12.1: Chapter 28- Physical Development in Late Adulthood

Chapter 28 Learning Objectives

- Describe different theories of aging
- Describe the changes in physical appearance in late adulthood
- Describe the sensory changes in late adulthood
- Describe chronic health conditions during late adulthood
- Describe the importance of nutrition and exercise in late adulthood
- Describe the physical and functional changes in the brain during late adulthood
- Explain what happens in Parkinson’s disease
- Explain how sleep patterns change in late adulthood
- Explain how sexuality changes in late adulthood

Theories of Aging

Why do we age? There are many theories that attempt to explain how we age, however, researchers still do not fully understand what factors contribute to the human lifespan (Jin, 2010). Research on aging is constantly evolving and includes a variety of studies involving genetics, biochemistry, animal models, and human longitudinal studies (NIA, 2011a). According to Jin (2010), modern biological theories of human aging involve two categories. The first is Programmed Theories that follow a biological timetable, possibly a continuation of childhood development. This timetable would depend on “changes in gene expression that affect the systems responsible for maintenance, repair, and defense responses,” (p. 72). The second category includes Damage or Error Theories which emphasize...
environmental factors that cause cumulative damage in organisms. Examples from each of these categories will be discussed.

Figure 9.10

Genetics: One’s genetic make-up certainly plays a role in longevity, but scientists are still attempting to identify which genes are responsible. Based on animal models, some genes promote longer life, while other genes limit longevity. Specifically, longevity may be due to genes that better equip someone to survive a disease. For others, some genes may accelerate the rate of aging, while others decrease the rate. To help determine which genes promote longevity and how they operate, researchers scan the entire genome and compare genetic variants in those who live longer with those who have an average or shorter lifespan. For example, a National Institutes of Health study identified genes possibly associated with blood fat levels and cholesterol, both risk factors for coronary disease and early death (NIA, 2011a).

Evolutionary Theory: Evolutionary psychology emphasizes the importance of natural selection; that is, those genes that allow one to survive and reproduce will be more likely to be transmitted to offspring. Genes associated with aging, such as Alzheimer’s Disease, do not appear until after the individual has passed their main reproductive years. Consequently, natural selection has not eliminated these damaging disorders from the gene pool. If these detrimental disorders occurred earlier in the development cycle, they may have been eliminated already (Gems, 2014).

Cellular Clock Theory: This theory suggests that biological aging is due to the fact that normal cells cannot divide indefinitely. This is known as the Hayflick limit and is evidenced in cells studied in test tubes, which divide about 40-60 times before they stop (Bartlett, 2014). But what is the mechanism behind this cellular senescence? At the end of each chromosomal strand is a sequence of DNA that does not code for any particular protein, but protects the rest of the chromosome, which is called a telomere. With each replication, the telomere gets shorter. Once it becomes too short the cell does one of three things. It can stop replicating by turning itself off, called cellular senescence. It can stop replicating by dying, called apoptosis. Or, as in the development of cancer, it can continue to divide and become abnormal. Senescent cells can also create problems. While they may be turned off, they are not dead, thus they still interact with other cells in the body and can lead to an increased risk of disease. When we are young, senescent cells may reduce our risk of serious diseases such as cancer, but as we age they increase our risk of such problems (NIA, 2011a). Understanding why cellular senescence changes from being beneficial to being detrimental are still under investigation. The answer may lead to some important clues about the aging process.
DNA Damage: Over time DNA, which contains the genetic code for all organisms, accumulates damage. This is usually not a concern as our cells are capable of repairing damage throughout our life. Further, some damage is harmless. However, some damage cannot be repaired and remains in our DNA. Scientists believe that this damage, and the body’s inability to fix itself, is an important part of aging (NIA, 2011a). As DNA damage accumulates with increasing age, it can cause cells to deteriorate and malfunction (Jin, 2010). Factors that can damage DNA include ultraviolet radiation, cigarette smoking, and exposure to hydrocarbons, such as auto exhaust and coal (Dollemore, 2006).

