Effects of Social Media Photography on Memory

Presented by Blake Berry

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I intend to submit a copy of my Polymathic Scholars thesis to the Texas ScholarWorks Repository. For more information on the TSW, please visit https://repositories.lib.utexas.edu/.

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Abstract

As social media sites such as Instagram, Facebook, Twitter, and Snapchat become more pervasive, we see more people sharing photos of experiences and updating friends on life events through digital platforms. Despite this increased presence of social media in our lives, little research has been published on the effects that social media photography can have on people. A particular area of concern is how this photography affects our minds. With this project, I explore how social media photography, posting, and reviewing of photos affect memory. I synthesize the results of many peer-reviewed articles published since 2005 that study the effects of social media photography on memory, and I suggest some best practices for people to use when engaging with social media in order to avoid hampering memory. Based on this literature review, I propose future work in the field that may help us better understand the complex and wide-ranging effects of social media—and images in particular—on our memories. Results have shown that specific processes seen in social media photography have interesting effects on memory. One of these processes is cognitive offloading, which occurs when a person does not have to store information in their own memory because it is reliably stored somewhere else, such as in a photograph. Distraction also plays a large role in affecting memory, as one's emotions, circumstances, and method of photography can all distract from the present experience. New findings show that point-of-view changes memory as we are adopting a third-person perspective in memories due to social media photography instead of the traditional first-person view because of our obsession with self-presentation. The complicated interactions between these processes and their effects reveal that some social media practices can improve memory of events, while many others are detrimental to memory formation.

Key Terms: Social Media, Photography, Memory

Introduction

A couple of years ago, I went on a trip throughout France, Spain, and Italy. On my first stop in Paris, I visited the Louvre, and trekked through the numerous halls to find the room that housed the famous "Mona Lisa." When I turned the corner into the room, I was amazed, not by one of the most famous and well-known works of art, but by the behavior of the audience "viewing" the painting. People were packed together in this room, all slightly pushing to get closer to the painting, but not to appreciate the painting with their eyes. Almost every single person had a smartphone, selfie-stick, or camera out taking hundreds of pictures of the painting. There were so many people with cameras and phones above their heads trying to get an unobstructed picture of the "Mona Lisa" that it was nearly impossible to view the painting from the back of the room due to the makeshift wall of people and cameras blocking the view. I saw teenagers hastily snapping pictures on social media applications like Snapchat and Instagram, posting the pictures, and then turning away from the painting to move to the next exhibit all without their eyes leaving their phones. At that moment, it dawned on me that technology has changed how people experience events. Many people value taking a picture at a destination more than they value being at and experiencing the destination itself. While this social media revolution could have many tremendous implications on human life and well-being, I became interested in how social media could affect memory. I was convinced that someone who walked into the Louvre without taking pictures on social media had to have a very different experience and memory of the Louvre as compared to a teenager who was busy taking pictures and posting them on social media the whole time.

Walking into almost any concert, event, festival, museum, or attraction, one commonality stands out: people will be taking pictures on cameras and phones. Most of these people are taking photographs in an attempt to remember the event, and many are planning to share them on social media later or even instantly. With platforms such as Instagram, Facebook, Twitter, and Snapchat, there has been a rapid shift toward sharing photos of experiences and updating friends on life events as these applications make it easier than ever to share photographs. While social media can increase connectivity among people that are continents apart, there could be some negative aspects of this practice, and there is a lack of research synthesizing how social media affects memories and experiences. There are many articles that suggest different effects of social media photography, "posting" pictures to social media, and reviewing of pictures, but no work that combines contrasting views and ties together these different processes. Without a proper understanding of how common social media practices affect experiences and memories, people could be altering their minds in ways they are not aware of, which could have significant future implications. By analyzing how photography, posting, and reviewing photographs affect memory, I hope to inform the public of the effects of these common social media practices and provide direction for future research in the field.

Background and Methodology

Memory is essential to identity. Without memories, a person's meaning for life diminishes greatly. How can someone be expected to build relationships, achieve goals, and experience intimacy if they cannot remember the progress they made? This is why it is common to react with devastation when a family member or loved one receives an Alzheimer's or dementia diagnosis, because memory is so important to everyday life and makes us human. A

famous Spanish filmmaker, Luis Brunel, explains, “You have to begin to lose your memory, if only in bits and pieces, to realize that memory is what makes our lives. Life without memory is no life at all, just as an intelligence without the possibility of expression is not really an intelligence. Our memory is our coherence, our reason, our feeling, even our action. Without it, we are nothing.” While social media does not “erase” our memory, or have the same implications as Alzheimer’s or dementia, it is still important to analyze the effects on memory of such a pervasive force in our lives. The effects of social media on memory can be greater than initially thought if our brains are being “rewired” by social media as other scientific research papers suggest (Tamir, Templeton, Ward & Zaki, 2018).

