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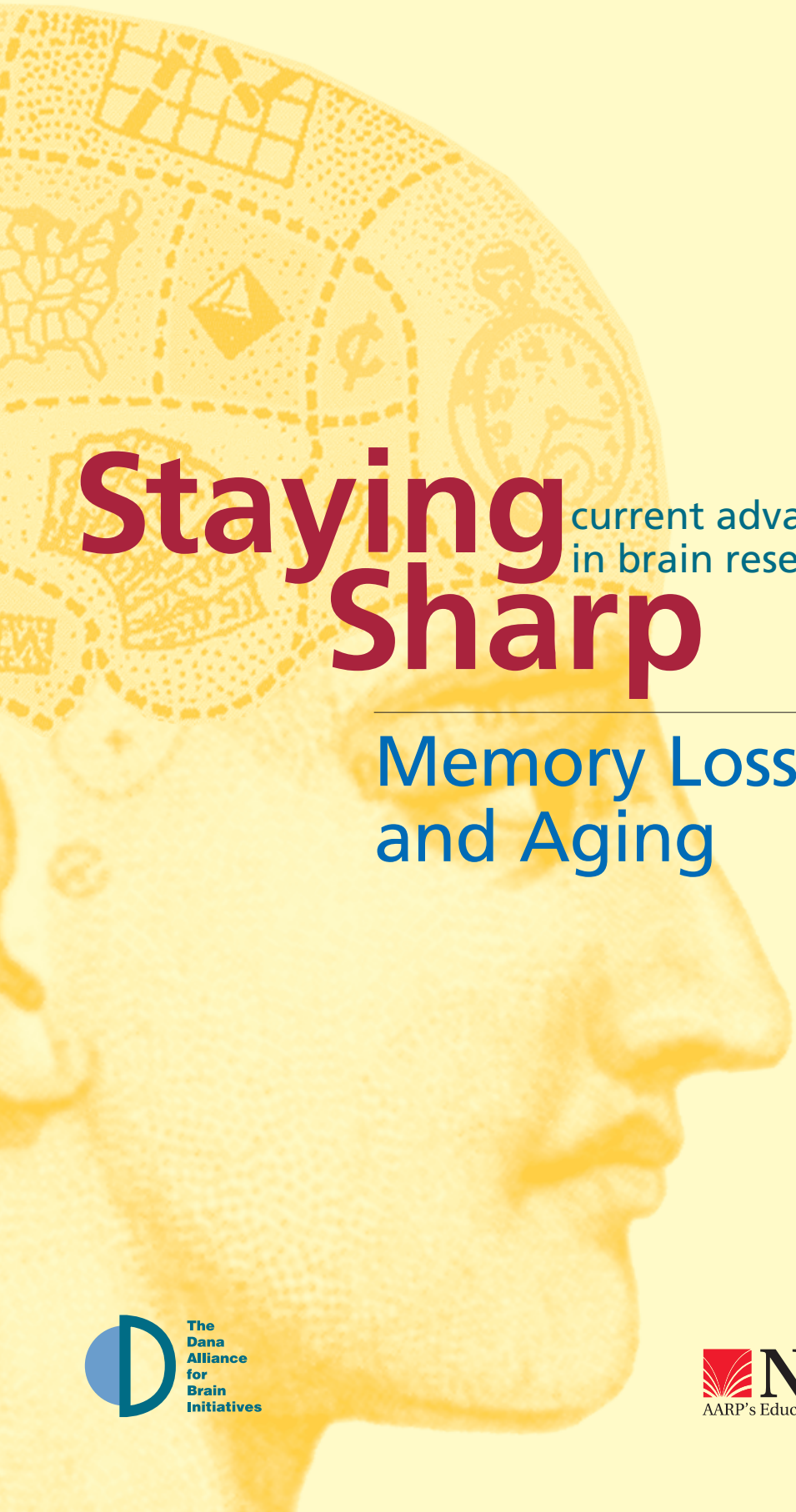


