MODULE 2

AGEING PROCESS AND DESIGN

UNIT 1

AGEING PROCESS AND RELATED CHANGES IN BODY SYSTEMS

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DESIRE

DESIGN FOR ALL METHODS TO CREATE AGE-FRIENDLY HOUSING

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DESIRE will provide professionals in the building industry and home furnishings sector with the tools and skills to apply Design4All methods as an integral part of the design process, with the aim to create or adapt age friendly housing as a solution for the wellbeing, comfort and autonomy of the older adults or dependents at home.

The DESIRE training platform consists of six modules and 21 units.

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INTRODUCTION

Module 2 comprises of four training units each having specific aims: Generally, the main aims of this module are to describe the ageing process through related changes in body systems and to empower the readers with tools and methods that would help them to design age-friendly environment. The module starts with the pathophysiological changes specifically for each body system and continues with the overview of the most common diseases of older adults and their impact on the quality of daily life. Afterwards the healthy lifestyle and physical activity as a key to healthy ageing process are presented. The last part of the Module 2 is focused on anthropological aspects of ageing body and its environment.

UNIT 1 – AGEING PROCESS AND RELATED CHANGES IN BODY SYSTEMS

IN A NUTSHELL

This unit describes the changes in various body systems associated with the ageing process. The focus of this unit is on age-related changes in the musculoskeletal system, respiratory system, endocrine system, cardiovascular system, and neurological system. As the structure of the body's systems changes due to the natural ageing process, the ability of older people to function on a day-to-day basis might be changed. Therefore, older adults can have different needs than younger people. One of the ways to maintain the satisfactory level of lifestyle of older adults is to adapt the living environment and design it to enable healthy and independent living. Therefore, professionals responsible for design and construction should be aware of the needs of older people and the changes in bodily functions that come with age

1.1 AGEING AS A NATURAL PROCESS

Ageing is a multifactorial process in which an individual is influenced by various triggers throughout his or her life. Therefore, genetics, socio-cultural, and environmental factors play an important role in the biology of ageing, or as Strohman (2002) says, “The genome suggests, but the phenomenon disposes.” External environmental factors such as temperature, humidity, infections, radiation, etc. trigger mutations by either expressing or altering genetic material to create new genes. These influence internal factors such as hormones, nervous system signals, or immune responses that help maintain homeostatic conditions. Overall, socio-cultural factors, genes and environmental factors enable growth, development and ageing.

1.2 FUNCTIONAL CHANGES OF THE NERVOUS SYSTEM

IN A NUTSHELL

It remains a challenge to accurately explain the ways in which the human nervous system changes throughout life, as physicians, scientists, and professionals working with older adults still have few straightforward answers to many questions about the peripheral and central nervous systems.

Studies that have compared the nervous systems of adults and older adults, or older people with or without neurological disease, have revealed functional, biochemical, and structural differences in the brain and its function (Peters, 2006).

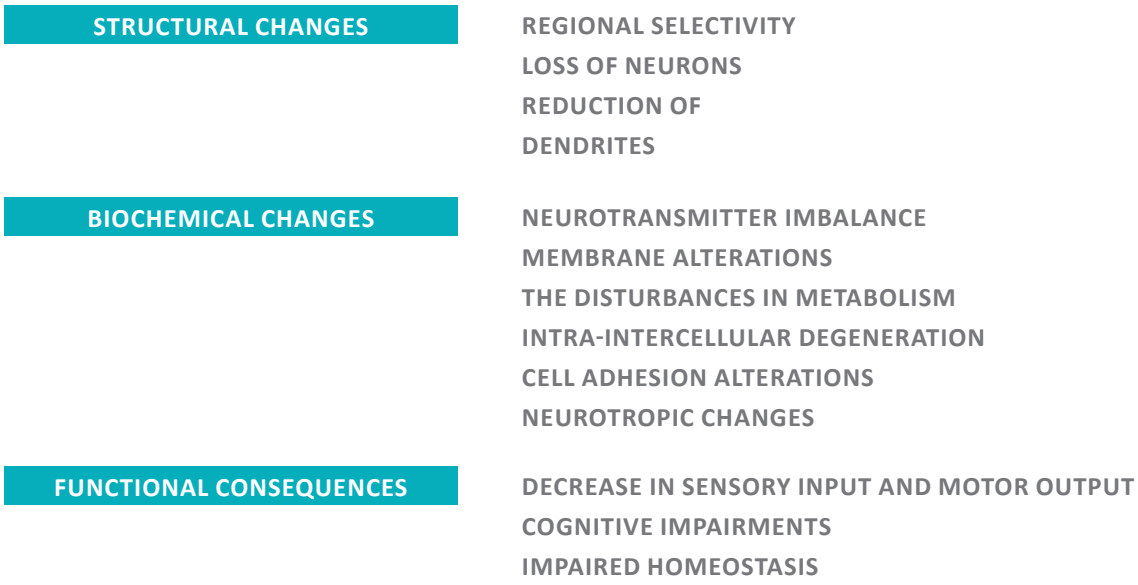

Figure 2.1.1 Most common changes of the nervous system with ageing

1.2.1 Structural changes of neurons, nerves and brain

Ageing affects neural structures differently. The weight and size of the brain between adults and the elderly do not differ significantly (Figure 2.1.2). This slight decrease in brain size, which is a consequence of the normal ageing process, has little functional significance, but some pathologic conditions, described in Chapter 2, may more severely affect brain structure and function and lead to loss of function. On the other hand, ageing leads to increased loss of neurons. The loss of neurons in the brains of healthy older adults is seen in individual areas of the brain and varies widely. In the cerebral cortex and cerebellum, the number of neurons remains constant throughout life, while other areas are more vulnerable to loss. As a compensatory response to neuronal damage, the number of glial cells increases with ageing to protect neuronal function and plasticity (Morrison & Hof, 1997; Peters, 2006). Both neuroglial and microglial cells continue to divide throughout life. Neuroglial cells play a critical role in brain plasticity by modulating neuronal transmission and regeneration. These cells, in addition to supporting neurotransmission, metabolism, and myelination, may also play a role as neuronal precursors.

Dendrites and axons are cell processes that branch from neurons and conduct impulses to or from the cell body and allow communication between neurons via synapses and dendritic spine. The axons of a neuron may be surrounded by a specialized membrane called myelin, which increases the speed of transmission of nerve impulses, or they may be unmyelinated. In some older adults, the number of dendrites and spines may be reduced, resulting in loss of synapses, alteration of neurotransmission, and impaired communication between neurons. However, in normal aging, the loss of dendrites may be minimal, or the lost dendrites may even be supplemented by other dendrites (dendritic growth).

Impaired function of the normal brain in old age may be due to hypoconnectivity and increased brain stiffness rather than neuronal loss. Aging may decrease the plasticity and dynamics of brain processes, while demyelination, axonal swelling, and changes in the number of neurofilaments may also occur.

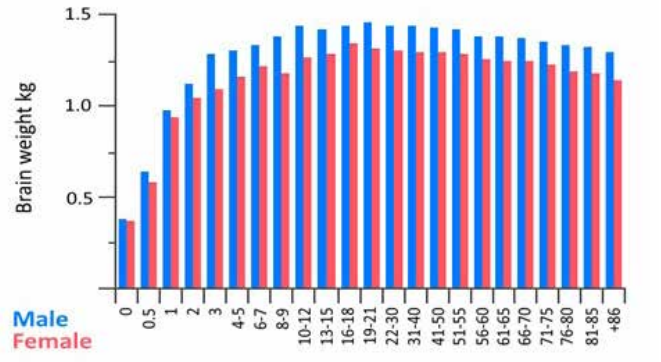

Figure 2.1.2 Brain weight in men and women

1.2.2 Nervous system as movement generator – posture, gait and balance

Balance or the sense of equilibrium is maintained by visual, vestibular, and somatosensory functions of the sensory systems. Information from these sensors is processed in the central nervous system. The vestibular system is located in the inner ear, where it measures the acceleration of the head. In addition, vision and proprioception provide specific information to the brains about the position of the body. The main role of the central nervous system is therefore to modulate information from receptors into coordinated movement pattern. However, when sensory input is diminished, motor responses result in imbalance or disequilibrium (Woollacott et al., 1986).

With age, there is a loss of visual acuity, peripheral vision, depth perception, and contrast sensitivity, which limits the ability to cope with the physical demands of the environment. Due to the loss of proprioception and increased threshold to detect movement, an increase in postural sway is observed in older adults (Shumway-Cook & Woollacott, 2012). In addition, the vestibular and sensorimotor systems are not only affected by ageing, but some medications and diseases can also contribute to balance problems. Additional disease-related neurological pathologies that contribute to posture, gait, and balance can be found in the Unit 2 Overview of the most common diseases in the older population.

1.2.3 Memory

Memory declines in more than 40 % of people over 60. As people age, the different memory systems are affected differently (Hess, 2005).

- Short-term forgetfulness in the elderly is attributed to ageing effects that mean associations cannot be formed as quickly as in younger patients
- Working memory, episodic memory, and prospective memory largely decline
- Procedural memory and part of prospective memory show little age-related change
- Retrieval and encoding of short-term memory decline sharply with age
- Speed of retrieval slows, as does working memory and encoding and retrieval of newly acquired information.
- Semantic memory is not impaired in older adults, provided the information is used frequently, but the ability to recall highly specific information such as names declines;

Working memory can be defined as “any of the various hypothetical systems involved in the brief storage of information in a readily accessible state” (Miller, Galanter & Pribram, 1960). Episodic memory is the ability to remember events that we have personally experienced and that occurred at a specific time and place. Prospective memory refers to the ability to remember to do something in the future, such as remembering to go to a meeting. Procedural memory is long-term memory that refers to knowing how to do something specific, such is to ride a bicycle. It should not be confused with semantic memory, which refers to remembering factual knowledge and concepts that enable us to carry on a conversation or recognise objects, for example. In contrast to these long-term types of memory, short-term memory refers to the reproduction, recognition, or recall of a limited amount of material after a period of about 10 to 30 seconds.

1.3 CHANGES OF THE SENSORY SYSTEM

IN A NUTSHELL

The sensory system takes in information from various stimuli in the environment, such as sounds, smell, taste, or light. Special organs in humans are responsible for identifying the stimuli. For example, we hear voices, see objects, and taste the foods we eat. As we age, our senses become less acute, making it more difficult to perceive and respond to changes in the environment. For this reason, sensory changes can affect the lifestyle of older adults.

1.3.1 Vision

Age-related changes occur in all structures of the eye and have different effects. The tissues of the eyelids slacken and the tension of the muscles around the eyes decreases. There is also less orbital fat. The most noticeable age-related changes occur in the lens, which becomes harder, thicker and therefore less flexible. There is also an increase in the opacity of the lens nucleus, the thickness of the cortex and the anterior lens capsule, which affects the most important ability of the lens, which is to change shape (Owsley, 2016).

Figure 2.1.3 It is important to use contrast when designing an environment for older adults

As these changes become more pronounced as the lens ages, the scattering of light passing through the lens becomes problematic, and older adults may have the problem of light shining directly into their eyes completely blinding them. These changes also limit the ability to distinguish between colours. Blue colours and shades of blue in particular are problematic because the lens selectively absorbs more blue light (Andersen, 2012). As we mentioned earlier, the lens is thicker and therefore stiffer, which allows it to respond to changes in tension. Focusing on near objects is therefore another difficulty for older adults.

Figure 2.1.4 How people with blurred vision see interior of an apartment

As we age, a number of changes occur in the retina. These include accumulation of melanin granules, accumulation of basal deposits on or in Bruch's membrane, accumulation of lipofuscin, and thickening of Bruch's membrane. In addition, the vessels in the eye constrict and the number of photoreceptors decreases. Thus, the deterioration of vision in older adults is due to a combination of factors associated with the normal ageing process.

1.3.2 Hearing loss

Many factors can affect the function of the sensory system, and it is often difficult to distinguish between those related to the normal ageing process and various others. To hear normally, information must be processed and integrated at approximately three levels. Peripheral processing occurs in the outer ear, middle ear, and inner ear, followed by processing by the auditory nerves and central auditory processing in the brainstem and cortex.

With age, there are a number of structural and pathophysiological processes associated with changes in the functional components of the ear. For example, the tympanic membrane, with its primary auditory function of producing vibrations following the impingement of sound waves, thickens. In addition, the muscles and joints in the middle ear become sclerotic, the number of hair cells in the inner ear decreases, and the nerves connected to the auditory centres degenerate. These age-related changes in the inner ear result in a decreased ability to hear high frequencies (Paplou et al., 2021). Another part of the inner ear that is affected by age is the vestibular system, where degenerative changes occur in the semicircular canals, utricle and saccule. Older adults have about half as many vestibular hairs and nerve cells as they did in their youth, which contributes significantly to a decline in vestibular system function.

Figure 2.1.5 Acoustic design for people with hearing loss

In general, one in three people older than 65 suffers from hearing loss, which can be defined as a greater or lesser degree of impairment in the ability to detect sounds. Hearing loss affects communication, and about 25–60 % of people over 65 have communication problems due to hearing loss. Roth, Hanebuth, and Probst (2011) reported that in Europe, the prevalence of hearing loss problems in older adults between 60 and 80 years of age varies from 10 to 55 %. Hearing disorders can also be categorised by the anatomical and physiological changes in the ear itself or by cause, such is noise exposure. For instance, any age-related lesion of the external ear canal or middle ear that affects sound transmission results in conductive hearing loss, while disease-related hearing problems are described in the next Unit 2.

1.3.3 Smell and taste

When smell and taste abnormalities are associated with other age-related physiological changes, the elderly are at high risk of suffering from malnutrition. The actual cause of decreased food intake is not clear; it is more likely that various physiological, pathological, functional, and socioeconomic factors have a strong influence. In older adults, inadequate food intake could lead to "old-age anorexia," which correlates strongly with a diminished sense of smell and taste. Similar to other organs, degeneration and reduction in the number of taste buds occurs with age. As a result, thresholds for taste detection are altered and vary by taste. For example, sweet taste is least affected in the elderly, while the ability to taste salty, bitter, or sour is most affected (Jeon et al., 2021). In addition, olfactory receptors on the roof of the nasal cavity and olfactory nuclei in the brain decline with age, resulting in a decrease in the ability to smell. These changes, along with other hormonal and gastric changes briefly presented in the next units are attributed to the loss of lean body mass and decreased basal metabolic rate with age.

1.4 ENDROCRINE SYSTEM AND HORMONAL REGULATION

IN A NUTSHELL

The altered endocrine system due to age is indirectly responsible for the decline in function and health of older adults. First, the production of hormones via the so-called hypothalamic-pituitary axis is altered and the sensitivity of the axis to respond to negative feedback is altered, and second, glucose homeostasis is disturbed. As a result, there is a loss of bone and muscle mass and an increase in fat mass. Thus, the adverse effects of the alteration of the endocrine system are mainly related to the decline in body functions

1.4.1 Pancreas

The pancreas produces two hormones that are critical for glucose metabolism, glucagon and insulin. With age, some morphological changes in the endocrine function of the pancreas have been noted, which include some degree of atrophy, infiltration of adipose tissue, and fibrosis.

In addition to the hormones already mentioned, several others are responsible for the regulation of carbohydrate metabolism, namely thyroid hormones, glucocorticoids, growth hormones, and epinephrine. From a metabolic perspective, one of the most important hallmarks of the ageing process is the reduction of carbohydrate metabolism

throughout the body (Elahi & Muller, 2000). In particular, glucose sensitivity or glucose tolerance decreases significantly with age, regardless of body mass or gender. As a result, the pancreas must produce more insulin to maintain homeostasis of glucose in and around cells. Another problem is that older adults have lower muscle mass, but the muscles absorb most of the glucose. This could further decrease insulin sensitivity. Other explanations for the insulin resistance phenomenon include various factors such as fat mass, fat distribution, diet composition, physical activity, and glucose uptake capacity.

