Forgetting

Authored by
mohammad looti

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Forgetting (retention loss) refers to apparent loss of information already encoded and stored in an individual's long term memory. It is a spontaneous or gradual process in which old memories are unable to be recalled from memory storage. It is subject to delicately balanced optimization that ensures that relevant memories are recalled. Forgetting can be reduced by repetition and/or more elaborate cognitive processing of information. Reviewing information in ways that involve active retrieval seems to slow the rate of forgetting.

Forgetting functions (amount remembered as a function of time since an event was first experienced) have been extensively analyzed. The most recent evidence suggests that a power function provides the closest mathematical fit to the forgetting function.

History

One to study the mechanisms of forgetting was the German psychologist Hermann Ebbinghaus. Using himself as the sole subject in his experiment, he memorized lists of three letter nonsense syllable words--two consonants and one vowel in the middle. He then measured his own capacity to relearn a given list of words after a variety of given time period. He found that forgetting occurs in a systematic manner, beginning rapidly and then leveling off. Although his methods were primitive, his basic premises have held true today and have been reaffirmed by more methodologically sound methods.

Theories of forgetting

The four main theories of forgetting apparent in the study of psychology are as follows;

Cue-dependent forgetting

Cue-dependent forgetting (also, context-dependent forgetting) or retrieval failure, is the failure to recall a memory due to missing stimuli or cues that were present at the time the memory was encoded. It is one of five cognitive psychology theories of forgetting. It states that a memory is sometimes temporarily forgotten purely because it cannot be retrieved, but the proper cue can bring it to mind. A good metaphor for this is searching for a book in a library without the reference number, title, author or even subject. The information still exists, but without these cues retrieval is unlikely. Furthermore, a good retrieval cue must be consistent with the original encoding of the information. If the sound of the word is emphasized during the encoding process, the cue that should be used should also put emphasis on the phonetic quality of the word. Information is available however, just not readily available without these cues.

Trace decay

Trace decay focuses on the problem of availability caused when memories decay. Hebb said that

incoming information causes a pattern of neurons to create a neurological memory trace in the brain which would fade with time. Repeated firing causes a structural change in the synapses. Rehearsal of repeated firing maintains the memory in STM until a structural change is made.

Organic causes

Forgetting that occurs through physiological damage or dilapidation to the brain are referred to as organic causes of forgetting. These theories encompass the loss of information already retained in long term memory or the inability to encode new information again. Examples include Alzheimer's, Amnesia, Dementia, consolidation theory and the gradual slowing down of the central nervous system due to aging.

Interference theories

Interference theory refers to the idea that when the learning of something new causes forgetting of older material on the basis of competition between the two. In nature, the interfering items are said to originate from an over stimulating environment. Interference theory exists in three branches: Proactive, Retroactive and Output. Retroactive and Proactive inhibition each referring in contrast to the other. Retroactive interference is when new information (memories) interferes with older information. On the other hand, proactive interference is when old information interferes with the retrieval of new information. Output Interference occurs when the initial act of recalling specific information interferes with the retrieval of the original information.

Decay theory

Decay theory states that when something new is learned, a neurochemical, physical "memory trace" is formed in the brain and over time this trace tends to disintegrate, unless it is occasionally used.

Definitions and controversy

Forgetting can have very different causes than simply removal of stored content. Forgetting can mean access problems, availability problems, or can have other reasons such as amnesia caused by an accident.

A debatable yet popular concept is "trace decay", which can occur in both short and long-term memory. This theory, applicable mostly to short-term memory, is supposedly contradicted by the fact that one is able to ride a bike even after not having done so for decades. "Flashbulb memories" are another piece of seemingly contradicting evidence. It is believed that certain memories "trace decay" while others don't. Sleep is believed to play a key role in halting trace decay, although the exact mechanism of this is unknown.

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State-dependent cues

State-dependent cues are governed by the state of mind and being at the time of encoding. The emotional or mental state of the person, such as being inebriated, drugged, upset, anxious, happy, or in love, are the key cues.

Context-dependent cues

Context-dependent cues are dependent on the environment and situation. Memory retrieval can be facilitated or triggered by replication of the context in which the memory was encoded. Such conditions include weather, company, location, smelling of a particular odour, hearing a certain song, even taste can sometimes act as a cue. For example, students sometimes fail to recall diligently studied material when an examination room's environmental conditions differ significantly from the room or place where learning occurred. To improve learning and recall, it is recommended that students should study under conditions that closely resemble an examination. Psychologists that have researched context dependent recall include Abernathy (1940), as well as Godden & Baddeley (1975).

