

Effects Of False Memory On Learning

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Abstract: Memory has always been one of the most important components of learning in the world of humans and animals. However, this crucial component also experiences errors and disruptions that significantly affect learning. One type of disruption is called false memory, which refers to an event that has never actually occurred in the real world but is recorded as a memory in the mind of the experiencer. The present study was conducted through a case study method, and the findings indicate that false memory ; A distorted memory is an event recall or a strong memory of an event that never actually occurred. Disorder can lead to learning setbacks. Therefore, employing memory enhancement techniques can prevent memory disorders and increase learning in learners by boosting memory.

Key words: memory distortion, false memories, memory creation

Introduction

There are some memories that you might remember while you are in the class although they have never happened. Our brains can sometimes create memories of events that never actually happened, and this can occur even when others might recall the event differently or when it didn't happen at all. Research indicates that approximately 15% of people worldwide have experienced false memories in childhood.(Nash et al., 2017) So, if you've had this experience, you're not alone- it's a widely documented occurrence.

Do you think this issue affects the learning process? If the answer is yes, will its impact be negative or positive? To answer these questions, we need to become familiar with the concept of false memory, its reasons, as well as the concept of learning and its importance. In the following section, we will only examine general concepts; in the main body, we will delve more into the details.

The concept of false memory

False memories are memory errors because details, facts, or events .often come to mind vividly, but the memories do not align with previous events False memories are created by combining real memories with content received from others. During this process, individuals may forget the source of the information.

The concept of learning

learning is a mean which can improve abilities, knowledge, behaviors. Perhaps leading to a potential change in the combination of data, depth of knowledge, approach, or behavior towards psychology (Gross, 2015) Resulting in extensive experiences.

The importance of learning

In general, the importance of learning includes four main aspects:

- It boosts self-esteem.
- It opens doors to new opportunities.
- It prepares you for unexpected situations.
- It energizes and activates you.

Background research

The concept of false memory has attracted considerable attention from researchers in recent years (for example (Loftus, 1997a) , (Brainerd & Reyna, 2005) , (Wade et al., 2007)) The main focus of many researchers has been to understand how these errors are generated, thus various programs have been developed and employed to study false memory. For further information on these methods, refer to (Wade et al., 2007). The most prominent of these programs is the Deese-Roediger-McDermott (DRM) paradigm (Miller, 1988), which has become well-known based on the names of its original creators and has been the focus of much research on false memory. The DRM paradigm has been widely used in research since 1995. So far, this program has inspired many studies on false memory, but it should be noted that its application in children is very limited.

Two important theories regarding the development of false memory DRM have been proposed: the fuzzy trace theory and the congruency-activation theory. According to the fuzzy trace theory, memory can be stored both in precise traces and in gist traces (general outlines), and both traces change with age. Precise traces are details of physical appearances, while gist traces represent the meaning or theme of stimuli. Accurate memory is related to precise traces, but false memory, words are recalled based on gist representations. Therefore, semantically related words are remembered because their general representations match. (Brainerd et al., 2008). The congruency-activation theory considers false memory as the product of retrieval and activation processes. This theory, inspired by scattered activation patterns, suggests that processing a word activates the corresponding node or, in other words, the corresponding concept in the mental lexicon and this activation continues under word list presentations. Brainerd and others (2008) examined seventeen DRM false memory studies conducted between 2002 and 2008. They found that overall, false recall and recognition of words increase with age. In fact, an increasing trend dominates false memory.

Memory distortion

When a person is very confident about a memory and this memory is very vivid in details, most of the people do not doubt that the person's recollection is accurate. However, it has been shown that confidence and vividness of details are not good predictors of accuracy (Schacter et al., 1996) A good example of this lack of correlation is the case of John Dean, a worker of the White House during Nixon's presidency. His memories about the coverup of Watergate were so rich in details, and he was so confident about them, that he started to be called the human tape recorder", referring to his extraordinary ability to remember accurately every single detail from those conversations with the president. However, when actual tapes of the conversations described by John Dean were found and compared to his testimonies, it was made clear that his memories were not as accurate as people initially thought. This case showed how people generally keep a very good memory for the gist of the events compared to the details and, also, how confidence and richness of details of the memory are not good predictors of its accuracy (Schacter et al., 1996)