Mitochondrial Damage: Damage to mitochondrial DNA can lead to a decaying of the mitochondria, which is a cell organelle that uses oxygen to produce energy from food. The mitochondria convert oxygen to adenosine triphosphate (ATP) which provides the energy for the cell. When damaged, mitochondria become less efficient and generate less energy for the cell and can lead to cellular death (NIA, 2011a).

Free Radicals: When the mitochondria use oxygen to produce energy, they also produce potentially harmful byproducts called oxygen free radicals (NIA, 2011a). The free radicals are missing an electron and create instability in surrounding molecules by taking electrons from them.
Immune and Hormonal Stress Theories: Ever notice how quickly U.S. presidents seem to age? Before and after photos reveal how stress can play a role in the aging process.

To understand how this stress affects aging, researchers note that both problems with the innate and adaptive immune system play a key role. The **innate immune system** is made up of the skin, mucous membranes, cough reflex, stomach acid, and specialized cells that alert the body of an impending threat. With age these cells lose their ability to communicate as effectively, making it harder for the body to mobilize its defenses. The **adaptive immune system** includes the tonsils, spleen, bone marrow, thymus, circulatory system and the lymphatic system that work to produce and transport T cells. T-cells, or lymphocytes, fight bacteria, viruses, and other foreign threats to the body. T-cells are in a “naïve” state before they are programmed to fight an invader and become “memory cells”. These cells now remember how to fight a certain infection should the body ever come across this invader again. Memory cells can remain in your body for many decades, and why the measles vaccine you received as a child is still protecting you from
this virus today. As older adults produce fewer new T-cells to be programmed, they are less able to fight off new threats
and new vaccines work less effectively. The reason why the shingles vaccine works well with older adults is that they
already have some existing memory cells against the varicella virus. The shingles vaccine is acting as a booster (NIA,
2011a).

**Hormonal Stress Theory**, also known as **Neuroendocrine Theory of Aging**, suggests that as we age the ability of the
hypothalamus to regulate hormones in the body begins to decline to lead to metabolic problems (American Federation of
Aging Research (AFAR) 2011). This decline is linked to an excess of the stress hormone cortisol. While many of the
body’s hormones decrease with age, cortisol does not (NIH, 2014a). The more stress we experience, the more cortisol
released, and the more hypothalamic damage that occurs. Changes in hormones have been linked to several metabolic
and hormone-related problems that increase with age, such as diabetes (AFAR, 2011), thyroid problems (NIH, 2013),
osteoporosis, and orthostatic hypotension (NIH, 2014a).

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**Physical Changes of Aging**

- Heart muscles thicken with age
- Arteries become less flexible
- Lung capacity diminishes
- Kidneys become less efficient in removing waste from the blood
- Bladder loses its ability to store urine
- Brain cells also lose some functioning, but new neurons can also be produced.

**Body Changes:** Everyone’s body shape changes naturally as they age. According to the National Library of Medicine
(2014) after age 30 people tend to lose lean tissue, and some of the cells of the muscles, liver, kidney, and other organs
are lost. Tissue loss reduces the amount of water in your body and bones may lose some of their minerals and become
less dense (a condition called osteopenia in the early stages and osteoporosis in the later stages). The amount of body
fat goes up steadily after age 30, and older individuals may have almost one third more fat compared to when they were
younger. Fat tissue builds up toward the center of the body, including around the internal organs.