1.4.2 Thyroid gland

A number of morphological and functional changes are associated with ageing of the thyroid gland. In particular, the structure of the thyroid gland changes with age. The number and size of the follicles and the colloid content decrease, the shape of the nodules changes, and lymphocytic infiltration occurs along with fibrosis of the connective tissue in the thyroid gland. Due to the structural changes, thyroid metabolism changes and secretion of T3 and T4 is reduced. However, the normal ageing process has little effect on serum levels of thyroid hormones, as TSH changes may be indeterminate, normal, or slightly decreased during the healthy ageing process.

1.4.3 Parathyroid gland

Several studies have shown that parathyroid hormone levels increase with age. This is due to decreasing calcium absorption, serum vitamin D levels, and declining renal function. This increase has been associated with osteoporosis and bone loss. In contrast to parathyroid hormone, calcitonin levels appear to decrease with age.

Please note that readers can find the basic changes in the endocrine system that lead to menopause, andropause, adrenopause, and somatopause in men and women in Unit 3 Basic pathophysiology of ageing of Module 1 Introduction to age-friendly and inclusive environments. Readers who want to know more about how hormones affect body composition are therefore invited to read aforementioned module and unit.

1.5 CARDIOVASCULAR SYSTEM ALTERATIONS

The integrity and ability of the myocardium to function as a systolic-diastolic pump normally depends on the extracellular collagen concentration. With age, there is an abnormal increase in extracellular fibrillar collagen, resulting in increased stiffness of the myocardium and altering its compliance. The most striking changes occur in early diastolic (filling) function as diastolic pressure increases. These mechanical changes lead to left ventricular diastolic dysfunction (Singam et al., 2020). Other important changes in the cardiovascular system, such as left ventricular hypertrophy, are described in Module 1. To refresh your knowledge, go back to Unit 3.

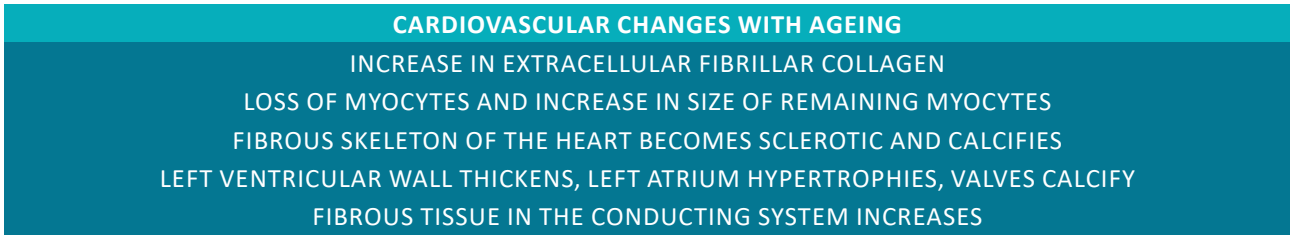

Figure 2.1.6 Cardiovascular changes with ageing

1.5.1 Changing cardiac muscle

Since there is a loss of myocytes with age (about 35 % of myocytes are lost), one would expect the heart muscle to shrink. But the opposite is true: with age, the wall of the left ventricle thickens in both men and women. Studies have shown that this is due to an increase in the size of the remaining myocytes, while the mass of the left ventricle does not increase (Sheydina et al., 2011). The filling rate of the left ventricle decreases by half compared to the peak rate at age 80. However, the volume of blood in the left ventricle at the end of filling does not decrease in the elderly, which is due to the vigorous contractions of the left atrium. During life, these are performed repeatedly and the left atrium adapts to the high force production by hypertrophy. It must be emphasised that the systolic function of the left ventricle at rest is not altered by ageing, nor is the resting cardiac output. On the other hand, the maximum heart rate that can be achieved during exercise decreases with age. Since the organs require more oxygen during physical exertion, the heart muscle must supply the peripheral parts of the body with a greater amount of blood and operate at a higher rate. This is the time when the structural changes of the aged heart become apparent and cardiovascular function is severely impaired during exercise in ageing healthy adults.

One of the most obvious changes is the reduction in maximal heart rate in both sexes (Tanaka et al., 2001) as a result of reduced beta-adrenergic responsiveness, which limits the maximal heart rate that can be achieved. Along with the decreased maximal heart rate, the ability of the myocardium to generate force (or so-called limited contractility) also decreases with age. Together, these two factors reduce cardiac output in older adults. In addition, altered automaticity in the cells

of the sinus node and slower conduction of the electrical signal within the heart increase the possibility of cardiac arrhythmias in older adults (Mirza et al., 2012). Numerous changes also occur in the cardiac vessels, leading to impaired function. Aortic valve sclerosis and moderate to severe aortic regurgitation are most common in the elderly. Calcification of the mitral annulus increases with age, resulting in a less flexible and thicker mitral annulus. This leads to changes in blood flow pathways within the heart.

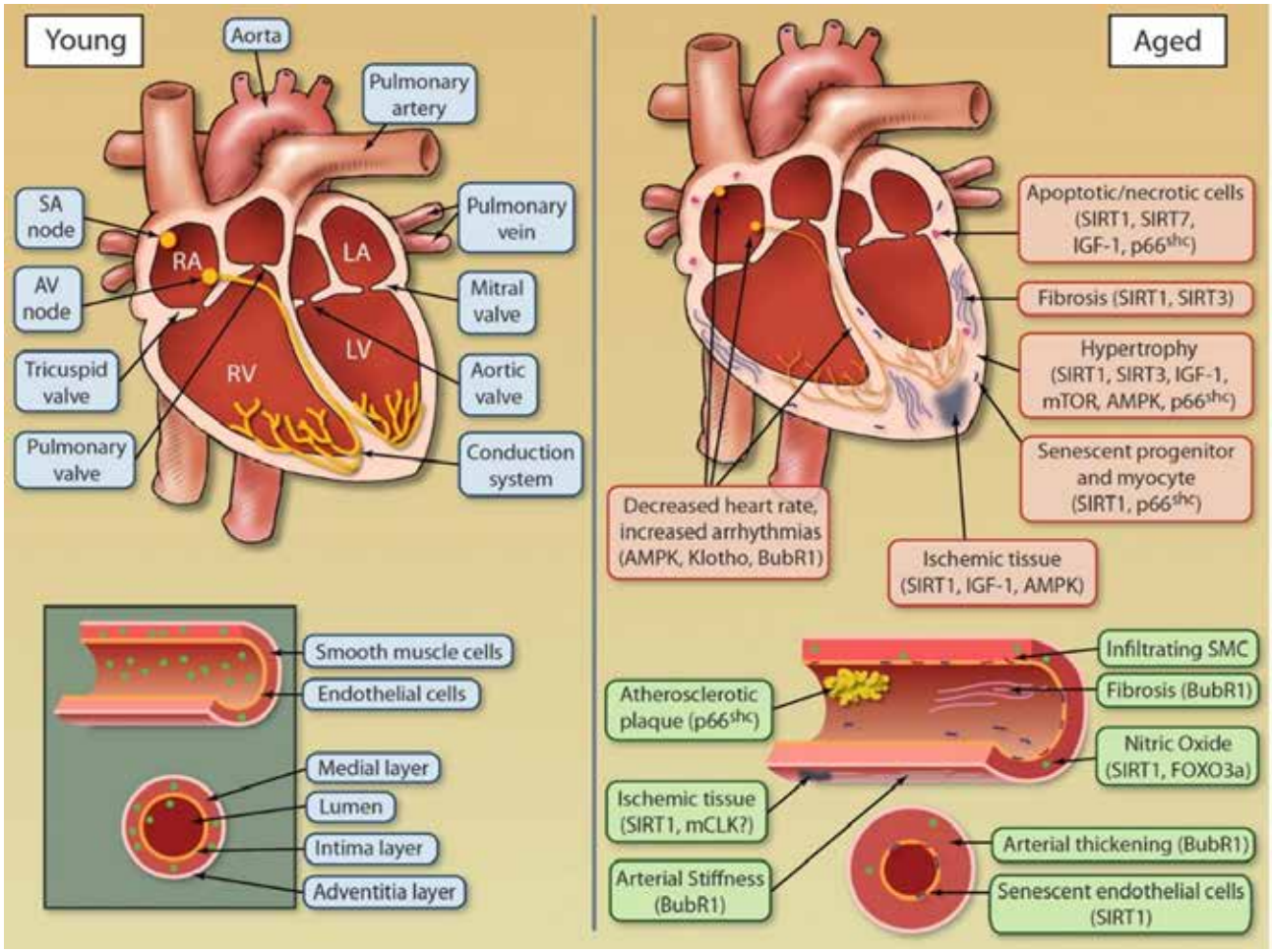

Figure 2.1.7 Age-related changes in the heart and vessels

1.5.2 Age-related changes in vessels

The normal ageing process is accompanied by physiological and structural changes in the arterial vasculature that have functional implications. The most common change is increased systolic blood pressure (Singh et al., 2022). The lumen enlarges and wall thickness increases, with stiffening primarily affecting the arteries (Figure 2.1.7). With age, arterial calcification and changes in elastin-collagen balance lead to a general thickening of the arteries. The stiffening of the vasculature leads to an age-related shift in the velocity of the reflected pulse wave from diastole to late systole. This results in increased systolic workload on the heart, decreased coronary perfusion, and transmission of higher pressures to the end organs. With age, the walls of the peripheral vessels become thicker and stiffer. The walls of the veins also become thicker due to the increase in connective tissue and calcium deposits.

1.6 RESPIRATORY SYSTEM CHANGES

IN A NUTSHELL

With age, various anatomical, immunological, and physiological changes occur in the respiratory system. Structural changes in the chest wall and thoracic spine affect breathing and the ability to cough effectively. Lung volumes changes to maintain normal respiratory function, and dead spaces in the lungs increase. Because of decreased respiratory receptor function, older adults have a delayed response to reduced oxygen delivery and are more susceptible to acute illness and poor outcomes.

During life, the lungs continue to develop and reach their maximum functional capacity in the early third decade of life. Thereafter, there is a gradual decline in function due to normal physiological and structural changes in the lungs and airways.

Anatomic changes in both the lungs and the chest wall, with multiple changes in structure and function, alter lung mechanics, respiratory muscle strength, and ventilatory control. Despite these changes, gas exchange is adequately maintained during the normal ageing process. Age-related changes in lung function leads to a decrease in respiratory reserve during acute illness. Changes in the pulmonary vasculature occur, resulting in an increase in pulmonary vascular stiffness, vascular pressure, and vascular resistance. It is therefore important to have a clear understanding of the changes in respiratory structure and function that accompany ageing, as these changes may affect, for example, the perioperative period of elderly patients (Bowdish, 2019).

- Anatomic changes lead to changes in lung mechanics, respiratory muscle strength, and ventilatory control.
- Changes in pulmonary function leads to a decrease in respiratory reserve during acute illness.
- Changes in pulmonary vasculature leads to increases in pulmonary vascular stiffness, vascular pressure, and vascular resistance.
- Thickening of the alveolar basement membrane leads to a decrease in gas diffusing capacity and an increase in heterogeneity of ventilatory perfusion.
- The decrease in the diameter of the small airways leads to an obstructive flow pattern.
- The conduction zone enlarges, leading to an increase in residual volume and functional residual capacity and a decrease in vital capacity.

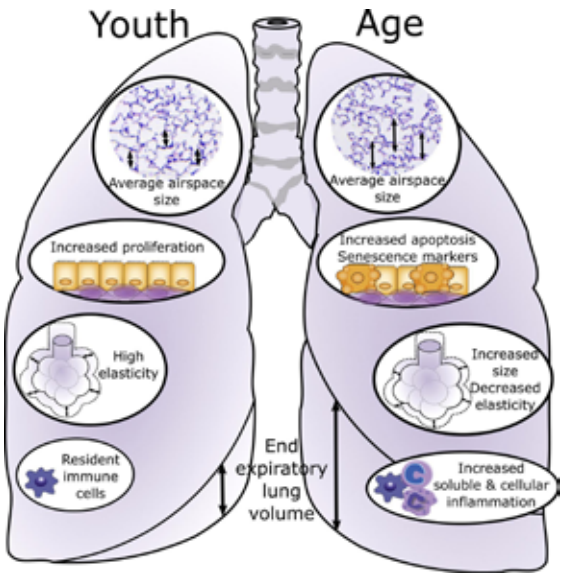

Figure 2.1.8 Changes in the aging lung (Bowdish, 2019)

1.7 FUNCTIONAL CHANGES OF THE NERVOUS SYSTEM

IN A NUTSHELL

Roughly speaking, the gastrointestinal system includes the mouth, stomach, small intestine, large intestine, rectum, and anus. It serves to digest food and fluids and to store, absorb, secrete, synthesize, and excrete macro- and micronutrients and excess substances. With age, the gastrointestinal system changes. Its neuromuscular function changes, the structure of the tract changes, and absorption and secretion functions are reduced (Soenen et al, 2016).

Due to the structural and functional changes in the large and small intestines, the gastrointestinal tract of the elderly operates with lower compliance. This results, for example, in an increased sensory threshold for defecation and an increased urge to defecate. Among these are few gastrointestinal functions that decline significantly with age. One of the most important points could be that gastrointestinal reserves are reduced in older adults. Therefore, they are extremely vulnerable to minor insults and decompensation. The change in taste is another important change that may contribute to a reduction in energy intake and the development of malnutrition in older adults. It is observed that thresholds for sweet, bitter, sour, and salty increase with age, which significantly affects dietary habits (Soenen et al, 2016).

Although not the rule, urinary incontinence may occur in older adults. Certain other age-related changes in the neuromuscular system may contribute to the etiology of incontinence. The tissues around the pelvic floor and bladder outlet weaken and smooth muscle tone decreases, resulting in an inability to stop urine flow.

1.8 MUSCULOSKELETAL SYSTEM

IN A NUTSHELL

One of the known effects of age on bones and skeletal muscles is that the bones become more fragile and the muscles lose their mass. This causes the bones to become more prone to fracture and decreases the muscle strength. Because this can affect mobility and increase the risk of morbidity, interventions to preserve muscle mass and function are an effective way to maintain independence in older adults and reduce mortality.

1.8.1 Ageing of the skeleton

Bone changes occur with the normal ageing process. Overall, different mechanisms lead to a loss of bone mass, a decrease in bone strength, and decreased quality. In humans, bone mass peaks in both men and women in the late 20s. This plateau persists for about a decade and then declines. In addition to age, several factors such as genetics, lifestyle, diet, race, gender, etc. can influence the progression of bone mass loss. Some of these factors may pose an additional risk for the development of osteoporosis. The gradual loss of skeletal mass occurs later in men than in women. While the gradual loss is usually seen between the ages of 40 and 50 in women, it is delayed by 10 years in men (Berger et al., 2008). When bone mass loss begins, it typically decreases by about 1 % per year. However, menopause in women accelerates this rate (Finkelstein et al., 2008).
To explain how bone mass is maintained, we need to understand the balance between resorption and formation of bone. With age, osteoclastic (resorption) activity is greater than osteoblastic (formation) activity, resulting in net bone loss (Boskey & Coleman, 2010). In addition, bone mineral density decreases and the amount of bone formed during remodelling is not as high as in younger years. It should be noted that bone tissue is particularly sensitive to mechanical stress and that the extent of bone mass loss or gain is directly related to the level of physical activity, deconditioning, or disease, so that a lower level of physical activity or a very deconditioned state results in a lower level of bone mass or a greater decrease in bone mass.

To understand why bone becomes more fragile with age, we need to consider the structural changes in the composition and matrix of bone that affect its strength and quality. The ageing process affects bone architecture, the protein composition of the bone matrix, the properties of mineral deposits in bone, the expansion and widening of the medullary cavity, and the accumulation of microfractures in bone. This logically affects the mechanical properties of the bone, such as its elasticity and stress resistance (Wang et al., 2002). Two structurally different forms of bone loss are described in the literature. The main difference between these forms is the rate at which bone mass decreases, either rapidly or slowly. The pathophysiology behind these two forms is beyond the scope of this unit. However, the reader must be aware that both pathways result in structural changes that affect the strength of the bone more than the reduction in bone mass, making the bone more fragile and prone to fracture.

