



Memory Lapses Usually Do Not Signal Serious Medical Problems

Researchers — including some who have studied pilot behavior — have measured age-related declines in performance of some memory tasks. They describe these declines as normal developments in the aging process, and they recommend techniques to help lessen memory loss.

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FSF Editorial Staff

People of all ages are forgetful on occasion, and with increasing age, forgetfulness sometimes becomes more frequent. As many as half of people age 50 and older say that they now forget the types of things that they once had no difficulty remembering.¹

Medical specialists say that slight lapses in memory — caused by medical problems, side effects of medications, or lifestyle factors — are expected as part of the aging process, but they disagree on how much of this forgetfulness is normal. For most people, memory lapses are relatively minor and do not interfere with daily life. In a relatively small number of cases, these lapses in memory can be an indication of dementia — a term that describes a number of illnesses (including Alzheimer's disease) that affect the brain and interfere with intellectual functions and other normal activities.²

Among pilots, several studies have measured age-related declines in performance of memory tasks.³

Medical specialists recommend — for pilots and nonpilots — specific lifestyle changes that might help stimulate the brain and limit risk factors for the development of memory problems.



Memory is defined as the “power or process of reproducing or recalling what has been learned and retained” and as “the totality of what has been learned and retained.”⁴ Scientists who study memory use several classification systems to describe various types of memory.

For example, *sensory memory* occurs automatically in response to information provided by the senses. Sensory memories are retained for only about one second.⁵

Short-term memory refers to information that is remembered temporarily — for less than one minute — and then is replaced by new information. Examples are numbers that are being “carried over” in a mathematical calculation, or a telephone number that is remembered from the time the number is heard until the number is dialed. Research has shown that a person typically holds about seven unrelated short-term memories (or “bits” of information) at one time.⁶

Short-term memories can be displaced easily; for example, if someone trying to remember a telephone number is interrupted with a question about the weather, the person probably will forget the telephone number.

One type of short-term memory is *working memory*, which involves manipulation of a “bit” of information; an example is a mental comparison of the remembered prices of items at a store.

A Harvard Medical School report on age-related memory loss describes the convenience of the transitory nature of short-term memory:

Imagine what life would be like if you kept every short-term memory — the name of the telemarketer who called your house an hour ago, the price of each dish you ordered from a Chinese restaurant, what color tie your friend wore yesterday. Your mind would be so overloaded with trivia that you’d have trouble focusing on the things that really are important. ... A famous case in the scientific literature describes a man who possessed a seemingly limitless capacity to remember detail — but this talent undermined his ability to lead a normal life. He retained so much information that he was unable to organize it into meaningful categories. This made it difficult for him to manage his life, set goals or pursue a clear path.⁷

Long-term memory refers to important memories that are stored for long-term use. Some long-term memories can be relatively recently acquired facts, which sometimes are easily displaced; other long-term memories are older and more firmly established. The human brain appears to be capable of storing an unlimited number of long-term memories — such information as the names of friends and relatives, routine information used every day on the job or at home, and sounds and images of events that may have occurred long ago — and of acquiring and retaining new information.^{8,9}

There are several types of long-term memory; the classifications depend upon the type of information being stored. For example, *declarative memory* (also called *explicit memory*) is information that can be retrieved from the brain with conscious effort. Within declarative memory are two subtypes: *Semantic memory* is a person’s factual knowledge of the world, and *episodic memory* (*autobiographical memory*) is his or her memory of events, including episodes as recent as the day’s events and as remote as a childhood vacation.

Nondeclarative memory (also called *implicit memory*) is information that at one time required effort to learn but since has become known implicitly.¹⁰ A major subtype is *procedural memory*, which involves knowledge of the skills needed to perform a task, such as riding a bicycle, using cursive handwriting or operating a global positioning system unit. Other subtypes are *conditioned reflexes* and *conditioned emotional responses*, which occur without the conscious involvement of the brain.¹¹

All long-term memory involves three consecutive processes:

- *Encoding* assigns meaning to the information and places the information in context;
- *Storing* is the process by which memories are consolidated within the brain; and,
- *Retrieval* (recall) is the process by which long-term memory is transferred temporarily into working memory. This can be accomplished voluntarily or involuntarily.¹²

Different Parts of the Brain Control Different Types of Memory

Different parts of the brain are involved in different aspects of memory (Figure 1). The pre-frontal lobe, located at the front of the brain, is important in short-term memory. The cortex — the outer layer of the cerebrum, the largest structure in the brain — stores long-term memory. The hippocampus, located in the inner folds of the temporal lobes at the sides of the brain, transfers information from short-term memory to long-term memory. The information is transferred via neurons, nerve cells that form networks to facilitate the passage of nerve impulses.¹³

