ratings during retrieval of recent and remote events (see Table 3 for means and SD). The main effect of Condition was significant, *Wilks' Lambda* = .462, $F(6, 174) = 40.36$, $p < .001$, $\eta^2_p = .18$. Follow-up univariate tests indicated that own eyes, $F(1, 179) = 40.36$, $p < .001$, $\eta^2_p = .18$, observer, $F(1, 179) = 45.54$, $p < .001$, $\eta^2_p = .20$, vividness, $F(1, 179) = 118.55$, $p < .001$, $\eta^2_p = .40$, emotional intensity, $F(1, 179) = 74.82$, $p < .001$, $\eta^2_p = .30$, importance, $F(1, 179) = 105.84$, $p < .001$, $\eta^2_p = .37$, and rehearsal, $F(1, 179) = 162.94$, $p < .001$, $\eta^2_p = .48$, were all higher in memories participants reported they had photographs of (Photo condition) compared to memories they did not report having photographs of (NoPhoto condition).

The main effect of Group was also significant, *Wilks' Lambda* = .915, $F(6, 174) = 2.71$, $p = .015$, $\eta^2_p = .09$. Follow-up univariate tests indicated that own eyes, $F(1, 179) = 6.57$, $p = .011$, $\eta^2_p = .04$, vividness, $F(1, 179) = 7.63$, $p = .006$, $\eta^2_p = .04$, emotional intensity, $F(1, 179) = 7.17$, $p = .008$, $\eta^2_p = .04$, importance, $F(1, 179) = 12.75$, $p < .001$, $\eta^2_p = .07$, and rehearsal, $F(1, 179) = 10.81$, $p = .001$, $\eta^2_p = .06$, were all higher in the recent than remote groups. However, there was no group differences in observer ratings, $F(1, 179) = .249$, $p = .618$, $\eta^2_p = .001$. The overall MANOVA was not significant for the Condition \times Group interaction, *Wilks' Lambda* = .961, $F(6, 174) = 1.18$, $p = .318$, $\eta^2_p = .04$. In sum, recent memories were rated higher than remote memories on recollective qualities and were more important and rehearsed. However, self-reported differences in having photographs was associated with similar subjective ratings across both recent and remote memories.

9.1 | Photo taking

There was a significant main effect of Condition, *Wilks' Lambda* = .681 $F(7, 140) = 9.38$, $p < .001$, $\eta^2_p = .32$. Follow-up univariate tests indicated

TABLE 3 Subjective ratings for experiment 3.

