Memory

Memory is the faculty of the mind by which data or information is encoded, stored, and retrieved when needed. It is the retention of information over time for the purpose of influencing future action.[1] If past events could not be remembered, it would be impossible for language, relationships, or personal identity to develop.[2] Memory loss is usually described as forgetfulness or amnesia.[3][4][5][6][7][8]

Memory is often understood as an informational processing system with explicit and implicit functioning that is made up of a sensory processor, short-term (or working) memory, and long-term memory.[9] This can be related to the neuron. The sensory processor allows information from the outside world to be sensed in the form of chemical and physical stimuli and attended to various levels of focus and intent. Working memory serves primarily as a retrieval processor. Information in the form of stimuli is encoded in accordance with explicit or implicit functions by the long-term memory processor. The working memory retrieves information from previously stored material. Finally, the function of long-term memory is to store through various categorical models or systems.[9]

Declarative, or explicit memory, is the conscious storage and recollection of data.[10] Under declarative memory resides semantic and episodic memory. Semantic memory refers to memory that is encoded without specific meaning, relying solely on repetition.[2] Meanwhile, episodic memory refers to information that is encoded along a spatial and temporal plane.[11][12][13] Declarative memory is usually the primary process thought of when referencing memory.[2] Non-declarative, or implicit, memory is the unconscious storage and recollection of information.[14] An example of a non-declarative process would be the unconscious learning or retrieval of information by way of procedural memory, or a priming phenomenon.[2][14][15] Priming is the process of subliminally arousing specific responses from memory and shows that not all memory is consciously activated,[15] whereas procedural memory is the slow and gradual learning of skills that often occurs without conscious attention to learning.[2][14]

Memory is not a perfect processor and is affected by many factors. The ways by which information is encoded, stored, and retrieved can all be affected. Pain, for example, has been identified as a physical condition that enhances memory, and has been noted in animal models as well as chronic pain patients.[16][17][18][19] The amount of attention given new stimuli can augment the amount of information that becomes encoded for storage.[2] Note that the storage process can become corrupted by physical damage to areas of the brain that are associated with memory storage, such as the hippocampus.[20][21] Finally, the retrieval of information from long-term memory is generally unaffected by decay, as stored memories remain intact almost indefinitely.[2] Normal functioning, short-term memory decay over time, and brain damage all affect the accuracy and capacity of the memory.[22][23]

Sensory memory

Sensory memory holds information, derived from the senses, for up to several minutes after an item is perceived. The ability to look at an item and remember what it looked like with just a split second of observation, or memorization, is an example of sensory memory. It is out of cognitive control and is an automatic response. With very short presentations, participants often report that they seem to "see" more than they can actually report. The first precise experiments exploring this form of sensory memory were conducted by George Sperling (1963)[24] using the "partial report paradigm." Subjects were presented with a grid of 12 letters, arranged into three rows of four. After a brief presentation, subjects were then played either a high, medium or low tone, cuing them which

of the rows to report. Based on these partial report experiments, Sperling was able to show that the capacity of sensory memory was approximately 12 items, but that it degraded very quickly (within minutes). Because this form of memory degrades so quickly, participants would see the display but be unable to report all of the items (12 in the "whole report" procedure) before they decayed. This type of memory cannot be prolonged via rehearsal.

Three types of sensory memories exist. Iconic memory is a fast decaying store of visual information, a type of sensory memory that briefly stores an image that has been perceived for a small duration. Echoic memory is a fast decaying store of auditory information, also a sensory memory that briefly stores sounds that have been perceived for short durations.[25][26] Haptic memory is a type of sensory memory that represents a database for touch stimuli.

Short-term memory

Short-term memory, not to be confused with working memory, allows recall for a period of several seconds to a minute without rehearsal. Its capacity, however, is very limited. In 1956, George A. Miller (1920–2012), when working at Bell Laboratories, conducted experiments showing that the store of short-term memory was 7±2 items. (Hence, the title of his famous paper, "The Magical Number 7±2.") Modern perspectives estimate the capacity of short-term memory to be higher, typically on the order of 12-15 items,[27] or argue for a more flexible limit based on information instead of items.[28] Memory capacity can be increased through a process called chunking.[29] For example, in recalling a ten-digit telephone number, a person could chunk the digits into three groups: first, the area code (such as 123), then a three-digit chunk (456), and, last, a four-digit chunk (7890). This method of remembering telephone numbers is far more effective than attempting to remember a string of 10 digits; this is because we are able to chunk the information into meaningful groups of numbers. This is reflected in some countries' tendencies to display telephone numbers as several chunks of two to four numbers.

Short-term memory is believed to rely mostly on a visual code for storing information, and to a lesser extent on an acustic code. Conrad (1964)[30] found that test subjects had more difficulty recalling collections of letters that were acoustically similar, e.g., E, P, D. Confusion with recalling acoustically similar letters rather than visually similar letters implies that the letters were encoded visually. Conrad's (1964) study, however, deals with the encoding of written text. Thus, while the memory of written language may rely on acoustic components, generalizations to all forms of memory cannot be made.