BILINGUAL PUBLISHING CO.
Pioneer of Global Academics Since 1984

Journal of Psychological Research
https://ojs.bilpublishing.com/index.php/jpr

ARTICLE

The Role of Photographs and Time Lag on Positivity Ratings of Vacation and Weekend Memories

Katinka Dijkstra[1*] Keri Pekaar[2] Jacky Hooftman[3] Yvette van Osch[4]

1. Erasmus University Rotterdam, Netherlands
2. Eindhoven University of Technology, Netherlands
3. Erasmus Medical Center, Amsterdam UMC, Vrije Universiteit Amsterdam, Netherlands
4. Tilburg University, Netherlands

Abstract: Two studies examined the question of whether photograph taking of an event influences the positivity of the evaluations of the event at a later point in time. Memories of photographed events yielded higher positivity ratings than memories that were not photographed. Although we expected fading of positivity ratings to occur more slowly over a period of two months for memories of photographed events, we found faster affect fading for those memories in Study 2 instead. The findings of the two studies support the idea that taking photographs of events sustains the affective reconstruction of autobiographical memories, regardless of whether these events are special, such as vacation memories, or more mundane, such as memories of the past weekend.

Keywords: Autobiographical memory; Memory fading; Memory affective positivity; Evaluation of remembered events; Photo-taking effect

1. Introduction

The role that taking photographs has in our lives seems to have changed. Decades ago, photographs functioned as a memory tool of remarkable events or experiences neatly organized in family albums. Nowadays, photographs have become snapshots or messages of everyday experiences with friends, family members, or followers on social media [1]. Rather than being mementos and markers of special events in the old days, photographs are now taken as expressions of all kinds of experiences, including everyday activities [2]. Given the breadth and frequency of experiences being photographed, these photographs may also have started to serve a different function. With so many events being documented and shared, from wedding pictures to a photograph of a fancy meal, remembering the events and their details may be too demanding on cognitive resources. This means that offloading information from the experience itself onto something tangible (i.e., a picture) may have become another function of photograph taking of events [3].

*Corresponding Author:
Katinka Dijkstra,
Erasmus University Rotterdam, Netherlands;
Email: k.dijkstra@essb.eur.nl

Received: 24 November 2021; **Revised:** 18 January 2022; **Acceptd:** 15 February 2022; **Published Online:** 18 February 2022

Citation: Katinka Dijkstra, Keri Pekaar, Jacky Hooftman, Yvette van Osch. The Role of Photographs and Time Lag on Positivity Ratings of Vacation and Weekend Memories. *Journal of Psychological Research*, 2022, 4(1), 4131. https://doi.org/10.30564/jpr.v4i1.4131

DOI: https://doi.org/10.30564/jpr.v4i1.4131

Copyright © 2022 by the author(s). Published by Bilingual Publishing Co. This is an open access article under the Creative Commons Attribution-NonCommercial 4.0 International (CC BY-NC 4.0) License. (https://creativecommons.org/licenses/by-nc/4.0/).

This presumed change in function and use, along with the increased accessibility of photograph taking devices such as smartphones, and ways to share those experiences on social media, has raised the question whether and how pictures impact our affective evaluation of photographed events. One possibility is that photographed events are evaluated more positively than events that were not photographed because attention is directed toward the event being photographed which makes aspects associated with the experience more salient [4,5]. Individuals may also take photographs to be able to enjoy or reexperience the moment again when they review these photographs at a later time. This would enhance memory for the photographs. However, the opposite is possible as well. Photograph taking may serve as a distraction or disengagement for the photographer. If the focus is on the capture of the scene, rather than the experience, attention may be directed away from the event when taking a photograph with the result that the event will be remembered less well.

We were interested in differences between affective evaluations of autobiographical memories of events that were photographed at the time of the experience and memories of events that were not photographed. Now that so many events are being photographed and shared, an important question is whether photograph taking contributes to the positive evaluation of the experience. We were also interested in the role of fading with regard to the positivity of memories from photographed events versus events that were not photographed to assess the durability of the positive affect associated with the event.

