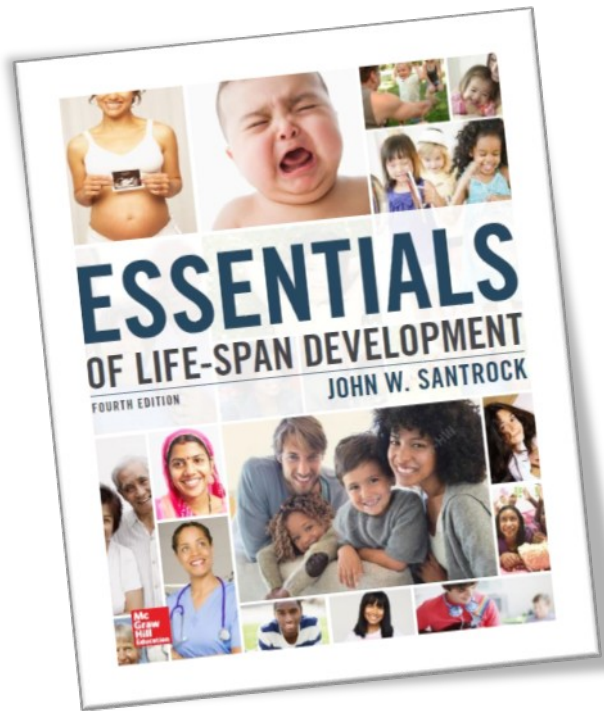




ESSENTIALS OF LIFE-SPAN DEVELOPMENT

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PHYSICAL AND COGNITIVE DEVELOPMENT IN LATE ADULTHOOD

15

CHAPTER OUTLINE

- Longevity, biological aging, and physical development
- Health
- Cognitive functioning
- Work and retirement
- Mental health

LONGEVITY, BIOLOGICAL AGING, AND PHYSICAL DEVELOPMENT

- **Life span:** Maximum number of years an individual can live
 - Between 120–125 years
- **Life expectancy:** Number of years that the average person born in a particular year will probably live
 - Average in the U.S. = 78.7 years
- Differences in life expectancy across countries due to factors such as health conditions and medical care

LONGEVITY, BIOLOGICAL AGING, AND PHYSICAL DEVELOPMENT

- In 2011, the overall life expectancy for women was 81.1 years, and for men, it was 76.3 years
- Beginning in mid-30s, women start to outnumber men because of:
 - Social factors, such as health attitudes, habits, lifestyles, occupation
 - Biological factors – females outlive males in virtually all species

LONGEVITY, BIOLOGICAL AGING, AND PHYSICAL DEVELOPMENT

- Centenarians – living beyond 100 years
 - Despite physical limitations, most centenarians have low rate of age-associated diseases, good mental health
 - *Supercentenarians* – ages 110-119
- *Compression of morbidity* – staving off of high-mortality chronic diseases until much later ages
- Longevity genes and ability to cope with stress among factors associated with living beyond 100
 - Low rates of obesity, smoking, and only a small percentage had significant changes in thinking skills

LONGEVITY, BIOLOGICAL AGING, AND PHYSICAL DEVELOPMENT

- Biological theories of aging
 - **Evolutionary theory:** Natural selection has not eliminated many harmful conditions and nonadaptive characteristics in older adults
 - **Cellular clock theory:** Cells can divide a maximum of about 75 to 80 times
 - Age makes cells less capable of dividing
 - *Telomeres* – DNA sequences that cap chromosomes become shorter, drastically reduced after about 70-80 replications
 - Healthy centenarians have longer telomeres

LONGEVITY, BIOLOGICAL AGING, AND PHYSICAL DEVELOPMENT

- **Free-Radical Theory** – Aging occurs because normal cell metabolism produces unstable oxygen molecules (*free radicals*)
 - Free radicals damage DNA and other cellular structures – leads to disorders such as cancer and arthritis
- Related theory emphasizes decay of *mitochondria* due to oxidative damage and loss of critical micronutrients supplied by the cell
 - Leads to range of disorders, including cancer, arthritis, Alzheimer disease