Even though there are some warnings against excessive social media use and numerous ways to try to limit screen time, social media applications are becoming more widely used than ever before. A study by the Pew Research Center found that, “Some 78% of 18- to 24-year-olds use Snapchat, and a sizeable majority of these users (71%) visit the platform multiple times per day. Similarly, 71% of Americans in this age group now use Instagram” (Smith & Anderson, 2018). This represents a huge portion of young adults using social media. It is not only young adults that use social media nowadays, as the same study found that, “roughly two-thirds of U.S. adults (68%) now report that they are Facebook users, and roughly three-quarters of those users access Facebook on a daily basis. With the exception of those 65 and older, a majority of Americans across a wide range of demographic groups now use Facebook” (Smith & Anderson, 2018). When walking on the streets, visiting places, and talking to people, it is obvious that social media is a huge aspect of today’s culture, and one of the most common practices in social media is photography. In fact, a study found that 400 million Instagram “stories” (photographs and videos that are viewed for a set amount of time in the application and not saved for future

viewing) are posted daily and over 100 million photographs and videos are posted daily (Omnicore, 2019). Social media platforms such as Facebook, Instagram, and Twitter have made it so simple to share photographs from life events and have become extremely popular among almost all age groups. While a lot of research has been done on how photography affects memory and experiences, little research has been done to see how specifically social media photography affects experiences and memories of experiences. Similarly, little research has been done to synthesize how social media photography, posting, and reviewing of posts affect memory.

In order to rectify this lack of synthesis of research in the field, I found various scholarly articles that deal with the effects of social media photography on memory. I searched the University of Texas Library Resources Database and Google Scholar to find available articles pertaining to this topic. I searched using the key phrases: “social media and memory”, “photography and memory”, “photography and reconsolidation”, and “effects of reviewing photographs”. After looking through the articles on these topics, I selected all articles with information pertaining to the three categories of social media practices that I decided to study: effects of photography on memory, effects of posting on memory, and effects of reviewing posts on memory. I found common themes among these articles and ended up selecting over twenty articles dealing with topics pertaining to how social media affects memory. If further evidence was needed or further clarification in some studies was desired, then articles found in the references section of other studies with titles pertaining to effects of social media on memory were read and used as supplementary information.

Effects of Photography on Memory

The two main arguments in scientific literature for how photography affects memory are distraction and cognitive offloading. Distraction, in the context of social media photography, comes from the presence of a camera and the use of the camera to take pictures. When someone is focusing on taking pictures, their attention is distracted from the external environment, which could result in worse memory. Cognitive offloading occurs in social media photography because people subconsciously believe that when they take a picture, enough of their memory is reliably stored in the photograph and therefore they do not have to remember the information. This is an automatic response and it means that they have "offloaded" their memory, or at least part of their memory, of the event from their mind because it is reliably stored in the photograph. In the following subsections, I will discuss the various literature dealing with photography as a distraction and the phenomenon of cognitive offloading as both relate to common social media practices.

Social Media Photography as a Distraction

Memory research has revealed that a variety of factors can affect formation and retrieval of memories. One of the most detrimental factors to memory formation is distraction. Although scientists are still not completely sure how memory works, the most common current model for memory states that information is first experienced from the sensory environment and then filtered by attention. Whatever the person decides to pay attention to is put into working memory (short-term memory) that can be deleted from the mind after a short amount of time if no further

action is taken. Information that is not focused on by attention is lost. If further action is taken, such as repeating the information or using other techniques, then the information can be encoded and stored in long-term memory. Under this model, attention is vital to memory formation. Distraction disrupts the encoding process at a variety of steps. Not only could distraction prevent initial exposure to the information and not allow the information into working memory, but it could also prevent encoding into long term memory. Distraction is a significant factor when it comes to photography because it is hard to focus on the surrounding environment when dedicating attention to taking a good photograph. However, distraction is relative: when taking a photograph someone might be focused on the object of the photograph but be completely unobservant of the surrounding environment and experience. This would result in distraction from the experience and a worse memory of the experience. Contrastingly, photographing an object would focus attention on the specific object and theoretically improve memory of the object photographed. There has been a lot of conflicting research in this area and the sections below detail the negative effects that distraction can have on memory, as well as the positive effects that focus or attention can have on memory.

Negative Effects of Photography on Memory- Distraction

The first major opinion in literature on the effects of photo-taking on memory came from Henkel's paper titled "Point-and-Shoot Memories: The Influence of Taking Photos on Memory for a Museum Tour." In this paper, Henkel's experiments resulted in a clear "photo-taking impairment effect" (Henkel, 2013). Her first test compared the memory of people taking photographs of designated objects in an art museum to people just observing the same designated objects without a camera. The second experiment was like the first except that the people taking

photos were given extra time so that they spent the same time observing the objects in the museum as the observation group, and a group of people in the photograph condition zoomed in on a specific part of a piece of art and taking the picture. The group taking photographs scored lower on both assessments, which tested their recognition of museum objects that were or were not on the museum tour, as compared to the group that was not taking photographs. Based on these findings, it was concluded that photography can result in impaired memory in certain situations due to the distraction it causes. This study by Henkel supports what I initially hypothesized about people who were snapping pictures at the Louvre: people who are busy taking social media pictures on their phones will have a diminished experience and memory of the event they are photographing, because they are so distracted by their social media photography.