Evidence for a more positive evaluation of photographed events comes from several experiments by Diehl and colleagues [4] who were interested in the question how taking photos would affect individuals' affective evaluation of their experiences. A pilot study indicated that intuitions about this issue were mixed, varying from expected increases in enjoyment, to no effect and even decreases in enjoyment. Subsequently, they tested the effect of photo taking on affective evaluations of experiences for a wide variety of events in different experimental settings, such as taking a bus tour, and events experienced in a lab environment. The results consistently demonstrated higher enjoyment of photographed events versus events that were not photographed. Their explanation of these findings is that taking photographs captures the experience, thereby focusing attention onto the experience, particularly those aspects that are worthy of a photograph. Consequently, the photographer will be more engaged and immersed in the experience and will evaluate it more positively.

Other studies have demonstrated negative effects of photograph taking in the context of attention and memory [6,7]. Henkel [6] demonstrated a photo-taking-impairment effect after participants took photographs of art objects of a museum tour (but not when they zoomed in on a detail). Soares and Storm [7] also demonstrated a photo-taking-impairment effect when participants looked at paintings and took photographs, but whether these photographs would be available later did not matter for how much they remembered these photographs (which enabled offloading of the information captured in the photograph) or not. In both studies, the act of photograph taking seems to draw the attention away from the experience and result in memory impairment because of a disruption of the experience [7].

Obviously, memory impairment effects due to photograph taking is something entirely different than a higher engagement in an event that is being photographed. It is relevant to mention those studies, however, because photograph taking of an event relates to how the event is being perceived with an affective component (positivity associated with the event) and a cognitive component (memory for the event). We could expect that when attention is indeed directed toward the event (by taking a photograph), the affective component is emphasized, hence emotions associated with the associated memory should be more salient. However, when attention is directed away from the event itself, either because the photographs serve to offload relevant information of the experience to be remembered later, or to focus on the visual capture of the event, the affective evaluation should be less salient.

To address this issue, we examined how photographed events may affect the evaluation of the autobiographical memories of these events relative to events that are not photographed. In contrast to the previous studies, the setting of the photograph taking was a real life setting when individuals take photographs spontaneously of events that they experience as part of their daily lives. Specifically, we were interested in the retrieval process of these memories from the past and how the affective evaluation of these autobiographical memories would be different for events that were photographed or not, and if this would hold for different types of events (vacation memories in experiment 1 and weekend memories in experiment 2).

Based on the discussion above, we can expect that if photographs of events are reflections of expressions of various experiences that direct attention toward the experience [5], the affective evaluation of autobiographical memories of photographed experiences should be

higher than for experiences that were not photographed. Alternatively, if photographs of events are meant to offload information of the event onto something more tangible, or if photograph taking disengages the person who takes the photograph from the experience due to distraction, then photographed events will be remembered more poorly or reacted to more negatively than events without photographs [7] .

In addition to the role of photograph taking of events and how this may affect the retrospective affective evaluation of these autobiographical memories, we were interested in how durable the positivity associated with these past events would be. Fading of emotions associated with autobiographical memories is a well-documented phenomenon. This so-called *fading affect bias* holds that memories associated with negative emotions fade faster than memories associated with positive emotions [8-10]. The underlying mechanism for this bias is the result of adaptive behavior that allows individuals to keep a positive outlook on life [8,10] in which the salience of positive emotional memories is sustained to a greater extent compared to negative recollections [11].

We explored if differential fading would occur in the current studies for different types of autobiographical memories, such as generally positive memories for the past summer vacation versus more neutral memories from the past weekend. When these memories are evaluated over time, we can expect fading in positivity of the evaluation of the autobiographical memories to be slower for events that happened during a summer vacation compared (because they tend to be more positive) to the events that happened during the past weekend (because they tend to be more neutral).

Photograph taking may play a role in this differential fading process as well. Diehl and colleagues [4] demonstrated less fading in enjoyment for photographed events than events that were not photographed when questioned again later (30 minutes later and a week later) even though the participants could not revisit these photographs. In this light, taking photographs would be considered adaptive behavior, as it enhances our ability to keep this positive outlook on life. In the current study, we therefore expected less fading in positivity ratings for memories from photographed events compared to events that were not photographed. Differences with the Diehl et al. study [4] were that we employed a real-life setting of a vacation or weekend, and chose a much longer time lag, two months, versus 30 minutes or a week. A longer time lag resembles a more natural interval between photo taking and revisiting the photographs later in real life. Another major difference between our studies and the studies by Diehl and colleagues is that we focused on remembering the events and the role of photographs on the positivity associated with the retrieval of these events, whereas Diehl and colleagues only studied whether the act of taking photographs or not had an impact on the experience itself without focus on the associated memory.