LONGEVITY, BIOLOGICAL AGING, AND PHYSICAL DEVELOPMENT

- **Hormonal stress theory** – Aging of the body's hormonal system lowers resistance to stress and increases likelihood of disease
 - With age, hormones stimulated by stress remain at elevated levels for longer periods of time
 - Increases risk to disease – cardiovascular disease, cancer, diabetes, and hypertension
 - Focus on stress-buffering strategies to attenuate negative effects of stress on the aging process
- Variation of hormonal stress theory focuses on immune system decline with age

LONGEVITY, BIOLOGICAL AGING, AND PHYSICAL DEVELOPMENT

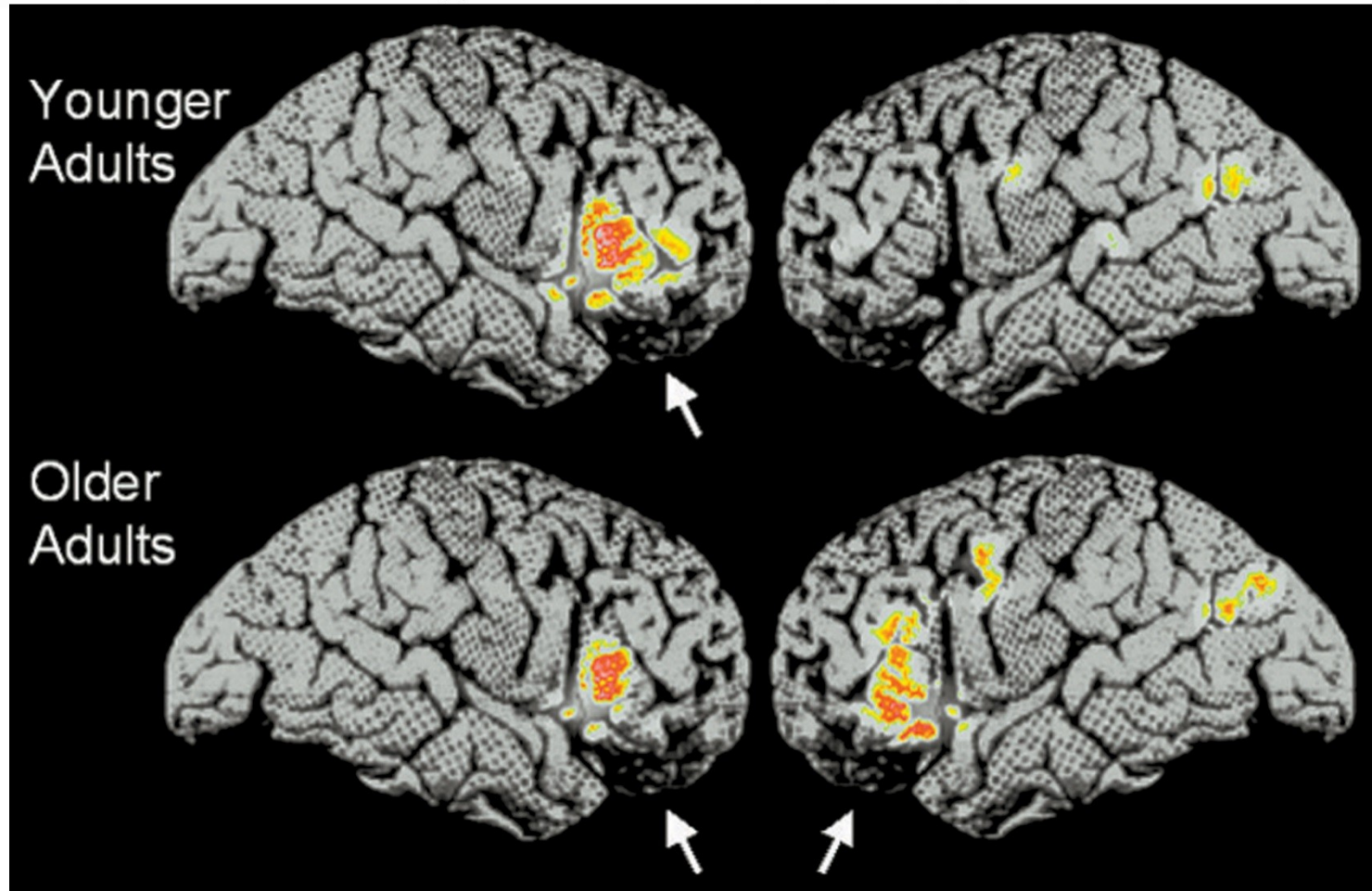
- Brain loses 5-10% of its weight between 20-90 years old
- Brain volume decreases due to:
 - Shrinkage of neurons
 - Lower numbers of synapses
 - Reduced length of axon
- Slowing of function in the brain and spinal cord begins in middle adulthood, accelerates in late adulthood
- Decline in neurotransmitter production
- Changes in myelination and neural networks