Memory biases

When trying to recall how we used to think years ago, we systematically remember our past attitudes as closer to our current ones than what they really were. For instance, in a study described by Schacter (1996), participants were asked to rate their attitudes toward some social issues. These ratings were collected twice for the same sample, with a 9 years

interval between them. The second time, in addition, the participants were asked to indicate what their attitudes were the first time they were asked. The results showed how estimations of their past attitudes were closer to their current attitudes than to their actual past ones. In other words, “memories of past impressions and feelings were filtered through, and made consistent with, current impressions and feelings” (Matteo et al., 2003) However, this retrospective bias does not always act to preserve consistency. In other cases, we bias the information to match our expectations of change. For instance, after completing a self-help program, people expect a change to happen. Even when the program is not effective, participants may rate their previous skill level as lower than what it really was, perceiving a skill improvement due to the program. The ‘self-enhancing memory bias’ is a tendency to remember better positive than negative things about one’s past. The lack of this bias in depression and anxiety disorders makes these patients attend to and remember more negative information (for depression) or threatening stimuli (for anxiety), and this leads to and maintains the respective disorders. This can also be explained by a more general memory bias, the ‘moodcongruent bias’, which makes individuals show attentional and memory biases for information that is consistent with their emotional state (Mineka & Nugent, 1995). Other memory biases described by Schacter (2001) are: hindsight and stereotypical biases. The former refers to the pervasive influence of current knowledge in the recollections of past events. Basically, it states that “once we learn the outcome of an event, we feel as though we always knew what would happen” (Schacter & Scarry, 2001) This bias is very typical of contexts such as sports or political elections, where we always ‘knew’ who was going to win or be elected (but after we already know the outcome). The stereotypical bias refers to the way we distort our memories in order to make them fit with our previous beliefs. It is specially interesting to learn that this occurs even in people that are not aware of holding certain stereotypes.

Flashbulb memories

Brown and Kulick in 1991 asked their subjects to recall events that occurred in the last 13 years. They found that 99% of the participants remembered the circumstances in which they heard about John F. Kennedy assassination. These authors coined the term ‘flashbulb memories’ to refer to the “memories for the circumstances of hearing about a highly surprising and consequential event” (Tekcan, 2001) their original article, Brown and Kulick described these recollections as being like a photograph, very resistant to forgetting and produced by a special biological mechanism that ‘print’ that image on one’s memory. However, they never tested the accuracy of those memories by objective means, relying only on subjective impressions of the participants. In order to investigate the accuracy of those ‘flashbulb memories’, Neisser and Harsch (1992) used the ‘Challenger explosion’ as the material to remember. The reason why they selected this event was because, due to its characteristics, it was a potential source of flashbulb memories. The authors collected the versions of a group of students the morning after the explosion and they compared them to their recollections of the event 32 to 34 months later. Neisser and Harsch concluded that flashbulb memories are not as accurate as Brown and Kulick proposed, even if they are vivid, detailed, and subjects show a lot of confidence about them. They also observed that, once participants included an error in their stories at the time of recall, those errors were integrated and remained in their memories. The unusual degree of retention over time of this kind of memories can be explained by known memory mechanisms, such as distinctiveness of the stimuli or a strong representation provoked by an intense emotion (Brewer, 1994). This explanation does not consider necessary a qualitatively different mechanism to explain this phenomenon.

Therapeutically techniques

There are some therapeutically approaches that consider the patients’ current symptomology as caused by traumatic events occurred in their past. However, the memories of these events are often repressed by the patients and, thus, they may not be aware of them. Since these approaches consider the recovery of these memories as a necessary step in resolving the trauma that is provoking the symptoms, therapists make use of certain techniques to help their patients to recover them. In addition, the therapists from these approaches usually believe in the accuracy of these recovered memories and do not consider that they are influencing them in any relevant manner (Matteo et al., 2003) Nevertheless, there is no empirical evidence that support the accuracy of these recovered memories and, in many cases, the experimental data strongly suggest that the therapeutical techniques may promote suggestibility and, as a consequence, memory distortion (Stocks, 1998) Some of these techniques are hypnosis, guided imagery, or dream interpretation.