Group	Rating	Photo conditions							
		NoPhoto	Photo	NoTook	Took	NoShare	Share	NoSelf	Self
Recent	Own eyes	5.11 (1.11)	5.55 (1.16)	5.29 (1.59)	5.64 (1.24)	5.25 (1.42)	5.61 (1.33)	5.80 (1.46)	5.52 (1.31)
	Observer	3.37 (1.50)	3.87 (1.69)	4.08 (1.83)	3.80 (1.75)	4.02 (1.78)	4.09 (1.85)	3.37 (1.91)	4.02 (1.76)
	Vividness	4.56 (1.06)	5.25 (1.18)	5.05 (1.43)	5.44 (1.18)	5.08 (1.19)	5.31 (1.40)	5.44 (1.46)	5.27 (1.25)
	Intensity	4.37 (1.16)	4.96 (1.27)	4.83 (1.54)	5.05 (1.24)	4.81 (1.33)	5.18 (1.30)	4.97 (1.65)	5.03 (1.23)
	Rehearsal	3.68 (1.15)	4.49 (1.24)	4.22 (1.68)	4.65 (1.20)	4.27 (1.47)	4.89 (1.40)	4.30 (1.67)	4.59 (1.34)
	Importance	3.56 (1.03)	4.24 (1.30)	4.31 (1.62)	4.26 (1.33)	3.98 (1.56)	4.49 (1.45)	3.82 (1.96)	4.45 (1.20)
	Photo review	—	—	2.89 (1.10)	3.51 (1.08)	2.71 (1.10)	3.82 (1.04)	2.94 (1.40)	3.46 (1.11)
Remote	Own eyes	4.72 (1.29)	5.04 (1.39)	4.87 (1.63)	5.28 (1.45)	4.81 (1.60)	5.33 (1.24)	5.55 (1.57)	4.96 (1.34)
	Observer	3.30 (1.29)	3.73 (1.55)	3.85 (1.62)	3.75 (1.73)	3.89 (1.60)	3.71 (1.65)	3.24 (1.99)	3.96 (1.35)
	Vividness	4.22 (1.14)	4.68 (1.27)	4.55 (1.46)	4.92 (1.16)	4.63 (1.36)	4.81 (1.41)	4.98 (1.35)	4.66 (1.23)
	Intensity	4.00 (1.02)	4.48 (1.09)	4.22 (1.25)	4.82 (1.07)	4.33 (1.30)	4.62 (1.23)	4.47 (1.71)	4.45 (1.20)
	Rehearsal	3.12 (1.18)	3.92 (1.36)	3.65 (1.51)	4.10 (1.36)	3.64 (1.56)	4.08 (1.57)	3.74 (1.76)	4.03 (1.32)
	Importance	2.96 (1.01)	3.73 (1.23)	3.47 (1.32)	3.96 (1.39)	3.55 (1.54)	3.91 (1.44)	3.28 (1.73)	3.82 (1.20)
	Photo review	—	—	2.39 (0.85)	2.92 (1.01)	2.31 (0.86)	3.08 (1.08)	2.16 (1.29)	2.61 (0.71)

Note: Mean (SD).

that vividness, $F(1, 146) = 18.02$, $p < .001$, $\eta^2_p = .11$, was higher in memories that participants reported they had photographs they had taken (Took condition) compared to memories they had photographs they did not take (NoTook condition; see Figure 1e). Additionally, memories of events with photographs the participant took were also rated higher on own eyes ratings, $F(1, 146) = 16.29$, $p < .001$, $\eta^2_p = .10$, emotional intensity, $F(1, 146) = 16.42$, $p < .001$, $\eta^2_p = .10$, rehearsal, $F(1, 146) = 15.50$, $p < .001$, $\eta^2_p = .09$, and photo review, $F(1, 146) = 44.75$, $p < .001$, $\eta^2_p = .24$. There were no univariate effects for observer ratings, $F(1, 146) = 3.41$, $p = .067$, $\eta^2_p = .02$, or importance, $F(1, 146) = 3.44$, $p = .066$, $\eta^2_p = .02$.

There was also a significant main effect of Group, *Wilks' Lambda* = .882, $F(7, 140) = 2.67$, $p = .013$, $\eta^2_p = .12$. Follow-up univariate tests indicated vividness, $F(1, 146) = 6.59$, $p = .011$, $\eta^2_p = .04$, emotional intensity, $F(1, 146) = 5.17$, $p = .024$, $\eta^2_p = .03$, rehearsal, $F(1, 146) = 7.19$, $p = .008$, $\eta^2_p = .05$, importance, $F(1, 146) = 7.88$, $p = .006$, $\eta^2_p = .05$, and photo review, $F(1, 146) = 14.25$, $p < .001$, $\eta^2_p = .09$, were all higher in the recent versus remote group. There were no univariate effects for own eyes, $F(1, 146) = 3.00$, $p = .085$, $\eta^2_p = .02$, or observer, $F(1, 146) = .29$, $p = .591$, $\eta^2_p = .00$. There was no Condition x Group interaction, *Wilks' Lambda* = .916, $F(7, 140) = 1.82$, $p = .087$, $\eta^2_p = .08$.