LONGEVITY, BIOLOGICAL AGING, AND PHYSICAL DEVELOPMENT

- *Neurogenesis*, generation of new neurons, can occur in human adults
 - May play role in neurogenerative diseases, such as Alzheimer disease, Parkinsons disease, and Huntington disease
- Dendritic growth may possibly occur in older adults
- Decrease in lateralization in aging adults
 - May play compensatory role to improve cognitive functioning

FIGURE 15.2 - DECREASE IN BRAIN LATERALIZATION IN OLDER ADULTS

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Courtesy of Dr. Roberto Cabeza.

LONGEVITY, BIOLOGICAL AGING, AND PHYSICAL DEVELOPMENT

- The Nun Study
 - Ongoing investigation of aging in 678 nuns
 - Nuns lead intellectually challenging lives, may contribute to their quality of life and longevity
 - Participate in annual assessments of cognitive and physical functioning and agree to donate brains for research upon death
 - Examination of nuns' brains lead neuroscientists to believe in brain's remarkable capacity to change and grow, even in old age

LONGEVITY, BIOLOGICAL AGING, AND PHYSICAL DEVELOPMENT

- Physical appearance and movement
 - Most noticeable changes - Wrinkles and age spots
 - Shorter with aging due to bone loss in vertebrae
 - Weight drops after age 60
 - Muscle loss gives body a sagging appearance
 - Older adults move more slowly
 - Exercise and appropriate weight lifting help to reduce muscle mass decrease and improve body's appearance

LONGEVITY, BIOLOGICAL AGING, AND PHYSICAL DEVELOPMENT

- Vision
 - Vision declines becomes more pronounced in late adulthood:
 - Light-dark adaptation
 - Glare tolerance
 - Visual field diminishes
 - Events in peripheral vision may not be detected
 - Depth perception declines

LONGEVITY, BIOLOGICAL AGING, AND PHYSICAL DEVELOPMENT

- Diseases that impair vision of older adults:
 - **Cataracts** - Thickening of the lens of the eye
 - Vision becomes cloudy, opaque, and distorted
 - **Glaucoma** – Optic nerve damage due to pressure buildup of fluid in the eye
 - If left untreated, can destroy vision
 - **Macular degeneration** - Deterioration of the macula of the retina
 - Produces relatively normal peripheral vision, but inability to see center of visual field

FIGURE 15.3 - MACULAR DEGENERATION

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LONGEVITY, BIOLOGICAL AGING, AND PHYSICAL DEVELOPMENT

- Hearing
 - Differing degrees of decline in hearing - 63% of adults aged 70 or older had hearing loss
 - Hearing loss associated with reduced cognitive functioning
- Smell and taste
 - Most older adults lose some of their sense of smell or taste, or both, beginning around age 60
- Touch and pain
 - Decline in touch sensitivity - not problematic for most
 - Estimated 60-75% of older adults report at least some persistent pain
 - Older adults are less sensitive to pain, but may be less pain tolerant