False-memory creation

Brief history

One of the first psychologists to study how questions affect the memories of children was Binet (1900). He presented children to different objects, testing later their memories for them in the presence or absence of misleading questions. He found an important effect of questions on the testimony of children. These data already suggested what is now well known: free recall promotes less complete, shorter, but more accurate testimonies, whereas questions promote more complete, longer, but less accurate ones (Matteo et al., 2003). Stern (1910) was also interested in the effect of questions on the memories of subjects (Schacter & Coyle, 1995). In his studies, the experimenter staged an event in front of a class or a group and the observers were later asked about the event. He also obtained an important effect of questions on witnesses' testimonies. Another important work in the history of memory distortion is the book written by Hugo Münsterberg (1908): *On the Witness Stand: Essays on Psychology and Crime*, where he reviews some studies about eyewitness testimony. He demonstrated how different people show important inconsistencies in their testimonies when witnessing the same situation. He considered it very relevant for the legal field because of the important influence that eyewitness testimonies have on the final verdicts in court (Münsterberg, 1913). From a different perspective, Sigmund Freud is also an important reference in the study of memory distortion. When he postulated his first theory about repression (Seduction Theory), he described it as a mechanism that takes certain (traumatic) memories out of our consciousness without voluntary control. One of the characteristics of this first theorization was the assumption that repressed memories were kept intact in the unconscious and, in the event of undergoing certain type of therapy, were susceptible to be recovered in their original format (without being subject to any kind of distortion). However, Freud faced later many cases that made him doubt about the validity of his first hypothesis. In the second formulation of his theory, he proposed that the recovered memories by the adult do not correspond to real past events, but to childhood fantasies or confabulations. He also states that it is almost impossible to distinguish these fantasies from veridical memories. For example, in 1910, he wrote about how, in the process of recalling childhood memories, "they are altered and falsify, and are put in the service of later trends, so that generally speaking they cannot be distinguished from fantasies" (Matteo et al., 2003). The next group of important studies about memory distortion came from the Gestalt school. Gestalt authors proposed that memories were modified over time following the Gestalt laws of organization, such as the tendency of remember symmetrical forms. However, they obtained many inconsistencies in their studies and this trend was abandoned (Richards, 1975). A very relevant book for the field was Bartlett's *Remembering: a study in experimental and social psychology* (Bartlett, 1995), often considered the first experimental study of memory distortion and false memory creation. It showed how people distort stories when they are instructed to remember them. Bartlett observed how subjects' previous knowledge affected their memories. Over time, subjects tended to recall shorter versions of the story in which some details were omitted and, what it is more important for us, others were added to make more sense of the story (rationalization). Even though these studies have not been replicated following the same procedure, and his methodology is susceptible to a lot of criticisms, the conclusions drawn from those experimental observations are widely accepted and Bartlett's work is now highly valued. The main conclusion is that memory as well as perception, is a constructive process and as a consequence, memories can never be replicas of the external world (McClelland, 1995). However, Bartlett's work was not considered as relevant until the late 1960s and early 1970s with the raise of Cognitive Psychology, for which it is an important predecessor (Matteo et al., 2003). Before the beginning of the systematic study of memory distortion, there were two more authors that provided important contributions to the field, working with lists of words. First, (Deese, 1959) created some lists of words semantically associated to a critical unrepresented word. Shortly after the presentation of the lists, the participants were asked to recall the lists. The unrepresented item was recalled with a high probability for some of the lists. Deese's study was ignored during the years following its publication until, in 1995, Roediger III and McDermott revived that methodology and added some extra features to it, originating a new paradigm called Deese-Roediger-McDermott (DRM) paradigm. (Roediger & McDermott, 1995) In this case, the study gave rise to abundant research that will be covered later in the paper. The second relevant author working with lists of words was (Underwood, 1965) He tested the recognition of words presented in the lists compared to words related to previously presented ones and to words with no association at all. He found that words that were associated to the originally presented ones were more likely

to provoke false alarms than unrelated words. Furthermore, larger number of related words increased the probability of false alarms (Underwood, 1965)