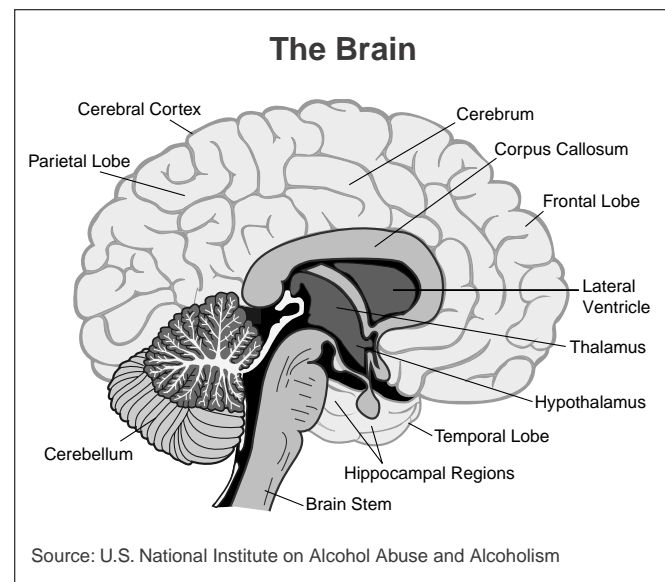


Figure 1

The fact that different parts of the brain have different functions explains why damage to a part of the brain by illness or injury may affect only a limited portion of a person’s memory.

With Age, New Learning May Take More Time

The ability to remember varies among people, depending on several factors. Researchers estimate that genetics determines

about 50 percent of mental ability. Other factors include physical health, emotional health, emotional stress, quality of sleep and quality of diet.¹⁴

After about age 20, people begin to lose brain cells and their bodies begin to manufacture less of the chemicals needed for the brain cells to function. Medical specialists say that these losses are not as dramatic as once was thought; nevertheless, as people age, they may require more time to learn new information and to form declarative memories; to pay attention to several things at one time; or to recall familiar names and words on demand.¹⁵

The Harvard Medical School report says that although these changes in the brain “may sound disturbing ... neurologists actually consider them relatively minor, as long as they’re strictly a sign of aging and not an illness such as Alzheimer’s disease. In other words, age-related changes in the brain may slow down your learning and may make it harder for you to apply strategies for learning. But ultimately, they don’t impair your ability to remember.”

In addition, people are able to compensate for the age-related slowdowns if they try harder to concentrate when learning new information and if they use memory-enhancing techniques such as repeating the new information and then talking about it.¹⁶

The report said that some types of forgetting are normal and not an indication of a more serious problem, such as dementia. Among the “normal” memory problems are transience (forgetting information with the passage of time), absent-mindedness (forgetting because “you [didn’t] pay close enough attention”), blocking (temporarily forgetting, even though the correct information “is on the tip of your tongue”), misattribution (forgetting the source of information), suggestibility (developing a false memory because of new information that is received during an attempt to retrieve a memory), bias (the unconscious reshaping of a memory because of personal beliefs or mood), and persistence (negative distortion of a memory of a traumatic event).

Some Memory Problems May Require Further Assessment

Other types of forgetting may indicate a serious medical condition. Medical specialists say that people who experience the following symptoms should consult a physician:

- An increase in the frequency of memory lapses;
- Difficulty performing complex tasks that require a series of actions, or difficulty performing tasks that once were routine;
- Difficulty learning, making choices or handling money;

- Repetition of the same phrases or the same stories within a conversation, or difficulty finding the correct words to express a thought;
- Inability to remember daily events;
- Difficulty responding effectively to problems at home or at work;
- Difficulty with orientation or spatial relationships;
- Difficulty driving; and,
- Behavioral changes, such as increased irritability or indifference to events that normally would prompt concern.¹⁷

In many cases, family members or friends are the first to observe these symptoms, and they may be able to assess them more accurately than the person who is experiencing the symptoms.

People often fear that lapses in memory mean that they are developing Alzheimer’s disease or another form of dementia, but there are numerous other causes of memory problems — some of them easily treatable and reversible.

Dementia involves the deterioration of memory and other cognitive functions, including thinking, learning and reasoning. Dementia is rare in people younger than 60. Between 50 percent and 70 percent of dementia cases are caused by Alzheimer’s disease, which involves not only the loss of neurons but also the development in the brain of abnormal protein deposits.^{18,19}

Other causes of dementia include stroke, cerebrovascular disease, alcoholism and severe head trauma.

Another memory problem, known as mild cognitive impairment, is more serious than normal age-related memory loss but less severe than dementia. Mild cognitive impairment involves the loss of one cognitive function — usually memory; people with mild cognitive impairment typically function normally in other areas.²⁰

Numerous medical conditions and medications also can cause memory problems.

