

Memory Distortion

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Synonyms

False memory; Memory illusions

Definition

Memory distortion refers to a memory report that differs from what actually occurred.

Characteristics

Memory's fate is determined by factors present at encoding (when the memory is first recorded), storage (how and where the memory is represented in the brain), and retrieval (when the memory is reported). The level of attention paid to the original event, the time that passes after the original encoding, the match between encoding and retrieval contexts, and the presence of competing and interfering information in memory are but a few of the factors that determine memory accuracy. Memory records experiences. The recording includes sensory information like sight, sound and touch, as well as emotions, thoughts, and feelings about the experience. These details are stored in a distributed fashion throughout the brain, making it difficult if not impossible to localize any particular memory trace in the brain [1].

The British psychologist, Sir Fredrick Bartlett [2] demonstrated the constructive nature of memory. Bartlett examined the fate of memory, and concluded that memory undergoes typical transformation over time including omissions, deletions and distortions. In one of Bartlett's most famous experiments, British subjects read a Native American folktale called the War of the Ghosts in which a battle occurs between two warring tribes. Using a method called serial reproduction (akin to the child game called "telephone"), one subject would recall the story in as much detail as possible. Another subject would

read the first subject's account of the story and then try to recall it, followed by additional subjects reading the account of their immediate predecessor and trying to recall it. This method revealed that memory for the original story undergoes massive distortion after very few repetitions.

Memory Distortion Techniques

Many techniques have been shown to distort memory. A partial list of techniques includes misinformation, outcome information, semantic relatedness, suggestion, imagination, and more subtle manipulations such as subliminal repetition and unscrambling. Each of these techniques reveals the inherent fallibility of memory.

In the early 1970s, researchers began to explore the effects of misleading post-event information on memory for events. In one study, subjects viewed a simulated vehicle-pedestrian accident. Some subjects watched as a car approached an intersection and stopped at a stop sign. The car then turned right and hit a pedestrian who was crossing the street. After viewing the accident, some subjects were asked a question that suggested it was a yield sign. Later subjects had to report on the sign they had actually seen, and many subjects who received the misinformation incorrectly recalled seeing the opposite sign. In related work, researchers showed how the wording of a question during an eyewitness interview affects memory for what was seen. For example, subjects who viewed an accident on film and were asked, "About how fast were the cars going when they smashed into each other?" reported greater speed than did subjects who were asked, "About how fast were the cars going when they hit each other?" Additionally, those who were asked the "smashed" question were more likely to report having seen broken glass than subjects who were asked the "hit" question, even though no broken glass had appeared. Thus, simple word choices can distort memory for details of an event [3].

In a related paradigm involving post-event information, subjects predicted the outcome of an event that had not yet occurred. After finding out the true outcome, they were asked to remember what they originally predicted. For example, prior to Nixon's 1972 visit to China and the Soviet Union, subjects were asked to provide probability estimates for various outcomes: President Nixon will meet Chairman Mao; President

Nixon will declare the trip a success. Even when told to ignore the true outcome, most subjects adjusted their original estimates to concur with the actual outcome, thereby claiming that they “knew it all along.” This hindsight bias has been demonstrated using a variety of materials and sensory modalities, including verbal, visual, and even gustatory judgments [4]. Like the misinformation effect, hindsight bias is a form of memory distortion that is influenced by outcome information that conflicts directly with one’s original memory.

Other techniques show how easy it is to distort memory for details of prior experience. For example, consider the following set of words: bed, rest, awake, tired, dream, wake, night, blanket, pillow. Most people who hear or read a similar list will mistakenly recall hearing or seeing the word, “sleep” in the original list. The fact that the words in the list are all semantically related to the critical word, “sleep” causes the vast majority of people to misremember [5]. Semantic relatedness also underlies another common form of memory distortion called **conjunction errors**. These errors occur when people fuse together in memory aspects of an event or experience. For example, subjects who read the words, blackboard and jailbird often mistakenly remember having read the conjunction word, blackbird. Again, these examples demonstrate how easy it is to distort people’s memory for details of a prior experience [6].

But is it possible to distort memory in a larger way, namely by making people believe that they experienced a whole event in the past that never occurred? The answer is, “yes.” Simply by suggesting to adults that they had experienced a particular event in their childhood, like being lost in a shopping mall for an extended period of time or being hospitalized overnight for an ear infection, investigators have created **false memories** for whole events in their subjects’ minds. In such studies, researchers often use a form of strong suggestion where they might tell a subject that a family member reported the event in question or that the subject’s dreams suggest that she had a particular unpleasant experience as a child. For instance, researchers might tell the subject that “most” people under the age of five have been attacked by a dog. The purpose of such suggestive techniques is to increase the plausibility of the false event. Researchers might also ask their subjects to imagine the false event in detail: “Even if you do not recall the event, just try to imagine what it was like. Where were you when the event occurred? Who were you with? What were you doing? How did it make you feel?” Imagination serves to imbue the false memory with sensory details, and often leads people to adopt the false memory as part of their autobiography [3].

In contrast to the more obvious forms of suggestion that distort memory for the past, memory can be distorted by more subtle means. Consider the phenomenon called

unconscious plagiarism, in which a person inadvertently claims ownership of an idea that belongs to someone else. There are numerous examples of unconscious plagiarism, including cases of accusations against high-profile individuals like the writer, Helen Keller and the singer, George Harrison. Unconscious plagiarism relates to priming in that the information or idea, once heard or read from another source, may return to one’s memory later without the person realizing that the information was encountered before. Another related form of memory distortion, called unconscious transference, occurs when an eyewitness to a crime adamantly declares that a certain person was the “one” who committed the crime simply because this certain person looks familiar. For example, the memory researcher, Donald Thomson, was accused of rape after appearing on live television in Australia. The victim in this case was raped while watching the television program featuring Dr. Thomson. Thus, the fact that the victim had seen Thomson’s face before, albeit in another context that was linked to the rape, was enough to lead her to believe that Thomson was the rapist.