Staying Sharp

current advances in brain research

Memory Loss and Aging

The Dana Alliance for Brain Initiatives

NRTA
AARP's Educator Community

NRTA: AARP's Educator Community

NRTA (www.aarp.org/nrta) is AARP's educator community. Consistent with AARP's mission, NRTA is dedicated to enhancing the quality of life for all as we age, specifically through a focus on education and learning. NRTA works for positive social change in the field of education and provides members with valuable information, advocacy and service initiatives related to learning and education. NRTA provides national leadership through its network of affiliated retired educators' associations in 50 states and 2,700 communities and through its national office at the AARP headquarters in Washington DC. The partnership with the Dana Alliance for Brain Initiatives, and the Staying Sharp initiative, recognizes and explores the intimate connection between the brain, human behavior and the ability to continue to learn throughout life.

The Dana Alliance for Brain Initiatives

The Dana Alliance for Brain Initiatives (www.dana.org) is a nonprofit organization of more than 200 leading neuroscientists, including nine Nobel laureates. The Dana Alliance is committed to advancing public awareness about the progress and benefits of brain research and to disseminating information on the brain in an understandable and accessible fashion. Supported entirely by the Dana Foundation, the Dana Alliance does not fund research or make grants.

The Dana Foundation is a private philanthropic organization with principal interests in science, health, and education. The Foundation's current areas of emphasis are in immunology and neuroscience research, and in K-12 education, particularly the training of arts educators.

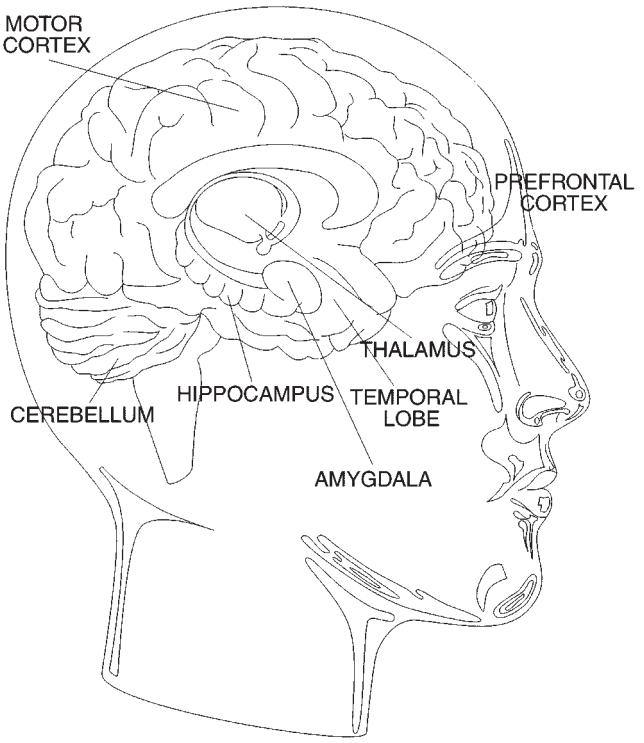
How many times have you walked into a room and forgotten what you came for? Searched in vain for keys that have mysteriously disappeared? Or forgotten the name of someone you should know? Such moments of forgetfulness happen to everyone — even the young — but as we get older, they may leave us wondering if we're losing our edge. Or worse, they may invoke the specter of Alzheimer's disease, the progressive dementia that now affects 4 million Americans.

Remembering and forgetting are perfectly normal parts of everyday life. But what happens as we get older? Is losing our memory an inevitable part of aging? And how do we know if it's an early sign of Alzheimer's?

Scientists are just beginning to sort out the answers to these questions. Much of the news from brain research is good. Cognitive decline may not be inevitable as we age, experts say. While with advancing age many people may experience some degree of change in so-called cognitive abilities, which include memory as well as a range of other intellectual functions, how big a change varies greatly. Moreover, there are a number of things we can do that seem to impact our memory and overall brain health as we age.