**Skin, Hair and Nails:** With age skin becomes thinner, less elastic, lose fat, and no longer looks plump and smooth.
Veins and bones can be seen easier, and scratches, cuts, and bumps can take longer to heal. Years exposed to the sun
may lead to wrinkles, dryness, age spots, and cancer. Older people may bruise more easily, and it can take longer for
these bruises to heal. Some medicines or illnesses may also cause bruising. Gravity can cause the skin to sag and
wrinkle, and smoking can wrinkle the skin. Also, seen in older adults are age spots, previously called “liver spots”. They
look like flat, brown spots and are often caused by years in the sun. Skin tags are small, usually flesh-colored growths of
skin that have a raised surface. They become common as people age, especially for women, but both age spots and
skin tags are harmless (NIA, 2015f).
**Height and Weight:** The tendency to become shorter as one age occurs among all races and both sexes. Height loss is related to aging changes in the bones, muscles, and joints. People typically lose almost one-half inch every 10 years after age 40, and height loss is even more rapid after age 70. A total of 1 to 3 inches in height is lost with aging. Changes in body weight vary for men and women. Men often gain weight until about age 55, and then begin to lose weight later in life, possibly related to a drop in the male sex hormone testosterone. Women usually gain weight until age 65, and then begin to lose weight. Weight loss later in life occurs partly because fat replaces lean muscle tissue, and fat weighs less than muscle. Diet and exercise are important factors in weight changes in late adulthood (National Library of Medicine, 2014).

**Sarcopenia** is the loss of muscle tissue as a natural part of aging. Sarcopenia is most noticeable in men, and physically inactive people can lose as much as 3% to 5% of their muscle mass each decade after age 30, but even when active
muscle loss still occurs (Webmd, 2016). Symptoms include a loss of stamina and weakness, which can decrease physical activity and subsequently further shrink muscles. Sarcopenia typically happens faster around age 75, but it may also speed up as early as 65 or as late as 80. Factors involved in sarcopenia include a reduction in nerve cells responsible for sending signals to the muscles from the brain to begin moving, a decrease in the ability to turn protein into energy, and not receiving enough calories or protein to sustain adequate muscle mass. Any loss of muscle is important because it lessens strength and mobility, and sarcopenia is a factor in frailty and the likelihood of falls and fractures in older adults. Maintaining strong leg and heart muscles are important for independence. Weight-lifting, walking, swimming, or engaging in other cardiovascular exercises can help strengthen the muscles and prevent atrophy.

Sensory Changes in Late Adulthood

**Vision:** In late adulthood, all the senses show signs of decline, especially among the oldest-old. In the last chapter, you read about the visual changes that were beginning in middle adulthood, such as presbyopia, dry eyes, and problems seeing in dimmer light. By later adulthood, these changes are much more common. Three serious eye diseases are more common in older adults: Cataracts, macular degeneration, and glaucoma. Only the first can be effectively cured in most people.

Cataracts are a **clouding of the lens of the eye.** The lens of the eye is made up of mostly water and protein. The protein is precisely arranged to keep the lens clear, but with age, some of the protein starts to clump. As more of the protein clumps together the clarity of the lens is reduced. While some adults in middle adulthood may show signs of cloudiness in the lens, the area affected is usually small enough to not interfere with vision. More people have problems with cataracts after age 60 (NIH, 2014b) and by age 75, 70% of adults will have problems with cataracts (Boyd, 2014). Cataracts also cause a discoloration of the lens, tinting it more yellow and then brown, which can interfere with the ability to distinguish colors such as black, brown, dark blue, or dark purple.

darkest red color on the map, more than 990 out of 100,00 people have a shortened lifespan due to the disability caused by cataracts.
age-related macular degeneration, which is the loss of clarity in the center field of vision, due to the deterioration of the macula, the center of the retina. Macular degeneration does not usually cause total vision loss, but the loss of the central field of vision can greatly impair day-to-day functioning. There are two types of macular degeneration: dry and wet. The dry type is the most common form and occurs when tiny pieces of a fatty protein called drusen form beneath the retina. Eventually the macular becomes thinner and stops working properly (Boyd, 2016). About 10% of people with macular degeneration have the wet type, which causes more damage to their central field of vision than the dry form. This form is caused by abnormal development of blood vessels beneath the retina. These vessels may leak fluid or blood causing more rapid loss of vision than the dry form.

glaucoma, which is the loss of peripheral vision, frequently due to a buildup of fluid in the eye that damages the optic nerve. As you age the pressure in the eye may increase causing damage to the optic nerve. The exterior of the optic nerve receives input from retinal cells on the periphery, and as glaucoma progresses more and more of the peripheral visual field deteriorates toward the central field of vision. In the advanced stages of glaucoma, a person can lose their sight. Fortunately, glaucoma tends to progress slowly (NEI, 2016b). Glaucoma is the most common cause of blindness in the U.S. (NEI, 2016b). African Americans over age 40 and everyone else over age 60 has a higher risk for glaucoma.