For example, hypertension (high blood pressure) can reduce the flow of blood (and oxygen) to the brain, thereby reducing the brain’s ability to perform some tasks.²¹ Beta-blockers, which sometimes are used to treat high blood pressure, also may interfere with memory.

Other medical conditions associated with memory problems include sleep apnea, in which breathing is interrupted many times during sleep, reducing the flow of blood and oxygen to the

brain; underactive thyroid (hypothyroidism);²² kidney disease; diabetes; and depression. A deficiency of vitamin B-12 can damage brain cells and lead to memory loss. In addition, Gulf War syndrome (a group of symptoms reported by more than 100,000 Persian Gulf War veterans from Canada, the United Kingdom and the United States) sometimes involves memory problems.²³

Studies of Pilots Found Age-related Memory Changes ‘Significant’

During the 1990s, researchers conducted a number of studies to evaluate the relationship between age, experience and pilot performance, including several studies that focused on age-related memory changes.

A review of relevant research by the U.S. Federal Aviation Administration (FAA) Civil Aeromedical Institute (CAMI) says, “Studies of pilot performance on memory tasks reveal significant age-related changes for most working memory tasks. [A 1992 study] found that pilots and nonpilots exhibited similar age-related declines in the recall of aviation-related materials.”²⁴

The review says that a 1994 study required pilots to read back routine air traffic control (ATC) messages.²⁵

“While expertise eliminated age differences for repeating heading commands presented visually, it reduced — but did not eliminate — differences from spoken messages,” the CAMI review says in summarizing the 1994 study. ...

“However, in a more recent study [conducted in 1999], the effects of expertise were not apparent in the recall of ATC messages of a route through a particular airspace.²⁶ ... Using the same task, but allowing pilots and nonpilots to make notes of the communications, [the researchers] found that age-related declines in readback accuracy were eliminated by expertise. Their earlier findings, when subjects were not allowed to write down the communications, were attributed to age-related declines in storage capacity.”²⁷

Some Memory Loss Can Be Prevented

Medical specialists say that age-related memory loss can be limited by making healthy lifestyle choices, including engaging in activities that challenge the mind.

When learning continues, the brain forms new connections between nerve cells. This helps the brain store information and retrieve information, regardless of a person’s age. Recommended mental challenges include learning to play a musical instrument, learning a foreign language, playing word games such as crossword puzzles, changing careers, developing

a new hobby, volunteering, staying informed about world events, reading, and interacting with other people.²⁸

Physical activity increases the flow of blood to the brain and might promote the growth of new brain cells. Medical specialists recommend at least 30 minutes of exercise on most days.²⁹

A healthy low-fat diet, including fruits and vegetables that contain antioxidants (substances that limit the damaging effects of oxygen on body tissues) and fish and other foods that contain omega-3 fats, may help nourish brain cells and may limit the buildup of cholesterol in the arteries. Antioxidants are plentiful in fruits and vegetables such as oranges, berries, broccoli, spinach, carrots, sweet potatoes and tomatoes.³⁰ Omega-3 fats are found in fatty fish such as catfish, halibut, salmon and tuna; soybeans/tofu; nuts such as walnuts; flaxseed oil; and canola oil. (These dietary guidelines are the same as those recommended to prevent heart attack and stroke.)

Other recommendations include the following:

- Protect the head from injury; wear a helmet when advisable;
- Minimize emotional stress;
- Limit consumption of alcohol;
- Obtain at least six hours of sleep each night. Although some people may require more sleep, research shows that six hours is the minimum required for learning new skills;³¹
- Do not smoke; and,
- Discuss concerns about memory loss with a physician.

Treatments for memory loss vary, depending on the cause of the problem. For example, treating hypertension, hypothyroidism, sleep apnea and other ailments often can relieve symptoms of memory loss. The same medications that often are prescribed to slow the progress of Alzheimer’s disease also have helped improve alertness for people with mild cognitive impairment.³²

In a 2002 study, one of these drugs — donepezil — was administered for one month to nine healthy, licensed pilots with an average age of 52 while members of a similar group were given a placebo. They received a set of complex instructions in flight simulators at the beginning of the study and were tested at the end of the study to determine how well they retained their flight skills. The study found that those who took the drug performed better than those who did not.³³

Some people use vitamins — typically vitamin C, vitamin E, vitamin B-12 and/or vitamin B-9 (folate) — or herbal

supplements — most notably ginkgo biloba — to improve memory and other cognitive functions. Studies have yielded conflicting findings on whether ginkgo biloba can help healthy people, but they indicate effectiveness in improving the cognitive behavior of Alzheimer's patients.³⁴

Lapses in memory are common as people age, and studies have measured age-related deterioration in some pilot tasks involving memory. Nevertheless, in some instances, experience offsets the age-related differences. In addition, specialists recommend a number of techniques that can help lessen memory loss.♦

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