Another interesting finding in many studies is that just the presence of a camera or a smartphone can pose such a distraction that memory is affected even without performing any action with the smartphone or camera. For example, a recent study found that just the presence of a smartphone during an event can negatively affect working memory capacity even if the phone is off and just present in the room (Ward, Duke, Gneezy & Bos, 2017). Another study found that the photo-taking impairment effect lasts even after the camera has been put down (Soares & Storm, 2017). Both findings suggest that cameras and smartphones pose distractions to cognition and memory. This evidence proves interesting when put in context with Henkel's museum study. It is possible the distraction caused by taking a photo may be a secondary distraction, implying that simply the presence of a camera or a smartphone is enough of a distraction to impede or disrupt memory formation. This could possibly result in the lower assessment scores for participants with a camera in Henkel's study. Therefore, it appears that a higher cognitive

process is affected by merely the presence of a camera or a smartphone and it is possible that our brains have been re-wired or changed to decrease cognitive function or become distracted when cameras and smartphones are present without even using them. This is alarming that there is the possibility of a camera or phone affecting our memory, cognition, and awareness without us even actively using the device.

Positive Effects of Photography on Memory- Focus

Counter to Henkel's paper and other experiments that found a photo-taking impairment effect, an article by Alixandra Barasch and her colleagues argues that photo-taking results in an increase in visual memory but a decrease in auditory or other types of memory (Barasch, Diehl, Silverman & Zauberman, 2017). As photography captures the visual experience, it implies that other sensory experiences would be less focused on, leading to worse auditory memory. The experiment was set-up similarly to Henkel's in which some people were part of a photograph condition, and others were not given a camera; however, instead of being assigned to take photographs of certain objects, participants in the photograph condition could take photographs of whatever they wanted to. The findings in this paper suggest that volitional photo-taking improves memory. This raises the question: are people taking photos of so many different things as more of an automatic response now that social media is so abundant, or, are people taking photos and focusing on them to post on social media? This is important because the options are very different in their effects. The care-free capturing and posting of photos in social media would take attention away and decrease memory, while someone that is more dedicated to getting a perfect photograph for their social media would have a better memory of the event and less distraction. To summarize, there is a trade-off in attention. If someone pays attention to one

thing, they are inherently paying less attention to another thing. A person's goal for where their attention should lie and what they want to remember seems to determine whether or not photography helps or hurts memory.

Interaction of Effects

In comparing Henkel's and Barasch's papers, many more questions surface figuring out how one of these study's results contradicts the other. In Henkel's experiment, her subjects were assigned to take photographs of objects they may or may not have been interested in at a museum. While this study showed that assigned photo-taking can hurt memory, this does not necessarily provide the best model for social media photo-taking and other avenues in which people decide what they want to take pictures of consciously. When participating in social media photography, it is very rare if not impossible that someone would ever be assigned to take pictures of something for the purpose of personal social media. Some photographers are assigned to post pictures to social media, but this is almost solely for a job, not for personal social media use. Assigning the photo-taking condition could be a possible confounding variable in the study because the photo-taking impairment effect could be greater when the photographer is assigned to taking a photograph as opposed to taking a picture of something the photographer is genuinely interested in.

Contrastingly, Barasch's experiment allowed some participants to take photos of their choosing and showed an increase in visual memory for those taking pictures as opposed to participants that did not take pictures. A comparison of these studies to the actual social media practice of choosing to take pictures would suggest that Barasch's model is a more accurate test of how social media photography affects memory. However, Barasch's article only provides

evidence of increased memory for objects captured in the picture, not necessarily for memory of the surrounding environment and situation, because of the design of the assessments following the study. Therefore, social media photography may increase memory of objects photographed intently but could worsen memory of elements in the surrounding environment that were not photographed.

Another study by Diehl and colleagues on the impact of photography on memory found that engagement is the key underlying characteristic in determining whether people enjoy an activity. The experimenters concluded that taking a photograph in many settings increases engagement in an activity instead of distracting from the activity, resulting in increased enjoyment (Diehl, Zauberman & Barasch, 2016). This study directly contradicts the hypothesis that photo-taking serves to distract from the situation and actually finds that it increases engagement, which should also help memory. Engagement would result in increased memory of what is being photographed, not of the surrounding environment. These two papers are the main arguments against Henkel's 2013 paper and other papers that have found the photo-taking impairment effect. These contradictions reveal that the association between photography and memory is much more complex than initially thought.

While all these papers initially seem to contradict each other, there are slight differences that actually reveal that these papers can both be correct when put in dialogue with one another. For example, Henkel's 2013 paper focuses the assessment questions on the surrounding environment and the experience of the subjects instead of just the objects they photographed. Alternatively, Barasch's study that allowed people to photograph whatever they wanted had questions focused on objects that were likely to be photographed on the museum tour. This slight difference reveals one of the key points in the effects of social media photography on memory:

distraction is relative. Since distraction is relative, one could argue that photography is a distraction but also a method of amplifying attention, and this is likely what is to have occurred in the two studies. In Henkel's study, the camera distracted from the surrounding environment, as shown by the memory assessment. For Barasch's study, subjects were also distracted from the external environment, but they were very focused on what they were choosing to photograph, which led to better memory of items that were photographed. This is exactly why the study by Diehl, Zauberman, and Barasch found that photography increases engagement with the objects being photographed at the expense of paying less attention to the objects in the surrounding environment.