The current study examined the role of photograph taking and the passing of time on the positivity with which recent autobiographical memories were evaluated. This was examined in two studies in which memories of past vacation events (Experiment 1) and past weekend events (Experiment 2) were recorded. To assess the fading of effect in the evaluation of memories, affective evaluations of these memories were assessed twice: once during initial retrieval (Session I) and once two months later (Session II). Experiment 2 served as a conceptual replication of Experiment 1 with a different instruction (prior instruction instead of no prior instruction), type of event (weekend experiences instead of vacation experiences) and a shorter initial time lag (a day instead of the past summer vacation) relative to the original experience.

Hypothesis 1 predicted that positivity ratings for photographed memories should be higher than for memories that were not photographed, suggesting that photograph taking results in directing attention toward the event rather than away from it. Hypothesis 2 predicted less fading in positivity for memories of photographed than for not photographed events due to the attention being drawn to the initial experience which should have sustained the emotion one felt during the experience. These hypotheses were tested in both experiments. In addition, the authors performed exploratory analyses and on the combined data set to address the question whether positivity ratings would differ between vacation memories and weekend memories. Moreover, a potentially different role of fading in relation to the type of memories and photograph taking could be explored in the combined data set. Differences in fading in positivity of memories from the summer vacation relative to memories of weekend events would suggest differences in the time course for the affective evaluation of different types of events.

2. Experiment 1

2.1 Materials and Methods

The study complied with the requirements from the Ethics Committee of the Erasmus University prior to the data collection and guidelines from the Declaration of Helsinki regarding good research practices. All participants provided written consent.

Participants were recruited from the research participant pool from the university and received two research credit hours for their participation in the two waves of the experiment. A total of 100 participants took part in phase I of the experiment (97 participants remained in phase II). Mean age was 20.17 (SD = 2.41) years, 86% being female. Participants were assigned randomly to a photograph upload and a control condition (50 students in each condition).

Participants in the photograph upload condition were instructed to write down five memories from their past summer vacation and to select and upload an accompanying picture of each memory from their smartphone on a private protected internet site. Thus, these participants were explicitly instructed to use photographs in their memory retrieval process. Participants in the control condition received the same instructions to write down five memories from their past summer vacation (see Appendix A for specific instructions). The difference from the photograph condition was that they did not get the information in the last part of the instruction to select or upload an accompanying picture of the memory from their smartphone.

We manipulated two variables. The first variable was the photograph manipulation (reporting a memory with or without an accompanying photograph). The second independent variable was time lag (session I versus session II). This yielded a mixed design. The dependent variable was the positivity rating of the vacation memories, reported on a sliding scale (How positive/negative was the event when you first experienced it, from 0 = very negative to 100 = very positive). Ratings were analysed for participants (mean ratings over five memories, N = 97) and memory items (unit = memory provided, N = 456).

Participants came to the lab for a study to answer questions about their smartphone (this was done to make sure they brought their smartphones) and to write their memories from their past summer vacation. They first provided written consent, answered questions about their smartphone and wrote five memories about their past summer vacation on a protected internet site with a minimum of 50 and a maximum of 100 words for each memory. Participants in the photograph upload condition wrote down five vacation memories, uploaded an accompanying picture from their smartphone onto the protected site (that was removed later), then evaluated the positivity of the event. From the instruction, they knew they had to retrieve memories from events that were photographed (for instructions see Appendix A). Participants who were assigned to the control condition, wrote down five memories about their past summer vacation, indicated if they had taken a photograph of this event (this question was redundant in the photograph condition) and evaluated the positivity of the event. Participants in both conditions also answered other questions (e.g. regarding their smartphone) to not have the exclusive focus on the positivity of the event but these questions were not considered here.

All participants came to the lab in the same period, early October, which meant that their summer vacation memories were similarly remote, around 1.5-2 months. For session II, (early December), participants returned to the lab, read the verbatim description of the memories they reported earlier (but participants in the photograph upload condition did not see their photographs) and evaluated the positivity of these memories again. They were debriefed and thanked.