LONGEVITY, BIOLOGICAL AGING, AND PHYSICAL DEVELOPMENT

- Circulatory system and lungs
 - Cardiovascular disorders increase in late adulthood
 - Resistant hypertension – cannot be controlled by at least 4 antihypertensive agents – is a growing concern in U.S.
 - Lung capacity drops 40% between the ages of 20 and 80, even without disease
 - Can be improved with diaphragm-strengthening exercises

LONGEVITY, BIOLOGICAL AGING, AND PHYSICAL DEVELOPMENT

- Sleep
 - Approximately 50% of older adults complain of difficulty sleeping
 - Sleep time and sleep efficiency declines in older adults
 - Poor sleep is a risk factor for falls, obesity, lower cognitive functioning, and earlier death
 - Many sleep problems are related to health problems

LONGEVITY, BIOLOGICAL AGING, AND PHYSICAL DEVELOPMENT

- Sexuality
 - Can be lifelong in the absence of disease or beliefs that older people should be asexual
 - Aging induces changes in sexual performance, more so in males than females
 - Orgasm becomes less frequent in males with age, more direct stimulation needed to produce an erection
 - Many are sexually active as long as they are healthy

HEALTH

- As we age, the probability of having some disease or illness also increases
 - Chronic diseases become more common in late adulthood
 - Arthritis is the most common followed by hypertension
- Causes of death in older adults
 - Nearly 60% of 65–74-year-olds die of cancer or cardiovascular disease
 - Cancer as leading cause of death in this age group
 - Cardiovascular disease is leading cause of death for adults aged 75-84 and 85+