Cognitive Offloading

The other major opinion in scientific literature for how photography affects memory comes from the cognitive offloading hypothesis. Another term commonly used to refer to cognitive offloading is transactive memory. Cognitive offloading refers to the idea that when information is readily accessible or can be easily stored and retrieved in places such as books, computers, photographs, or another person, the brain does not have as much of a need to memorize and retain that information. Therefore, that information can be offloaded, and the brain has a capacity for other important knowledge that is not reliably stored elsewhere. For example, if someone takes a photograph of an event, the photograph can serve as a source of prosthetic memory. The information and memories associated with the photograph do not necessarily have to be fully remembered, because the necessary information is stored in the photograph itself and is ready to be recalled when the photograph is viewed again. The brain only needs to memorize

enough cues to be triggered by review of the photograph later, then the photograph will provide the necessary information to remember the event fully.

A study by Sparrow, Liu, and Wegner describes and tests if Google and the internet are platforms that humans use for transactive memory and cognitive offloading. Information stored on the internet does not have to be memorized as it is always there and almost always available, ready to be accessed. This causes some information found on the internet to be easily offloaded. Four different experiments were conducted to test how much and in what way this form of transactive memory affects information recall. Through the four experiments, the authors found that when people believed that information was deleted or not stored, their memory of the information itself was better. Contrastingly, if information was believed to be stored and able to be accessed in the future, then memory of the information itself was decreased, but memory for the location of the information, such as on a certain website, was better. The authors conclude that this is the result of the brain adapting to new technologies and greater use of transactive memory through these technologies (Sparrow, Liu & Wegner, 2011). Since photographs and social media are other technologies that reliably store information, cognitive offloading could be prevalent following these social media practices and could also negatively affect memory formation in the context of photo-taking.

Reviewing the literature surrounding distraction and cognitive offloading, it is reasonable to believe that both processes play a large part in affecting memory. To test whether cognitive offloading is a primary cause of decreased memory in the context of photography, it is necessary to construct an experiment in which some participants believe that their photographs are being reliably saved somewhere for future reference and another group of participants that are taking pictures knowing their pictures will not be saved. Theoretically, the group that knows their

photographs are being saved would experience some cognitive offloading, while the group that knows their photographs are being deleted would not consciously offload the information because it is not reliably stored. If both groups are tested for their memory of the task and the group that took pictures knowing they would be stored scores significantly lower than the other group, then cognitive offloading could be a possible factor in the photo-taking impairment effect. However, if the groups score similarly then there is likely another variable other than cognitive offloading that is causing worse memory in the test group. Possible other explanations could be the presence of a camera, distraction, or a variety of other factors.

Is Cognitive Offloading a Reasonable Hypothesis for the Photo-Taking Impairment Effect?

An article by Soares and Storm titled "Forget in a Flash: A Further Investigation of the Photo-Taking Impairment Effect" tests whether the cognitive offloading hypothesis or the attentional disengagement (distraction) hypothesis is more appropriate for describing the phenomenon of worse memory after taking a photograph. The first experiment in their study used Snapchat, a commonly used social media platform in which an image is captured and then can be sent to someone but is deleted after a time limit, so it is not saved for reference. The other group in this experiment used a camera application, which reliably saves photographs. The cognitive offloading hypothesis predicts that those participants using the Snapchat app would have better memories of what they photographed than the participants that used the camera app, because the Snapchat users knew their photos would not be stored. Therefore, they did not "offload" any information or rely on saved photographs to aid their memories. However, the results of the experiment showed the same amount of impairment between both experimental groups. To be sure that a confounding variable, such as user familiarity with the Snapchat app,

was not responsible for the results, the experimenters performed a second experiment which consisted of participants deleting photos themselves after taking them. Once again, the results of this experiment showed equal impairment among both groups. The results of this study showed that the attentional disengagement hypothesis is a better explanation for the photo-taking impairment effect than cognitive offloading because memory was impaired after taking the photographs regardless of whether the photograph was going to be saved or not (Soares & Storm, 2017).

While the results seem to deny the effects of cognitive offloading on memory in photography, the authors do not fully discount offloading as a possible factor. They explain the results show, "explicit offloading cannot fully account for the photo-taking-impairment effect. Instead, they are more consistent with the idea that photo-taking disrupts how people engage or encode the objects they are viewing" (Soares & Storm, 2017). The experiments do have some limitations because the objects that were photographed were assigned to the picture-taker, which is not a common practice in the real world of social media where people take photos whenever they please of things that may interest them. However, this evidence does demonstrate that photo-taking in certain settings can affect the photographer's memory of that experience and that explicit cognitive offloading in photographs is not necessarily a main factor in disrupting memory. The authors also claim that, "the results are more consistent with the idea that taking photos causes participants to limit or disengage their attention when encoding an experience, an effect that is assumed to take place regardless of whether participants believe the photos are being saved" (Soares & Storm, 2017). This means that attentional disengagement is most likely the main source of memory disruption in photography, not cognitive offloading. However, in the discussion, the authors do claim that some kind of automatic offloading could have occurred in

which the human mind believes it has encoded and offloaded information into a new place by simply taking a picture, even if the picture is deleted. Although this may seem like a stretch, it is not entirely unlikely and cannot be overlooked.

