Chapter 6: Human Memory

Part II: Memory Processes

1. Encoding and Transfer of Information

Before information can be stored in memory, it first needs to be encoded for storage. Even if the information is held in our short-term memory, it is not always transferred to our long-term memory. So in order to remember events and facts over a long period of time, we need **to encode** and subsequently **transfer** them from **short-term** to **long-term storage**.

1.1. Forms of Encoding

1.1.1. Short-Term Storage

Encoding of information in short-term memory appears to be largely, although not exclusively, acoustic in form. Information in short-term memory is susceptible to acoustic confusability—that is, errors based on sounds of words. But there is some visual and semantic encoding of information in short-term memory.

2.1.1. Long-Term Storage

Information in long-term memory appears to be encoded primarily in a semantic form. Thus, confusions tend to be in terms of meanings rather than in terms of the sounds of words. In addition, some evidence points to the existence of visual encoding, as well as of acoustic encoding, in long-term storage.

2. Transfer of Information from Short-Term Memory to Long-Term Memory

The means of moving information depends on whether the information involves declarative or nondeclarative memory. Some forms of nondeclarative memory are highly volatile and decay quickly. Other nondeclarative forms are maintained more readily, particularly as a result of repeated practice (of procedures) or repeated conditioning (of responses).

Entrance into long-term declarative memory may occur through a variety of processes:

- Attending to information to comprehend it
- Consolidating by making connections or associations between the new information and what we already know and understand. In consolidation, we may use various metamemory strategies to preserve or enhance the integrity of memories. Metamemory strategies involve reflecting on our own memory processes with a view to improving our memory.
- Reconsolidation has the same effect that consolidation does, but it is completed on previously encoded information. Reconsolidation does not necessarily occur with each memory we recall but does seem to occur with relatively newly consolidated material (Walker et al., 2003).

Two key problems are faced when information is transferred from short-term memory to long-term memory**: interference and decay** (Berman et al., 2009).

- **Interference**: it occurs when competing information interferes with our storing information,
- **Decay:** it occurs when information is forgotten facts just because time passes,

2.1. Rehearsal

It is the repeated recitation of an item. The effects of such rehearsal are termed practice effects. Rehearsal may be **overt**, in which case it is usually aloud and obvious to anyone watching. Or it may be **covert**, in which case it is silent and hidden (Tulving, 1962). There are two types of rehearsal:

2.1.1. Elaborative Rehearsal

In elaborative rehearsal, the individual somehow elaborates the items to be remembered. Such rehearsal makes the items either more meaningfully integrated into what the person already knows or more meaningfully connected to one another and therefore more memorable.

2.1.2. Maintenance Rehearsal

In maintenance rehearsal, the individual simply repetitiously rehearses the items to be repeated. Such rehearsal temporarily maintains information in short-term memory without transferring the information to long-term memory.

2.2. Mnemonic devices

They are specific techniques used to help memorize lists of words (Best, 2003): categorical clustering, acronyms, acrostics, interactive imagery among items, pegwords, and the method of loci—can help you to memorize lists of words and vocabulary items:

• **In categorical clustering**, organize a list of items into a set of categories.

• **In interactive images**, imagine (as vividly as possible) the objects represented by

words you have to remember as if the objects are interacting with each other in some active way.

• **In the pegword system**, associate each word with a word on a previously memorized list and form an interactive image between the two words.

• **In the method of loci**, visualize walking around an area with distinctive, wellknown landmarks and link the various landmarks to specific items to be remembered.

• **In using acronyms,** devise a word or expression in which each of its letters stands for a certain other word or concept.

• **In using acrostics,** form a sentence, rather than a single word, to help one remember new words.

• **In using the keyword system**, create an interactive image that links the sound and meaning of a foreign word with the sound and meaning of a familiar word.

3. Retrieval

Are items retrieved all at once (parallel processing) or sequentially (serial processing)? If retrieved serially, the question then arises: Are all items retrieved, regardless of the task (exhaustive retrieval), or does retrieval stop as soon as an item seems to accomplish the task (self-terminating retrieval)?

In fact, studying retrieval from long-term memory is difficult due to problems of differentiating retrieval from other memory processes. It also is difficult to differentiate accessibility from availability. Availability is the presence of information stored in long-term memory. Accessibility is the degree to which we can gain access to the available information.