After inspection of the written memories, it became clear that some participants did not adhere properly to the instructions of reporting vacation memories from the past summer vacation because they reported memories from a previous summer vacation. These older memories were removed (23 out of 479 memories) as the time lag would be different for those memories. The remaining data (N = 456) for the memory analyses consisted exclusively of memories from the past summer vacation.

2.2 Results

The first hypothesis was that the positivity ratings would be more positive in the photograph upload than in the control condition (Hypothesis 1) for both the participant and memory item analyses. We also expected a condition by time interaction with a smaller effect of fading of positivity in the photograph upload than in the control condition (Hypothesis 2). The analyses were conducted with participants as a random factor ($_{part}$) and test items (memories) ($_{item}$) as a random factor. The 2 (condition: photograph upload versus control) by 2 (time: session I versus session II) mixed model ANOVA indicated a main effect of time, $F_{part}(1, 91) = 8.63$, $p = .004$, $\eta^2 = .086$, [95% CI 76.12-82.76 session I, 73.80-80.43 session II] F_{item} ① $(1, 436) = 5.75$, $p = .017$, $\eta^2 = .013$, [95% CI 77.26-82.07 session I, 75.16-79.47 session II], a main effect of condition, $F_{part}(1, 92) = 5.95$, $p = .017$, $\eta^2 = .061$, [95% CI 69.72-78.93 control, 77.73-86.74 photograph upload], $F_{item}(1, 436) = 13.36$, $p < .001$, $\eta^2 = .030$, [95% CI 71.32-77.55 control, 79.50-85.60 photograph upload], but no time by condition interaction, $F_{part}(1, 92) = .689$,

① We controlled for the nesting of memories within participants in the analyses as there were five memories per participant.

p = .409, η^2 = .007, F_{item} (1, 436) = 1.32, p =.252, η^2 = .003). Confirming Hypothesis 1, positivity ratings were higher in the photograph upload than in the control condition both in the participant and memory item analyses. Moreover, positivity of the memories faded from session I to session II, but this happened regardless of whether photographs were taken of these events and uploaded or not, yielding no support for Hypothesis 2.

When we examined the answers to the question in the survey in the control condition whether the event was photographed or not, we observed that many of these memories were also photographed (131 memories). Given that this outcome could not have been prevented because participants retrieved these memories spontaneously without the instruction to upload a photograph, we performed an additional exploratory analysis to compare positivity ratings of autobiographical memories of photographed events with positivity ratings of autobiographical memories that were not photographed within the control condition. Note that photographed memories in the control condition were different from those in the photograph condition in the previous analysis because memories were not selected and uploaded from available photographs on the smart phone. This exploratory analysis was conducted as a within-subjects factor in the memory item analysis only because some of the five memories that had to be reported were photographed and some were not. The 2 (photographed versus not photographed) by 2 (session I versus session II) mixed model ANOVA showed a main effect of photograph taking on the positivity of the remembered event, F_{item}(1, 190) = 20.77, p <.001, η^2 = .099 [95% CI no-photograph 57.07-69.79, photograph 76.98-86.02] but no main effect of time, F_{item}(1, 190) = .828, p =.364, η^2 = .004, nor a time by photograph interaction, F_{item} (1, 190) = .069, p =.793, η^2 < .001. Again, the results support the hypothesis that memories of photographed events are evaluated more positively than memories of events that are not photographed. This is remarkable because the memories were not cued by the selection and upload of a photograph but solely cued by the instruction to retrieve a memory from the past summer. The difference from the photograph upload condition was that positivity ratings in this exploratory analysis remained stable from session I to session II. Hence, Hypothesis 2 was not supported.

Together, the results from the comparisons of positivity ratings of autobiographical memories from photographed events or events that were not photographed confirm Hypothesis 1. This hypothesis predicted higher positivity ratings for autobiographical memories that were photographed (uploaded or not) than memories that were not photographed, supporting the idea that taking photographs directs attention towards (positive aspects of) the experience, rather than drawing attention away from the event. Moreover, positivity ratings faded over a period of two months in the whole data set (but not the subset of the no-photograph condition), but this fading was not moderated by photograph taking as predicted in Hypothesis 2. This hypothesis was not supported.

