



The Reliability of Memory: A General Review from Two Memory Models

Shen Hu^{1,*}

¹Beijing Huijia Private School

*Corresponding author. Email: 23hushen@huijia.edu.cn

Abstract. The reliability of memory is a debatable topic that contemporary psychologists are investigating. They aim to determine a specific boundary that is eligible enough to distinguish the extent to which memory can be considered reliable or not. Flashbulb memory and reconstructive memory are two aspects focused on in this review to explain the specific type of memory and factors that can influence the reliability of memory. In the recent field of psychology research, a vast amount of studies focused on flashbulb memory have explained the crucial role of the “personal relevance” and the “element of surprise” serving to make flashbulb memories reliable. Oppositely, the misinformation effect emphasized in reconstructive memory tends to explain the unreliable notions of memory. It proposed that during the recall process, false memories could be created due to either a leading question or a series of post-event information effects. The reliability of memory is always a hot debatable, and questionable topic. One of its social significance that is discussed in this paper is the auxiliary role of memory that helps the court to make justice sanctions toward crime scenes according to a recalled eyewitness testimony.

Keywords: Reliability of Memory, Flashbulb Memory, Misinformation Effect

1 INTRODUCTION

In this era of societal development, vast scientists’ interests have been redirected to investigate the inner nature of humans, that is, the invisible cognition system that makes people human beings. Cognition is the mental action or process of acquiring knowledge and understanding through thought, experience, and senses. The cognitive process includes perception, thinking, decision-making, problem-solving memory, language, attention, and judging [1]. One cognitive process is memory, which is a complex process that guides our behavior and involves the encoding, storing, and retrieving of information [2]. For years, scientists have been arguing about the extent of reliability of memory. Conventionally, people tend to have great trust in their memory; however, many scientists pointed out that our memory can sometimes be prone to make errors and distortion during reconstruction. It proposes that memory, rather than a passive and retrieval process, is an active process involving the reconstruction of information

stored. From this point of view, humans are not cameras that record and store information. Instead, we rebuild everything when it is time to recall [3].

The flashbulb memory theory was proposed by Brown and Kulik, and they defined it as a highly detailed, exceptionally vivid “snapshot” of the moment when a surprising and emotionally arousing event happened [4]. Furthermore, they clarified two critical variables of the creation of flashbulb memory: surprise and emotion [5]. These two variables can increase the rehearsal of memory on both an overt and covert basis that may strengthen the consolidation of memory. Also, Brown and Kulik have explained how “personal importance” was a variable in maintaining clear flashbulb memory by using the importance-driven model, which stated that personal consequence could determine the intensity of emotional reactions [6]. With the introduction of the special-mechanism hypothesis, which assumed the existence of a permanent record of information is determined by whether the incident has overridden one’s critical level of surprise, many believe memory is reliable as it comes to the flashbulb memory [7].

The discussion of memory’s reliability is necessary because memory-based evidence applications are gradually becoming more prevalent and overdependent. Hence, the investigation of the reliability of memory would reveal the true nature and the trustworthiness, which is incredibly decisive for formal occasions where evidence of making the final judgment is recalled and self-reported [8].

Therefore, this review will mainly focus on discussing the reliability of memory, which is to what extent is the information in a memory trustworthy and reliable, by analyzing two models of memory formation: flashbulb memory and reconstructive memory [9].

2 METHODS

The articles and studies cited and referred to in this review for claiming statements were gathered mainly from Google Scholar, an open-public platform that offers academic journals and essays. The search keywords were ‘cognition’, ‘memory’, ‘reliability of memory’, ‘flashbulb memory’, and ‘reconstructive memory’. By entering keywords, the researcher is allowed to be efficiently gathered numerous pre-existing papers highly matched with topics of inquiry. In a total count, 21 either published reports or articles have been accessed along the process of composing this essay. They are relevant and reliable enough to become solid supporting references.

3 TWO MODELS OF MEMORY RELIABILITY

3.1 Flashbulb Memory

Flashbulb memory is a term that refers to a particular type of emotionally related memory that Roger Brown and James Kulik introduced. This type of memory is defined by a series of characteristics of being “an exceptionally long-lasting and vivid ‘snapshot’ of an event” [10]. Due to its high emotional and personal relatedness, the recall

process of flashbulb memories is enhanced and the event is also more frequently rehearsed, thereby creating a solid memory [11]. In addition, several studies that focused on the presence of flashbulb memory have shown reliable aspects of memory.