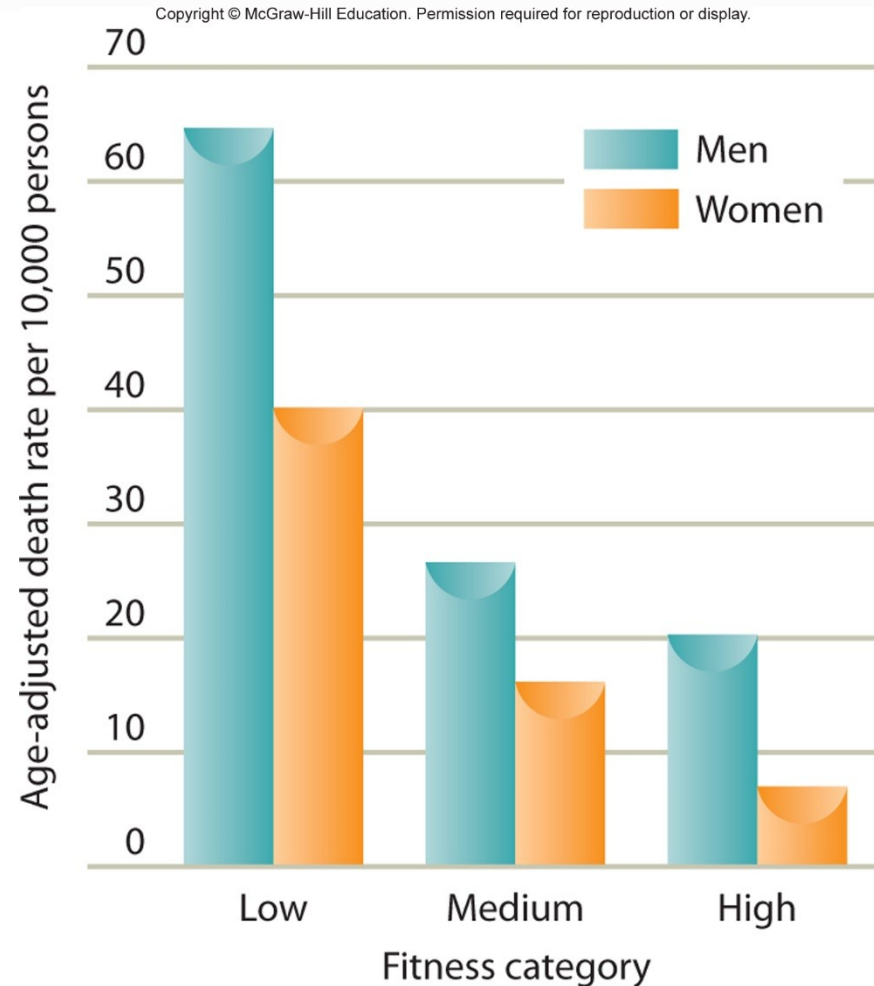
HEALTH

- **Arthritis**
 - Inflammation of the joints accompanied by pain, stiffness, and movement problems
- **Osteoporosis**
 - Extensive loss of bone tissue
- Accidents are the 6th leading cause of death among older adults
 - Falls as leading causes of injury deaths for adults 65 and older

HEALTH

- Exercise
 - Low cardiorespiratory fitness is a significant predictor of all-cause mortality
 - Strength training is recommended in addition to aerobic activity and stretching
 - Current recommendations include:
 - 2 hours and 30 minutes of moderate-intensity aerobic activity per week
 - Muscle strengthening activities 2 or more days per week
 - Exercise has positive effect on older adults' cognition
 - Linked with increased longevity

FIGURE 15.4 - PHYSICAL FITNESS AND MORTALITY



HEALTH

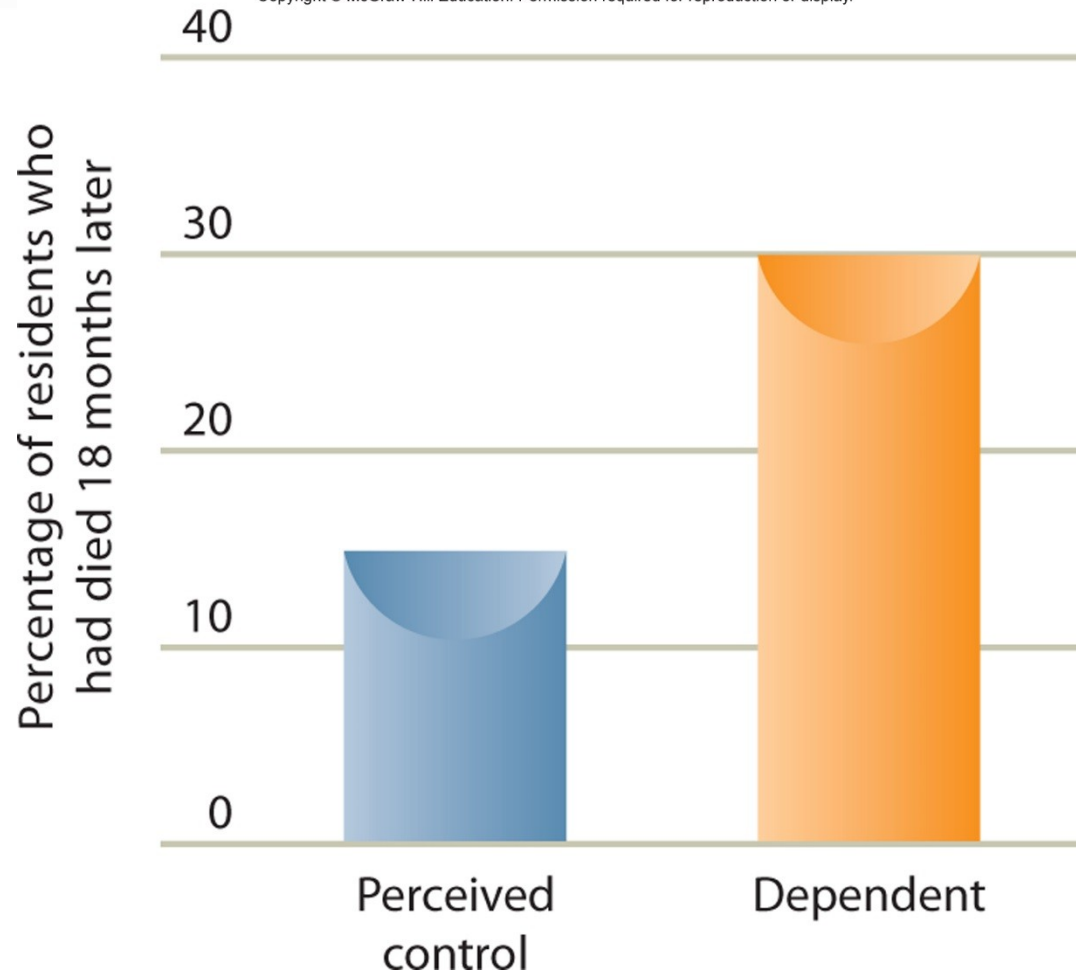
- Nutrition and Weight
 - Calorie restriction increases animals' life span, benefits unclear in lengthening human life span
 - Typical calorie restriction levels about 30% decrease:
 - About 1120 calories per day for the average woman
 - About 1540 calories per day for the average male