3. Experiment 2

Experiment 2 was conducted as a conceptual replication of Experiment 1 to determine if the results regarding the positivity of autobiographical memories would hold if an explicit instruction for taking photographs (similar to [4]) was given prior to the experience of events to be reported and evaluated later. In contrast to the evaluation of summer vacation memories, selection issues in this design would be minimized. A second reason for this conceptual replication was to see if the positivity effect for photographed and uploaded events from autobiographical memories relative to memories from events that were not photographed would hold for more neutral everyday memories. A third reason was to be able to compare data of two different experiments in a combined data set to examine differences in affective evaluation over time between vacation and weekend memories.

The hypotheses for experiment 2 were the same as in experiment 1, higher positivity ratings in the photograph upload versus the control condition and a time by condition interaction, suggesting less fading in positivity in the photograph upload relative to the control condition.

3.1 Materials and Methods

The study complied with the requirements from the Ethics Committee of the Erasmus University prior to the data collection and guidelines from the Declaration of Helsinki regarding good research practices. All participants provided written consent.

Participants were recruited from the research participant pool from the university (but could not participate in this study if they had already participated in Experiment 1) and received two research credit hours for their participation in the two waves of the experiment. A total of 93 participants took part in session I of the experiment; 79 participants remained in session II. Mean age was 19.76 (SD = 2.62) years with 91% women participating. Participants were assigned randomly to a photograph upload (53%) and a control (47%) condition.

Participants were notified before a previously set

weekend that they were to report five memories from events that they experienced the upcoming weekend on Monday. Half of the participants received the additional instruction to photograph these events, half of the participants did not receive this additional instruction. The e-mail notification also contained the consent form they had to sign and return. On Monday, participants wrote five memories from the past weekend in the online questionnaire and evaluated them on their positivity. Participants who were assigned to the photograph upload condition, uploaded the photographs on a private protected site. If they were in the control condition, they indicated if the event they had written about had been photographed or not.

In session II, two months later (same delay as in Experiment 1), participants received another link with a verbatim description of their memories they submitted earlier. They were asked to evaluate them again on their positivity. Similar to Experiment 1, participants in the photograph upload condition only saw the verbatim description of the event, not their photographs.

A difference from Experiment 1 was that participants reported and evaluated their autobiographical memories online at home in session I and II instead of in the lab. It was not feasible to have this large number of participants visit the lab on the same day (Monday after the weekend or two months later) which necessitated this online procedure.

After inspection of the memories, one participant did not adhere properly to the instruction of reporting memories from the past weekend. From the description it was obvious that one of the memories was from an earlier weekend and therefore this memory was removed from the dataset.

The study had a mixed factorial design with condition (photograph upload versus control) as a between-subjects factor and time lag (session I versus session II) as a within-subjects factor. The dependent variable was the positivity rating of the memories during session I and session II.

3.2 Results

Similar to Experiment 1, the first hypothesis was that the positivity ratings would be more positive in the photograph upload than in the control condition (Hypothesis 1). We also predicted a time by condition interaction with a smaller effect of fading of positivity in the photograph upload than in the control condition (Hypothesis 2).

The analyses were conducted with participants as a random factor (*part*) and test items (memories) (*item*) as a random factor (the latter while controlling for the nesting of memories within participants).

The 2 (time: session I versus session II) by 2 (condition: control versus photograph upload) mixed model ANOVA demonstrated a main effect of time for the participant analysis, $F_{part}(1, 76) = 16.78$, $p < .001$, $\eta^2 = .181$, [95% CI 69.11-75.31 session I, 65.81-71.74 session II], but not the memory item analysis, $F_{item}(1, 384) = 2.61$, $p = .107$, $\eta^2 = .007$, a main effect of condition in the memory item analysis but not the participant analysis, $F_{part}(1, 76) = 3.63$, $p = .061$, $\eta^2 = .046$, $F_{item}(1, 384) = 4.94$, $p = .027$, $\eta^2 = .013$, [95% CI 64.02-71.09 control, 69.64-77.15 photograph upload], and a significant time by condition interaction, $F_{part}(1, 76) = 8.55$, $p = .005$, $\eta^2 = .101$, $F_{item}(1, 384) = 10.15$, $p = .002$, $\eta^2 = .026$. Positivity ratings of autobiographical memories were more positive in the photograph upload than the control condition in the memory item analysis as predicted, fading occurred over time in the participant analysis, but unexpectedly, fading of positivity from session I to session II occurred to a greater extent in the photograph upload condition than in the control condition.