These deteriorations in bone quality could be reduced. And this is due to the forces generated by muscle contractions and by ground reaction forces during impact, which positively stimulate bone remodelling (Novotny et al., 2015). So there seems to be a potential link between muscle quality and skeletal health. However, muscle mass and strength decrease with age, further limiting the potential beneficial effects of muscle contractions on bone health.

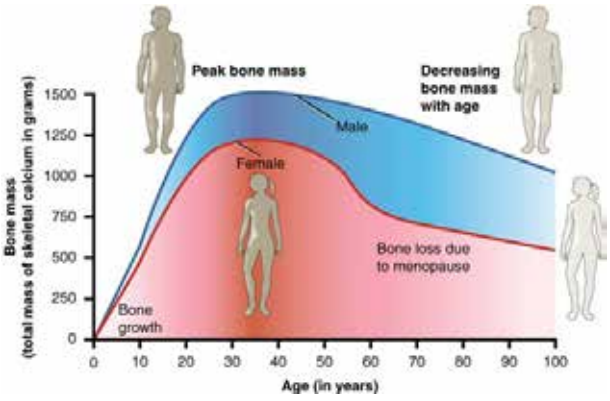

Figure 2.1.9 The rate of change in bone mass in man and women

1.8.2 Ageing of the skeletal muscle

After puberty and until the end of the third decade of life, muscle mass and therefore strength reach their peak. Normally, a decrease in muscle mass is observed in middle age, and around the age of 80, muscle loss usually leads to progressive weakness. In addition, by age 75, about half of the functional muscle is replaced by adipose tissue. The rate and extent to which muscle and muscle mass change is genetic to some degree, but is largely influenced by other factors. The major factors contributing to muscle changes are:

- Loss of neurons due to the decline of the central nervous system,
- Loss of contractile muscle function,
- Hormonal factors (decreased levels of growth hormone, testosterone and oestrogen),
- Increased catabolic mediators,
- Decreased rate of protein synthesis in skeletal muscle.

Other factors associated with muscle loss in the elderly that are more likely to be due to the influence of the external environment are lower levels of physical activity and, in contrast, increased rates of sedentarism, immobilisation, and deconditioning diseases.

Muscle strength is a direct result of muscle mass and the ability to activate muscle. By age 60, it decreases by 20–30 %, and voluntary contractile strength decreases by 20–40 % in both men and women. Physiological and anatomical changes in skeletal muscle due to ageing are directly responsible for these observations. In addition, with age, adipose tissue is deposited in muscle tissue (see Figure 2.1.10) and the lost muscle tissue is replaced by fibrous tissue, further limiting the muscle's ability to exert force.

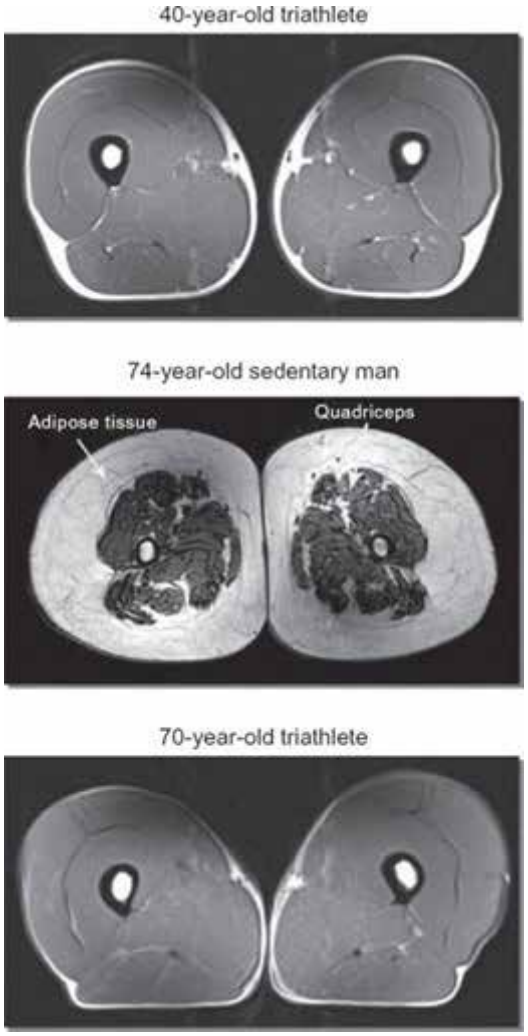

Figure 2.1.10 Differences in the muscles structure of physically active 40 year old individual, 74-year old sedentary individual, and physically active 70 year old individual

The structural quality of the muscle is also affected by ageing. Fibre composition, contractility, fatigue characteristics, and muscle metabolism are altered (Deschenes, 2004). Type II muscle fibres, known as fast-twitch muscle fibres that produce fast and forceful muscle contractions, decline more than type I muscle fibres, known as slow-twitch muscle fibres that produce lower forces but can sustain them longer and are therefore responsible for maintaining posture. One of the most notable functional limitations due to the deficit of type II muscle fibres is the decrease in speed and power in older adults (Trombetti et al., 2016).

Regardless of overall function, there is a strong relationship between muscle quality, muscle mass, strength, and overall health. As mentioned earlier, the forces generated by muscle contractions can be an important factor in bone quality. For example, vertebral compression fractures in postmenopausal women may be due to inadequate support of the spine by the surrounding back muscles. In addition, after a fall, the muscles, rather than the bone, can cushion the high force impact and reduce susceptibility to fracture. Along with the muscles, other soft tissues become stiffer and less flexible. Ligaments and tendons lose strength and stiffness (McCarthy & Hannafin, 2014). These changes are usually most pronounced in weight-bearing joints of knees, hips, and spine.

1.8.3 Changes in body composition

Body composition can be described in terms of two components, fat mass and free fat mass. While a greater proportion of fat mass is observed prior prepuberty, puberty influences the increase in free fat mass. In general, fat mass is greater in women than in men. Already after the age of 20, at the expense of decreasing bone mineral density and the amount of muscle protein, lean body mass also decreases (van Asselt & de Groot, 2017).

AGE	MALE % OF BODY FAT	FEMALE % OF BODY FAT
20–39	up to 20	up to 30
40–59	up to 22	up to 33
60–79	up to 25	up to 35

Figure 2.1.11 Mean body fat percentage of man and women of different age

As we age, the distribution of fat also changes. The proportion of deep body fat increases and the proportion of subcutaneous fat decreases. In addition, fat is shifted to the centre of the body in both sexes. This centralized fat is associated with an increased risk of chronic non-communicable diseases such as type 2 diabetes, dyslipidemia, cardiovascular disease and certain cancers, which are described in the next chapter. The following are some of the key considerations regarding the accumulation of body fat with age:

- The proportion of people with central fat distribution increases,
- Subcutaneous fat on the trunk increases,
- Subcutaneous fat on the limbs decreases,
- Increasing proportion of deep (visceral) fat and decreasing proportion of subcutaneous fat,
- Unfavourable body composition increases the risk of some chronic diseases – non-communicable diseases.

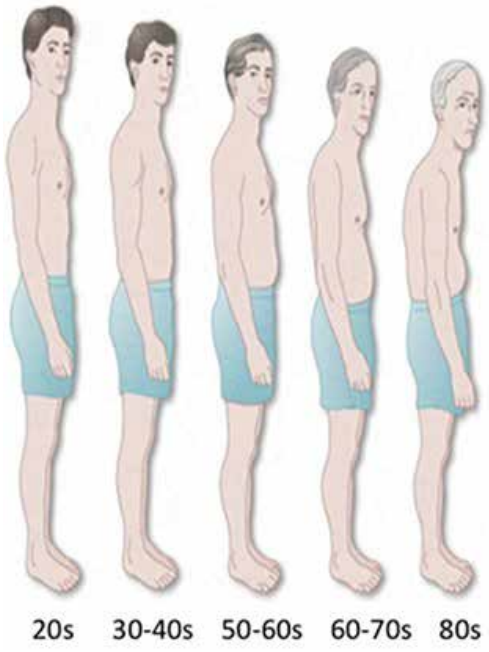

Figure 2.1.12 Changes in body composition with age (Ponti et al, 2020)

1.9 MUSCULOSKELETAL SYSTEM

IN A NUTSHELL

As we age, the skin loses more and more of its structure. The extent of loss is related to intrinsic and extrinsic factors that affect the integrity of the skin. Skin cells age simultaneously at a genetically determined rate and due to other extrinsic factors from the environment that additionally affect skin function.

The layers of the skin are presented at Figure 2.1.13. The outermost layer of the skin, the epidermis, is a multi-layered structure composed of several different cells, each of which plays its specific role. Below this is the dermis, which contains supportive connective tissue and houses hair roots, sweat glands, blood vessels, nerve cells and fibres, and lymphatic vessels. Beneath the dermis is the subcutaneous tissue.
There are approximately two factors that contribute to skin ageing. Intrinsic, which are more genetic and due to the passage of time, and extrinsic, which are caused by environmental factors such as chronic sun exposure. With ageing, structural and functional changes occur in all structures of the skin (Tobin, 2017). All three main layers of the skin become thinner, the number of specific cells decreases, and their function is reduced due to the lower quality of neuronal connections and decreased blood supply. There is also atrophy of blood vessels in the dermis, resulting in thinner and translucent skin that also loses its elasticity. The skin becomes dry and itchy, the ability to sweat decreases and the hair follicles are lost, so that the hair begins to turn grey.

Throughout life, a number of external factors affect the premature ageing of the skin. One of the most common is chronic sun exposure over the years, which leads to significant changes in the skin. For example, it has been estimated that about 80 % of facial skin ageing is due to sun exposure. Some common skin changes attributed to sun exposure are wrinkling, dryness, coarseness, irregular pigmentation, etc. Like most extrinsic factors, these changes are related to the duration and intensity of sun exposure.

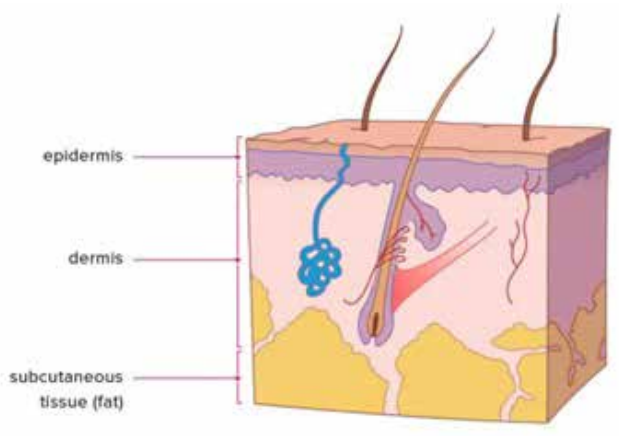

Figure 2.1.13 Skin layers

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MODULE 2

AGEING PROCESS AND DESIGN

UNIT 2

OVERVIEW OF THE MOST COMMON DISEASES IN THE OLDER POPULATION

Nastja Poderkar Loredan • Matic Sašek

DESIRE

DESIGN FOR ALL METHODS TO CREATE AGE-FRIENDLY HOUSING

DESIRE is a European project funded by the Erasmus+ programme.
Project number 2020-1-SK01-KA202-078245.

ISBN 978-80-227-5271-8

DESIRE will provide professionals in the building industry and home furnishings sector with the tools and skills to apply Design4All methods as an integral part of the design process, with the aim to create or adapt age friendly housing as a solution for the wellbeing, comfort and autonomy of the older adults or dependents at home.

The DESIRE training platform consists of six modules and 21 units.

Co-funded by the European Union

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UNIT 2 – OVERVIEW OF THE MOST COMMON DISEASES IN THE OLDER POPULATION

IN A NUTSHELL

The most common pathologies related to musculoskeletal, cardio-vascular, pulmonary, and neurological systems among older adults are described in this unit. Their impact on limitations and needs of older adults in built environment is severe and therefore the professionals in building industry should address it when designing living environment.

2.1 MUSCULOSKELETAL DISORDERS

2.1.1 Structural changes of neurons, nerves and brain

Osteopenia is a skeletal disease characterized by lowered bone mass. Osteopenia is also called a pre-stage of osteoporosis, which is described as a progressive systemic skeletal disease characterized by low bone mass and impairment of bone tissue. Osteoporosis leads to increased bone fragility and susceptibility to fracture (Raisz & Gideon, 2003) Risk factors for osteoporosis are multifactorial and may include older age, female sex, genetics, low levels of physical activity, and smoking (Föger-Samwald et al., 2020).

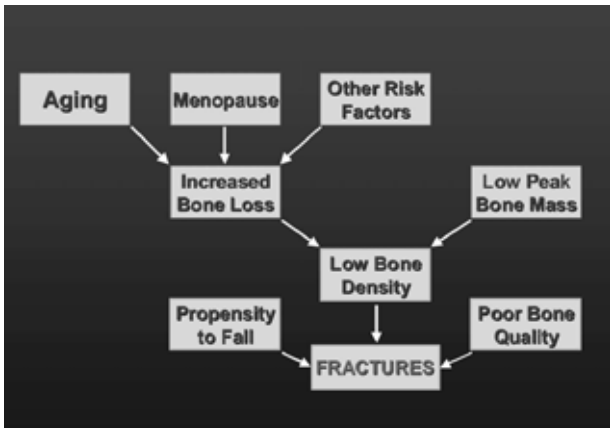

Figure 2.2.1 Bone fracture risk factors

Osteoporosis may affect both sexes, but the brunt of the disease is in menopausal women. It is estimated that approximately 30 % of postmenopausal women have osteoporosis (Bijelic et al., 2017). The major determinants of postmenopausal osteoporosis are suspected to be endocrine deficits due to decreased ovarian function (decreased estrogen levels), reduced dietary intake, and vitamin D deficiency (Karaguzel & Holick, 2010). As a result, there is an imbalance in bone resorption and bone formation. The most common consequence of osteopenia and osteoporosis is therefore reduced bone mass. Aggravation of osteoporosis significantly increases the risk of bone fractures. The most common fractures occur in the hip, spine, followed by arms and lower legs. It is estimated that approximately 50 % of women and 20 % of men will experience a fragility fracture after age 50 (Lorentzon, 2019).

Effective fracture prevention has a major impact on individual morbidity and a significant impact on mortality. Because of the morbid consequences of osteoporosis, prevention of this disease and its associated fractures is considered essential for maintaining the health, quality of life, and independence of the elderly population.

2.1.2 Sarcopenia

One of the changes associated with human ageing is the progressive decline of skeletal muscle mass. This pathological condition is called sarcopenia, and is defined as a progressive and generalized skeletal muscle disorder characterized by low levels of measures for three parameters: **i)** muscle strength, **ii)** muscle quantity/quality, and **iii)** physical performance (Cruz-Jentoft & Sayer, 2019). Recently, low muscle strength overtook the role of low muscle mass as a principal determinant in sarcopenic individuals.

The cause of sarcopenia is multifactorial. Several factors contribute to the onset of disease such as physical inactivity, loss of neurons due to central nervous system decline, loss of muscle contractile function, decreased endocrine function (decreased levels of growth hormone, testosterone and estrogen, and reduced rate of skeletal muscle protein synthesis). Other possible risk factors for sarcopenia include female gender, low birth weight, genetic predisposition, malnutrition, alcohol and cigarette consumption, and chronic diseases.

Figure 2.2.2 Change in muscle mass due to sarcopenia

Sarcopenia can occur in adults over the age of 45 years, increases with age, and is the most prevalent after the age of 70. However, the decrease in muscle mass is now recognized to begin even earlier in life, soon after 30 years of age. The prevalence of sarcopenia varies among age groups and other demographic characteristics and is estimated to be between 1–29 % in individuals aged (Beaudart et al., 2014). Individuals with sarcopenia have increased likelihood of adverse outcomes including falls, fractures, physical disability, cardiac disease, respiratory disease, cognitive impairment, and mortality. In long term sarcopenia leads to lowered quality of life, loss of independence and need for long-term care placement.