HEALTH

- About 3% of adults 65 or older in U.S. live in a nursing home at some point in their lives
 - With age, likelihood of living in a nursing home or extended care facility increases
- Quality of nursing homes and other extended-care facilities for older adults varies enormously
 - Home health care, elder care centers, and preventive medicine clinics as alternatives
 - Feelings of control and self-determination linked to health and survival in nursing homes

FIGURE 15.5 - PERCEIVED CONTROL AND MORTALITY

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COGNITIVE FUNCTIONING

- Attention
 - *Selective attention* – focusing on a specific aspect of experience while ignoring others that are irrelevant
 - Generally decreases in older adults
 - *Sustained attention* – ability to focus attention on a selected stimulus for a prolonged period of time
 - Older adults perform as well as middle-aged and younger adults

COGNITIVE FUNCTIONING

- Memory
 - **Explicit memory** – memory of facts and experiences that individuals consciously know and can state
 - **Implicit memory** – memory without conscious recollection
 - Implicit memory is less likely to be adversely affected by aging than explicit memory

COGNITIVE FUNCTIONING

- Episodic and semantic memory are forms of explicit memory
 - **Episodic memory** – Retention of information about the where and when of life's happenings
 - Younger adults have better episodic memory than older adults
 - **Semantic memory** - Person's knowledge about the world
 - Older adults often take longer to retrieve semantic information, but can ultimately retrieve it
 - Ability to retrieve very specific information, such as names, usually declines in older adults
- Episodic memory declines more than semantic memory

COGNITIVE FUNCTIONING

- Declines in *working memory* - memory as a place for mental work - during late adulthood
- Perceptual speed – amount of time it takes to perform simple perceptual-motor tasks – shows considerable decline in late adulthood
 - Strong link between perceptual speed and working memory

COGNITIVE FUNCTIONING

- Executive functioning
 - Involves managing one's thoughts to engage in goal-directed behavior and self control:
 - General aspects of executive functioning decline in late adulthood
 - Considerable variability in executive functioning among older adults

COGNITIVE FUNCTIONING

- **Wisdom:** Expert knowledge about the practical aspects of life that permits excellent judgment about important matters
 - High levels of wisdom are rare
 - Factors other than age are critical for wisdom to develop to a high level
 - Personality-related factors are better predictors of wisdom than cognitive factors

COGNITIVE FUNCTIONING

- Education, work, and health are important influences on cognitive functioning of older adults
 - Important factors in cohort effects that need to be taken into account in studying older adults
- Successive generations of Americans in 20th century:
 - Were better educated
 - Had work experiences that included stronger emphasis on cognitively-oriented labor
 - Have been healthier in late adulthood
 - Better treatments for a variety of illnesses