Similar to Experiment 1, we performed an additional exploratory memory item analysis comparing photographed and not photographed memories in the control condition. Again, a distinction was made between memories that were not photographed (135 memories) versus memories that were photographed (67 memories) in the control condition. There was no main effect of time, $F_{item}(1, 199) = 2.64$, $p = .608$, $\eta^2 = .001$, but there was a main effect of photograph, $F_{item}(1, 199) = 24.23$, $p < .001$, $\eta^2 = .109$, [95% CI 56.22-65.50 no photograph , 74.14-87.59 photograph], and no time by photograph interaction, $F_{item}(1, 199) = .352$, $p = .554$, $\eta^2 = .002$. Photographed memories were evaluated more positively than memories that were not photographed in the control condition, but the effect remained constant over time.

Together, these results confirm Hypothesis 1 that predicted higher positivity ratings for autobiographical memories that were photographed (uploaded or not) than memories that were not photographed, supporting the idea that taking photographs directs attention towards (positive aspects of) the experience, rather than drawing attention away from the event. Hence, we replicated the findings from Experiment 1 to the extent that the effect was only demonstrated in the memory item analyses. Similar to the findings from Experiment 1, the exploratory analysis showed that photographed memories in the control condition were evaluated more positively than memories that were not photographed.

Similar to experiment 1, fading occurred when comp-

aring positivity ratings of memories from events in the photograph versus no-photograph condition, but this only happened in the participant analysis. In contrast to Experiment 1, a condition by time interaction for the positivity ratings was found, however, but only for the upload photograph condition which was in the contrary direction than predicted. We will discuss these unexpected findings later.

3.3 Combined Data Experiment 1 and Experiment 2

With the combined data set we explored whether higher positivity ratings would occur for vacation memories than for weekend memories and a differential role of fading in relation to the different types of memories and photograph taking. The 2 (experiment: vacation versus weekend memories) by 2 (condition: photograph upload versus control) by 2 (time: session I versus session II) repeated measures ANOVA showed a main effect of experiment, $F_{part}(1, 168) = 12.23$, $p = .001$, $\eta^2 = .068$, [95% CI 75.32-81.24 vacation, 67.24-73.74 weekend], $F_{item}(1, 821) = 11.74$, $p = .001$, $\eta^2 = .014$, [95% CI 76.09-82.09 vacation, 66.51-73.08 weekend], a main effect of time $F_{part}(1, 168) = 24.76$, $p < .001$, $\eta^2 = .128$, [95% CI 73.54-78.12 session I, 70.69-75.20 session II], $F_{item}(1, 821) = 8.35$, $p = .004$, $\eta^2 = .010$, [95% CI 74.04-77.68 session I, 71.35-74.70 session II], a main effect of condition $F_{part}(1, 168) = 9.18$, $p = .003$, $\eta^2 = .052$, [95% CI 67.94-74.09 control, 74.62-80.89 photograph upload], $F_{item}(1, 821) = 16.06$, $p < .001$, $\eta^2 = .019$, [95% CI 68.66-73.37 control, 75.48-80.26 photograph upload], and a time by condition interaction, $F_{part}(1, 168) = 7.20$, $p = .008$, $\eta^2 = .041$, $F_{item}(1, 821) = 9.48$, $p < .001$, $\eta^2 = .011$ but no other interactions. Positivity ratings were higher for vacation than weekend memories, and for photographed and uploaded events compared to events in the control condition, but not in interaction with photograph taking. Similar to the outcomes of experiment 2, the overall data set also demonstrated more fading in positivity in the photograph upload condition when compared to the control condition.

The higher positivity ratings for the vacation than the weekend memories and photographed events suggest that holiday memories are evaluated more positively than weekend memories but did not demonstrate an effect of photograph taking in relation to the type of event. The findings therefore cannot answer our questions regarding the role of photograph taking in relation to different types of events (vacation or weekend). With regard to fading of positivity, ratings of memories that were photographed and uploaded resulted in faster fading than events in the control condition.

4. Discussion

This paper examined the role of photograph taking in the affective evaluation of vacation and weekend memories using two naturalistic experiments. Our hypotheses predicted that photographed memories would be evaluated more positively than memories that were not photographed (Hypothesis 1), and that the positivity of photographed memories would fade less over time than that of memories of events that were not photographed (Hypothesis 2). We also explored the role of type of memory (vacation versus weekend) in the combined data that allowed for a comparison of positivity and fading for vacation versus weekend memories in relation to photograph taking.