Sarcopenia is associated with numerous diseases. One of them is sarcopenic obesity as a new class of obesity in older adults in which low skeletal muscle mass is coupled with high levels of adiposity. Older adults with sarcopenic obesity may have higher levels of cardiovascular risk factors and an increased risk of mortality (Moon, 2016).

If sarcopenia progresses beyond a certain threshold of functional requirements, it leads to disability and frailty. Hence, it should be important to prevent or at least postpone the onset of the disease as much as possible to enhance survival and to reduce the demand for long-term care.

2.1.3 Rheumatoid arthritis

Rheumatoid arthritis is a chronic, autoimmune (immune system attacks healthy cells in the body by mistake) disease affecting the joints (Lin et al., 2020). It is characterized by a progressive inflammation of affected joints bilaterally, resulting in cartilage destruction, bone erosion, and disability (McAllister et al., 2011). Joints in the hands, wrists, and knees are most affected. Other tissues in the body can as well be affected and cause problems in organs such as the lungs, heart, and eyes.

Rheumatoid arthritis affects approximately 1 % of the population in Europe and North America (van der Woude & van der Helm-van Mil, 2018). It affects at least twice as many women as men, and although it can occur at any age, the peak incidence is around the age of 50 years. Other risk factors, beside age, are family history of rheumatoid arthritis, are the genetic factors and exposure to tobacco smoke. Typical articular symptoms are joint pain, stiffness, and swelling. Individuals with rheumatoid arthritis may also experience tender, warm, swollen joints, fatigue, and loss of appetite. Joint stiffness is usually worse in the mornings and after inactivity while pain may be reduced with movement or activity.
Individuals with severe rheumatoid arthritis may have problems with participation in everyday activities due to pain, limited range of motion in affected joints, loss of selective movements especially in hands which can lead to decreased quality of life.

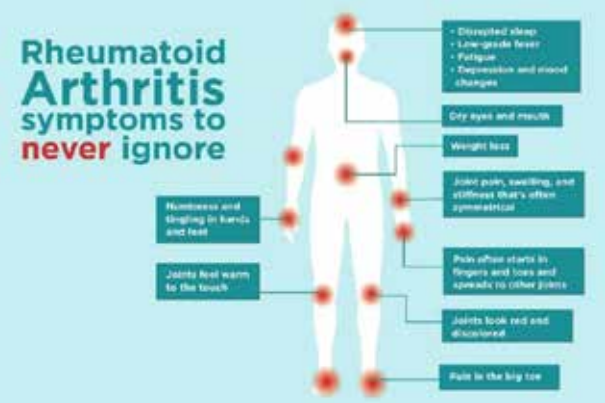

Figure 2.2.3 How rheumatoid arthritis affects the body

2.1.4 Osteoarthritis

Osteoarthritis is the most common form of arthritis (joint inflammation) and a leading cause of pain and disability in older adults. It can be defined as a degenerative disease characterized by focal areas of loss of articular cartilage within the joints, associated with hypertrophy of the bone and thickening of the capsule (Loeser et al., 2012).

Although osteoarthritis can damage any joint, the disease most commonly affects joints in the hands, knees, hips, and spine. Osteoarthritis symptoms often develop slowly and worsen over time. The disease is most common after age 50 and affects more women than men (Palazzo et al., 2016). The prevalence of the disease ranges from 12 % to 22 % and is generally higher in developed countries (Palazzo et al., 2016). The WHO Scientific Group on Rheumatic Diseases estimates that 10 % of the world's population 60 years or older have significant clinical problems attributable to osteoarthritis.

The risk factors for osteoarthritis are multi-factorial and usually include a combination of:

- Age: the risk of the disease increases with age,
- Gender: women are at higher risk,
- Obesity: higher body weight can put more stress on joints. Obesity may also have metabolic effects that increase the risk of osteoarthritis,
- Genetics,
- Joint injury or overuse: especially repetitive stress on a joint.

Signs and symptoms of osteoarthritis include pain (affected joints may ache during or after movement), stiffness (especially upon waking or after inactivity), tenderness (after light pressure on or near the joint), limited joint mobility, a cracking sensation, bone spurs (extra pieces of bone that feel like hard lumps may form around the affected joint), and swelling due to inflammation. The symptoms of osteoarthritis can usually be relieved, although the damage to the joints cannot be reversed.

Figure 2.2.4 Joint changes due to osteoarthritis and rheumatoid arthritis

Osteoarthritis can lead to functional limitations and disability. Depression and sleep disturbances can result from the pain and disability caused by osteoarthritis. As the disease worsens over time it often leads to chronic pain which lowers the quality of life. Joint pain and stiffness can become so severe that it makes difficult to perform everyday tasks or work.

2.1.5 How musculoskeletal disorders affect everyday life of older adults

Musculoskeletal disorders are among the most common problems affecting older adults. They are a serious condition that can lead to loss of functionality, mobility, and physical independence. Loss of mobility and physical independence due to joint disease and fractures can be particularly devastating in this population, not only physically and psychologically, but also in terms of increased mortality rates. One of the most serious consequences of musculoskeletal conditions are falls, which are a one of the leading cause of disability and mortality in older adults.

Falls most often occur at home, where older people tend to feel safest and are most familiar with their surroundings. Therefore, fall prevention begins with creating a safe living environment that is tailored to the needs and limitations of older adults. In addition to designing indoor spaces to prevent falls (e.g., avoiding carpets, slippery floors, having poles and handrails), it is also important to think about other limitations older adults may have due to musculoskeletal conditions. In previous chapters, we wrote about rheumatoid arthritis and osteoarthritis, which cause painful, swollen joints with limited range of motion. These diseases often affect the joints in the wrist, resulting in limited, selective movement. When this happens, older adults have difficulty holding small objects or even opening a cabinet if a handle is too small. They may have trouble opening their mailbox or performing kitchen tasks such as holding a knife and cutting. When the disease affects the hip and knee joints, all tasks that involve bending are limited. Typically, they cannot use (kitchen) drawers below knee

level. In addition, after total hip replacement, people need to avoid bending their hips more than 90° – so they need a higher chair, sofa, bed, toilet, etc. People with shoulder pain usually have difficulty reaching objects placed higher than shoulder height. In particular kitchen design should take into account the limitations of older people who can no longer easily reach for the top shelves.

Interior design should take into account the limitations of older people, both in the layout of rooms and in the design of interior spaces and products. The built environment should be designed to provide safe living conditions while promoting the right level of active lifestyle for older adults, adapted to their specific conditions.

2.2 CARDIOVASCULAR DISORDERS

2.2.1 Hypertension

Blood pressure is the pressure or force with which the blood presses against the vessel walls of the arteries as the heart carries the blood through the body. Blood pressure is measured by two numbers. Systolic pressure (the higher number) is the force with which your heart pumps blood through your body. Diastolic pressure (the lower number) is the pressure in arteries when the heart rest between to beats. In Europe, hypertension is usually diagnosed when blood pressure is above 140/80 mmHg (Williams et al., 2018).

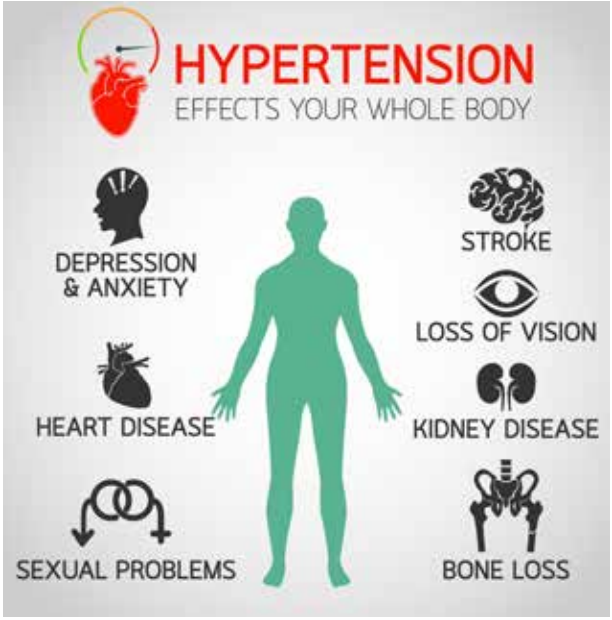

Figure 2.2.5 Hypertension affects whole body

The main risk factors for hypertension are genetics, obesity (abdominal obesity, body mass index above 30), inadequate diet, smoking, and older age. An unhealthy lifestyle is thus one of the most important factors that can contribute to the development of the disease. The symptoms and signs of arterial hypertension are often uncharacteristic and unnoticed, which is why it is often called the "silent killer". Headaches, dizziness, shortness of breath on exertion, chest tightness, palpitations, and fatigue can occur.

High blood pressure is one of the most important risk factors for chronic non-communicable diseases such as cardiovascular disease, which is the leading cause of death and premature mortality worldwide (Roth et al., 2020). Among other complications, high blood pressure can cause damage to the heart. Excessive pressure can harden the arteries and reduce the flow of blood and oxygen to the heart. This increased pressure and decreased blood flow can cause the following:

- Chest pain, also called angina pectoris,
- Heart attack, which occurs when the blood supply to the heart is blocked and the heart muscle cells die due to lack of oxygen,
- Heart failure, when the heart can no longer pump enough blood and oxygen to other

vital organs of the body,
- Stroke, by blockage of the arteries that supply blood and oxygen to the brain,
- Kidney damage, leading to kidney failure.

High blood pressure is a serious condition that can lead to various cardiovascular and other diseases. As cardiovascular disease is the leading cause of death worldwide, preventing high blood pressure can have a huge impact on health and improve the quality of life of older adults.

2.2.2 Heart failure

Heart failure is defined as a condition in which the heart is unable to provide sufficient cardiac output per minute to meet the current metabolic needs of the body, or can only do so with increased filling pressure/heart rate (Bozkurt et al., 2021). It can affect the pumping function of the heart (systolic heart failure) or the filling of the heart (diastolic heart failure). Chronic heart failure develops gradually and therefore has less severe clinical signs compared to acute heart failure. The prevalence of heart failure is 2–5 % of the general population and the incidence increases with age.

The most common risk factors for heart failure are coronary artery disease and hypertension. Other risk factors include pericardial disease, metabolic disorders, and arrhythmias. The New York Heart Association (NYHA) classifies heart failure into four stages, from Class 1, where patients have no limitation of physical activity, to Class 4, where breathing problems occur at rest and worsen with the slightest physical exertion.

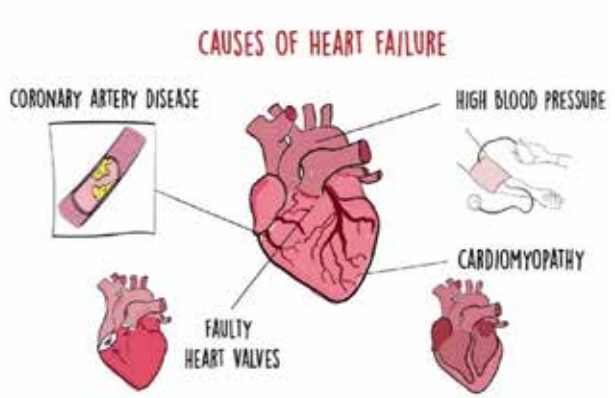

Figure 2.2.6 Causes of heart failure

The symptoms and signs of heart failure are due to decreased blood supply to the organs and include shortness of breath, fatigue, decreased exercise capacity, swelling, increased heart rate, swelling of the legs, cold extremities, peripheral cyanosis, enlarged liver, and ascites.

In patients with chronic heart failure, widening of blood vessels, which would ensure adequate blood supply and thus muscle activity during exertion, is impaired. The reduced blood supply to the skeletal muscles and physical inactivity in patients with chronic heart failure leads to atrophy of the skeletal muscles.

Heart failure is one of the cardiovascular diseases that mainly affects older people. People diagnosed with heart failure have reduced physical fitness, which significantly limits their ability to perform everyday tasks, especially in the later stages of the disease

2.2.3 Peripheral artery disease

Peripheral artery disease (PAD) is a chronic narrowing or blockage of the vessels that carry blood from the heart to the legs, resulting in reduced arterial blood flow in the limbs. The disease develops slowly, is asymptomatic for a long time and causes increasingly severe limb ischaemia in advanced stages. The prevalence of PAD increases with age, affecting more than 20 % of the elderly population over 80 years of age (Shu & Santulli, 2018).

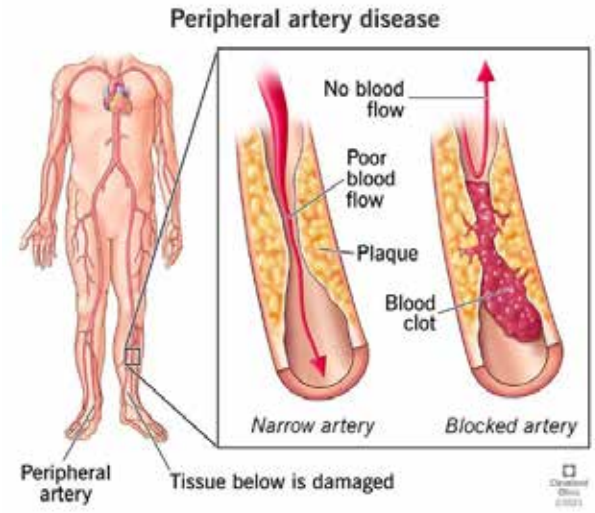

Figure 2.2.7 Blockage of blood flow in arteries

Plaques consisting of fats and other substances in and on the artery walls (also called atherosclerosis) contribute most to the development of the disease. Individuals with advanced atherosclerosis have at least 10 times the risk of PAD than the general population. Diabetes mellitus is also an important risk factor for increasing the risk of developing PAD and accelerates the development of the disease by about 5 times. The most common symptoms of PAD is cramping pain in the muscles supplied by the affected artery that occurs when walking, also called intermittent claudication. Ischaemic rest pain may also occur in the distal parts of the extremities (toes) and diminishes or disappears when the person sits down.

PAD affects the arteries in the lower limbs and severely limits the person's ability to walk longer distances. In advanced stages, it can even lead to limb amputation. Individuals with PAD often suffer from pain and therefore also have a higher risk of social and emotional deficits and participate less often in social activities.

2.2.4 How cardiovascular disorders affect everyday life of older adults

Ageing can lead to changes in the heart and blood vessels, increasing the risk of various diseases such as hypertension, coronary heart disease, heart failure, and others. One of the main causes of most cardiovascular diseases is the accumulation of fat deposits in the walls of the arteries over many years. In the past 30 years, it has been shown that a healthy lifestyle, including regular physical activity, reduced sedentary behaviour, a balanced diet, good quality sleep, absence of smoking and alcohol consumption, and low stress, contributes significantly to a lower incidence of cardiovascular disease. Physical activity and sleep, in particular, can be influenced to some extent by the built environment in which we live.

To help prevent cardio-vascular diseases, indoor spaces should be designed to promote physical activity in older adults, at least to some extent. An example of a very simple measure is to use the stairs instead of the lift. Of course, all safety rules should be observed when doing so. Further on, older adults should also have the possibility to perform some kind of exercise

indoors. This can be achieved by designing one part of the space for exercise and placing some simple equipment there.

In addition to indoor spaces, outdoor areas also play an important role in increasing physical activity among older adults. A variety of neighbourhood features are related to physical activity of older adults. For example, if the paths are safe and wide enough, older people are more likely to go for a walk. And if there are several benches along the paths, older adults are more likely to spend time outdoors because they feel safer knowing they can rest if needed.

In fact, living in walkable neighbourhoods has been shown to be associated with a lower prevalence of high body mass index, diabetes mellitus and metabolic syndrome.

Both indoor and outdoor environments should aim to promote at enhancing physical activity among older adults by providing safe and walkable environments. Designing indoor and outdoor spaces that promote active ageing by incorporating pathways, parks and other green spaces can improve both the physical and mental health of older adults.