Context-dependent forgetting

A large body of research has shown that memory performance is reduced when an individual's environment differs from encoding to retrieval than if the two environments were the same. This effect is known as context-dependent forgetting. As a result, a number of techniques have been created for the purpose of reducing context-dependent forgetting associated with environmental cues.

Context recall technique

One strategy for overcoming context-dependent forgetting is the context recall technique. This technique involves consciously generating old environmental cues from memory rather than physically reinstating the cued environment. For example, if an individual learned material in a classroom in which the desks were organized in rows, that person could visualize that specific arrangement at a later testing date in a new environment (i.e. with the desks arranged in a circle). In a study conducted by Smith in 1979, participants who used this technique while being tested in a new room were able to recall as many words as participants who were tested in the original learning room. Participants who were tested in a new room that did not use this technique showed typical context-dependent forgetting, recalling only two-thirds of the words recalled by the other groups. Therefore, the effects of context-dependent forgetting can be reduced by visualization of the learning environment without full reinstatement. However, this technique is only useful and successful when the learning context is easy to remember.

Multiple learning context technique

The multiple-learning-context-technique is another strategy proposed by Smith to combat context-dependent forgetting. This technique involves presenting subsets of the learning material in multiple contexts rather than presenting them all in the same environment. When given a free recall test in a new room, participants who studied in multiple rooms recalled more words than participants who only studied in one room. Smith suggests that when individuals have additional environmental cues their performance will be sustained because it will be less likely that all of the cues will be forgotten.

Along with the multiple learning context technique, other research has demonstrated that increasing the number of environmental cues will increase an individual's recall performance. The cue-overload theory proposed by Watkins and Watkins in 1975 explains that the effectiveness of an environmental cue will decline when there is an increase in the number of items that it is associated with. Therefore, when given a fixed number of items to recall, performance will increase if the number of cues also increases. This theory focuses on one of the two factors that must be considered when determining the effectiveness of multiple learning environments: the variety of contextual cues. However, research conducted by Jones in 1976 demonstrates that in order for this technique to be useful, the cues must use different senses. For example, there is no recall advantage when only the number of visual cues is increased. On the other hand, there is a recall advantage when different sensory media such as sight, sound, and smell were added together. Hence, this suggests that using multiple sensory media as sources for cues during encoding will provide an advantage in different testing environments where the number of contextual cues has been reduced.

Attention

The second factor to be considered when determining the effectiveness of multiple learning environments is the likelihood that an individual will even use environmental cues when recalling. Instructing subjects to use self-generated cues (i.e. the context recall technique) will increase recall for participants tested in a different environment. However, individuals do not automatically do this when learning occurs in a single location. Therefore, by moving individuals from room to room, they may pay more attention to the environmental cues. Smith claims that both the context recall technique and the multiple learning context technique work similarly, in that both methods force individuals to pay attention to and remember environmental information.

In 2003, Chu et al. demonstrated that conscious effort and attention is important to overcome context-dependent forgetting. Their research has shown that active processing of the context during the encoding phase is an important factor of successful performance. When actively attending to environmental cues with the goal of using a technique such as the context recall technique, stronger associations are created between the material and the environment. However, if an individual does not actively attend to environmental cues during the encoding phase, such cues may not be easily visualized in the recall phase if a new context is present.

Ambient and transferable cues

The word ambient is defined as completely surrounding and encompassing. Music is considered an ambient cue in that it is all encompassing and aids in recall when learning context and recall context are different. Some researchers have suggested that ambient cues, such as odour and sound, aid in recall when the learning context and recall context are different. In addition, these cues are useful in recall because they can also be transferable. For example, if music is played in a room in which material is learned, it is sometimes possible to transfer that musical source to a different room in which material will be tested. This phenomenon, which occurs when a memory or emotion is reactivated by a song that is associated to a specific event, demonstrates the effectiveness of sound (and odour) as useful cues in the absence of the original context. Using transferable cues may be useful for individuals who have difficulty using the context recall technique because they have trouble creating a mental image of the original environment. For example, this technique has been proven useful for patients at home who are trying to reproduce skills that they learned in a hospital environment.