The first hypothesis was supported in both experiments and in the combined data set, although the effect of photograph taking with upload was only demonstrated in the memory item analysis of the weekend experiment. Overall, it appears that taking a photograph of an event and uploading it, be it a special event from a summer vacation or a weekend event, directs attention toward the experience when the event is retrieved from memory and sustains the positive emotion associated with the event. This effect was replicated in the exploratory analyses among the photographed memories in the control condition that were not uploaded. This suggests that taking a photograph during the initial experience is a meaningful act for the affective evaluation for later retrieval and contributes to the higher positivity ratings of the event. The effect was found in two different experiments that involved different types of memories, differences in prior instructions, and different time intervals for the initial report of the memories, hence do not support the idea that photograph taking results in offloading information or distraction because, in that case, positivity ratings of autobiographical memories of photographed events would not be higher than those in the control condition. Rather, the emphasis is on the experience itself when photographed and appears to be enjoyed once again when the experience is retrieved later.

The second hypothesis predicted that the positivity of memory ratings of photographed events would fade less over a period of two months than of events that were not photographed. This hypothesis was not supported as no condition by time interaction occurred for the positivity ratings in Experiment 1 and a different interaction pattern than expected occurred in Experiment 2 (and for the combined data set). Why was fading more pronounced for positivity ratings of weekend events in the photograph upload than in the control condition and for the combined

data set? An answer could be that there was a heightened focus on the memory and details surrounding the memory when it was uploaded as part of the experimental procedure. In contrast to the vacation experiment, participants in the weekend experiment knew beforehand they had to take photographs of weekend experiences. When they had to upload the photograph after the weekend as part of the memory description, the focus of the experience was on the combination of the photograph and the experience including the emotions they felt at the time of the event. This may have contributed to the higher positivity rating of the event compared to the control condition. When they had to evaluate the description (and not the photograph) of this experience two months later, the photograph upload experience that was salient during their first retrieval, was lacking, along with the emotions they felt at that time, possibly because the photograph taking was the result of an instruction and not a spontaneous action. This may have contributed to faster fading of positivity in the photograph upload condition relative to the control condition. The fact that faster fading of positivity did not occur for photographed events in the control condition, supports this assumption, as photographs were taken spontaneously, without previous instruction. Another reason that there was no fading effect could be that rereading their earlier written report after two months could have revived their memory independent of the photograph upload experience. This does not explain, however why a time by condition interaction effect occurred in the weekend experiment and the combined data set as all participants reread their verbatim description (irrespective of condition). To rule out the effect of rereading the earlier report, future research could explore other cues to re-evaluate the memory rather than the verbatim description of the memory.

Faster fading of positivity in photographed and uploaded memories contradicts the findings from Diehl et al. [4] who demonstrated that enjoyment of photographed events faded more slowly over time (30 minutes and a week later) than enjoyment of events that were not photographed. However, the time lag in this study was relatively short compared to our study where the time lag covered two months which may explain the difference. Also, the events being photographed in the Diehl et al. [4] experiments were part of pre-selected experiences with photograph instructions that all participants took part in, not events that participants experienced in a natural setting as was the case in our study. Even though vacation memories were evaluated more positively than weekend memories, which can be expected based on the longer, and more positive time-period to select from, no interaction with photograph taking was found. Photograph taking thus seems to reflect documentation of all kinds of experiences [2] when examined in a naturalistic environment [4] and seem to leave a positive trace when remembered later. Compared to the Diehl et al.'s experiments [4], our design lacked control which can be considered a limitation of our studies given that participants made the selection of what to report and photograph from a larger variety of events themselves.

To gain deeper insight into the importance of uploading photographs of events, the type and content of the autobiographical memories should be examined in future research, along with the extent to which these memories can be retained in memory. Research has shown differential findings in memory impairment for photographed events depending on what is being photographed, the whole object or details [6], and whether the photograph remains available or not [7].

5. Conclusions

It can be concluded that memories of photographed events are evaluated more positively when retrieved than events that are not photographed. Photographs therefore serve an important function in sustaining the emotion associated with the event. When the event is retrieved as a memory, attention is directed toward the event being photographed which makes aspects associated with the experience more salient. In other words, if you quickly want to savor positive events in your memory, you should take a photograph of them!