Hearing: As you read in Chapter 8, our hearing declines both in terms of the frequencies of sound we can detect, and the intensity of sound needed to hear as we age. These changes continue in late adulthood. Almost 1 in 4 adults aged 65 to 74 and 1 in 2 aged 75 and older have disabling hearing loss (NIH, 2016). Table 9.4 lists some common signs of hearing loss.
Presbycusis is a common form of hearing loss in late adulthood that results in a gradual loss of hearing. It runs in families and affects hearing in both ears (NIA, 2015c). Older adults may also notice tinnitus, a ringing, hissing, or roaring sound in the ears. The exact cause of tinnitus is unknown, although it can be related to hypertension and allergies. It may come and go or persist and get worse over time (NIA, 2015c). The incidence of both presbycusis and tinnitus increase with age and males have higher rates of both around the world (McCormak, Edmondson-Jones, Somerset, & Hall, 2016).

Taste and Smell: Our sense of taste and smell are part of our chemical sensing system. Our sense of taste, or gustation, appears to age well. Normal taste occurs when molecules that are released by chewing food stimulate taste buds along with the tongue, the roof of the mouth, and in the lining of the throat. These cells send messages to the brain, where specific tastes are identified. After age 50 we start to lose some of these sensory cells. Most people do not notice any changes in taste until one’s 60s (NIH: Senior Health, 2016b). Given that the loss of taste buds is very gradual, even in late adulthood, many people are often surprised that their loss of taste is most likely the result of a loss of smell.

Table 9.3 Common Signs of Hearing Loss

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<th>Common Signs of Hearing Loss</th>
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<tbody>
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<td>* Have trouble hearing over the telephone</td>
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<td>* Find it hard to follow conversations when two or more people are talking</td>
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<td>* Often ask people to repeat what they are saying</td>
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<td>* Need to turn up the TV volume so loud that others complain</td>
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<td>* Have a problem hearing because of background noise</td>
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<td>* Think that others seem to mumble</td>
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<td>* Cannot understand when women and children are speaking</td>
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Adapted from NIA, 2015c

Loss of smell due to aging is called presbyopia. Olfactory cells are located in a small area high in the nasal cavity. These cells are stimulated by two pathways; when we inhale through the nose, or via the connection between the nose and the throat when we chew and digest food. It is a problem with this second pathway that explains why some foods

Table 9.4

<table>
<thead>
<tr>
<th>Types of Smell Disorders</th>
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<tbody>
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<td>Presbyosmia</td>
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<td>Hyposmia</td>
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<td>Anosmia</td>
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<td>Dysosmia</td>
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<td>Phantosmia</td>
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<th>Loss of smell due to aging</th>
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<tbody>
<tr>
<td>Smell loss due to aging</td>
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<tr>
<td>Loss of only certain odors</td>
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<tr>
<td>Total loss of smell</td>
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<td>Change in the perception of odors. Familiar odors are distorted.</td>
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<td>Smell odors that are not present</td>
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Adapted from NIH Senior Health: Problems with Smell

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Updated: Wed, 02 Jun 2021 01:59:17 GMT
Powered by
such as chocolate or coffee seem tasteless when we have a head cold. There are several types of loss of smell. *Total loss of smell*, or *anosmia*, is extremely rare.

**Touch:** Research has found that with age, people may experience reduced or changed sensations of vibration, cold, heat, pressure, or pain (Martin, 2014). Many of these changes are also aligned with a number of medical conditions that are more common among the elderly, such as diabetes. However, there are changes in the touch sensations among healthy older adults. The ability to detect changes in pressure have been shown to decline with age, with it being more pronounced by the 6th decade and diminishing further with advanced age (Bowden & McNelty, 2013). Yet, there is considerable variability, with almost 40% showing sensitivity that is comparable to younger adults (Thornbury & Mistretta, 1981). However, the ability to detect the roughness/smoothness or hardness/softness of an object shows no appreciable change with age (Bowden & McNulty, 2013). Those who show increasing insensitivity to pressure, temperature, or pain are at risk for injury (Martin, 2014).