9.2 | Intention to share

There was a main effect of Condition, *Wilks' Lambda* = .518, $F(7, 140) = 18.62$, $p < .001$, $\eta^2_p = .48$. Follow-up univariate tests indicated that vividness, $F(1, 146) = 5.27$, $p = .023$, $\eta^2_p = .04$, was higher for memories of events with photographs intended to share with others (see Figure 1f). Unlike the previous experiments,

memories of events in the Share versus NoShare conditions were associated with higher own eyes ratings, $F(1, 146) = 17.02$, $p < .001$, $\eta^2_p = .10$, but there were no univariate effects for observer ratings, $F(1, 146) = .186$, $p = .667$, $\eta^2_p = .001$. Additionally, ratings were higher for the Share versus NoShare conditions for emotional intensity, $F(1, 146) = 10.77$, $p = .001$, $\eta^2_p = .07$, importance, $F(1, 146) = 11.47$, $p < .001$, $\eta^2_p = .07$, rehearsal, $F(1, 146) = 16.66$, $p < .001$, $\eta^2_p = .10$, and photo review, $F(1, 146) = 111.46$, $p < .001$, $\eta^2_p = .43$.

There was also a significant main effect of Group, *Wilks' Lambda* = .878, $F(7, 140) = 2.79$, $p = .01$, $\eta^2_p = .12$. Follow-up univariate effects indicated that vividness, $F(1, 146) = 5.59$, $p = .019$, $\eta^2_p = .04$, emotional intensity, $F(1, 146) = 7.74$, $p = .006$, $\eta^2_p = .05$, rehearsal, $F(1, 146) = 11.55$, $p < .001$, $\eta^2_p = .07$, importance, $F(1, 146) = 5.73$, $p = .018$, $\eta^2_p = .04$, and photo review, $F(1, 146) = 15.41$, $p < .001$, $\eta^2_p = .10$, were all higher in the recent versus remote group. There were no univariate effects for own eyes, $F(1, 146) = 3.02$, $p = .084$, $\eta^2_p = .02$, or observer, $F(1, 146) = .976$, $p = .325$, $\eta^2_p = .007$. There was no Condition x Group interaction, *Wilks' Lambda* = .970, $F(7, 140) = .625$, $p = .734$, $\eta^2_p = .03$.

9.3 | Self-presence

There was a main effect of condition, *Wilks' Lambda* = .612, $F(7, 104) = 9.41$, $p < .001$, $\eta^2_p = .39$. Follow-up univariate tests indicated that vividness, $F(1, 110) = 4.58$, $p = .035$, $\eta^2_p = .04$, was higher in memories that participants reported with photographs that did not include the self (NoSelf condition) compared to photographs that included the self (Self condition). We also found that own eyes ratings were higher in the NoSelf versus Self conditions, $F(1, 110) = 10.92$, $p = .001$, $\eta^2_p = .09$, whereas observer ratings were higher in the Self

versus NoSelf conditions, $F(1, 110) = 21.44, p < .001, \eta^2_p = .16$ (see Figure 2e,f). Additionally, importance, $F(1, 110) = 13.89, p < .001, \eta^2_p = .11$, and photo review, $F(1, 110) = 12.71, p < .001, \eta^2_p = .10$, were both higher in the Self versus NoSelf conditions. There were no univariate effects for emotional intensity, $F(1, 110) = .019, p = .890, \eta^2_p < .001$, or rehearsal, $F(1, 110) = 2.93, p = .09, \eta^2_p = .03$.

There was also a main effect of Group, *Wilks' Lambda* = .816, $F(7, 104) = 3.35, p = .003, \eta^2_p = .18$. Follow-up univariate tests indicated that vividness, $F(1, 110) = 5.11, p = .026, \eta^2_p = .04$, emotional intensity, $F(1, 110) = 4.56, p = .037, \eta^2_p = .04$, rehearsal, $F(1, 110) = 5.11, p = .026, \eta^2_p = .04$, importance, $F(1, 110) = 4.66, p = .033, \eta^2_p = .04$, and photo review, $F(1, 110) = 21.79, p < .001, \eta^2_p = .17$, were all higher in the recent versus remote group. There were no univariate effects for own eyes, $F(1, 110) = 2.65, p = .106, \eta^2_p = .02$, or observer, $F(1, 110) = .089, p = .766, \eta^2_p = .001$. However, there was no Condition \times Group interaction, *Wilks' Lambda* = .984, $F(7, 104) = .237, p = .975, \eta^2_p = .02$.