Effects of Posting on Memory

While photography has many direct effects on memory, the effects of posting on memory are less researched. Evidence shows that posting and even intent to post a picture can have various effects on memory by affecting attention, point of view, and emotions. Therefore, posting can affect memory in a variety of ways, starting before a social media photograph is even taken.

Distraction and Third-Person Perspective

The intent to post a photograph has many effects on attention. Since attention is one of the most important aspects to forming memories, the fact that intent to post a picture poses a distraction could be highly detrimental to memory. In a study by Lee, Lee, Moon, and Sung, they found that the primary motives for using social media are, “social interaction, archiving, self-expression, escapism, and peeking” (2015). The fact that self-expression is a major motive is evidence that social media can distract from the present situation because if someone is thinking of self-expression and other factors, they are much less focused on their external environment and their memory of that environment could suffer.

A similar study by Sung, Lee, Kim, and Choi outlined motivations for taking selfies, or a picture of oneself, the most common type of photo posted on social media websites. They found

that “attention seeking, communication, archiving, and entertainment” are the most common motivations for posting selfies (Sung, Lee, Kim & Choi, 2016). If a person is cognitively thinking about seeking attention, communicating, entertainment, and archiving then there is little chance that the person is putting the necessary thought and attention into remembering the present moment. In particular, if someone is primarily thinking of posting a selfie which is a picture of the self and not necessarily the surrounding environment, then it is likely that the focus on the self could restrict memory of the surrounding environment. For example, if a person is getting ready to take a picture that they know they will post on social media, they may have a variety of factors going through their mind. These factors can include making sure the picture is cool enough, if it is taken at the correct angle, how people who are not there will view the photo, as well as many other factors. Similarly, people get so distracted by social media that they will engage in behaviors that completely distract them from experiencing the environment. For example, people may focus on getting someone else to take a photograph of them in front of a famous place, and they completely miss experiencing the place because they are so focused on how they look and getting a picture at the place. Meanwhile, their back is facing the famous place that they came to experience initially. Almost all these things come to mind solely with the intent to share a photo and would not necessarily be factors if the photograph was only being taken for the purpose of personal archiving of an event.

One of the biggest findings in this field of research regarding the effects of posting on memory is that point of view changes when a picture is taken with the intent to post. When a person plans to post a picture, they turn attention towards how they look or how they can find the best picture to post instead of genuinely experiencing their surroundings (Gonzales & Hancock, 2011). The focus is on self-presentation instead of the experience itself. The focus on self-

presentation results in a shift to a third-person perspective. People think about how other people will view their posts instead of how they are currently experiencing the environment or event that they are planning to post about. Self-presentation is not a new phenomenon and has played a large role in society for a long time. Roy Baumeister describes the common American predisposition towards prioritizing self-presentation in his 1982 paper; this phenomenon has continued and has become more amplified in the age of social media photography (Baumeister, 1982). This is shown in a 2008 paper by Van Dijck. Van Dijck's argument suggests that self-presentation has become a large part of photography in the digital age (Van Dijck, 2008). Therefore, there is the possibility that many of the effects on memory could stem from self-presentation in photography, not from the spread of social media. However, the spread of social media could have also amplified this focus on self-presentation.

In the introduction to another paper, Gonzales and Hancock mention that Facebook results in people becoming an "object of their own consciousness." This is very similar to other articles that find that social media and photography result in people taking a third-person perspective in their own life experiences, because they contemplate how to best present themselves to others (Gonzales & Hancock, 2011). This study also found photographs intended for sharing create a heightened self-presentational concern that leads to anxiety and less enjoyment. Similarly, another paper found that taking photographs to share leads the photographer to adopt a third-person perspective on their memory of the experience (Barasch, Zauberman & Diehl, 2018). There is a wealth of information in scholarly literature about the shift from a first-person perspective to a third-person perspective in memories due to a focus on self-presentation in social media.

In this field of research on how social media affects point-of-view, it is obvious that social media is at least changing memory in the switch from a first-person to a third-person perspective. However, it is unclear whether this is actually worsening memory of events. A study by Barasch, Zauberman, and Diehl focused on how the simple motivation behind taking a picture can affect the experience and the memory of the experience (Barasch, Zauberman & Diehl, 2018). Their study is the first to, "highlight the importance of anticipated sharing during an experience." This means their study focuses on how the intent to share an experience affects a person's present experience before it is even shared. The two motivational states they study are taking a photograph with the intent to share on social media and taking a photograph with the intent of preserving a memory for oneself, which they cite as the two main reasons or motivations for photography. Through a variety of field tests, laboratory studies, and surveys, the researchers found that the intent to share a photograph leads to less enjoyment of experiences. This occurred in all different testing methodologies. The authors conclude that the lack of enjoyment is a by-product of the self-presentational concern felt when planning to share photographs. This concern can lead to feelings of anxiety and nervousness that will decrease enjoyment of an experience that could be posted or shared. In terms of affecting memory, the authors found that, "taking photos to share makes people more likely to remember the experience from a third-person perspective, as well as to select more photos with smiling people, a posed (vs. candid) format, and prototypical holiday content.". A very interesting final conclusion is that the decrease in enjoyment seen when taking photos to share is mitigated when the photos are only shared with close friends (Barasch, Zauberman, & Diehl, 2018). This finding shows that close friends do not necessarily elicit this self-presentational concern, but it is the idea of sharing

events with other followers, friends, and the general public that makes people focus on self-presentation when planning to post a photograph on social media.