Cognition vs. Memory

Many studies of brain aging look at a range of cognitive abilities, beyond memory alone. Cognition includes not only remembering and forgetting, but also abstract thinking, reasoning, attention, imagination, insight, and even appreciation of beauty.



Where Memories Are Made

Philosophers and scientists have been studying and debating the roots of memory for centuries, yet there are still many unanswered questions about how the brain accomplishes this most basic of mental functions. Memory is not a single process, but rather a series of interactive processes beginning when we are exposed to new information, which is registered by the brain, encoded, and, in the right conditions, stored for later retrieval.

The brain systems most involved with memory are shown here. The brain seems to have different, though overlapping, systems for the two primary types of memories, declarative and nondeclarative.

Declarative (also called explicit) memories are those that can be recalled consciously and described verbally. They include the facts, people, places, and things that we encounter daily. Declarative memories primarily involve the brain's medial temporal lobes — the hippocampus in particular — and the prefrontal cortex, where higher intellectual functions seem to originate.

Nondeclarative (also called implicit) memory is the capacity for learning skills and procedures, including motor skills such as those used when playing golf or dancing. As such, it involves brain structures outside the medial temporal lobes, including the amygdala and brain areas related to movement, such as the cerebellum and motor cortex.

Forgetting and Normal Memory Loss

As brain functions go, forgetting may be almost as important as remembering; it would be inefficient for our brains to try to retain every bit of information we're exposed to throughout life. How the brain sorts out what makes it into long-term memory and what doesn't is a matter of continuing debate, and may be influenced by many factors, including our emotional state, stress level, the environment around us, previous memories, biases, and perceptions.

Brain scientists believe that the effects of normal aging on memory may result from the subtly changing environment within the brain. With aging, the brain seems to lose cells in areas that produce important neurotransmitters, upsetting the brain's delicate balance of these chemical messengers. Other changes occur in the brain's white matter, which is made up of nerve cell fibers, the "telephone cables" of brain cells through which communication with other cells takes place. Just how these changes affect memory is not entirely clear, but it may be that they decrease the efficiency of cell-to-cell communication.

What scientists do know is that, as we get older, our ability to lay down new memories may be affected, making it more difficult to learn new things. It's not so much that we forget more easily, but that we may take longer to learn the information in the first place. Memory studies have shown that about a third of healthy older people have difficulty with declarative memory, yet a substantial number of 80-year-olds perform as well as people in their 30's on difficult memory tests. More good news: Once something is learned, it is retained equally well by all age groups, even if it takes a bit longer for the older persons to learn it.

In practical terms, this means that as we get older, we may have to pay closer attention to new information that we want to retain, or use different strategies to improve learning and trigger memories. (See below.)

Keep Your Memory Sharp

What may seem like a faltering memory may in fact be a decline in the rate at which we learn and store new information. Practice these memory skills to enhance learning and make remembering easier:

- RELAX: Tension and stress are associated with memory lapses, and managing stress improves memory.
- CONCENTRATE: Your teachers were right: if you want to recall something later, pay attention.
- FOCUS: Try to reduce distractions and minimize interferences.
- SLOW DOWN: If you're rushing, you may not be focused or paying full attention.
- ORGANIZE: Keep important items in a designated place that is visible and easily accessed.
- WRITE IT DOWN: Carry a notepad and calendar, and write down important things.
- REPEAT IT: Repetition improves recall; use it when meeting new people and learning new things.
- VISUALIZE IT: Associating a visual image with something you want to remember can improve recall.

Source: The Dana Alliance for Brain Initiatives (Press Office)

Other studies have shown that people who tend to age "successfully," that is, with the least declines in cognition and memory, share certain characteristics that may help keep them sharp:

- Physical activity is strongly linked with lifelong brain health. Aerobic exercise in particular seems to sharpen memory skills.
- Mental exercise, especially learning new things or pursuing activities that

are intellectually stimulating, may strengthen brain cell networks and help preserve mental functions.