10 | EXPERIMENT 3: DISCUSSION

The findings from Experiment 3 replicated the overall finding from two previous experiments, that memories in which participants reported having photographs of were rated more highly than memories they reported did not have photographs. Memory remoteness had the expected effect of reducing all subjective ratings, except for observer perspectives. Additionally, photos of these more remote memories were also less frequently reviewed than recent memories. However, there were no significant differences related to the self-reported presence of photographs in memories on the phenomenology of recent and remote memories.

Replicating the previous experiments, memories that participants reported having photographs that they took were remembered more vividly. Unlike the previous experiments, however, our exploratory analysis revealed a significant increase in emotional intensity in memories that participants reported they had photographs they had taken. Given that the memories elicited here included more remote events, an intriguing possibility is that self-reported differences in memories with photographs taken by the participant could have differed in childhood.

Like Experiment 1 and 2, memories in which participants reported having photographs in which they were visible also influenced the visual perspective adopted, with lower own eyes ratings coupled with higher observer ratings during remembering when compared to memories that participants reported with photographs in which they were not visible. Unlike Experiment 1 & 2, however, there were no significant effects in the intention to share on observer perspective ratings. Instead, the results of Experiment 3 demonstrated an increase in own eyes ratings in memories in which participants reported having photos that were taken with the intention of sharing. Given that both recent and remote memories were included here, we wondered whether this conflicting finding across the studies was due to the inclusion of the remote group. However, inspection of the mean values for own eyes ratings demonstrated that they were higher in the Share compared to

the NoShare conditions in both the recent and remote groups, and a separate univariate analysis conducted in the recent group only also indicated that this difference was significant, $F(1, 79) = 7.56, p = .007, \eta^2_p = .09$. The impact on memories might differ according to the circumstances in which photographs are intended to be shared, such as on social media versus with a close circle of family or friends (e.g., Barasch et al., 2018), and subtle differences across the three experiments might have contributed to this unreliable pattern.

11 | DISCUSSION

The current study examined how the self-reported presence of photographs influences autobiographical memory retrieval across three separate experiments. As expected, memories in which people reported having photographs of were remembered with heightened vividness, emotional intensity and visual perspective, and these memories were also evaluated as more important and likely to have been rehearsed. However, the self-reported nature of the photographs also differentially impacted memory phenomenology. We found that photographs of events that people reported they had taken themselves or that were intended to share with others were remembered more vividly than memories people reported were taken by other people or not intended for sharing. Additionally, memories for events in which people reported having photographs in which they were visible in the image were associated with higher observer-like perspectives. In contrast, we did not find a reliable pattern of effects on visual perspective ratings regarding the intention to share photographs with others. Below we discuss the wider implications of these results.

Our findings support intuitions that photographs are a useful way to preserve our memories. Perhaps what is most surprising is that photographs continue to have a beneficial effect on memories despite the staggering number of images captured by individuals in daily life (e.g., Henkel et al., 2021). Here we showed that autobiographical memories that people reported they had photographs of were associated with greater vividness and emotional intensity and were also rated as being more important and more likely to be rehearsed. One potential explanation is that memories of events that people report having photographs of differ in their personal significance and/or amount of rehearsal from memories of events without self-reported photographs. It is unknown based on the current findings whether these events differed initially or whether they developed into more significant events because of the presence of photographs. Of course, there are many key moments in our lives that are impactful but less likely to be photographed in daily life, such as meeting our significant other for the first time or the death of a loved one. In the current study, we tried to account for these potential differences in events with and without photographs by including a variety of retrieval cues that included some of these more poignant examples of non-photographed events (e.g., *starting school or a new job*). There are also individual differences related to the frequency and number of photographs that people take every day that could further help to understand the potential impact of photos on memory (e.g., Konijn et al., 2016). Given that the findings relied on self-reported differences

in the presence of photographs, there could also be biases in reporting having a photograph of an event when memories are more vivid and or emotionally arousing. While the current study examined the role of self-reported presence of photographs of events on the characteristics of memories, people frequently aim to preserve to the past via other sources (e.g., souvenirs) that can enhance memory (e.g., Kirk & Berntsen, 2018; Miles et al., 2013; Taylor & Garry, 2019). It would be of interest for future research to examine potential differences in photographs and the variety of mementos that people collect to preserve the past.