COGNITIVE FUNCTIONING

- Use it or lose it
 - Certain mental activities can benefit the maintenance of cognitive skills
 - Reading books, doing crossword puzzles, going to lectures and concerts
 - Research suggests that mental exercise may reduce cognitive decline
- Training cognitive skills
 - Improves the cognitive skills of many older adults
 - Some loss in plasticity in late adulthood, especially in the oldest-old
 - Cognitive vitality of older adults can be improved through cognitive and physical fitness training

COGNITIVE FUNCTIONING

- Cognitive neuroscience and aging
 - *Cognitive neuroscience* - Discipline that studies links between the brain and cognitive functioning
 - Relies on brain imaging techniques, such as fMRI, PET, and DTI (diffusion tensor imaging) to reveal brain areas activated when individuals engage in certain cognitive activities
 - Changes in the brain can influence cognitive functioning, and changes in cognitive functioning can influence the brain

WORK AND RETIREMENT

- Work
 - After 1995, adults aged 65+ engaging in full-time work rose substantially
 - Also increases in part-time work after retirement
 - Reflected in nation's economy, may not have adequate money reserves to fund retirement
 - Increasing number of middle-aged and older adults are embarking on 2nd or 3rd careers
 - Opportunities for productive activity, social interaction, and positive identity
 - Older workers have lower rates of absenteeism, fewer accidents, and higher job satisfaction than their younger counterparts
 - Older adults who continue to work have better physical profiles than those who retire

WORK AND RETIREMENT

- Retirement in the U.S.
 - When people reach their 60s, the life path they follow is less clear
 - Some individuals don't retire, continuing in their career jobs
 - Some retire from their career work and then take up a new and different job
 - Some retire from career jobs but do volunteer work
 - Some retire from a post-retirement job and go on to yet another job
 - Some move in and out of the workforce, so they never really have a “career” job from which they retire
 - Some individuals who are in poor health move to a disability status and eventually into retirement
 - Some who are laid off define it as “retirement”

WORK AND RETIREMENT

- Older adults who adjust best to retirement are:
 - Are healthy
 - Have adequate income
 - Are active
 - Are educated
 - Have an extended social network including both friends and family
 - Usually were satisfied with their lives before they retired