Post-event misinformation effect

Memory impairment hypothesis

Almost 50 years ago Loftus and Palmer studied how the information a person receives after witnessing an event may affect or alter the original memory of the event. (Loftus & Palmer, 1974) The fact that we commit a lot of errors in estimating amounts of time, distance or speed has been demonstrated since the beginning of the century. Loftus and Palmer investigated how different formulations of questions affected those estimations. They presented movies of traffic accidents to the participants and, after each one of them, they asked them to explain the accident and answer to some specific questions about it. The manipulation consisted in changing the verbs used in the questions to refer to the collision; they supposed that the different verbs implied different gravity of the accident (for example, 'smashed into' implied a harder collision than "hit"). The results of this experiment showed that, even though the real speed of the cars (between 32 and 60 km/h) did not influence the estimations of the participants, the verb used in the questions had important and systematic effects. Furthermore, when one week later the subjects were asked whether they saw any broken glasses, the subjects that were asked with verbs that implied a more violent collision remembered more often the glasses than the ones that were asked with lighter verbs. It is important to note that the original scene did not contain any broken glass. (Loftus, 1974) However, it was not until 1978 that Loftus, Miller and Burns proposed a paradigm to study the effect of post-event information on the memory for the original event. (Loftus et al., 1978) These authors presented to the subjects a sequence of slides depicting a car accident. Among them, there was a critical one that was different for half of the subjects: for the first half, the car stopped in front of a stop sign and, for the rest, in front of a yield sign. The second part of the experiment consisted in a 20 item questionnaire that the subjects had to complete about the accident. This questionnaire contained a critical item that referred to the traffic sign in the car accident. In this case, half of the participants were asked with information consistent with what they saw in the slides, and the rest with misleading information (a stop sign instead of a yield, or vice versa). For the experiments 2 and 3, (Loftus et al., 1978) included a third condition where no signal was mentioned in the questionnaire. The final part of the experiment consisted on a forced-choice recognition test. The participants were presented to a sequence of pairs of slides and they were asked to choose the one that did appear in the original presentation. The critical pair included both the original slide and a new one that contained the object suggested to each subject in the questionnaire. The results obtained by (Loftus et al., 1978) showed a poorer performance for participants in the misled condition compared to the rest of conditions. The explanation proposed by the authors is that, when new information is presented, this information is introduced in the representation of the accident, modifying it. An alternative hypothesis that the authors considered is that the participants accepted the misleading information, even though they still remembered what they saw in the first place. Later studies (McCloskey & Zaragoza, 1985; Powers et al., 1979) investigated this alternative by offering three options to the subjects in the forced choice recognition test and asking them to report what their second choice would be, in the case the first one was wrong. The participants that chose the misleading information as their first option did not perform better than chance in their second guess. These results supported Loftus' hypothesis.

Coexistence hypothesis

The interpretations of the studies described above as indicative of impairment of the original memory due to the presentation of post event misleading information has been controversial. The first alternative interpretation proposed to account for the misinformation effect is the coexistence hypothesis (Bekerian & Bowers, 1983; Christiaansen & Ochalek, 1983; McCloskey & Zaragoza, 1985) which proposes that the original memory is not modified by the misleading information, but it merely renders it inaccessible. (Christiaansen & Ochalek, 1983) introduced a modification in the original paradigm used by (Loftus et al., 1978) in order to evaluate this alternative hypothesis. This modification was introduced between the presentation of the misleading information and the recognition test and consisted in warning some of the participants about the existence of inaccurate details in the post-event information. The warning intended to help the participants regain access to the original information that, according to their hypothesis, was still available. Therefore, they expected the subjects in the misled/ warned condition to perform better

than the subjects that never received the warning but did receive the misleading information. Their results were consistent with their hypothesis. (Bekerian & Bowers, 1983; McCloskey & Zaragoza, 1985) also defended the coexistence hypothesis. They proposed that the recognition test used in previous studies (e.g. (Loftus et al., 1978)) made it difficult to access to the original memory, but failed to demonstrate that the representation was not there. They argued that the presentation of test items in a random order impeded the use of some cues that otherwise would help the participants to access to these memories. Instead, they proposed the use of a test that reinstated the original encoding environment more fully, presenting the items in the same order as they were originally encoded. They obtained that the order of the items in the recognition test had an effect on the performance of their subjects. Thus, the use of a random order test provoked a better performance of the consistent post-event information group compared to the misleading information group. In contrast, when using a sequential order test, the results showed no difference between both groups. Altogether with the study of Christiaansen and Ochaleck, these two studies constitute the main support for the coexistence hypothesis.