- Longer formal education is associated with mental sharpness among older persons, possibly because continued learning creates a "neural reserve" of denser, stronger nerve-cell connections.
- A sense of control or influence over our lives and those of others — believing that what we do makes a difference — seems to prevent cognitive decline, for reasons that are unclear.

Memory Loss or Alzheimer's?

Even though memory loss is one of the earliest symptoms of Alzheimer's and other dementias, there are clear differences between what scientists call "age-related memory loss" (ARML) and dementia — both in the symptoms that might be experienced and in the underlying biological changes in the brain. While dementia involves a broad loss of cognitive abilities, ARML is primarily a deficit of declarative memory. Forgetting where you parked your car can happen to everyone occasionally, but forgetting what your car looks like may be a cause for concern.

Brain researchers are working hard to pin down where forgetfulness ends and Alzheimer's begins. The question is a difficult one, and a subject of much debate among experts in brain aging. One important clue from brain research is that people with Alzheimer's are able to retain significantly less information after a period of delay than healthy people. That means that new information may be learned, but little will be remembered after a delay of even a few hours.

Other studies have suggested that Mild Cognitive Impairment (MCI), a condition marked by repeated lapses in short-term memory, may in fact be early-stage Alzheimer's in some patients — but certainly not in all. Distinct changes in memory that occur over the course of a year or two, and can be verified with psychological testing, are the hallmarks of MCI. Such changes may at first be mild enough that daily functions are not disrupted, and are often first noticed by a loved one.

If you or someone you love is experiencing significant changes in memory or persistent forgetfulness that interferes with work or home responsibilities, seek a doctor's help. Stress and fatigue can affect memory, and even if MCI is diagnosed, there may be a cause other than Alzheimer's, such as side effects from medications, depression, stroke or mini-strokes, or a head injury. (See "Diagnosing Alzheimer's Disease.")

Dementia and Alzheimer's

Dementia is a medical condition that disrupts the way the brain works. Generally used to describe people with impaired cognitive functioning, it can affect young and old alike. It is not a normal part of the aging process. There are many different types of dementia, and many different causes.

Alzheimer's disease (AD) is the most common form of dementia. Because its frequency increases with age, the number of people it strikes is growing as the population ages. In addition to memory loss, the first signs of Alzheimer's often include language difficulties and trouble with routine activities, such as driving and shopping. Mood changes may also occur. As the disease progresses, long-term memory may also be affected, and behavioral changes such as aggression, agitation, delusions, and verbal outbursts may occur. The ability to carry out daily tasks, such as dressing or bathing, may be compromised. In severe Alzheimer's, the abilities to talk and walk may be lost.

Causes of Alzheimer's Disease

Alzheimer's is a neurodegenerative disease, which means neurons (brain cells) progressively degenerate, eventually losing function and dying. Cells in the hippocampus, a seahorse-shaped structure deep in the brain that plays a major role in the formation of memories, appear to be especially vulnerable. In brain-imaging studies of people with Alzheimer's, the hippocampus is consistently smaller than normal. The brain pathways that link the hippocampus to other brain regions are also damaged, especially those that lead to the prefrontal cortex, the brain's control center for cognitive functions. Many scientists believe this damage may be responsible for the

persistent short-term memory problems (as described on page 5) that appear in early stages of the disease.

The cause of nerve cell death is the subject of intense scientific investigation, which has provided important clues but few answers. Many experts believe that cell death is related to an accumulation of a sticky protein called amyloid, which forms the dense plaques and tangles of nerve fibers that were first described by physician Alois Alzheimer over a century ago.