2.3 PULMONARY DISORDERS

2.3.1 Obstructive and restrictive pulmonary diseases

Ageing is a multisystem process which leads to alterations of many diseases, including pulmonary disorders. The prevalence of pulmonary disorders increases with age and contributes to morbidity and mortality in older adults. The most common pulmonary disorders among older adults are respiratory infections, chronic obstructive pulmonary disease and bronchial asthma (Akgün et al., 2012).

In general, we can divide pulmonary diseases into two types: obstructive and restrictive. Obstruction refers to increased airway resistance, i.e. obstructed airflow through the airways. It is usually caused by a narrowing of the airways. Obstruction can be reversible (e.g. in asthma) or irreversible (e.g. in chronic obstructive pulmonary disease). In contrast to obstructive diseases, restriction leads to a reduction in lung volume without narrowing of the airways. Typical restrictive pulmonary diseases include fibrosis, diseases of the respiratory muscles, chest wall and pleura, and systemic diseases that also affect the lungs. In certain diseases, such as cystic fibrosis, there can be both obstruction and restriction of the lungs. In this case, we speak of a restrictive-obstructive ventilation disorder.

Chronic obstructive pulmonary disease (COPD) is a common condition that is preventable and treatable. It is characterised by a permanent reduction in airflow through the airways, which is usually progressive and associated with chronic inflammation of the airways and lungs by harmful particles or gases (Global Iniciative for Chronic Obstructive Lung Disease, 2022). According to the World Health Organisation, COPD is the third leading cause of death worldwide.

COPD is most commonly caused by smoking, but can also occur in non-smokers. Long-term occupational exposure to dust and chemicals, older age, lower socioeconomic status and an urban environment are associated with a higher incidence of the disease. There is a clear dose-response relationship with smoking, so the more years you smoke, the higher your risk of developing the disease. COPD is a systemic

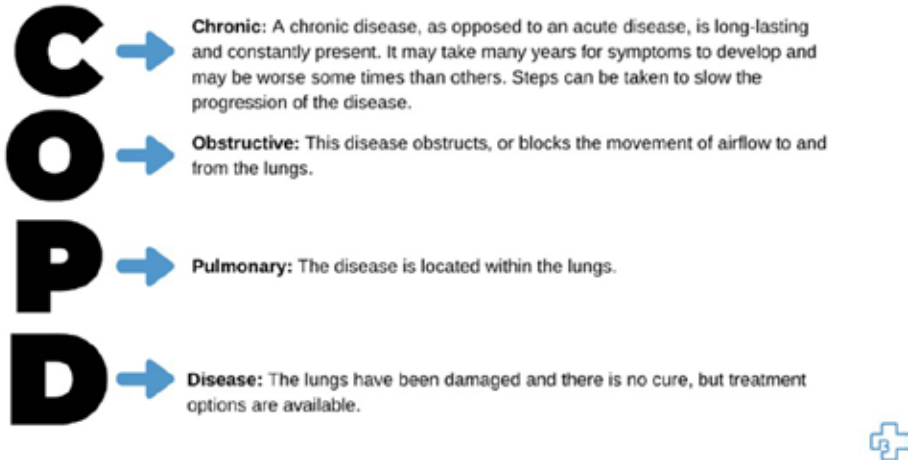

Figure 2.2.8 Explanation of the acronym COPD

disease that affects not only the lung tissue but also other organs in the body. People with COPD often have reduced cardiovascular capacity, impaired peripheral skeletal muscle strength, hormonal changes, systemic inflammation, and increased resting energy expenditure (Andersson, 2016). People with COPD typically suffer from cough, shortness of breath (initially on exertion, and in later stages at rest), prolonged expiration, skeletal muscle weakness, hypoxaemia, and hypercapnia.

COPD, like other lung diseases, significantly affects quality of life and it worsens considerably with increasing severity of the disease. Older adults with COPD suffer from reduced physical fitness and are often unable to participate in various social activities.

2.3.2 Limitations and risks for older adults due to pulmonary diseases

The prevalence of pulmonary disease increases with age and contributes to morbidity and mortality in older adults. In addition, quality of life is also reduced as the most basic human function – breathing – is impaired.

As lung disease progresses, activities of daily living, from the simplest tasks to more demanding activities, are limited and quality of life declines. Shortness of breath, the most distressing symptom of COPD, worsens over time and reduces exercise tolerance, further limiting daily activities and worsening health. Older patients with pulmonary diseases such as COPD are also at increased risk for other conditions that contribute to functional limitations. COPD is associated with both osteoporosis and falls, which significantly increase the risk of hip fractures, one of the leading causes of disability in older adults. In addition, older adults with lung disease are more likely to have poor sleep quality and more likely to report symptoms of anxiety and depression.

Built environment may have a role in preventing or worsening pulmonary disorders. For older adults with or without pulmonary disorders it is important to avoid inhaling chemical irritants, allergens, or toxins in the built environment. This can be achieved by using natural building materials such as wood, which can also have positive psychological effects, contributing to a better well-being of older people in the built environment.

2.4 NEUROLOGICAL DISORDERS

2.4.1 Parkinson disease

Parkinson's disease is a brain disorder that causes involuntary or uncontrollable movements such as tremors, stiffness, and difficulties with balance and coordination. Symptoms usually start gradually and get worse over time. As the disease progresses, individuals may have difficulty walking and talking. They may also have sleep problems, behavioural changes, depression, memory problems, and fatigue.

The most noticeable signs and symptoms of Parkinson's disease occur when the dopamins neurons in the area of the brain that controls movement become impaired or die (Hawkes, 2008). Normally, these nerve cells produce an important brain chemical known as dopamine. When the neurons die or become impaired, they produce less dopamine, which leads to the movement problems. So far, the cause of the onset of the disease is still unknown.

Parkinson's disease has four main symptoms (Heavenaver & Bradshaw, 2022):

- Tremor in the hands, arms, legs, jaw, or head,
- Muscle rigidity, where muscles remain tense for long periods of time,
- Slowness of movements,
- Impaired balance and coordination.

Some people with Parkinson's may experience changes in cognitive function, including problems with memory, attention, and the ability to plan and carry out tasks. Over time, as the disease progresses, some people may even develop dementia and be diagnosed with Parkinson's dementia, also called Lewy body dementia. People with Parkinson's dementia can have severe memory and thinking problems that interfere with daily life (Blanc & Bousiges, 2022).

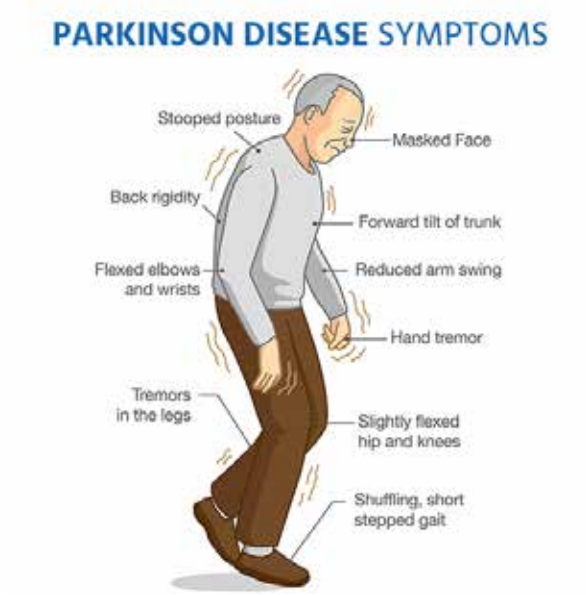

Figure 2.2.9 Symptoms of Parkinson's disease

Although the progression of Parkinson's disease is usually slow, a person's daily life may eventually be affected. Parkinson's disease cannot be cured, but medication can significantly improve symptoms. However, activities such as working, taking care of a home and participating in social activities with friends can become challenging.

Figure 2.2.10 Symptoms and signs of dementia

2.2.4 Dementia

Dementia is not a specific disease, but rather a general term for the impairment of the ability to remember, think, or make decisions that interferes with the performance of everyday activities. Alzheimer's disease is the most common form of dementia. Although dementia mostly affects older adults, it is not part of normal ageing process. The prevalence and incidence of dementia increase exponentially after the age of 65. The estimated prevalence of dementia in Europe among older adults is 4.7 % (Lopez & Kuller, 2019).

As dementia is a general term, symptoms can vary greatly from person to person. People with dementia have problems with memory, attention, communication, reasoning, judgement and problem solving, and visual perception beyond the typical age-related changes in vision. Risk factors for developing dementia include older age, genetic factors, poor cardiovascular health (e. g. high blood pressure), and traumatic brain injury. There are several types of dementia, but the most common are Alzheimer's disease, vascular dementia, Lewy body dementia, and mixed dementia (Raz et al., 2016).

Signs that may indicate dementia include:

- Getting lost in a familiar environment,
- Using unusual words for familiar objects,
- Forgetting old memories,
- Not being able to do tasks independently.

Dementia is not curable. However, a healthy lifestyle with a healthy diet, absence of smoking, regular exercise, and cognitive stimulation can reduce the risk of cognitive decline and dementia.

Alzheimer's disease is a neurological disorder that slowly destroys memory and thinking ability, and eventually the ability to perform the simplest tasks. For most people who develop Alzheimer's disease, the first symptoms appear later in life. Alzheimer's disease is the most common form of dementia and accounts for 60–80 % of all cases (Garre-Olmo, 2018). Alzheimer's disease is a progressive disease, meaning that symptoms develop gradually over many years and eventually become more severe.

Memory loss is the main symptom of Alzheimer's disease. Early signs include difficulty remembering recent events or conversations. As the disease progresses, memory problems worsen and other symptoms appear, such as insomnia, wandering, restlessness, anxiety, and aggression. Some people with memory problems have what is called mild cognitive impairment. In this case, they have more memory problems than normal for their age, but their symptoms do not interfere with their daily life. Older people with mild cognitive impairment have a higher risk of developing Alzheimer's disease, but not all of them develop it (Sanford, 2017).

The exact cause of Alzheimer's disease is not yet fully understood, although several factors are thought to increase the risk of developing the disease. The causes of Alzheimer's disease are likely to be a combination of genetic, environmental, and lifestyle factors (e.g. poor cardiovascular health). It is known that the risk of Alzheimer's disease increases with age and that people with untreated depression are more likely to develop the disease, although depression can also be one of the symptoms of Alzheimer's disease.

Alzheimer's disease is a complex disease for which there is no cure to successfully treat it. Current approaches to treating Alzheimer's disease focus on helping people maintain mental function, treating the underlying disease process and controlling behavioural symptoms.

2.4.3 Peripheral neuropathies and tremor

Peripheral neuropathy is a term used to describe conditions in which the muscles and sensory organs are weakened or injured due to damage to the nerves that supply them. Symptoms of peripheral neuropathies include numbness and paraesthesia, which may be accompanied by weakness and pain.

Most peripheral neuropathies develop slowly over months or years, but some are rapidly progressive. Carpal tunnel syndrome is the most common mononeuropathy, with a prevalence of 5 %. In general, peripheral neuropathies are more common in male older adults (Hanewinckel et al., 2016). There are several risk factors for developing peripheral neuropathies, but diabetes is a common cause.

Peripheral neuropathies can cause tremor, which refers to involuntary rhythmic oscillations of a body part, most commonly hand (Anouti & Koller, 1995). Tremor varies in frequency and amplitude and can be influenced by physiological and psychological factors and also by medication. There are different types of tremors with different pathophysiological backgrounds. We generally associate tremor with Parkinson's disease, but other types of tremors can also occur.

In general, tremor can be the only physical abnormality (isolated tremor), or it can be combined with other neurological or systemic signs (combined tremor). Essential tremor is the most common example of an isolated tremor syndrome, and resting tremor with parkinsonism is the most common combined tremor syndrome. However, there are many other isolated and combined tremor syndromes that can occur in older adults (e. g. dystonic tremor, action tremor with ataxia, focal and task-specific tremor) (Elble, 2017). Tremor in the hands is the most common and has a major impact on quality of life and the ability to perform everyday tasks.

The hand is a very complex structure consisting of many different bones, muscles and ligaments that allow for a high degree of movement and dexterity. There are three main types of bones in the hand itself, including:

- Phalanges. The bones found in the fingers of each hand. Each finger has 3 phalanges while the thumb has 2,
- Metacarpal bones. The bones that make up the middle part of the hand,
- Carpal bones. The bones that make up the wrist. The 2 rows of carpal bones are connected to the bones of the arm.

There are numerous muscles, ligaments, tendons, and sheaths in the hand. The muscles are the structures that can contract to allow the bones in the hand to move. The ligaments are fibrous tissues that hold the joints of the hand together. The sheaths are tubular structures that surround part of the fingers. The tendons connect the muscles to the bones to allow movement. In addition, there are arteries, veins and nerves in the hand that provide blood flow and sensation to the hand and fingers. The skin normally covers and protects the deep structures of the hand and wrist. The fingernails are essentially a specialised part of the skin that protects the fingertips.

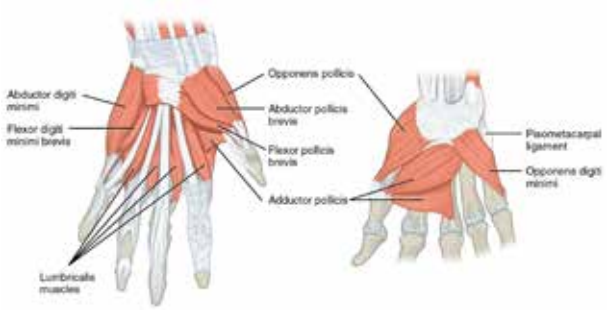

Figure 2.2.11 Hand anatomy

Peripheral neuropathies and tremor are common in older adults. The hand is the most commonly affected by tremor. We know of different types of tremors that are triggered by different background mechanisms. So far, there is no general cure for tremor, but treatments can relieve the symptoms and improve quality of life. Certain lifestyle changes and specific treatment can help reduce tremor.

2.4.4 Gait disorders

Human gait is based on a complex interaction between the nervous system, the musculo-skeletal system and the cardiorespiratory system (Pirker & Katzenschlager, 2017). Each gait pattern is influenced by an individual's age, personality, mood, and socio-cultural factors. To ensure safe walking, intact cognition and executive control are required.

Gait disorders are common in the older adult population and increase with age. Gait disorders result in a loss of personal freedom, increase the risk of falls and injuries, and lead to a reduction in quality of life. Older adults with gait disorders often suffer from imbalance, shuffling, staggering, and stiffening. We know several causes of gait disorders, from orthopaedic to neurological conditions such as Parkinsonism. There are several types of gait disorders, including:

- Impulsive gait. This type of gait is observed in patients with parkinsonism. It is characterised by a stooped, rigid posture, with the head and neck bent forward. Steps tend to become faster and shorter.
- Scissor gait. This type of gait is common in patients with spastic cerebral palsy. The knees and thighs meet or cross each other in a scissor-like fashion when walking. The legs, hips and pelvis are bent, giving the impression that the person is squatting. The steps are slow and small.
- Spastic gait. This type of gait is observed in patients with cerebral palsy or multiple sclerosis. Spastic gait is a type of walking in which one leg is stiff and drags in a semicircular motion on the side most affected by long-term muscle contraction.
- Stepping gait. A “high-stepping” gait in which the leg is raised high, the foot drops and the toes point down and scrape the ground as the person walks. Atrophy of the peroneal muscle or injury to the peroneal nerve can cause this type of gait.

Although the different types of gait disorders have different pathophysiological backgrounds and require different types of treatment and rehabilitation, they result in similar limitations in older adults. Older adults with a gait disorder often have weaker muscles, delayed reaction, and less muscle coordination. Consequently, they have reduced balance and coordination and a higher risk for falls.

2.4.5 Limitations and risks for older adults due to neurological disorders

Neurological disorders are conditions that result from damage to part of the brain or nervous system. Neurological disorders are common in older adults and are associated with a high risk of adverse health outcomes, including mortality, disability, and hospitalisation.