Interestingly, there is a lot of recent research in the field of neuroscience that studies how different first-person and third-person thoughts and memories are encoded and formed. There are two main types of spatial encoding that form our memories. One type is allocentric coding, which predominately takes a third-person perspective. In allocentric coding, objects and space are remembered in terms of where they are in relation to other objects and in space in general. The other type of coding is egocentric. Egocentric coding refers to memory based on the presence of the viewer, or where objects are located from the viewer. Wang et. al describe that, "Episodic memory, the conscious recollection of past events, is typically experienced from a first-person (egocentric) perspective" (Wang, Chen, Lee, Deshmukh, Yoganarasimha, Savelli & Knierim, 2018). However, if social media is causing a shift in memory from a first-person perspective to more of a third-person perspective then this could signal that social media is also causing a change in some memories from egocentric coding to allocentric coding. Recent research actually shows that there are different brain cells located in different brain regions for allocentric coding and egocentric coding. A paper by Wang and colleagues describes that the hippocampus, the brain region responsible for forming new memories, has two major projections: the lateral entorhinal cortex (LEC) and the medial entorhinal cortex (MEC). The researchers found that egocentric coding is associated with the LEC and that, "MEC cells tended to represent allocentric bearing" (Wang et al., 2018). While all this evidence may not necessarily mean a better or a worse memory, it signifies a possible change in memory due to social media at the neuronal level.

Emotion and Memory

With all this evidence, especially from the study by Barasch, Zauberman, and Diehl, it is evident that posting photographs or even just having the intent to post them would be detrimental to experiences and memory. However, there are actually some memory benefits to posting a photograph. Emotion is tied to memory in many ways, and many studies have found that strong emotions normally better encode memories for long-term retrieval. Therefore, if social media posting can evoke certain emotions, it is possible that those emotions could strengthen memory of the event.

One study by Lambert and colleagues found that positive experiences that elicit positive feedback for a person will improve memory of that experience. The results of this study imply that sharing a positive experience can improve the mood of the sharer, and this effect is amplified when the sharer receives positive feedback (Lambert, Gwinn, Baumeister, Strachman, Washburn, Gable & Fincham, 2012). Therefore, it would appear that sharing a positive experience on social media should improve mood and that receiving positive feedback, such as likes and comments on that photo, should further enhance the positive mood. This is one example of how sharing a photo on social media can improve memory. It has been shown that emotion plays a large part in forming long-term memories, so the fact that emotion is elicited from feedback would suggest that positive feedback on a social media photo could better a person's memory of the event.

Another article explores the effects of sharing selfies and groupies on social media sites. Wang, Yang, and Haigh find that the characteristics of "self-esteem, need for popularity, and life satisfaction" are all affected by sharing selfie and groupie pictures (Wang, Yang & Haigh, 2017).

Since these characteristics all are elicited by sharing selfies and groupies, which are common to social media, it is not difficult to assume that changes in these categories could affect memory because of the strong emotions that accompany them.

A phenomenon that is particularly interesting is if positive emotions created via commenting on a social media post after an event could change a person's feelings and/or memory of the event. As discussed previously, shared positive events that receive positive feedback will improve a person's mood (Lambert, Gwinn, Baumeister, Strachman, Washburn, Gable & Fincham, 2012). However, a new experiment could test other varieties of this phenomenon. An article by Garry and Gerrie suggests that responses to photographs can change memory. Since comments are reactions to social media posts, this could have profound implications (Garry & Gerrie, 2005). Based on this article, many ideas dealing with photography could possibly be extrapolated to social media use. For example, if someone posted a photograph looking happy at an event in which they were not actually happy and posted a fun caption with it, then, based on this research, they could look back at the photograph accompanied with the caption and construct false memories about how much fun they had at the event. This could be an example of emotion causing reconsolidation of memory, which will be discussed in the next section.