One study that stated positivity of the reliability of memory was from Yuille and his colleagues [12]. It aimed to determine whether leading questions would affect the memory of eyewitness at a real crime scene. The study was conducted on a group of people who had experienced a shooting event in Vancouver. They were informed previously about the interview, which offered them two misleading questions (no broken headlight), which are group 1: if they saw a broken headlight or a yellow panel on the car. Group two: if they saw the broken headlight or the yellow panel on the vehicle. The result showed that these 13 participants could recall a large amount of accurate detail --- between 79% and 84% --- that could be confirmed by the police report. Also, they have made no errors, even with the leading questions. In conclusion, eyewitness and flashbulb memory are very reliable as they have been emotionally triggered throughout the event, indicating intense personal importance and surprise had increased the rehearsal of the robbery both covertly and overtly. Therefore, strengthening the memory and permanently storing it. This study is discussed because it has shown that if personal relevance and the critical level of surprise are met, memory could be reliable regarding its. Discussing the highly accurate eye-witness testimonies reported by the participants, Yuille and Cutshall et al. demonstrated the reliable property of flashbulb memory, which further supports the solidity and trustworthiness of emotionally aroused-memory-based justifications.

Another study that has demonstrated the intensified influence of emotion on creating long-stored and reliable flashbulb memories was done by Brown and Kulik [6]. In this study, the researchers investigated 80 American participants' recall of a series of significant events. A questionnaire with 10 events, distributed with 9 assignments of well-known public figures and an unexpected personal shock, was given to all the participants to fill with. They were asked about how much they could rehearse these events in both a covert and overt manner. The results indicated that participants tend to have vivid memories of political assassinations; In addition, African Americans recalled Martin Luther King accurately while white participants recalled President Kennedy better. Also, most of the participants had very detailed memories of the death of their loved ones. All these results have jointly indicated that memories are reliable if the event or figure has a close relationship and personal relevance that is sufficient to trigger the formation of flashbulb memories. Hence, this study has proven that flashbulb memory is highly reliable, whereas if personal relevance and the critical level of surprise are attained, it becomes a more solidly memorized emotional memory.

However, flashbulb memory may not always be as accurate as the abovementioned research. In the study of Kulkofsky et al. [13], the researcher recruited 274 middle-class adults from five different countries. They were asked to recall in 5 minutes as much as "public events" as they could. Then, researchers offered all the participants a list of questions that tend to induce the participant's recall of information about the events. For the last task, participants were asked about how those memories are personally important to them and how many times they have spoken about them. The results showed that participants from countries with collectivistic cultures like China recalled

fewer memories due to their culturally lacking emphasis on personal relevance to the event. However, participants from individualistic societies such as Britain and America have created more effective and accurate memories due to their emphasis on generating a personal relevance immediately after the event happens. Hence, it is shown that memories are unreliable due to their highly plastic property when encountering cultural factors' effects on generating personal importance.

3.2 Reconstructive Memory

Reconstructive memory is another type of memory introduced by Sir Frederick Bartlett. He emphasized that the recalling process of memory does not function as a video recorder. Instead, it is an active process in which one rebuilds every piece of information by searching it in the brain using schema [14]. This reconstructive memory also raises concerns and debates that the recalling process is exceptionally prone to errors either due to leading questions or post-event information [15].

3.2.1. Leading Questions.

One causal factor of the misinformation effect is through leading questions, which are deliberately designed questions with leading verbal cues that aim to reflect expected answers. Leading questions tend to alter one's cognitive schema—the mental representation of thinking, belief, and expectation—and, therefore, affect how one categorizes and retrieves information. In addition, one study that explained the extent of memory's unreliability was the Loftus and his colleagues [16]. Two studies were conducted in the same area of research. However, the second experiment will be focused on this discussion, while the first one vaguely investigated the effect of leading questions on the estimation of speed. The second experiment aimed to further and more precisely test the role of leading questions in a recall. The experiment was carried out by showing 150 participants a video clip of a car accident. Later, they were divided and asked to estimate the car's speed with three conditions: a word choice of "Hit" and "Smashed", or participants were not asked about the speed at all. A week later, participants were gathered and asked whether they saw any broken glasses in the video. As a result, most participants accurately reported no broken glasses, but, in comparison, more participants in the "smashed" condition reported broken glasses. The researcher has shown his investigation on memory reliability by showing that the leading questions-smashed, hit-can result in the various extent of misinformation effect when reconstructing a piece of memory after one week due to the word "smashed" may trigger more intense emotional arousal; hence, altering the schema and creates false memory. Therefore, due to the influence of memory cues such as leading questions, the reliability of memory could be low. This is because one's recall process could be disturbed and anchored to misleading information that eventually creates flawed recalls.