Creation of impossible memories

Even though the studies described above already demonstrated the possibility of creating false childhood memories in healthy adults, the following studies reinforce this evidence by implanting impossible memories, either because they belonged to a period of life when it is not possible to have any memory (Spanos et al., 1999) or because the event is not feasible in real life (Braun et al., 2002). (Spanos et al., 1999) were interested in studying how the use of hypnotic versus non-hypnotic procedures affected the creation of false memories. They administered some questionnaires to the participants and, after completing them, they were led to believe that their answers were being computer analyzed. However, all the participants received the same results, independently of their performance in the tests. They were said that they possessed a specific profile characterized by an “insightful and intuitive cognitive style” (p.205), which was largely determined by the stimulation received during a critical period: the first days after birth. The participants were suggested that they possessed this style because they were probably born in a hospital that hung “swinging colored mobiles a few inches over the head of infants” (p.205). They were said that they were going to be regressed to the first days after birth in order to confirm the hypothesis that they were early stimulated in the hospital. This regression was made either with a hypnotic procedure or with a non-hypnotic one. The responses of the participants were audio taped and analyzed to examine whether they recovered any memory of the day after birth and whether they recalled the suggested mobile. Fifty eight percent (58%) of the subjects reported memories from the day after birth in response to suggestion for age regression. Furthermore, up to 51% of the participants recalled the suggested mobile. The interest of this study for our discussion lay on the nature of the memories that were implanted. These memories were supposed to belong to the first day after birth, which is a period from which adult recall of episodic memories is impossible according to what we know about infantile amnesia. Thus, these results show how impossible false memories can be created when an authoritative figure makes them plausible, the subjects are given information consistent with the false memory, and they are led to believe that the administered procedure will facilitate its recovery. This study has important clinical implications. From a very different field, (Braun et al., 2002) have recently investigated the effect of certain autobiographical advertisement on the memories of the observers. They hypothesized that if advertisers presented consumers with false information about their pasts, they could make them believe that those events had happened to them. In their experiment, the participants were showed an advertisement of Disney that made autobiographical reference to their past, inviting them to remember when they were in the thematic park and shake hands with Bugs Bunny. This information was absolutely impossible because Bugs Bunny is a Warner Bros. character that would never be in Disneyland. The results showed how 16% of the subjects receiving the false information recalled the event. Even though the effect is quite small, the conditions of the experiment (only one presentation to the advertisement and a character that is not representative of the specific park) suggested that real life advertisement using this strategy might have a larger effect. However, for the purpose of this section what it is interesting in this study is the possibility of creating memories of impossible events.

Conclusions

Most of the errors we commit are a kind of ‘side effect’ of an adaptive feature of memory (Schacter & Dodson, 2001). Thus, for example, we have talked at various moments during the paper about how our ability to associate new incoming information with our previous stored knowledge may help us remembering better in most situations. Furthermore, this ability is a necessary condition for learning. Most of the techniques to improve memory use this associative nature of memory to enhance the ability of people to learn new material and be more resistant to forgetting. Unfortunately, these associations with previous knowledge may also provoke errors in accuracy. Good examples of this effect are the high rate of false recognition that the presentation of associated words provoke in the rememberer (Roediger & McDermott, 1995) or the introduction of what we believe it is going to happen into the memory of what in fact happens. External suggestions and misleading information have been shown to influence somehow our memory for an event. The magnitude and characteristics of this change has been a controversial issue (Loftus et al., 1985; McCloskey & Zaragoza, 1985). However, at this point most of the researchers support that there is an effect of post-event information on our ability to remember the event, even if there is no consensus for the explanation (Matteo et al., 2003). This external influence is not only able to affect our memory for an event without personal significance by changing insignificant details. It has also been demonstrated to be capable of creating whole new memories that we will experience as real events that had occurred to us in our past (Loftus, 1997b). However, individual differences play an important role in modulating this vulnerability to external suggestions (Hyman & James Billings Jr, 1998). Is it necessary that an external source influence us in order to distort our memories? Memory biases that most of us possess, and that preserves our self-concept, show that memory distortion does not require the influence of external source (Schacter & Dodson, 2001). Is it possible to create whole new memories without external influence? The studies of Bartlett in 1932 showed how we reconstruct our memories from limited information that we have stored (Wagoner, 2013). This reconstruction is prone to different errors, including the addition of new details. However, the results of Bartlett and other researchers that have investigated the recall of stories (Wagoner, 2013) demonstrated the existence of spontaneous distortion. However, it just suggested the possibility of creating spontaneous false memories. The paradigm of Deese, Roediger and McDermott (Roediger & McDermott, 1995) seems to be more effective in demonstrating that false memories can be created in the absence of any external influence that promotes it. Previous knowledge can be considered as an internal suggestion that leads us to distort our memories.

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