Effects of Reviewing Posts on Memory and Experience

After studying how social media photography affects memory and how posting or even intent to post can affect memory, the next logical step is to look at the last major part of the typical social media process: reviewing of posts. People take thousands of photos over their

lifetimes and post many of these pictures, but what is the motivation to take and post these pictures? The articles by Lee and colleagues in 2015 and Sung and colleagues in 2016 each conducted surveys and created lists of key motivations that participants cited as reasons for social media activity and posting. According to the articles, one main motivation for posting that is seen in both of the articles' lists is archiving (Sung, Lee, Kim & Choi, 2016). Archiving in this context refers to creating a digital timeline or storage center for photographs of one's life or experiences. Lee's article describes that, "The emergence of the archiving motive suggests that Instagram users utilize this platform to record their daily events and traces (e.g., trips), thereby creating their own personal cyber documentary through a variety of fancy photos" (Lee, Lee, Moon & Sung, 2015). Since archiving is such a major motivation, it would make sense that people post these photos with the intent to go back and look at this archiving of memories in the future. When initially thinking about this subject, it is logical to think that reviewing posts would only lead to improved memory, because if someone reviews a picture, it is evident that as long as the picture portrays accurate information, then it should be familiar and aid in retrieval of memories and only serve to further strengthen that memory and the connections leading to it. While this may be true for many situations, there are other phenomena affecting and changing memories, mainly the process of reconsolidation.

Reconsolidation and Changing Memories

Reconsolidation is "a process in which the retrieval of a previously consolidated memory returns to a labile state which is then subject to stabilization" (Forcato, Argibay, Pedreira & Maldonado, 2009). Essentially, this means that when memories are retrieved, they are subject to a period of possible change or modification. This process of reconsolidation presents the possibility of changes in memory for events that have or have not happened and can also change

one's feelings about an event. In a paper by Garry and Gerrie, the researchers describe how past experiments have shown that memory can be altered with very simple technologies such as the written word. However, they describe that we have increasingly more complex technologies, like the photograph and particularly photo-editing software, that can vastly change perception, opinion, and memory of an event. Therefore, they "hypothesize that the photograph helps subjects to imagine details about the event that they later confuse with reality" (Garry & Gerrie, 2005). In this review, they find that, "both doctored and true photographs can cultivate false memories for personal experiences, and true photographs can lead to false memories for the news" (Garry & Gerrie, 2005). This is not necessarily a surprising finding, but it is definitely a phenomenon that goes unnoticed in daily life. Many people believe their memory is infallible- that if they remember something then it must have happened or be true- but the evidence shows that our memories are prone to reconsolidation and other changes. This phenomenon is only increasing with more of people's lives being captured in photographs due to social media photography.

Social media then becomes even more of a driving force in memory, as the process of reviewing social media pictures could lead to more reconsolidation. A 2013 study by Peggy St. Jacques and Daniel Schacter explored the phenomenon of reconsolidation. They performed an experiment by having subjects take photographs in a museum and then later used other photographs to reactivate memories of the participants and see if reconsolidation occurred and/or how memories were affected. The experimenters predicted that, "reactivation would both enhance and distort memory via updating, and therefore lead to an increase in subsequent true and false memory" (St. Jacques & Schacter, 2013). After performing three studies, they concluded that reconsolidation does occur when retrieval of past memories occurs and confirmed

their hypothesis that, “reactivation selectively influences personal memories by both enhancing and distorting memory via updating” (St. Jacques & Schacter, 2013). This means that sometimes reactivation of an old memory by viewing a photograph can lead to improved memory after reconsolidation, but also that reactivation of a memory under a different context or with information that could portray a memory in a different light could result in changed or impeded memory. St. Jacques and Schacter make it clear that reactivation of memories and reconsolidation can have both positive and negative effects on memory.

While it is obvious that reconsolidation is a phenomenon that can occur when new information or related information is presented, it is not as obvious that reconsolidation could occur when the same information is presented, such as posting a social media photograph and then later reviewing the same photograph. For example, in the study by St. Jacques and Schacter, different photographs were used than the photographs that participants took in order to test if the participants knew whether the information in the photographs was present on their tour (St. Jacques & Schacter, 2013). This presentation of new information led the participants to falsely remember that some items and places were present on their tour, when in fact, they were not. So, this brings forth the question of whether or not the participants could invent new memories or emotions from viewing the original photographs taken on the tour, and not introducing new fake photographs.

Since most studies only take into account reconsolidation after new information is presented, then, for the purpose of this paper, it is important to establish whether or not social media presents new information upon review of photographs or if the information is stagnant. It would seem that an initial posted picture would be the same as when it is reviewed at a later time on social media, but this is a much more complicated interaction than it seems. On the most basic

level, very little reconsolidation could occur from reviewing previous posts, as the picture that is posted is the same exact picture that is reviewed later. In that case, no new information is presented, and according to research it is likely that little reconsolidation would occur. However, where social media is unique is that so many different features can alter a post. For example, the comments section on most social media posts is open indefinitely- people can add comments to a post even years later. Similarly, all comments and reactions to a post occur after the picture is posted. Therefore, a social media post is almost always changed in some way from when it is originally posted. Another argument for changes in a social media picture occurs as the picture is being posted. For example, editing pictures has become a very common practice and hobby in social media. Edits to a picture to make the background seem more vibrant, or a beach to seem less cloudy, or water to appear a deeper blue all have the potential to reconsolidate memory when the picture is reviewed. Then the person posting the picture may forget over time that they made those edits initially and their new memory of the pictured place might now represent a perfect beach vacation, when in reality the weather was cold and cloudy.