It is well known that patients with neurological disorders have a lower quality of life. One of the most common neurological disorders in older adults is dementia, which leads to impaired memory, attention, and communication. Nowadays it is known that the built environment can influence human emotions, behaviour and physiological responses as well as social relationships. Personalised (hospital) rooms, the right choice of colours of walls and furniture, the use of simple and functional equipment, appropriate aesthetics of the environment, customisation of objects are just some of the possible solutions we can incorporate into the built environment to improve well-being of neurological patients. Special attention should be paid to the location of equipment such as mirrors and TV, as well as protection against falls and other injuries (avoid sharp edges on furniture) or the possibility of a suicide attempt (safe windows). Special attention should be paid to safe restraints, such as the use of a safe cooker.

Older adults with peripheral neuropathies often suffer from numbness and pain in the body, which significantly affects their ability to perform everyday tasks. People with carpal tunnel often have a weaker grip in their hand, so that in the worst cases they even find it difficult to hold a glass of water. Older adults with peripheral neuropathies or parkinsonism may also suffer from tremor. Although there are different types of tremors, all older adults with tremor have difficulty with hand accuracy. Therefore, objects in their living environment should be larger and designed so that they can be easily grasped and manipulated (e. g. cutlery or cups with a larger opening for the fingers). Older adults with neurological disorders may also have problems walking. Impaired walking increases the risk of falls and related injuries. Therefore, special care should be taken in the design of the built environment to ensure that there are level floors without carpets and doorsteps. Walls should be equipped with safety handles to help them keep balance when needed.

Proper design of the built environment can help with therapy and rehabilitation and positively influence the patient's behaviour. Above all, it is important that the built environment ensures a safe and comfortable living environment for people with neurological disorders.

2.5 AGE FRAILTY

Frailty is a common clinical geriatric syndrome associated with a high risk of decline in health and function in older adults. Frailty has been defined as meeting three of the five criteria: low grip strength, low energy, slowed rate of waking, low physical activity, and/or unwanted weight loss (Fried et al., 2001). About 10 % of people over the age of 65 live with frailty. As frailty increases with age, the prevalence of frailty among those over 85 ranges from 25 % to 50 % .

Frailty in old age includes unwanted weight loss, weakness, and fatigue. There is often reduced food intake and gait problems (Guinan, 2016). Older adults with frailty often also suffer from sarcopenia and osteoporosis. Older adults with frailty have a higher risk of falls, disability, hospitalisation, and mortality. It should be noted that frailty is a multidimensional concept that relates not only to physical domains, but also to psychological and social domains. Social frailty is defined as a condition in which there is a risk of losing resources that are essential for meeting one or more basic social needs (Bunt et al., 2017). Due to the multidimensional nature of frailty, the combination of physical, psychological, and social frailty is more likely to contribute to disability and mortality than physical, psychological, or social frailty alone.

Frailty is a serious geriatric syndrome. Frail older adults suffer from various symptoms and signs that lead to reduced muscle performance, physical fitness, and psychological well-being.

2.5.1 Limitations and risks for older adults due to age frailty pathologies

Frailty is defined as a state of increased vulnerability to adverse health effects resulting from multiple deficits in physiological, physical, and mental functioning. Frail older adults are at higher risk for falls and consequently for hospitalisation and mortality.

When designing the built environment for frail older adults, special care should be taken to prevent falls. Carpets, uneven floors (e. g. in the shower) should be avoided. If possible, frail older adults should live on the ground floor to avoid using stairs. The bathroom should be specially designed and equipped with non-slip tiles. The toilet, shower, and other elements in the bathroom should be equipped with holders to facilitate the completion of tasks in the bathroom (e. g. transitioning from the toilet to standing up).

When designing the built environment for frail older adults, we want to make the environment as safe and comfortable as possible. On the other hand, we should include elements to promote physical activity, as this is an important goal in the prevention of frailty. In fact, lower levels of physical activity are associated with worsening frailty syndrome. It is important that frail older adults engage in regular physical activity, but always in a safe and controlled environment. Taking all these limitations into account, the built environment should have indoor elements that promote physical activity among frail older people.

As frailty is a common syndrome in older adults that increases the risk of hospitalisation and morbidity, the built environment should be designed to meet the needs and limitations of frail older people to provide a safe and

comfortable living environment. Frail older adults require special care and treatment, as well as a living environment that takes into account their physical and mental limitations and consists of individually adapted furnishing solutions to enable them to live safely and independently.

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MODULE 2

AGEING PROCESS AND DESIGN

UNIT 3

ACTIVE AGEING AND PHYSICAL ACTIVITY PROMOTION IN OLDER ADULTS

Nastja Poderkar Loredan • Matic Sašek

DESIRE

DESIGN FOR ALL METHODS TO CREATE AGE-FRIENDLY HOUSING

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DESIRE will provide professionals in the building industry and home furnishings sector with the tools and skills to apply Design4All methods as an integral part of the design process, with the aim to create or adapt age friendly housing as a solution for the wellbeing, comfort and autonomy of the older adults or dependents at home.

The DESIRE training platform consists of six modules and 21 units.

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UNIT 3 – ACTIVE AGEING AND PHYSICAL ACTIVITY PROMOTION IN OLDER ADULTS

The concept of active ageing may present a reasonable step towards better quality of life in the older age. Exercise-based approaches that preserve health, function and increase independence such as resistance, aerobic, or balance training can be incorporated into everyday of older adult. In this unit general effects of physical activity are described together with intended impacts on health (e.g., fall prevention), cognition and socialisation. Since the living environment can be a crucial factor that promotes physical activity in older adults the theory behind physical activity promotion is discussed. Together with that the design of environment which promotes physical activity is presented.

3.1 PHYSICAL ACTIVITY AND OLDER ADULTS

IN A NUTSHELL

Regular and sufficiently intense physical activity provides numerous and significant health benefits. It reduces the risk of premature mortality and the risk of many age-related chronic diseases described in the previous Unit 2. Exercise alone can improve our mood and directly affect our psychological well-being. In addition, exercise is used to treat many chronic diseases due to its therapeutic effects and reduces the risk of disability (Viña et al., 2012). It affects our everyday functions, as we can improve our ability to perform daily tasks, which could help older adults live independently.

3.1.1 Benefits of physical activity and the recommendations

The greatest health benefits result from moderate physical activity. These include reducing the risk of cardiovascular disease, colon and breast cancer, obesity, osteoporosis, and type 2 diabetes. Because of its psychoactive effects, physical activity can reduce symptoms of some mental disorders such as anxiety and depression (Guerrieri et al., 2017). With regard to older adults, some of the most important therapeutic benefits of exercise are associated with better functioning, balance, strength, and endurance, which reduces the risk of falls and disability in older adults (Langhammer et al., 2018). Some of the health benefits of physical activity, such as prevention of dementia and some cancers, need further study to allow for more serious conclusions. For older adults in particular, some risks of physical activity need to be acknowledged. Therefore, it needs to be promoted in a way that minimises the risks of activity-related injuries through risk management strategies that should be guided by general physical activity guidelines

The physical activity guidelines for older adults are similar to those for adults. The new recommendations (Bull et al., 2020) recommend at least 150 to 300 minutes of moderate-to vigorous intensity aerobic physical activity or at least 75 to 150 minutes of high-intensity aerobic physical activity, or an equivalent combination of the two, during the week. Resistance training for all major muscle groups is recommended at least 2 days per week. A novel feature of the guidelines is that time spent sedentary should be reduced and replaced with some type of physical activity of any intensity. Specifically for older adults, falls and related injuries, physical function, frailty, and osteoporosis should be addressed. There is compelling evidence that balance and functional exercises can reduce the rate of falls and improve physical function. Multi-part physical activity that combines balance, strength, endurance, gait, and physical function at moderate or higher intensities should be included in the weekly schedule of older adults at least 3 times per week. This is recommended for all older adults, not just those with limited mobility, as these programmes have been shown to be significantly effective in preventing bone health and osteoporosis.

If older adults do not comply with the recommendations, they are considered physically inactive. Studies have shown that inactivity in older adults is associated with poorer quality of life and also lower functional capacity (Acree et al., 2006). However, there is insufficient evidence that physical activity programmes can reduce health care utilisation and associated costs. Increasing physical activity, however, can lead to modest improvements in well-being among community-dwelling older adults. To maintain the positive effects of physical activity over the long term, activity levels should be maintained. Ideally, this can be achieved by designing living environments that provide and encourage opportunities to remain active and healthy.

3.1.2 Guidelines for physical activity interventions

Physical activity for older adults is ideally prescribed on an individual basis and general principles of exercise therapy can be applied when planning exercise programmes. One principle that underlies most exercise prescriptions is hidden under the acronym F-I-T-T. This acronym stands for the exercise variables of frequency (F), intensity (I), type (T), and time (T), which are common but different among exercise programmes (Reed & Pipe, 2016). Exercise programmes can include different types of activities to achieve physiological benefits. For example, strength training, aerobic training, balance training, flexibility training, and functional mobility programmes, among others, can be used to achieve muscle strength, cardiorespiratory fitness, or fall prevention. Frequency of training refers to the number of exercises in a given period of time (e.g., a week or a day), while intensity of training can be interpreted differently for each type of exercise.

One of the most common approaches is to consider intensity based on the energy expended by a person performing a particular activity compared to the energy expended in sedentary activities (Reed & Pipe, 2016). Time spent on exercise refers to the amount of time an exercise is performed. This can be a small unit such as a second, minutes, or even hours, depending on the type of exercise and the goal of the exercise. In addition to the FIIT principle, there are three important principles to keep in mind, especially for older adults. These are specificity, overload, and recovery. Recovery refers to the time needed to bring physiological functions back to homeostasis. Specificity, on

the other hand, describes the phenomenon that a specific physiological outcome can only be improved if the training targets a specific physiological system. Overload refers to the theory that the system being trained must be stimulated by loading beyond its current capacity in order to achieve improvement in the function of that system. When planning physical activity interventions, these aspects must be considered to achieve the desired effect. Therefore, the living environment that should promote physical activity and health in older adults allows for regular physical activities that are long enough, intense enough, and, above all, safe.

3.2 EXERCISE FOR OLDER ADULTS

3.2.1 Gait and posture biomechanics in older adults

Some changes in postural control in older adults may affect gait and consequently increase instability and risk of falls. Nonpathological changes in gait occur with age. Older people no longer elevate their feet as high when walking or moving, increasing the tendency to trip and fall. In addition, older men tend to have a more stooped posture and develop a wide-legged and short-stepped gait to increase stability when walking. In contrast, older women's gait tends to become narrow and waddling (Pirker & Katzenschlager, 2017).

These biomechanical changes in gait are related to impairments in the brain and musculature that lead to muscle weakness and decrease sensory input during locomotion. In addition, orthostatic hypotension, which is very common in older adults, can affect posture, especially after rising from a chair and taking the first steps. For the above reasons, older adults altered posture and unsteady gait must be taken into account when designing the living environment. First, to ensure safety and prevent accidents, and second, to allow movement and physical activity despite these functional limitations.

Figure 2.3.1 Posture deviation in older adults

3.2.2 Changes in body function and structure due to exercise

Studies examining the effects of endurance sports such as walking, cycling, dancing, or swimming provide the best evidence of the health benefits of physical activity for older adults. Some studies have found that an average walk of 3.2 km per day can reduce the risk of heart disease and, interestingly, prevent falls. Among the various benefits that can be achieved through exercise are improvements in metabolism, cardiovascular system, and brain function. Key metabolic adaptations from exercise include increased insulin sensitivity and glucose tolerance, while improved blood flow to the brain, lower blood pressure, and improved lipid profile are among the key cardiovascular adaptations (Benton & Part, 2015). The main benefits of physical activity for the body system of older adults can be found in Figure 2.3.2.

Because of the positive effects of exercise on bodily functions, it is possible that exercise may prevent some of the most common chronic non-communicable diseases such as osteoporosis, obesity, cardiovascular disease, and some types of cancer. In addition, resistance training can increase and maintain muscle size and strength, even in older adults. Programs that include a combination of strength and endurance exercises are therefore recommended for individuals with sarcopenia. Overall, older adults who are more physically active have significantly higher functional capacity. Studies have also shown that exercise has the potential to improve and maintain aerobic capacity, slow bone density loss, and significantly reduce mortality in older adults (Stensvold et al., 2020).

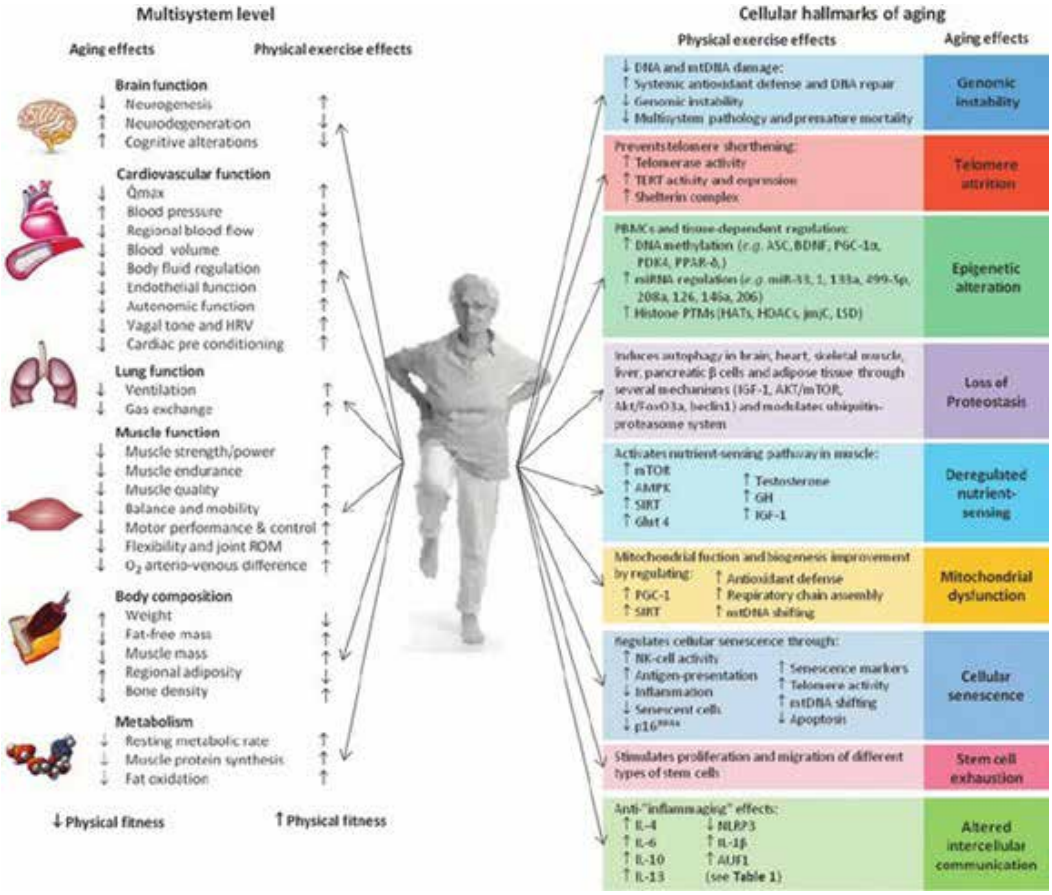

Figure 2.3.2 Anti-ageing effects of exercise, Garatachea et al. (2015)

3.2.3 Balance training and considerations

Balance training in combination with other types may reduce the rate and risk of falls in older adults (Sherrington et al., 2019). Interventions that focus on balance training in combination with various functional exercises or resistance training have been found to be particularly effective in reducing the risk of falls. Among the many types of balance exercises, Tai Chi has been the best studied and has been shown to be very effective in reducing the incidence of falls in community-dwelling older adults (Li et al., 2005). Balance exercises consist of movements involving multidirectional weight transfer, coordinative movements of the lower and upper limbs, conscious body alignment, and the inclusion or exclusion of various sensory systems such as vision, proprioception, or head alignment. Although the benefits of exercise in the elderly clearly outweigh the potential hazards, it must be emphasised that adverse effects may occur specifically in older adults. Therefore, the environment in which older people exercise should be designed so that safety precautions can be taken.