MENTAL HEALTH

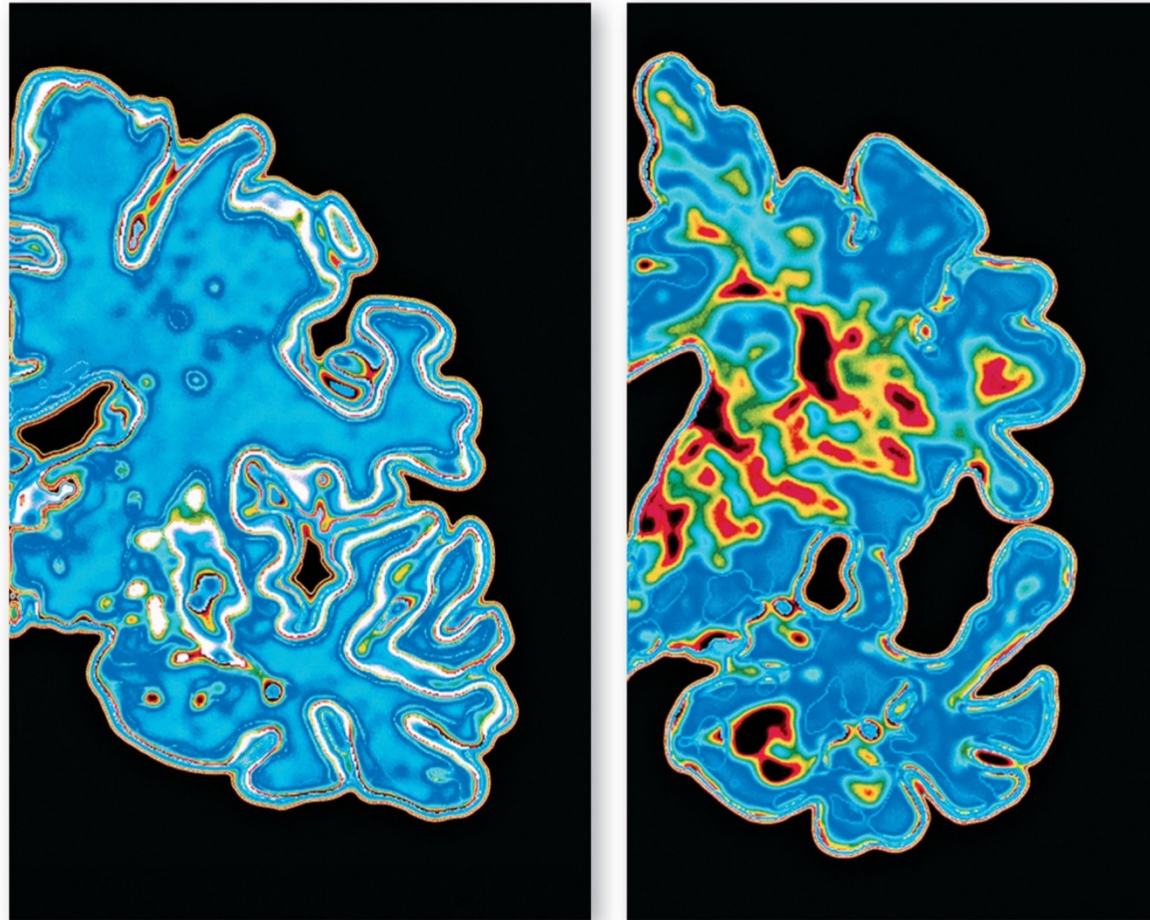
- Psychological disorders among older adults are point of concern
 - Older adults do not have a higher incidence of psychological disorders than younger adults
- **Dementia** – Global term for neurological disorders in which primary symptoms involve deterioration of mental functioning
 - Often lose the ability to care for themselves and may become unable to recognize familiar people or surroundings
 - 23% of women and 17% of men 85 years or older are at risk for developing dementia

MENTAL HEALTH

- **Alzheimer Disease** – Progressive, irreversible brain disorder characterized by deterioration of memory, reasoning, language, and eventually, physical functioning
 - Estimated 5.4 million adults in the U.S have Alzheimer disease
 - Women are more likely to develop Alzheimer disease because of longer life expectancy
 - Involves a deficiency in the brain messenger chemical *acetylcholine*
 - Formation of *amyloid plaques* (dense deposits of protein that accumulate in blood vessels) and *neurofibrillary tangles* (twisted fibers that build up in neurons)

FIGURE 15.8 - TWO BRAINS: NORMAL AGING AND ALZHEIMER DISEASE

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MENTAL HEALTH

- *Mild Cognitive Impairment (MCI)*
 - Represents a transitional state between the cognitive changes of normal aging and very early disease
 - fMRI shows smaller brain regions involved in memory for individuals with MCI

MENTAL HEALTH

- Drug treatment of Alzheimer disease
 - Cholinerase inhibitors and other drugs slow the downward progression of the disease
- Caring for individuals with Alzheimer disease
 - Support is often emotionally and physically draining for the family
 - Respite care services

MENTAL HEALTH

- **Parkinson disease**

- Chronic, progressive disease characterized by muscle tremors, slowing of movement, and facial paralysis
- Triggered by the degeneration of dopamine-producing neurons in the brain
- Several treatments are available – drug treatments and deep brain stimulation (DBS)
 - Difficult to determine correct dosage, loses efficacy over time
 - DBS involves implantation of electrodes within brain
 - Stem cell transplantation and gene therapy are being explored as treatment options