In the study conducted by Loftus and Pickrell [17], the researcher gathered 24 participants who believed they were doing a memory test that investigated their experiences of being lost in a mall. Specifically, three self-reported interviews were carried out throughout the experiment. For one, the family members of all participants were

interviewed to provide detailed stories about the participants from the age of 4-6 years old and were then asked whether the participants had been lost in a mall. In the second interview, the participants were asked to read and respond to four memories, including three real ones and one fake event of themselves getting lost in a mall. For the third interview, the participants were asked to recall the maximum amount of information about the four events and then rate their confidence toward these recalls on a Likert scale ranging from 1 to 10. The results have shown that 25% of the participants recalled the false memory of losing in a mall, showing that they are memories are prone to distortion when suggestions about the happening of an event are offered to the participants; hence, the study has shown that memory is not always reliable.

3.2.2. Post-event Information.

Another factor that can cause misinformation effects is post-event information. It explains how information following the happening of an event may alter one's original schema and, hence, influence the retrieval of information about the event. One study that can explain the influence of post-event information was conducted by Neisser and Harsch [18]. In the study, the researcher investigated 106 students' impressions of the Space Shuttle Challenger Disaster that happened on January 28th, 1986. Specifically, the researcher immediately (less than 24 hours) surveyed 106 students by using a list of questions that focused on some statements of fact when the news was broadcasting, such as "How did you hear about it?", "Where were you?", "Who told you?" and so on. After two and half years after the first survey, participants were once again gathered to redo the same questionnaire with the same list of questions but with two additional alternatives of reporting their confidence in the similarity of the current with the previous answers and asking if they have filled this questionnaire before. As a result, the mean score of correctness out of 7 questions was 2.95, indicating significant discrepancies between the two questionnaires, while the average level of confidence was 4.17, which showed that the participants were highly confident. This study showed that reconstructive memory could influence flashbulb memories and the misinformation effect precisely due to participants' exposure to post-event information.

4 IMPLICATIONS

This review aims to facilitate people's acknowledgment of the reliability of memory by which offering a holistic discussion on both the trustworthiness and the unsoundness of memories. Additionally, the utilization of eyewitness testimony as evidence is an increasingly used mechanism for judging crimes and charging lawful sentences. This article alerted that these testimonies may not always be factual and objective due to the distortive factors that alter memories, such as culturally affected personal relevance in maintaining the consistency of memory for long periods, misleading questions or suggestions offered before a recall of the related event, and the exposure to post-event information that may yield memory distortion due to the change of memory categorization ---- the schema [19]. As discussed above, in the study conducted by Yuille &

Cutshall [20], testimony is used as a trustworthy method for providing additional evidence. Nevertheless, the influencing factors that influence one's testimony cannot be solely evaluated from a cognitive perspective. In contrast, such testimonies may become less accurate if the witness has personal emotion and a relationship with the case, which causes one to subjectively and selectively decide what to recall and what to reveal to the court [21].

Factors that alter memory's reliability are not limited to levels of surprise and its relevance to oneself [6]. As revealed in Bartlett et al. [19], cultural factors may also play a role by facilitating memory formation and recall in favor of their own culture through assimilation, leveling, and sharpening. These cultural factors were later concluded to be a representation of people's rationalization process that aims to adapt information during recall in a manner that is more consistent and coped with one's existing schema [19].

Future studies are encouraged to focus on investigating the relationship between a particular circumstance and its corresponding influence on the reliability of memory. Also, the relationship and the true nature of the reliability of memory are still highly discussable due to their complexity. As an elusive mental process, the absolute control of extraneous and confounding variables in experiments is hard to be achieved. But researchers are still highly encouraged to maintain high internal validity by applying controlling strategies such as the random allocation of participants (randomly allocating participants into different experimental conditions), the utilization of the single-blind method (the participants are not informed about the true aim of the study), etc. to demonstrate a causal relationship between a cognitive factor and its effect on the reliability of memory.

5 CONCLUSION

Although this paper has offered a holistic discussion of the current debates about the reliability of memory by heavily evaluating the problem from flashbulb memory and reconstructive memory, however, memory is a complex and highly sophisticated puzzle in one's cognitive system, meaning that the potential influencing factors of the reliability of memories are definitively not restricted to a countable number.

Therefore, the mechanism of alleviating the reliability of memory is still in the infant phase of investigations. All such investable and essential sealed knowledge are blocking the contemporary scientists' footsteps' footsteps to fully understanding the true nature and the field of psychology with an in-depth vision.