Retrieval of information from short-term memory appears to be in the form of serial exhaustive processing. This implies that a person always sequentially checks all information on a list. Nevertheless, some data may be interpreted as allowing for the possibility of self-terminating serial processing and even of parallel processing (Tulving & Pearlstone, 1966)

4. Memory Distortions

People have tendencies to distort their memories. For example, just saying something has happened to you makes you more likely to think it really happened. This is true whether the event happened or not. These distortions tend to occur in seven specific ways, which Schacter (2001) refers to as the "seven sins of memory." Here are Schacter's "seven sins":

- **Transience:** Memory fades quickly. For example, although most people know that O. J. Simpson was acquitted of criminal charges in the murder of his wife, they do not remember how they found out about his acquittal. At one time they could have said, but they no longer can.
- **Absent-mindedness:** People sometimes brush their teeth after already having brushed them or enter a room looking for something only to discover that they have forgotten what they were seeking.
- **Blocking**. People sometimes have something that they know they should remember, but they can't. It's as though the information is on the tip of their tongue, but they cannot retrieve it.
- **Misattribution**: People often cannot remember where they heard what they heard or read what they read. Sometimes people think they saw things they did not see or heard things they did not hear.
- **Suggestibility**: People are susceptible to suggestion, so if it is suggested to them that they saw something, they may think they remember seeing it. For example, in one study, when asked whether they had seen a

television film of a plane crashing into an apartment building, many people said they had seen it. There was no such film.

- **Bias**: People often are biased in their recall. For example, people who currently are experiencing chronic pain in their lives are more likely to remember pain in the past, whether or not they actually experienced it. People who are not experiencing such pain are less likely to recall pain in the past, again with little regard to their actual past experience.
- **Persistence**: People sometimes remember things as consequential that, in a broad context, are inconsequential. For example, someone with many successes but one notable failure may remember the single failure better than the many successes.

4.1. Deficient Memory

There are many syndromes associated with memory loss. The study of deficient memory provides us with many valuable insights into how memory works. In this section, we will have a look at two syndromes. The first and also most well known is amnesia. Afterwards, we will explore the symptoms and causes of Alzheimer's disease, which is another prominent disease that causes memory loss.

1) **Amnesia :** Amnesia is severe loss of explicit memory, scientists distinguished three types:

a) **Retrograde amnesia**, in which individuals lose their purposeful memory for events prior to whatever trauma induces memory loss

b) **Anterograde amnesia,** the inability to remember events that occur after a traumatic event

c) **Infantile amnesia** Another kind of "amnesia" that is the inability to recall events that happened when we were very young.

Amnesia and Neuropsychology Studies of amnesia victims have revealed much about the way in which memory depends on the effective functioning of particular structures of the brain. By looking for matches between particular lesions in the brain and particular deficits of function, researchers come to understand how normal memory functions. Thus, when studying cognitive processes in the brain, neuropsychologists frequently look for dissociations of

function. In dissociations, normal individuals show the presence of a particular function (e.g., explicit memory). But people with specific lesions in the brain show the absence of that particular function. This absence occurs despite the presence of normal functions in other areas (e.g., implicit memory).

4.2. Alzheimer's Disease

Alzheimer's disease is a disease of older adults that causes dementia as well as progressive memory loss (Kensinger & Corkin, 2003). Dementia is a loss of intellectual function that is severe enough to impair one's everyday life. The memory loss in Alzheimer's disease can be seen in comparative brain scans of individuals with and without Alzheimer's disease. As the disease advances, there is diminishing cognitive activity in the areas of the brain associated with memory function.

Alzheimer's disease leads to an atrophy (decrease in size) of the brain; especially in the hippocampus and frontal and temporal brain regions (Jack et al., 2002). The brains of people with the disease show plaques and tangles that are not found in normal brains. Plaques are dense protein deposits found outside the nerve cells of the brain (Mirochnic et al., 2009). Tangles are pairs of filaments that become twisted around each other. Alzheimer's disease is diagnosed when memory is impaired and there is at least one other area of dysfunction in the domains of language, motor, attention, executive function, personality, or object recognition. The symptoms are of gradual onset, and the progression is continuous and irreversible.