**Pain:** According to Molton and Terrill (2014), approximately 60%-75% of people over the age of 65 reports at least some chronic pain, and this rate is even higher for those individuals living in nursing homes. Although the presence of pain increases with age, older adults are less sensitive to pain than younger adults (Harkins, Price, & Martinelli, 1986). Farrell (2012) looked at research studies that included neuroimaging techniques involving older people who were healthy and those who experienced a painful disorder. Results indicated that there were age-related decreases in brain volume in those structures involved in pain. Especially noteworthy were changed in the prefrontal cortex, brainstem, and hippocampus. Women are more likely to identify feeling pain than men (Tsang et al., 2008). Women have fewer opioid receptors in the brain, and women also receive less relief from opiate drugs (Garrett, 2015).
Nutrition
dairy products such as milk, cheeses, and yogurts. Unfortunately, changes in sensory functions, such as smell and taste, along with loss of teeth, can derail an older adult's ability to eat right.

Chronic Conditions

Chronic illnesses are illnesses that are ongoing, generally incurable conditions that require continuous medical attention and affect daily life. As individuals live longer, diseases that affect older individuals will become more prevalent, and the burden of chronic illness grows with age. Less than 50% of adults 50-64 have a chronic condition, 90% aged 75 and up do (Cohen, 2011). Almost 80% have at least one chronic disease, and 77% have at least two (National Council on Aging, 2019). Older women are more likely to have a chronic condition than are older men (83% vs. 88%) (CDC, 2009). Table 9.6 lists the percentage of older adults who have certain chronic illnesses based on the National Health Survey conducted in 2014. Other studies place the figure of diabetes in older adults at 26% (CDC, 2014).

<table>
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<tr>
<th>Percentage of Older Adults with Chronic Conditions</th>
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<td>High cholesterol</td>
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<td>Hypertension</td>
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<td>Arthritis</td>
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<td>Cancer</td>
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<td>Diabetes</td>
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<td>Heart disease</td>
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<td>Ulcers</td>
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<td>Stroke</td>
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<td>Asthma</td>
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<td>Kidney disease</td>
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<td>Chronic bronchitis</td>
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<td>Emphysema</td>
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Cancer and Major Cardiovascular Disease: As discussed in chapter 8, cancer and cardiovascular disease are the overall leading causes of death, and they are especially high reasons for death in middle and late adults. Table 9.7 identifies the percentages of deaths due to cancer and cardiovascular disease for selected age groups in 2016; the most recent year for data (Heron, 2018).
Cancer: Advancing age is a significant risk factor for cancer, with persons over 65 accounting for 60% of newly diagnosed cancer and 70% of all cancer deaths (Berger et al., 2006). Additionally, more than 70% of the mortality associated including prostate, bladder, colon, uterus, pancreas, stomach, rectum and lung occurs in patients 65 and older. Other conditions that affect the elderly can occur with cancer, including anemia, coronary artery diseases, congestive heart failure, chronic obstructive pulmonary diseases, renal insufficiency, cerebrovascular diseases, neurovascular complications of diabetes mellitus, and arthritis that restricts mobility (Balducci & Extermann, 2000). Comorbidity will complicate treatment.

Heart Disease: There are changes to the heart that happen with age, and some may increase a person’s risk of heart disease. These include stiffening blood vessels and valves, which may result in leaks or problems pumping blood out of the heart (NIA, 2012). As previously stated, heart disease is the leading cause of death for those in late adulthood (CDC, 2016b). There are different types of heart disease, and as already discussed in chapter 8, the most common is atherosclerosis, the buildup of fatty deposits or plaques in the walls of arteries. As plaque builds up, blood is unable to flow normally and bring oxygen throughout the body, including to the heart. Depending on where the buildup is, atherosclerosis can cause a heart attack, leg pain, or a stroke. However, Atherosclerosis is not part of normal aging. Many of the problems older people have with their heart and blood vessels are caused by disease and not by aging. For example, an older heart can normally pump blood as strong as a younger heart, while less ability to pump blood is caused by disease. Therefore, leading a heart-healthy lifestyle is most important to keeping one’s heart strong in late adulthood.