3.3 MULTIDISCIPLINARY APPROACH TO PROMOTING PHYSICAL ACTIVITY AMONG OLDER PEOPLE

IN A NUTSHELL

All guidelines recommend that older people of all ages engage in some form of exercise or physical activity, as functional capacity in older people is highly associated with independent living, active engagement, and high quality of life. Specifically, older adults who are able to exercise themselves are referred to as ageing successfully. However, older adults have many barriers that prevent them from being physically active, such as chronic illness, functional abilities, pain, anxiety, finances, or dependence. To achieve the best outcome, it is important to know what type of physical activity will produce the best results for specific older adults. Ideally, a professional should prescribe a personalised exercise programme for the individual.

3.3.1 Which type of physical activity to promote among older people?

This programme usually includes exercises to improve cardiovascular and pulmonary function, strength, and balance. Among the most appropriate types of aerobic exercise that improve cardiovascular and pulmonary function are walking and cycling. In terms of experience, walking is the easiest exercise, while cycling requires a certain level of experience. For this reason, it is safer to do cycling on a stationary bike than on the road. In addition to cardiovascular exercise, strength training can have additional physical and physiological benefits for the health and quality of life of older adults. Since many older adults do not have experience with strength training, it is recommended that they start with their own body weight and gradually increase the resistance with small weights or elastic bands. With the right equipment, most appropriate strength exercises can be done at home. Although strength training can significantly improve balance, specific balance exercises are an important part of any exercise programme for older adults.

These three types of exercises are beneficial for any older adult. Therefore, it is recommended that the environment in which they live also provides them with these exercises. Practical suggestions for professionals in the building sector include planning large indoor spaces that allow walking or, if possible, placing bicycle ergometers in special exercise rooms or living rooms. For strength training, it would be ideal if furniture could be designed to allow for secure attachment of elastic bands. Multifunctional items could be designed to be used as light free weights. In addition, furniture in the bathroom should allow older adults to safely do balance exercises during daily activities so that they can hold onto something if their balance is disturbed.

Figure 2.3.3 Different types of exercise are recommended for older adults

3.3.2 Maximising participation in physical activity among older adults

One of the biggest barriers to older adults' participation in physical activity is adherence (Garmendia et al., 2013). Many factors can affect participation, but the most important are self-efficacy, motivational barriers, and planning. Non-self-efficacious older adults tend to be less physically active than self-efficacious ones. Therefore, experts recommend identifying specific factors that affect physical activity self-efficacy in older adults so that exercise is a coping experience for all. Older adults need to be educated about how physical activity affects them, acutely and chronically, why physical activity is good for them, what type of exercise they will do, etc. In this way, objective and subjective factors that affect self-efficacy will be limited, and older adults will prefer to participate in physical activity.

Knowing the benefits of physical activity in old age can drastically affect an individual's motivation to be active. And when combined with intrinsic motivation, changes in health behaviours can be achieved (Stehr et al., 2021). Older adults need to play an active role in activity programmes, and their expectations should be aligned with achievable outcomes. However, there is no one-size-fits-all approach to motivating older adults to be more physically active. The best motivational plan is likely to be a combination of several integrative approaches that meet the specific needs of older people. The design of the living environment should also follow this goal – to motivate older adults and minimise barriers to physical activity.

In addition, the built environment should allow older people to plan their physical activity and self-monitor how they are doing with exercise. For example, technologies such as smartphones or wearables (bracelets, watches, etc.) can encourage older adults to lead healthier lifestyles (Knippenberg et al., 2021). Although the use of high technology seems like a good starting point, it should be used in combination with other behavioural techniques that are less demanding and more easily adopted by older adults. When designing a smart home for older adults, these aspects should also be considered.

Figure 2.3.4 Fitness trackers are useful to encourage older adults to be more physically active

3.4 IMPLEMENTING PHYSICAL ACTIVITY IN OLDER ADULT COMMUNITY

IN A NUTSHELL

Physical activity programmes should be based on the positive recognition that older adults' (in)abilities are qualities, not weaknesses. With this in mind, older adults need to be involved in the process of designing physical activity interventions. In this way, they will be offered the opportunity to live healthier lives, and the chance that they will seize this opportunity is much greater if their physical activity needs and goals are taken into account.

In long-term care, certain factors should be considered to remove barriers and optimise uptake and participation in physical activity interventions. For example, the patient's own body weight, elastic bands, or simple dumbbells can be used to increase resistance during strength training. Balance and walking can be improved through functional exercises. These exercises usually aim to increase the amount and frequency of walking. To ensure safety during such activities, the environment can be adapted. Preferably in a way that also allows for individually tailored balance exercises. For older adults who live independently, the environment must be designed to allow safe activities. For people with limited walking ability, handrails should be available, floors should not be shiny or distracting, and spaces should not be cluttered. If you live in a stimulating environment, you are much more likely to develop a lifestyle where activity is a part of your daily life routine.

Figure 2.3.5 Exercise park for older adults in Tržič, Slovenia

3.4.1 Indoor environments that promote physical activity among older people

Globally, the housing situation for older adults varies according to personal needs and preferences, cultural norms, individual characteristics, financial status, geographic location, etc. In Europe, approximately one-third (30–40 %) of older adults live alone "at home," while the rest live with their caregivers. Only a small proportion of older adults (approximately 5–10 %) live in supportive housing such as community or long-term care facilities. Therefore, the buildings in which the majority of older adults currently live are not conducive to ageing in place. To learn more about adaptable housing read Unit 3 Residential buildings and their surroundings in Module 3 Age-friendly built environment. Older adults spend most of their day indoors (Spalt et al., 2016), indicating the potential of indoor spaces to promote healthy ageing. Thus, physical activity that can be performed indoors could be integrated into daily routines through microelements such as furniture or architecture, as well as behavioural changes aimed at active indoor use. For example, the strength or balance training mentioned in the previous chapters are possible forms of physical activity that have a significant impact on the quality of life of older people and should therefore be integrated into the daily routines of older people.

Figure 2.3.6 Parallel bars provide extra support and improve balance for older people when walking or exercising

When designing indoor environments that ideally promote physical activity in older people, some basic principles that support active living should be considered, such as accessibility, universal design, and age-friendly principles. When designing the living environment, care should be taken to ensure that the size of the dwelling, location, entrances/doors, number of floors, number of stairs, social environment, nearby destinations, and immediate outdoor space support and encourage physical activity among older people. To enable older people to move more and be physically active in the living environment, the interaction between older people's abilities and preferences and the living environment should be considered.

An indoor environment that ideally promotes physical activity in older adults must be affordable, accessible, and age-appropriate. Studies have found that older adults are more physically active when they live in larger spaces in an uncluttered and accessible home environment (Portegijs et al., 2015). Although some items may be perceived by people as obstacles, they can also be good opportunities for physical activity. For example, if stairs are designed to support walking (see Figure 2.3.7), they can be a great tool to promote independence and increase physical activity. However, older adults should be encouraged and educated about the use of such aids, which ideally will lead to behaviour change. When designing interiors, it is important to incorporate "health" into the design and construction of furniture. Overall, designers must keep in mind that older adults should feel safe to be physically active. Therefore, furniture should be designed to support locomotion.

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Figure 2.3.7 AssiStep stair assistance device

3.4.2 Restorative environments that promote physical activity among older adults

Functional affordability is an essential feature of a stimulating environment. Similar to other people, older adults need an environment that provides just enough curiosity and complexity to motivate them to be physically active. These are all characteristics of a restorative environment, one that promotes recovery from cognitive fatigue, stress, or low mood (Ryburn et al., 2009). For most people, physical activity contributes to cognitive recovery and significantly reduces stress.

One benefit of a restorative environment is that it facilitates mobility, which has a dramatic impact on quality of life. Although it is difficult to establish a direct link between such environment and physical activity, it may be that decision making, working memory, and curiosity are improved. Therefore, people are more likely to play sports or be physically active. In addition, cognitive health and socialisation are improved in an environment that includes nature. These characteristics are especially beneficial for older people whose attention spans decline with age and who are prone to forgetfulness and loneliness. The home environment of older adults should be designed as restorative because of the many health benefits. Architectural variations could be important to encourage older adults to move and explore.

3.4.3 How do we measure physical activity and could the monitoring be integrated into build environment?

Various objective and subjective methods can be used to measure physical activity and sedentary behaviour (see Ainsworth, 2009 for details). Subjective methods can be influenced by individual interpretation, while objective methods are direct and not influenced by our own perception. Different questionnaires are most commonly used to assess physical activity subjectively, while accelerometers or inertial sensors are used for objective assessment of physical activity.

Figure 2.3.8 Devices for measuring the physical activity via accelerations of the body segments

To evaluate the “quality” of physical activity, its dimensions and domains should be assessed. Four dimensions are most commonly measured, relating to the type, frequency, duration, and intensity of physical activity in the domains of leisure, occupation, home activities, and transportation. There are many wearable measurement devices such as pedometers, accelerometers, or multisensory systems that can provide real-time physical activity data. Among others, time spent in moderate to vigorous physical activity is the most commonly used indicator of physical activity levels. However, Kim et al. (2022) provided an interesting idea for technological opportunities to indirectly measure health status, gait speed, and some components of physical activity using smart floors. Moreover, fall detection can be used for emergency situations that require immediate intervention. The main advantage of such a way of measuring physical activity is that older adults do not need to wear a wearable token and physical activity is measured spontaneously.

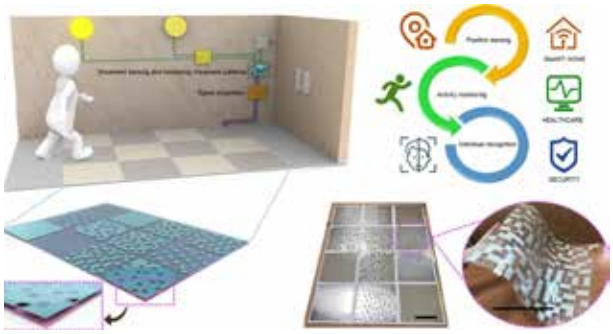

Figure 2.3.9 The sensors integrated into flooring can serve as a tool to measure physical activity bouts of older adults

3.4.4 Sedentary behaviour is the main threat

Sedentary behaviour is described as the time when one expends ≤1.5 METs of energy. Although one might think that the negative effects of a sedentary lifestyle during the day can be masked by 60 minutes of physical activity (or exercise) during the day, the situation is quite the opposite. Studies have shown that the greatest impact on overall health is likely to come from habitual mobility during the day rather than 30 minutes of structured physical activity. Furthermore, sedentary behaviour has a particular impact on our health, as prolonged sedentary behaviour has been linked to arthritis, depression, sleep deprivation, and even anxiety. To combat the negative health effects of sedentary behaviour, it is important to take breaks from it. It appears that taking regular breaks from sitting can benefit individual's health. Several studies have shown that light physical activity in lieu of sedentary behaviour has positive metabolic effects (Duvivier et al., 2017) and also provides significantly better health benefits than the same amount of structured exercise.

It has been observed that older adults spend more time sitting than younger people (Harvey et al., 2013). Therefore, the risk of developing a chronic disease related to sedentarism is even greater in this population. In conjunction with novel technologies and smart homes, it is possible to integrate monitoring of sedentary activity levels into the living environment of older people. If significantly increased levels of sedentariness are detected, a mechanism to encourage light physical activity instead of of sitting could be incorporated into the smart home. Or the home and furnishings could be designed to encourage “active” behaviour and discourage prolonged sitting.

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MODULE 2

AGEING PROCESS AND DESIGN

UNIT 4

EMBODIMENT AND THE MATERIALITY OF OLD AGE

Soňa G. Lutherová • Ľubica Voľanská

DESIRE

DESIGN FOR ALL METHODS TO CREATE AGE-FRIENDLY HOUSING

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DESIRE will provide professionals in the building industry and home furnishings sector with the tools and skills to apply Design4All methods as an integral part of the design process, with the aim to create or adapt age friendly housing as a solution for the wellbeing, comfort and autonomy of the older adults or dependents at home.

The DESIRE training platform consists of six modules and 21 units.

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UNIT 4 – EMBODIMENT AND THE MATERIALITY OF OLD AGE

4.1 INTRODUCTION

In this unit, ageing and living environment will be considered from the perspective of embodiment and the materiality of old age.

With embodiment we understand what is known as the process of perception, however, not a process of mapping sensory stimuli to an inner model of the world, but rather a sensorimotor coordination that always occurs in the overall concept of an acting being. With other words, the cognition is body based, abstract cognitive processes are often based on the simulation of sensorimotor processes. Thus, the body and the environment play a role in cognitive activities (for various examples see Lynott – Connell & Holler, 2013).

On the other side, ageing is often perceived through the body, and although ageing of the body is an inevitable fact in the contemporary society, the society usually determines how the body will be viewed (Buženková, 2022, Fung, 2013, Uhrín, 2017). Often, when older adults become involved with the biomedical health care system, it's the first time they feel old. Moreover, they often run into the risk of being reduced to ageing and most of the time unhealthy body, not a whole being with their own perspectives and habits.

At the same time, the body is an important part of the definition of the activity (Katz 2000:136), so often associated with the well-being in old age. It is the "neoliberal antiwelfarist agendas that attempt to restructure dependency through the uncritical promotion of positive activity, they also problematize older bodies and lives as dependency prone and "at risk."" (Katz 2000:147).

Precisely because of the closeness of the themes of sexuality and sensuality connected with bodily experience, the common denominator of this part is also the body or embodiment, which helps to co-create aging and old age as a natural part of the cycle of human life, but on the other hand it is standardized by the cultural and social context.

4.2 EMBODIMENT AND AGEING BODY

IN A NUTSHELL

The perception of the ageing body as deficient or pathological can lead to an ageist approach in health care. This includes misdiagnosing due to the stereotypical perspectives on ageing and overall lower quality of health care. As Stephen Katz remarks, in Western society, the perspective on ageing is framed around biological decline. He suggests the materiality of embodied ageing that approaches "the ageing body as both creator and product of the experiences configured by our material worlds, such as the spaces we live in and environments in which we move" (Katz, 2011).

As we age, our body is conditioned to various forms of deteriorating processes. This process is natural and, in this sense, inevitable. However, the individual forms of ageing are diversified and might be completely different from one case to the other. Not only the health care providers but also designers and architects designing living environments for older people should be informed about bodily changes and typical health problems that are connected to ageing. But at the same time, they should pay critical attention to the way they approach their older clients, as generalization often leads to ageism. The idea that certain health conditions are simply related to age and do not need to be dealt with in any way can be a very effective way of functioning health facilities as an institution. Sometimes, doctors and other health care providers have to make decisions hastily. Under time pressure, it might be easier and faster to base their decision on stereotypical notions, leading to (albeit often unwanted or unconscious) discrimination. The refusal or minimization of the satisfaction of patients' requests regarding their health status is also a manifestation of ageism. For example, it can strengthen the belief of older people that back pain is directly related to old age or that the staff has no other means to help them. Consequently, they might no longer ask for help in the future.

There are various ways the perception of the ageing body as deficient and pathological might lead to ageist approach in health care. For example, older people have to acquire adequate health care by themselves. At the same time, they are endangered by taking too many drugs (polypharmacy) as they are subdued to inappropriate prescribing. Patients also run the risk of being provided a cheaper version of care, less strenuous, less demanding, etc., or not providing any form of care at all. Likewise, in the field of mental care, the treatment of mental illnesses is often influenced by ageism. It can be affected by psychologists' feelings and attitudes regarding clients' age. Due to the stigma of ageing, mental illness is often mistaken for ageing symptoms and vice versa. This misguided perspective on ageing and old age often prevents quality treatment for older adults with mental disabilities. Dementia sometimes coincides with old age and is an excellent example of ageism's pervasive and debilitating presence in the healthcare system.