Returning to the 2005 article by Garry and Gerrie on how emotion can affect memory, it would appear reasonable for someone's memory and emotions to have the potential to be affected after posting a picture to social media due to reconsolidation. Someone who posted a photograph while smiling and looking excited, when in fact they were actually miserable at the event, could go back and review the picture and reconsolidate their memory and actually completely change their perception of their experience at that event.

Since self-presentation is a major factor in social media, it is understandable why people would want to alter pictures and receive encouraging comments. There is pressure on people to make their social-media-self appear as cool, fun-loving, and attractive as possible. These

pressures can lead to the portrayal of fake-enjoyment through photographs, edits, captions, and comments that can all play a large part in reconsolidation since our memories are so malleable when reviewing previous social media posts.

Conclusions, Limitations, and Future Directions

Synthesizing the effects that result from social media photography, posting, and reviewing of posts reveal a lot about how our minds are being affected by social media practices. Upon initially reviewing popular literature in the field, it appears that social media is only harming our memories and humanity; however, there are social media practices that do help memory. After reviewing over twenty articles, the evidence reveals that there are a variety of practices that affect memory in different ways. The key to using social media in a beneficial way is to understand the varying effects that social media has on memory and then formulate a way to maximize the positive aspects and minimize the negative practices.

For social media photography, research shows that there is a photo-taking impairment effect when taking a picture, but conflicting research shows that recall is actually better for photographed objects. When first reading these studies, it would be easy to say that they simply conflict and disprove each other with the simple conclusion that more research needs to be done. However, when closely analyzing the details, these studies do not contradict each other at all and provide some key insight into the issue of how social media photography affects memory. It becomes clear that the photo-taking impairment effect occurs on objects in the surroundings, while the improvement in memory occurs for the actual object being photographed. This is a simple case of attention: if you want to remember your experience and the surroundings better,

then simply pay attention to them and do not use a camera. Conversely, if you want to remember a specific object or moment, then spending time focusing on the image and capturing a good photograph will improve memory of that object or moment.

Since posting a picture or intending to post a picture can lead to anxiety and actions to improve self-presentation, it would be best to take photographs for personal enjoyment and archiving instead of for social media posting. This would minimize the negative effects of anxiety, self-presentation, and switching to a third-person perspective.

Based on this research, reviewing posted pictures should be done carefully to maintain clear memories. In order to minimize changing of memory by reconsolidation, posted photographs and captions should reflect the reality of the event or experience or else reconsolidation could change memories in the future.

Ultimately, it is very difficult to tip-toe around the various effects that social media has on memory. Social media has become such a fundamental part of many people's lives and the effects of social media use are ingrained in our society. After summarizing the effects of social media photography, posting, and reviewing, it may seem that most of the possible effects on memory have been studied; however, the brain is very complex and there is still much to be understood in this realm of research.

This study was limited in that it was a literature review of other experiments and findings in the field. The problem with most memory research is that it is very difficult to test or visualize so even the reviewed studies have many limitations. It is almost impossible to replicate many social media tendencies and the resulting feelings in an experimental setting. For example, many experiments had to assign people to take photographs, which is a condition that rarely happens in real-world personal social media practice. Similarly, each experiment looked at only one of the

possible effects of social media without looking at possible interactions among effects. In scientific work, it is important to have a clear independent variable and to minimize intervening variables. It is challenging to summarize effects when they can not be tested independently. For example, it would be hard to see how the photo-taking impairment effect could possibly be mitigated by reviewing a photograph later or by responding to a positive comment from a friend on the post.

While this paper synthesizes many effects of social media, there are various other intricacies and processes that need to be tested in order to ascertain the overall effects of social media photography on memory. Many issues also came up in this research that seemed to be unresolved questions in the field. For example, the paper by Soares and Storm that dealt with whether attentional disengagement or cognitive offloading was the more appropriate explanation for the photo-taking impairment effect puts forth a major limitation towards the end of their paper. Similar to how it was proven that smartphones and cameras can be distracting even when they aren't being used, Soares and Storm, after concluding that their results did not show cognitive offloading, state that there still is the possibility of automatic offloading that occurs when taking photographs (Soares & Storm, 2017). If this is the case, the results from their experiment would not be wholly true, as cognitive offloading would play a much larger role. This would be a tough idea to test, however, as it would be a phenomenon occurring in the mind. Similarly, it would be very interesting to test the effects of comments and interactions on social media on memory. For example, it is established that emotion can greatly influence memory and that positive feedback can produce positive emotions that aid in memory. Therefore, it would be feasible to conclude that positive reactions to social media would improve memory, but this has not been explicitly tested. Also, social media does not solely consist of positive comments and

interactions, so it would also help to test how negative or neutral comments and interactions can influence memory. Lastly, it would be interesting to test if reconsolidation of memory can occur from an unchanged or original photograph.

Although there are countless questions and future directions in this field of research, one thing is very clear: social media photography and the practices associated with it are at least changing the way we experience, memorize, and encode information of our personal life events. It is likely that the teenagers I witnessed snapping photographs in the Louvre and posting them to social media experienced many different effects on memory as compared to a person that did not use a camera. Whether or not this change or re-wiring of our brains is positive, negative, or simply just a change is up to future research to distinguish, but this is a very relevant and important phenomenon that needs to be addressed.

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