Arthritis: Arthritis and other rheumatic conditions are the most common cause of disability among US adults and have been the most common cause of disability among US adults for the past 15 years (NIH: National Institute of Arthritis and Musculoskeletal and Skin Diseases, 2014). According to the NIH, approximately 62% of adults with arthritis are 65 years old and up. Almost 1 in 2 older adults with arthritis have some degree of mobility limitations, such as climbing stairs, walking, and grasping objects. The pain and other limitations of arthritis can also increase the risk of depression and other forms of mental distress. Osteoarthritis is the most common type of arthritis. “When the cartilage, the slick, cushioning surface on the ends of bones wears away, bone rubs against bone, causing pain, swelling, and stiffness. Over time, joints can lose strength and pain may become chronic” (Arthritis Foundation, 2017, para 3). Common risk factors for osteoarthritis include genetics, obesity, age, previous injury, and other medical conditions.

Osteoporosis and Kyphosis: Osteoporosis is a disease that thins and weakens bones to the point that they become fragile and break easily. After age 50, 1 in 2 women and 1 in 4 men will experience an osteoporosis-related fracture in their lifetime, often leading to hip, spine, and wrist fractures (Dailey & Cravedi, 2006). Broken hips are a very serious problem as we age. They greatly increase the risk of death, especially during the year after they break (NIH Senior Health, 2015). In the U.S., more than 53 million adults either already have osteoporosis or at high risk due to low bone mass (NIH Senior Health, 2015). As bones weaken in the spine, adults gradually lose height and their posture becomes
hunched over, which is called Kyphosis. Over time a bent spine can make it hard to walk or even sit up. Adults can prevent the loss of bone mass by eating a healthy diet with enough calcium and vitamin D, regularly exercising, limiting alcohol, and not smoking (National Osteoporosis Foundation, 2016).

Chronic obstructive pulmonary disease (COPD) is a progressive lung disease in which the airways become damaged making it difficult to breathe. COPD includes problems such as emphysema and chronic bronchitis (NIH Senior Health, 2013). COPD kills more than 120,000 people every year, making it one of the leading causes of death. COPD was once considered a “man’s disease”. However, since 2000, 58% of those with COPD are women and they comprise 8% of all women (American Lung Association, 2019). Research has indicated that women may be more susceptible to the effects of cigarette smoke due to having smaller lungs and estrogen worsening the effects.

cirrhosis, which is a disease in which the liver becomes scarred and does not function properly. While some people with ATT deficiency are not affected and live a normal life, COPD is more likely to occur in such individuals if their lungs are exposed to environmental irritants.
**Shingles:** According to the National Institute on Aging (2015e), the **shingle** is a disease that affects your nerves. Shingles are caused by the same virus as chickenpox, the varicella-zoster virus (VZV). After you recover from chickenpox, the virus continues to live in some of your nerve cells. It is usually inactive, and most adults live with VZV in their bodies and never get shingles. However, the virus will become active in one in three adults. Instead of causing chickenpox again, it produces shingles. A **risk factor for shingles includes advanced age as people have a harder time fighting off infections as they get older.** About half of all shingles cases are in adults age 60 or older, and the chance of getting shingles becomes much greater by age 70. Other factors that weaken an individual’s ability to fight infections, such as cancer, HIV infections, or other medical conditions, can put one at a greater risk for developing shingles.