REFERENCES

1. M. I. Posner, *Cognition: An introduction*, Scott, Foresman, 1973.
2. C. R. Brewin, B. Andrews, & L. Mickes, Regaining consensus on the reliability of memory, *Current Directions in Psychological Science*, 2020, 29(2), pp. 121-125. DOI: <https://doi.org/10.1177/0963721419898122>

3. G. H. Bower, Experiments on story understanding and recall, *The Quarterly Journal of Experimental Psychology*, 1976, 28(4), pp. 511-534. DOI: <http://dx.doi.org/10.1080/14640747608400579>
4. N. Er, A new flashbulb memory model was applied to the Marmara earthquake, *Applied Cognitive Psychology: The Official Journal of the Society for Applied Research in Memory and Cognition*, 2003, 17(5), pp. 503-517. DOI: <https://doi.org/10.1002/acp.870>
5. W. Hirst, & E. A. Phelps, Flashbulb memories, *Current Directions in Psychological Science*, 2016, 25(1), pp. 36-41. DOI: <https://doi.org/10.1177/0963721415622487>
6. R. Brown, & J. Kulik, Flashbulb memories, *Cognition*, 1977, 5(1), pp. 73-99. DOI: [https://doi.org/10.1016/0010-0277\(77\)90018-X](https://doi.org/10.1016/0010-0277(77)90018-X)
7. T. Lanciano, A. Curci, G. Matera, & G. Sartori, Measuring the flashbulb-like nature of memories for private events: the flashbulb memory checklist, *Memory*, 2018, 26(8), pp. 1053-1064. DOI: <https://doi.org/10.1080/09658211.2018.1428348>
8. C. R. Brewin, B. Andrews, & L. Mickes, Regaining consensus on the reliability of memory, *Current Directions in Psychological Science*, 2020, 29(2), pp. 121-125. DOI: <https://doi.org/10.1177/0963721419898122>
9. M. Conway, *Flashbulb memories*, Psychology Press, 2013.
10. C. Finkenauer, O. Luminet, L. Gisle, A. El-Ahmadi, M. Van Der Linden, & P. Philippot, Flashbulb memories and the underlying mechanisms of their formation: Toward an emotional-integrative model, *Memory & cognition*, 1998, 26(3), pp. 516-531. DOI: <https://doi.org/10.3758/BF03201160>
11. G. H. Bower, & P. R. Cohen, *Emotional influences in memory and thinking: Data and theory*, Affect and Cognition, Psychology Press, 1982.
12. J. C. Yuille, & J. L. Cutshall, A case study of eyewitness memory of a crime, *Journal of applied psychology*, 1986, 71(2), pp. 291-301. DOI: <https://doi.org/10.1037/0021-9010.71.2.291>
13. S. Kulkofsky, Q. Wang, M. A. Conway, Y. Hou, C. Aydin, K. Mueller-Johnson, & H. Williams, Cultural variation in the correlates of flashbulb memories: An investigation in five countries, *Memory*, 2011, 19(3), pp. 233-240. DOI: <https://doi.org/10.1080/09658211.2010.551132>
14. S. F. Larsen, & C. P. Thompson, Reconstructive memory in the dating of personal and public news events, *Memory & Cognition*, 1995, 23(6), pp. 780-790. DOI: <https://doi.org/10.3758/bf03200929>
15. J. P. Lipton, On the psychology of eyewitness testimony, *Journal of Applied Psychology*, 1977, 62(1), pp. 90-95. DOI: <https://doi.org/10.1037/0021-9010.62.1.90>
16. E. F. Loftus, & J. C. Palmer, Reconstruction of automobile destruction: An example of the interaction between language and memory, *Journal of verbal learning and verbal behavior*, 1974, 13(5), pp. 585-589. DOI: [https://doi.org/10.1016/S0022-5371\(74\)80011-3](https://doi.org/10.1016/S0022-5371(74)80011-3)
17. E. F. Loftus, & J. E. Pickrell, The formation of false memories. *Psychiatric annals*, 1995, 25(12), pp. 720-725. DOI: <https://doi.org/10.3928/0048-5713-19951201-07>
18. U. Neisser, & N. Harsch, *Phantom flashbulbs: False recollections of hearing the news about Challenger*, Cambridge University Press, 1992. DOI: <https://doi.org/10.1017/CBO9780511664069.003>
19. C. C. Carbon, & S. Albrecht, Bartlett's schema theory: The unreplicated "portrait d'homme" series from 1932, *Quarterly journal of experimental psychology*, 2012, 65(11), pp. 2258-2270. DOI: <https://doi.org/10.1080/17470218.2012.696121>
20. J. C. Yuille, & J. Cutshall, Analysis of the statements of victims, witnesses and suspects. In *Credibility assessment* (pp. 175-191). Springer, Dordrecht, 1989.

21. M. A. Wheeler, & H. L. Roediger III, Disparate effects of repeated testing: Reconciling Ballard's (1913) and Bartlett's (1932) results, *Psychological Science*, 1992, 3(4), pp. 240-246. DOI: <https://doi.org/10.1111/j.1467-9280.1992.tb00036>

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