Given the variety of memory distortions that have been observed and created in laboratory experiments, what is the evidence that memory distortion also happens in the real world? Unfortunately, all-too-meaningful therapists, seeking to help a client, may encourage their client to plumb the depths of memory for clues that might help explain the client’s problems. Although potentially therapeutic, this tactic sometimes backfires: Therapists have been known to implant false memories in their clients, often using many of the techniques that we have discussed here, like suggestion and imagination. These implanted false memories have resulted in innocent people being sent to prison, and have caused lasting and irrevocable damage to family unity and trust. Related to this issue of false memory, is the issue of repressed memory. **Repressed memory** refers to the hypothesized notion that the mind banishes traumatic experiences from conscious awareness due to the memory’s threatening nature. This memory, once repressed, may return to consciousness at some later point in a person’s life. The resulting memories are thought to be accurate in detail, and the processes involved different from ordinary forgetting and remembering. Although there is clear experimental evidence that false memories exist, there is at present no direct experimental evidence for repressed memories.

By now, it should be clear that memory is malleable. Given the variety of techniques that can and have been used to distort memory, one might ask how these techniques work.

Proposed Mechanisms

Several theories have been proposed to explain the formation of false memories and memory distortion. We focus here on three of these theories. According to the

Source Monitoring Framework, people routinely monitor their memory for accuracy. ▶ **True memories** tend to elicit more sensory and contextual detail, for example, “It was a rainy afternoon when I saw the accident. I remember that my jacket was drenched and my shoes squished when I walked. The car turned at the intersection and hit the pedestrian in the crosswalk.” False memories, however, can also contain sensory detail. This makes it particularly difficult to distinguish between true and false memories. The Source Monitoring Framework argues that techniques such as imagination serve to create memory traces that sometimes can be distinguished from actual experiences stored in memory. The problem is that over time it becomes harder to monitor the origin of information coming from different sources like imagination, perception and action, resulting in source monitoring errors and false memories [7].

Another theory, related to source monitoring, involves what is called *Familiarity Misattribution*. According to this theory, techniques like suggestion, imagination, repetition and unscrambling serve to increase the fluency with which a person processes an event or experience. By fluency, we mean that the experience is processed more quickly. Consider imagination and repetition. Both techniques serve to prime an individual to process an event or experience more quickly. After imagining an event in detail, the event will be processed more quickly and fluently when the person subsequently thinks about it. In this way, the event seems to “spring” to mind. Similarly, repetition speeds subsequent processing. For example, if I present the word “window” to you, and then sometime later ask if you ever broke a window as a child, you will process the word “window” more quickly the second time you see it. This means that you will read and understand the word “window” faster than if you had not seen that word presented earlier. Just like with imagination, we tend to interpret the enhanced processing fluency as familiarity. So, the event, “broke a window” might now feel somehow familiar to you. If you fail to realize that the event feels familiar because you saw the word, “window” earlier, then you may mistakenly claim that you broke a window as a child [8].

One final theory that we discuss, called *Fuzzy-trace theory*, divides memory into two types of traces. Verbatim traces store sensory information, while gist traces store semantic information. Verbatim-based memory relates to detailed recollection of past experience, while gist-based memory relates to familiarity for past experiences [9]. Both types of memory traces can produce true and false memory; however, true memory is more often associated with verbatim traces, while false memory is more often associated with gist traces. Returning to our memory-distortion techniques, the suggestion that one was lost in the mall as a child leads to many different associations

with malls. The person receiving this suggestion might begin to think about different, actual experiences that she did have in malls as a child. She might even think about how she would feel if she were lost in the mall. These associations, thoughts, and emotions would be stored as gist-based memory traces. When later asked about the event in question “were you ever lost in the mall as a child,” the event will likely feel familiar. If our imaginary subject fails to realize the source of this familiarity – that last week the experimenter told her that she had been lost in the mall as a child – she will mistakenly come to believe that the event actually occurred.

Thus, source monitoring, familiarity misattribution and fuzzy trace theory all posit that people routinely monitor their memory for accuracy. Failure to distinguish among potential sources (e.g., I imagined the broken glass, I saw the broken glass, I only heard the broken glass) can result in memory distortion.

Memory Distortion and Brain

Much work over the past decade has focused on the neural regions supporting true and false memory. In search of a neural signature of true and false memories, researchers have employed a variety of neuropsychological, neuroimaging, and electrophysiological techniques. These include lesion studies, Positron Emission Tomography (PET), functional Magnetic Resonance Imaging (fMRI), electroencephalogram (EEG), event-related potentials (ERPs), and more recently transcranial stimulation, and near-infrared spectroscopy. A consensus is beginning to emerge that true and false memories activate different brain regions, leading some investigators to claim that they have located a neural signature of false memories. Specifically, the medial temporal lobe has been implicated in false recognition, while the prefrontal cortex has been implicated in memory monitoring errors [7,10]. Despite these advances, some studies have also found that true and false memories activate similar brain regions, including prefrontal cortex, parietal cortex and medial temporal lobe. There is at present growing excitement in the field of cognitive neuroscience. As this field advances, it should soon be possible to distinguish true from false memories reliably and consistently by observing brain activation. Someday it may even be possible to determine the veridicality of one’s memory for an individual event simply by looking at the person’s overall pattern of brain activity.

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