Our more targeted analyses within the photograph condition demonstrated differential effects on memory phenomenology depending upon the self-reported nature of the photographs taken. Across the experiments we found that memories that people reported having photographs they took themselves or intended to share with others were rated more vividly than memories of events that people reported with photographs that lacked these aspects. The current findings are consistent with prior research demonstrating that taking photographs and intending them to share them with others can enhance memory during encoding because it influences how we attend to and process these experiences (e.g., Henkel, 2014; Pathman et al., 2011). Our findings suggest that beneficial effects of taking photos and planning to share them may persist at significantly longer retention intervals than used in previous studies (e.g., 5 years or more) and can influence the subjective experience of remembering. The boost to memory phenomenology we observed could be due to a combination of both encoding and retrieval effects, because events in these photo conditions were also more likely to have been reviewed and benefit from memory rehearsal. Interestingly, we did not find differences in the impact of self-reported differences in taking photographs or intending to share them based on the recency or remoteness of events. The ratings we used to assess the age of the memory were intended as a validity check rather than with the aim to isolate potential differences in the age of remote memories. Given that the nature of photographs in early childhood may differ from that of early adolescence, it would be of great interest to further understand how this could impact how people recall remote memories of different ages.

Photographs necessarily capture a particular viewpoint of events, and recent evidence suggests an equal percentage of photographs are taken from own eyes and observer-like perspectives (Niese et al., 2023). Here we found that memories with photographs in which people reported the self was visible were associated with higher observer-like perspectives than memories with photographs that people reported did not include the self. The current findings highlight that the perspective taken in photographs can bias the viewpoint people use during remembering. These findings support constructive accounts of memory (Conway & Loveday, 2015; Schacter & Addis, 2007), which propose that processes that contribute to how memories are initially built and later recalled can reshape memories. Along with these differences in perspective, we found some evidence that memories of events that people reported having photographs in which they were visible were less vivid than memories in which they reported they were not visible in the photographs (Experiment 2 & 3), which is consistent with prior research demonstrating that adopting

an observer-like perspective during autobiographical recall is associated with less vivid remembering (for review see St. Jacques, 2022). However, this finding was not replicated in Experiment 1, suggesting that there may be other factors that contribute to whether events with photographs depicting the self will have an impact on the vividness of memories. In the current study, it was unclear whether biases in the perspective of memories occurred when the photograph was taken (e.g., taking a selfie) or during later retrieval as people reviewed photographs of these experiences because the photo condition was based on self-report. Marcotti and St. Jacques (2018) demonstrated that reviewing photographs of naturalistic events encoded in the lab that were taken from an observer-like perspective influenced the visual perspective that people later adopted when recalling these events. Compared to reviewing first-person perspective photos, third-person perspective photos increase observer-like perspective ratings and the tendency for people to adopt the identical observer viewpoint shown in the photograph (i.e., in front, at eye-level, and within 6-feet). Interestingly, the visibility of the self in the third-person perspective photograph did not differentially impact the perspective people adopted during remembering. Prior research has often defined observer-like perspective based on the visibility of the self (e.g., “as if you were seeing yourself in the memory”), but recent evidence has shown that these are separable constructs (Kinley et al., 2021). Thus, it could be of interest to examine how photographs depicting third-person perspectives that differ based on whether the self is visible may differentially bias memory perspective. The presence of the self in photographs may also be difficult to distinguish from other features of photographs such as whether they were taken by the participant as a selfie or by another person, and disentangling these and other potential questions could be important for understanding how self-visibility in photographs influences memory.