Common Symptoms of Alzheimer's Disease

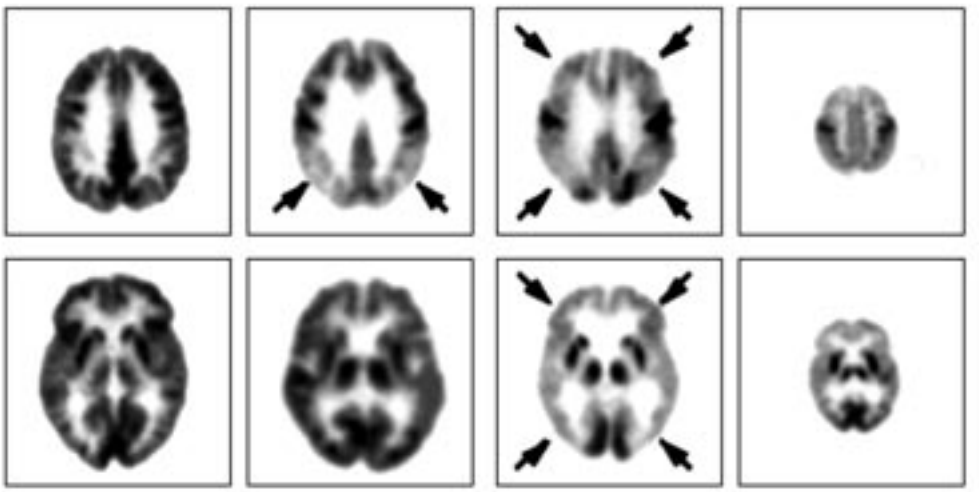
Each person with Alzheimer's may experience different symptoms, and symptoms may change over the course of the disease. Some of the common ones are described below.

- Profound difficulty in recalling names, objects, places, times, and dates
- Not recognizing family and friends, or not recalling their names
- Forgetting one's own phone number or address
- Difficulty finding your way to or from a familiar place
- Tendency to wander from home or office
- Forgetting to eat or maintain one's hygiene
- Day/night disorientation with difficulty sleeping
- Noticeable language and intellectual decline
- Poor judgment, inability to follow simple instructions or stay focused on a task
- Progressive sense of distrust
- Dulled emotions or interest in activities
- Depression
- Unusual agitation and irritability
- Hallucinations or delusions

Source: Alzheimer's Association

Whether these amyloid plaques are the cause of cell death or just the remnants of it is not perfectly clear. Other proteins, including tau and presenilin, are also being studied, and it could be the interaction of different proteins that ultimately leads to cell death.

Many scientific questions remain about what triggers Alzheimer's disease in some people and not others. Inherited genes play a role in relatively rare early-onset forms of Alzheimer's, but their influence on the more prevalent form is less clear. One gene, ApoE4, has been associated with late-onset AD, so people who carry this gene are at increased risk for developing the disease. However, genes are only one factor. AD is probably triggered by a combination of genetic and environmental factors, which might include suffering a head injury.



Pet images show metabolic degeneration of brain of Alzheimer's patient; metabolic function in late stages resembles that of a child, as does patient's behavior.

Diagnosing Alzheimer's Disease

The earliest signs of Alzheimer's disease are usually first noticed by a friend or relative. If you or someone close to you is experiencing any of the symptoms listed in "Common Symptoms of Alzheimer's Disease," it is important to see a doctor as early as possible to determine the cause. Memory loss could be the result of a number of things, many of which may be reversible.

Currently, the only definitive diagnosis for Alzheimer's disease is based on an examination of brain tissue during autopsy. To establish a clinical diagnosis, doctors focus on ruling out, by process of elimination, all other possible causes of symptoms to determine whether AD might be the cause.