Authors' Contributions

First author: Katinka Dijkstra - study design, data organization, data analysis, writing the paper;

Second author: Keri Pekaar - study design, data organization, data analysis, substantial feedback on the paper;

Third author: Jacky Hooftman - study design, feedback on the paper;

Fourth author: Yvette van Osch - substantial feedback on the paper.

Conflict of Interest

The authors declare no conflict of interest.

Acknowledgements

The authors wish to think Adriana Cotorobai, Rowan

Moelijker, Theresa Schmaderer, Niclas van Hasselt-Thissen, and Svea Rietdorf for their help with the data collection of this study.

References

[1] Nunes, M., Greenberg, S., Neustadter, C., 2009. Using physical memorabilia as opportunities to move into collocated digital photo-sharing. International Journal of Human-Computer Studies. 67(12), 1087-1111.
DOI: https://doi.org/10.1016/j.ijhcs.2009.09.007

[2] Chou, H.T.G., Edge, N., 2012. They are happier and having better lives than I am: The impact of using Facebook on perceptions of others' lives. Cyberpsychology, Behavior, and Social Networks. 15(2), 117-121.
DOI: https://doi.org/10.1080/cyber.2011.0324

[3] Sparrow, B., Liu, J., Wegner, D.M., 2011. Google effects on memory: Cognitive Consequences of having information at our fingertips. Science. 333(6043), 776-778.
DOI: https://doi.org/10.1126/science.1207745

[4] Diehl, K., Zauberman, G., Barasch, A., 2016. How taking photos increases enjoyment of experiences. Journal of Personality and Social Psychology. 111(2), 119-140.
DOI: https://doi.org/10.1037/pspa0000055

[5] Barash, A., Diehl, K., Silverman, J., et al., 2017. Photographic memory: The effects of volitional photo taking on memory for visual and auditory aspects of an experience. Psychological Science. 28(8), 1056-1066.
DOI: https://doi.org/10.1177/0956797694868.

[6] Henkel, L.A., 2014. Point-and-shoot memories: The influence of taking photos on memory for a museum tour. Psychological Science. 25(2), 396-402.
DOI: https://doi.org/10.1177/0956797613504438

[7] Soares, J.S., Storm, B.C., 2018. Forget in a flash: A further investigation of the photo-taking-impairment effect. Journal of Applied Research in Memory and Cognition. 7(1), 154-160.
DOI: https://doi.org/10.1016/j.jarmac.2017.10.004

[8] Walker, W.R., Vogl, R.J., Thompson, C.P., 1997. Autobiographical memory: Unpleasantness fades faster than pleasantness over time. Applied Cognitive Psychology. 11(5), 399-413.
DOI: https://doi.org/10.1002/(SICI)1099-0720(199710)11:5<399

[9] Skowronski, J.J., Walker, W.R., Henderson, D.X., et al., 2014. The Fading Affect Bias. Advances in Experimental Social Psychology, Elsevier. 49, 163-18.
DOI: https://doi.org/10.1016/b978-0-12-800052-6.00003-2

[10] Ritchie, T.D., Skowronski, J.J., Cadogan, S., et al., 2014. Affective responses to self-defining Autobiographical events. Self and Identity. 13(5), 513-534.
DOI: https://doi.org/10.1080/15298868.2013.863222

[11] Walker, W.R., Skowronski, J.J., Thompson, C.P., 2003. Life is pleasant--and memory helps to keep it that way!. Review of General Psychology. 7(2), 203-210.
DOI: https://doi.org/10.1037/1089-2680.7.2.203

Appendix A

Instruction Experiment 1 Photograph upload condition

In the textbox below, write down an experience from your summer holiday (with a minimum of 50 words, and a maximum of 100 words). The experience should be a memory of something you were personally involved in and it should be about something that took place over a period of minutes or hours (but not days or a recurring event). It does not matter whether the memory describes something important or boring. The main thing is that it is a memory of an event you experienced and took a photograph of with your smartphone. You should write it down as a coherent story, not in the form of key words. After you write down the experience, email the matching photograph from your smartphone to yourself, then upload it onto the dedicated location in this questionnaire. If you have trouble doing this, contact the experiment leader.