![Shingles Rash](source)

Some people may be left with ongoing pain, called post-herpetic neuralgia (PHN) in the area where the rash had been (NIA, 2015e). The older one is when getting shingles, the greater the chance of developing PHN. Some people with PHN find it hard to go about their daily activities, like dressing, cooking and eating. They can also suffer from depression, anxiety, and sleeplessness. Medicines can help with pain and usually, PHN will disappear. Unfortunately, the blisters from shingles may become infected or leave a scar. Blisters near or in the eye can cause lasting eye damage or blindness. A brief paralysis of the face, hearing loss, and very rarely, swelling of the brain (encephalitis) can also occur. There is a shingles vaccine that is recommended for those aged 50 and older. Shingles are not contagious, but one can catch chickenpox from someone with shingles.

**Beliefs about Health:** Despite the fact that the majority of older adults have at least one chronic illness, most rate their overall health positively (Graham, 2019). Based on the results of the CDC’s 2017 National Health Interview Survey, 82% of those aged 65-74 and 73% of those 75 and older rated their health as excellent, very good or good. Because older adults focus more on emotional well-being, positive social relationships, remaining active, and overall life satisfaction, poor physical functioning is not considered as important. Older adults often look to those who are worse off than themselves, including those having died or are in a nursing home, and consequently feel more positive about themselves. This perspective is in contrast to those younger who believe that there should not be anything wrong with them, and consequently experience negative feelings when they have an illness. Older adults expect there will be some deterioration in their health and are able to adapt to it. Similarly, most older adults identify positive mental health in conjunction with their physical health.

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**Brain Functioning**

**Continued Neurogenesis:** Researchers at the University of Chicago found that new neurons continued to form into old age. Tobin et al. (2019) examined the post-mortem brain tissue of individuals between the ages of 79 and 99 (average...
age 90.6) and found evidence of neurogenesis in the hippocampus. Approximately 2000 neural progenitor cells and 150,000 developing neurons were found per brain, although the number of developing neurons was lower in people with cognitive impairments or Alzheimer’s disease. Tobin et al. hypothesized that the lower levels of neurogenesis in the hippocampus were associated with symptoms of cognitive decline and reduced synaptic plasticity.

**Scaffolding Theory of Aging and Cognition** which states that the brain adapts to neural atrophy (dying of brain cells) by building alternative connections, referred to as scaffolding. This scaffolding allows older brains to retain high levels of performance. Brain compensation is especially noted in the additional neural effort demonstrated by those individuals who are aging well. For example, older adults who performed just as well as younger adults on a memory task used both prefrontal areas, while only the right prefrontal cortex was used in younger participants (Cabeza, Anderson, Locantore, & McIntosh, 2002). Consequently, this decrease in brain lateralization appears to assist older adults with their cognitive skills.

**Healthy Brain Functioning:** Cheng (2016) found that physical activity and stimulating cognitive activity resulted in significant reductions in the risk of neurocognitive disorders in longitudinal studies. Physical activity, especially aerobic exercise, is associated with less age-related gray and white matter loss, as well and diminished neurotoxins in the brain. Overall, physical activity preserves the integrity of neurons and brain volume. Cognitive training improves the efficiency of the prefrontal cortex and executive functions, such as working memory, and strengthens the plasticity of neural circuits. Both activities support **cognitive reserve**, or "the structural and dynamic capacities of the brain that buffer against atrophies and lesions" (p. 85). Although it is optimal to begin physical and cognitive activities earlier in life, it is not too late to start these programs in late adulthood to improve one’s cognitive health.

**Can we improve brain functioning?** Many training programs have been created to improve brain functioning. **ACTIVE** (Advanced Cognitive Training for Independent and Vital Elderly), a study conducted between 1999 and 2001 in which 2,802 individuals age 65 to 94, suggests that the answer is “yes”. These racially diverse participants received 10 group training sessions and 4 follow up sessions to work on tasks of memory, reasoning, and speed of processing. These mental workouts improved cognitive functioning even 5 years later. Many of the participants believed that this improvement could be seen in everyday tasks as well (Tennstedt et al., 2006). However, programs for the elderly on memory, reading, and processing speed training demonstrate that there is an improvement in the specific tasks trained.
but there is no generalization to other abilities (Jarrett, 2015). Further, these programs have not been shown to delay or slow the progression of Alzheimer’s disease. Although these programs are not harmful, “physical exercise, learning new skills, and socializing remain the most effective ways to train your brain” (p. 207). These activities appear to build a reserve to minimize the effects of primary aging of the brain.