The evaluations your doctor should perform include:

- **Medical history** – current medical or psychological conditions, including a thorough review of personal and family health history and medications being used
- **Neurological examination** – assesses one's sense of time and place, ability to remember, understand, communicate and complete simple calculations
- **Physical examination** – evaluation of nutritional status, blood pressure and pulse rate

If these initial examinations don't reveal a clear problem, additional tests might include:

- Brain imaging scans, such as MRI or CT, to look for telltale brain changes
- Laboratory tests, including blood and urine tests to try to identify blood-based or hormonal irregularities
- More extensive neuropsychological evaluations, which might include tests of memory, reasoning, vision-motor coordination, and language function
- Psychiatric evaluations, to assess mood and other emotional factors

A diagnosis of Alzheimer's disease is usually said to be either:
Probable: All other disorders that may cause dementia have been ruled out; or **Possible:** AD is suspected, but other causes cannot be ruled out.
Source: Alzheimer's Association

Treatment

As science progresses toward a better understanding of what kills brain cells in Alzheimer's disease, the hope is that medicines or other therapies might be developed to delay, prevent, or reverse the damage. Clinical trials are underway for drugs, as well as a vaccine (see next page), that seek to interrupt the build-up of amyloid in the brain. If they are found to be safe and effective, these would be the first treatments that address what many experts think is the underlying cause of cell death. Unfortunately, it could take years for these therapies to reach patients. In the meantime, the primary goals of therapy for AD are to improve quality of life and day-to-day functioning.

Current treatments for Alzheimer's include three relatively new medications that increase brain levels of acetylcholine, a neurotransmitter involved in learning and memory processes. These drugs — Aricept, Exelon, and Reminyl — have been modestly successful in some patients for improving memory and attention skills, and they may also have a beneficial effect on behavioral symptoms such as aggression.

Other therapies currently under investigation target early stages, with the goal of stopping the disease's progression. These include vitamin E (an antioxidant that may help protect brain cells from damage) and anti-inflammatory drugs, especially those in a new class called COX-2 inhibitors.

Treatments may also target behavioral symptoms associated with AD, such as agitation, delusions, hallucinations, depression, or sleep difficulties. Medications to control these problems might include antidepressants (such as Prozac, Zoloft, and others), antipsychotics (such as Valium and its cousins), or sleep aids (such as Ambien). Consistent medical and psychological therapy is important for the individual as well as for family members.

What's New in Brain Research

Brain research has pointed to the sticky plaques made up of amyloid as a likely root cause of nerve cell death in Alzheimer's. A great deal of research is now focused on understanding the biological processes that lead to the unnatural build-up of amyloid so that those processes might be shut down or influenced in beneficial ways. One strategy is to develop an Alzheimer's vaccine that attacks the amyloid plaques and marks them for removal by the brain's own clean-up system. Early tests of the vaccine in animals appear to show that it can successfully prevent and reduce amyloid deposits. These preliminary results have raised the prospect, for the first time ever, that Alzheimer's disease might be reversible. The initial trial of the vaccine in humans had to be discontinued because of the development of inflammation of the brain in some subjects. However, plans for a trial of a modified vaccine are in progress.

Living with Alzheimer's

When severe memory loss significantly interferes with daily life, simple tasks can be difficult or insurmountable. Below are some strategies recommended by experts that may help lessen the impact on day-to-day functioning.

- Establish and follow a regular routine in familiar surroundings.
- Label or color code doors to help reduce getting lost.
- Draw a map for simple routes; write down directions.
- Make lists, and use a calendar or pocket diary to jot down reminders and keep track of important dates and financial matters.
- Recognize the limitations of what can be done, and set realistic daily goals.
- Keep track of when medicines are taken; use a reminder box or chart posted on the refrigerator to stay current with prescriptions.

- Get regular medical check-ups, and tell the doctor about any medicine being taken or changes in health status.
- Keep a list of names and numbers near the telephone.

- Stay in touch with family, friends and acquaintances.
- Get treatment for any other chronic health conditions, such as high blood pressure, diabetes, high cholesterol, or heart disease.
- If agitation is a problem, find alternative ways to express anger, such as exercising, hitting a punching bag, or making a gripe list.

Source: Alzheimer's Disease and Related Disorders Association, Inc.

Caring for a Person with AD

Long-term, progressive dementia ultimately makes independent living impossible. This means long-term care is necessary, in either the home, an assisted-living environment, or a nursing home. More than half of people with AD live at home, but may require nursing home care in the most advanced stages. The National Institutes of Health estimate that half of the people who live in nursing homes have AD. The tremendous financial expenses associated with long-term nursing care are compounded by the emotional toll of no longer being able to care for a sick loved one.