The self-reported intention to share photographs with others did not lead to reliable effects on visual perspective ratings across the experiments. While memories that participants reported with photographs they intended to share were rated higher on observer-like perspectives in Experiment 1 and 2, we found the opposite pattern in Experiment 3 such that own eyes ratings were higher. This inconsistent finding could reflect differences in how participants planned to share photographs. Prior research has shown that the platform through which photos were to be shared (e.g., social media, text message) and the closeness of the desired audience (e.g., acquaintances, close friends, family) can both potentially impact an individual's self-presentational concern (i.e., fear of judgement; Barasch et al., 2018). Stronger feelings related to how we are portrayed by others during encoding are thought in turn to influence whether people adopt an observer-like perspective (for review see St. Jacques, 2023).

11.1 | Limitations

The current study used a retrospective approach to examine how self-reported differences in the presence of photographs influenced the phenomenological properties of autobiographical memories. One advantage of our approach was that participants were only asked to

evaluate the presence of photographs and other characteristics of these images following the selection and rating of all memories. Thus, participants were not inadvertently biased to select memories and/or in how they rated their subjective experience of remembering. Nonetheless, having selected and rated the memories themselves could have influenced the responses that participants provided when evaluating the nature of their photographs for these events. For example, remembering events from an observer-like perspective could have led participants to infer that they had photographs of these events in which the self was visible. Additionally, the reliance on self-report limits the causal interpretations that can be made regarding the influence of photographs on memories. Future research using a prospective approach (e.g., Henkel, 2014; St. Jacques et al., 2011) in which participants are asked to take photographs of events with and without the self would be important for addressing this potential limitation.

11.2 | Conclusions

Our engagement with photographs of events is multifaceted, such that it is not just that we view photographs, we actively take them, organize them, share them with others (Fawns, 2020). The current findings provide evidence that photographs can powerfully influence how we remember our personal past by biasing the resolution of the visual images and the viewpoint we adopt when remembering these experiences.

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CONFLICT OF INTEREST STATEMENT

The authors have no conflict of interest to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in OSF at <https://osf.io/x5ydz/>.

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ENDNOTE

ⁱ This is because we did not include memories in which participants did not indicate the photo status, which occurred more frequently in the remote group.

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APPENDIX A

Experiment 1: Event cues

- A first date.
- Being accepted to university.
- First online class.
- Starting a new job or course.
- First day of university.
- Getting an official document (e.g., license) or certificate.
- A fun group project.
- Meeting a new friend.
- Spending time on a favorite hobby.
- Receiving a high mark on an assignment.
- High school graduation/prom.
- Meeting someone famous or that you admire (e.g., author, musician, etc.).
- A vacation.
- Attending a concert/festival.
- A significant birthday.
- A family reunion or gathering.
- A holiday celebration.
- Visiting a museum.
- Attending a sporting event.
- Going out with friends.

Experiment 2: Additional event cues

- Watching a sunset or sunrise.
- Spending time with a significant other or close friend.
- An anniversary.
- Visiting a landmark.
- Celebrating a milestone.
- Going on a hike or walk, or spending time in nature.
- Spending time with pets or animals.
- Doing an outdoor winter activity.

- A car ride or road trip.
- Visiting a cafe/donut shop/ice cream shop.

Experiment 3: Remote event cues

- First day of school.
- A fun school event.
- A class presentation.
- Playing a sport/exercising.
- Practicing a skill.
- Outdoor at recess.
- After school club.
- Professional development day at school.
- Spending time on a favourite hobby.
- Meeting a new friend.
- A vacation.
- A significant birthday.
- A family reunion or gathering.
- A holiday celebration.
- Attending a sporting event.
- Visiting a landmark.
- Celebrating a milestone.
- Going on a hike or walk, or spending time in nature.
- Spending time with pets or animals.
- Doing an outdoor winter activity.
- A car ride or road trip.
- Picture day at school.
- A school dance.
- Visiting a cafe/donut shop/ice cream shop.
- Visiting a museum.
- A sleepover with friends.
- A field trip.
- Spending time with friends.
- Going camping.
- Attending a concert/festival.