**Parkinson’s disease** is characterized by motor tremors, loss of balance, poor coordination, rigidity, and difficulty moving (Garrett, 2015). Parkinson’s affects approximately 1% of those over the age of 60, and it appears more frequently in family members in a little less than 10% of cases. Twenty-eight chromosomal areas have been implicated in Parkinson’s disease, but environmental factors have also been identified and include brain injury. Being knocked unconscious once increases the risk by 32% and being knocked out several times increases the risk by 174% (Garrett, 2015). Other environmental influences include toxins, industrial chemicals, carbon monoxide, herbicides and pesticides (Olanow & Tatton, 1999). The symptoms are due to the deterioration of the substantia nigra, an area in the midbrain whose neurons send dopamine-releasing axons to the basal ganglia which affect motor activity. Treatment typically includes the medication levodopa (L-dopa), which crosses the blood-brain barrier and is converted into dopamine in the brain. Deep brain stimulation, which involves inserting an electrode into the brain that provides electrical stimulation, has resulted in improved motor functioning (Garrett, 2015).

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**Sleep**

but they tend to go to sleep earlier and get up earlier than those younger. This pattern is called **advanced sleep phase syndrome** and is based on changes in circadian rhythms (National Sleep Foundation, 2009). There are sleep problems in older adults, and insomnia is the most common problem in those 60 and older (NIA, 2016). People with **insomnia** have trouble falling asleep and staying asleep. There are many reasons why older people may have insomnia, including certain medications, being in pain, having a medical or psychiatric condition, and even worrying before bedtime about not being able to sleep. Using over the counter sleep aids or medication may only work when used for a short time. Consequently, sleep problems should be discussed with a health care professional.

**Sleep apnea** refers to repeated short pauses in breathing, while an individual sleeps, which can lead to reduced oxygen in the blood. Snoring is a common symptom of sleep apnea and it often worsens with age. Untreated sleep apnea can lead to impaired daytime functioning, high blood pressure, headaches, stroke, and memory loss. **Restless legs syndrome** feels like there is tingling, crawling, or pins and needles in one or both legs, and this feeling is worse at night. **Periodic limb movement disorder** causes people to jerk and kick their legs every 20 to 40 seconds during sleep. **Rapid eye movement sleep behavior disorder** occurs when one’s muscles can move during REM sleep and sleep is disrupted.

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Sexuality

Causes of Sexual Problems: According to the National Institute on Aging (2013), chronic illnesses including arthritis (joint pain), diabetes (erectile dysfunction), heart disease (difficulty achieving orgasm for both sexes), stroke (paralysis), and dementia (inappropriate sexual behavior) can all adversely affect sexual functioning. Hormonal changes, physical disabilities, surgeries, and medicines can also affect a senior’s ability to participate in and enjoy sex. How one feels about sex can also affect performance. For example, a woman who is unhappy about her appearance as she ages may think her partner will no longer find her attractive. A focus on youthful physical beauty for women may get in the way of her enjoyment of sex. Likewise, most men have a problem with erectile dysfunction (ED) once in a while, and some may fear that ED will become a more common problem as they age. If there is a decline in sexual activity for a heterosexual couple, it is typically due to a decline in the male’s physical health (Erber & Szuchman, 2015).

Concluding Thoughts: Key players in improving the quality of life among older adults will be those adults themselves. By exercising, reducing stress, stopping smoking, limiting the use of alcohol, and consuming more fruits and vegetables, older adults can expect to live longer and more active lives (He et al., 2005). Stress reduction, both in late adulthood and earlier in life, is also crucial. The reduction of societal stressors can promote active life expectancy. In the last 40 years, smoking rates have decreased, but obesity has increased, and physical activity has only modestly increased.

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