Many spouses and relatives of people with AD choose to care for them at home. These caregivers are often called the "second victims" of Alzheimer's. Due to their immense responsibilities, caregivers may find themselves isolated from friends and social contacts, which can negatively affect overall health. A number of studies have described the physical and mental health difficulties associated with caregiving, including fatigue, weakened immunity, and increased risk for depression. One

recent poll found significant depressive symptoms in more than half of caregivers surveyed. Many caregivers, not surprisingly, report high levels of stress, which may weaken immune functions. A number of studies have linked high stress levels in caregivers with decreased immune-system function, making caregivers more susceptible to flu or other viruses, and slower to heal after injury.

Profile of a Caregiver

A 1997 survey of caregivers for adults with brain disorders (Alzheimer's disease, stroke, head injury, Parkinson's disease, etc.) conducted by the National Caregiver's Alliance, underscores the importance of taking care of caregivers. Here's what the survey found out about caregivers:

- About three-quarters are female
- The average age is 60
- Three-quarters live with the patient
- Half also work outside the home, though some have had to quit working or reduce their hours
- An average of 73 hours per week are spent providing care for the patient
- About two-thirds of patients cannot be left alone, and half of these are unable to perform basic daily functions such as eating, bathing, or dressing
- About a third receive no help from family and friends

Source: Family Caregiver Alliance

Caring for the Caregiver

If you're caring for someone with Alzheimer's or any other serious progressive disorder, try not to ignore your own needs, emotional and physical. There are many options for getting assistance, including home healthcare, adult day care or assisted-living programs. Alzheimer's patient support groups and caregiver groups can be important sources of information and referral, and they sometimes coordinate "share-care" programs that enable caregivers to take needed breaks. Here are some other suggestions that can, in the long run, enable you to take better care of your loved one:

- Join a support group for caregivers, especially (if possible) one for caregivers of people with Alzheimer's.
- Seek psychological and emotional support from family or friends, counselors, clergy, or through community groups.
- Don't isolate yourself; maintain social networks.
- Allow yourself to take regular breaks to pursue things you enjoy doing; arrange for others to stay with the patient if necessary.
- Don't be afraid to ask for help; seek help from community services or home-health agencies if needed.
- Schedule regular health check-ups for yourself, and be sure to tell your doctor about your caregiving role.
- Be alert to signs of depression, and seek treatment if you have symptoms such as persistent sadness, especially in combination with sleep disturbances or a loss of pleasure from things you used to enjoy.

Source: Family Caregiver Alliance

Conclusion

Brain science is making tremendous progress in better understanding just what happens to memory and other cognitive functions as we age. The mysteries of Alzheimer's disease are also slowly being revealed. While many questions remain, it is clear that normal age-related memory loss is distinct and very different from Alzheimer's or other dementias. There are a number of things we can do every day that may help preserve our mental abilities, and these can help us enjoy a better quality of life as we get older. Alzheimer's disease, while still incurable and shrouded in unknowns, is nonetheless yielding to the advances of science and medicine, and promising new treatments are on the horizon.

Resources

AARP
www.aarp.org

Alliance for Aging Research
Tel: (202) 293-2856; Fax: (202) 785-8574
www.agingresearch.org

Alzheimer's Association
Voice: (800) 272-3900; Fax: (312) 335-1110
www.alz.org

Alzheimer's Disease Education and Referral Center
Voice: (800) 438-4380; Fax: (301) 495-3334
www.alzheimers.org

Family Caregiver Alliance
Tel: (415) 434-3388; Fax: (415) 434-3508
www.caregiver.org

National Alliance for Caregiving
www.caregiving.org

National Council on Aging
Voice: (202) 479-1200; Fax: (202) 479-0735
www.ncoa.org

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