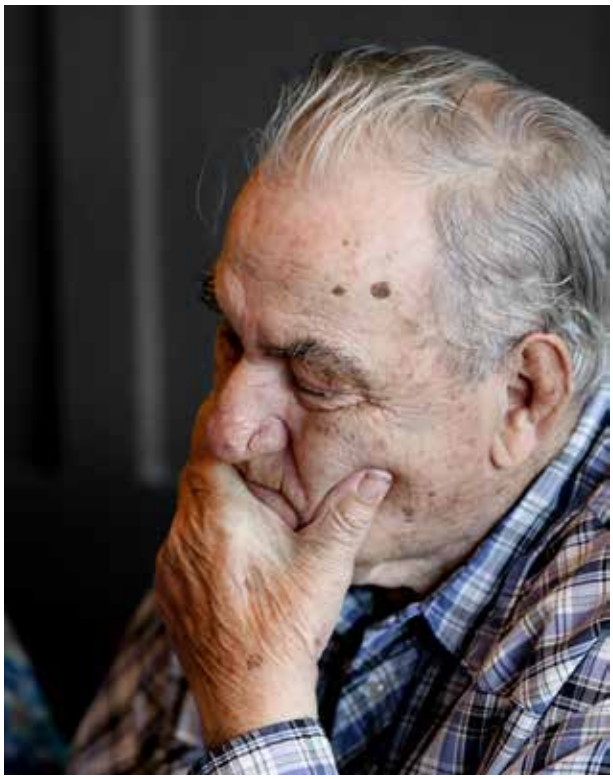

Figure 2.4.1 (Doerfler, 2018)

DO YOU WANT TO KNOW MORE ABOUT...

THE MEDICALIZATION OF OLD AGE

In general, the image of retirement, old age or older age is largely influenced by terms or categories of medicine. The medicalization of old age has been developing since the 19th century hand in hand with other processes of modernization. The modern welfare state has brought a new approach – through geriatrics and gerontology, older people have moved from the margins to the center of attention of the healthcare system. According to several authors (Conrad 1999; Laslett 1995; Tschirge; Grüber-Hrćan 1999) , it is the medicalization and professionalization of old age that is responsible for its stigmatization or for the fact that the attitude towards older adults was mostly uniform and rather negative. The description of old age as a disease was probably related to the dissection of the dead bodies of older adults, which became widespread especially in the 19th and 20th centuries. Autopsies have convinced doctors that the aging process causes irreversible pathologies that result in a range of incurable diseases. All symptoms that occurred after the so-called major climacteric and reached the final stage, they used to be described as firstly weak, but later inevitably worsening manifestations of senile dementia. According to Peter Laslett, who quotes and paraphrases the British geriatrician J. Grimley Evans, calling senile dementia Alzheimer's disease marked a significant shift in science. Had dementia not been classified as a normal condition in old age for many years, research on old age could have developed much more rapidly (Laslett, 1995, 51).

In health facilities, older adults are often a bit “lost” or “invisible” from the doctors' perspective, especially in hospitals that also deal with acute health issues. This issue becomes even more pressing when their stays are prolonged due to the lack of space in the specific institutions designed for long-term care. Older patients are often considered a burden on the healthcare system and might be referred to as “social cases” or “bed takers” in these cases.

Another problem, which is not only a problem of the facility staff, is the way care is organized in the institutional wards. For practical reasons, they often tend to be run like a “treadmill” – with a strictly assigned program and schedule. Older patients, whose lives are dominated by this well-established rhythm of care, are submitted to the requirements of the care plan and cannot express and fulfil their individual needs and habits.

Figure 2.4.2 (Kaiyv, 2020)

DO YOU WANT TO KNOW MORE ABOUT...

AGEISM IN FACILITIES

In her research, Tova Band-Winterstein (2015) defined ageism as the neglect of daily routine care, where the client becomes invisible and forgotten. Older patients are not perceived as whole human beings but rather as "objects of treatment" in an automated way. As such, they do not receive a sufficiently accurate medical diagnosis, and the staff uses ageistic language and cheaper material compared to younger years.

Several examples of ageism in long-term care facilities for the older adults could be named. For example, this relates to a specific physical environment and surroundings (e.g., not fixing the bathroom that is closer to the rooms due to budget constraints); not using the social space in an inclusive way (e.g., leaving all the older clients alone together in one room and no one attends to them); the use of nicknames (often derogatory) to describe different types of residents; using multilevel settings (such as exaggerating differences between relatively autonomous clients and older people who are more dependent); lack of independence (e.g., discouraging older people from carrying out certain tasks); lack of respect (e.g., not valuing clients who may feel like prisoners); not providing enough privacy (constant surveillance). In conclusion, the situation would improve by the provision of such care, which would not place the most significant emphasis on the decline of older people's standard of living and their increasing dependence.

If you want to know more about ageism, read Module 1, Unit 2, Part 2.3.

4.3 A FUNCTIONING BODY AS THE KEY TO "SUCCESSFUL AGEING"

IN A NUTSHELL

At times it is necessary to also pay critical attention to some of the conclusions and research in the field of gerontology. To give an example, let's focus on the concepts of "successful aging" or "productive aging". They might be perceived as problematic, as they put older adults in a precarious position. Because of this, from both a psychological and a social perspective, some researchers reject them entirely (Katz, S., & Calasanti, T. 2015) The concepts contain a normative perspective (Holstein, 1999) based on specific values associated with economic success in capitalist economies (Voľanská, 2018). Therefore, we would instead suggest using the terms "quality aging" or "quality old age". This perspective acknowledges that ageing does not always have to be active or productive as old age is diversified and has many faces.

It may seem like a lot of attention is focused on the body related to the medical view of old age, but we should take into consideration how powerful and influential medicine has been and still is in this regard. In all matters related to old age and aging, governments, legislators, cities, public authorities as those who determine the time span and amount of social security, but also the heads of businesses and companies, usually unconditionally accept the medical knowledge. Equally important is the realization that older adults' self-perception, their abilities, and their value can be primarily influenced by what they learn in a doctor's waiting room or in his office or hospital. An unplanned consequence of medicalization has become the problematization of certain life phases or situations in older age. This also sheds light on such concepts as "successful aging" or "productive aging". In this sense, they might be understood as related to particular – production-oriented – culture, valuing productivity of its members (Holstein, 1999).

As opposed to this, the theme of embodiment forms the basis of concepts of aging based on the distinction between the external, physical/ bodily aspects of aging and the internal aspects of individuals. From such a theoretical point of view, people remain their continuously young "I", while their bodies are marked by signs of aging or old age – i. e., "masks" or "traps", a moment of alienation of body and psyche occurs (Gunreben & Mahr, 2014). As the individual ages, the "resilient self" tries to maintain the status of a full-fledged adult. The theme of creating one's own self is as important in old age as during other phases of a person's life, as described by Andreas Kruse (2013). Ethnologist Harm-Peer Zimmermann's thoughts also go in this direction, specifically his thoughts on Alters-Coolness: "It's about maintaining distance, distance inward and outward: distance from one's own problems and distance from hectic and alarming public opinion " (Zimmermann, 2013, 114).

One of the forms of dealing with the situation can be the acceptance of bodily weakening or decline, but persistent insistence on the continuity of a healthy intellect.

Figure 2.4.3 (Pauliniová, 2022)

DO YOU WANT TO KNOW MORE ABOUT...

SEXUALITY AND OLD AGE

Sexuality is a particular area where the idea of a functioning body plays an important role (Sandberg, 2015). At an individual level, older adults' sexual behaviour is shaped by their expectations and beliefs. However, individuals do not live in isolation, detached from the public perspectives and ideas of the people around them. Instead, their experiences, expectations, and behaviour are largely influenced by media portrayals and the opinions of medical professionals, long-term care providers, and – last but not least – their family members.

Understanding sexuality as something non-existent and invisible in old age or perceiving it as a purely biological "issue" often contributes to older people feeling ashamed or completely excluding sexuality from their lives (see more in Gewirtz-Meydan & Ayalon, 2022). The diversity of experiences, desires, and opinions about sexuality among older adults is usually not given space at all (Sedláková & Ševčíková, 2020).

In addition, if we talk about sexuality in connection with institutional care, Jolana Novotná suggests using the term "heteronormative blindness" (Novotná, 2019). In this context, we can also see a connection with "blindness" towards individualism or the needs of the individuals living in different care institutions such as retirement homes or treatment centers for long-term sick people. Again, this is a structural setting, and its change would bring a better life to all residents of institutions.

On the other side, there exists a narrative about staying sexually active, which might also cause pressure on those older adults who do not seem to fulfil this kind of expectation (Baumeister et al., 2001, Potts & Tiefer, 2006, Bell et al., 2016).

The way out from this dichotomy of attributing asexuality to older adults or stressing the norm of sexual activity is to find a whole new perspective shifting meaning from being to becoming, from fixedness to fluidity. In addition to masculinity and femininity, sexuality and its manifestations also become fluid. In the work of Linn Sandberg (2011), based on her interviews with older men, the central idea of the narratives is an improvement, during which men stop being selfish and oblivious to women's sexual pleasures and become more attentive, gentle, and sexually capable partners. In the narratives, old age is depicted as a period in which touch and intimacy acquire great importance. Paraphrasing the words of one of the respondents in Linn Sandberg's research: It wasn't about intercourse; it was about physical warmth, which can be hugely important. Moreover, talking (in addition to touching) can bring about a much more intense intimate experience, whether sexual or not.

Figure 2.4.4 (Matos, 2019)

Finally, it is important to be aware how important is the language we use to describe the situation. The words we choose can hurt, but at the same time they can sometimes make light of the situation and, by offering different nuances, change our attitude towards problematic and difficult experiences. If the body is a non-binary system, it means that we do not have a clear boundary between the material and the language. In other words, as bodies change, these changes reshape the practices and ways in which that body can be represented. However, the available representations and available language concerning bodies also "determine" what bodies can do and how their subjectivity is formed.

4.4 MATERIALITY: PLACE AND SPACE IN THE LIVES OF OLDER ADULTS

IN A NUTSHELL

The research shows that the relationship between people, their living environment, and things are not straightforward and is far more complicated than one would imagine. Not only are the people creating their material environment, but their identities are also recreated in this process.

The environment of our homes is an indisputably essential factor in the overall quality of living. Indeed, this is also true for older adults, who often have to remake their homes because of their changing needs and the new obstacles in their lives. Some even have to move closer to their relatives or into a care home facility. However, with a careful, inclusive design, designers and architects can significantly influence their wellbeing and increase their feelings of privacy, independence, and security. All of these are essential parts of feeling at home (Lutherová, 2009).

The number of studies focused on the significance of places and environments in the lives of seniors is growing (Lawton 1985, 1989; Douglas 1991; Gieryn 2000). This provides a more profound understanding of the importance of materiality in the ageing society. The design process, which includes this kind of research, should consequently provide a better quality of places for older adults.

Many older adults have to deal with specific dilemmas that often come with the old age. The bodily changes might bring such issues as mental deterioration, problems with mobility or other, that result in the necessity to recreate the housing in accordance to the changing needs and new obstacles in their everyday lives. For some, the solution resides in accommodating and redesigning their current housing. For others, the only solution might be to move to a institutional care facility.

The older adults' need to remain in “their” familiar environment is considered an adaptive feature of ageing (Rowels & Ravdal 2002). Therefore, ageing in place is an essential strategy. Not only is it related to belonging to a specific community, but it is also tied to life stories. Ageing in place thus plays a vital role in maintaining the continuity of the life cycle (Sixsmith et al., 2014, 7). The process of aging in relation to place needs to be understood in regard to previous life stages – places and things must also be studied within the perspective of the life course (Rowels & Ravdal 2002). To learn more about ageing in place from the design perspective read the text on Adjustable housing in Module 3 Unit 3.

Home is a socially and culturally constructed category, that various people inscribe to different things – some approach it as a specific place with distinguished characteristics, others may understand it through the relationships with people they live with (Lutherová, 2009). Home is intrinsically related to the feeling of home or homeliness. The feeling of homeliness is often established through the ability of staying in control. This might be consciously or unconsciously perceived through deciding on the order of things (Lutherová, 2014). The ideal of home is often connected to other notions, such as privacy, intimacy or security. Feeling of homeliness might also be evoked through various sensations, such as, to give an example, particular smells or sounds that are connected to specific memories (Lutherová, 2009). Nevertheless, one needs to keep in mind

that the feeling of home does not necessarily have to be positive, but it might also evoke bad memories, doubts, and vulnerability. To read more about the concept of home from the anthropological perspective read Module 1 Unit 2 – Ageing and environment through the lens of anthropology.

In her work "The Idea of a Home: A Kind of Space", renowned social anthropologist Mary Douglas brought the dimension of time into the research of home. She claims that home is not only space but also has a particular structure in time that is connected to aesthetic and moral dimensions of home (Douglas, 1991, 289). What becomes a home for us can also depend on the individual periods of our lives, on where we are on our life's journey.

At the same time, Douglas problematizes the home's essential functions that we usually encounter. She says that as much as we can talk about the home as a point of stability that deepens and enriches the personality, there are just as many opinions and experiences that claim home cripples and suppresses the personality (Douglas, 1991, 288). Home is a space that can always be located but does not have to be located. It does not need bricks or walls; it can also be a tent or a car. Douglas argues that it doesn't have to be a big space, but it has to be space because (as already stated above), the home is characterized by being a place over which we have control (Douglas, 1991, 289).

When older adults (voluntarily or involuntarily) move to an institutional care facility, the demand for the character of the housing environment becomes particular. It must be designed to ensure the clients' wellbeing and enable them to realize their own perception of creating and establishing a home according to their ideals, needs, and preferences. Indeed, this might not be a simple task, as the environment must be variable and accommodate various people's perspectives.

According to the research of Jaber F. Gubrium (1997), even the interaction of the staff and clients of an institution caring for older adults are determined by the offices, rooms, and floors. The environment influences the possibilities and quality of mutual communication. Gubrium showed there is a relationship between space and the world of meaning of an individual. As shown by other gerontologists, there is a cross-sectional relationship between the architectural and design characteristics of the built environment of care homes, the quality of life of the older adults and the perception and attitude of the staff (Parker et al., 2004).

Figure 2.4.5 (Matos, 2019)

DO YOU WANT TO KNOW MORE ABOUT...

THE ATTACHMENT TO PLACE

The topic of routine behaviour in the sense of more effortless fulfilment of everyday tasks is also linked to the study of attachment to place, which several authors have interpreted differently. Randall Collins connects routine with intimate knowledge of space and an emotional bond to a place (Collins, 1981), Thomas Gieryn connects routine behaviour with subjective security in a given place (Gieryn, 2000), and Anthony Giddens (1998) with the confidence of individuals in the stability of the material and social environment, or in the stability of their own identity.

4.4.1 Staying in control as part of quality ageing

People who find themselves in "negotiation" related to the aging process, or those who have already negotiated their place "in old age", try to maintain control over their situation in relation to themselves and others. They consider the conditions and available resources, including (without doubt) also spaces and things (Marshall, 1995).

We perceive the space and environment that a person creates for themselves or in which they appear (willingly or not) as an essential part of human beings, but also one of the factors affecting human experience. The core of this relationship relies on the act of choosing. It makes a difference whether a person chose this space themself or whether they were forced to be in a given space under the influence of circumstances. According to Thomas Gieryn, space with things is constructed in two ways: on the one hand, people produce it; on the other hand, space and things retroactively frame human activity and influence the actions of individuals. At the same time, individuals perceive and interpret space and things/objects, and they thus become part of their identity (Gieryn, 2000, 465–467). The longer people live in a place and accumulate their biographical experience there, the stronger they feel rooted there (Gieryn, 2000, 481). It is necessary to mention the statement of Powell Lawton, who emphasized that "home is a maximized autonomy" (Lawton, 1989, 153) in the sense that an individual may or may not demonstrate his competencies, he may control them as well as give them up. However, the important thing is that it still depends on his decision.

The need to make a decision can also be brought about by changes that accompany the ageing process and life in old age which may lead to the need to change the place of residence of an older adult. This can be associated with psychological and social risks associated with the loss of the intimate environment of an apartment, house, or close neighbourhood. At the same time, it is also associated with the loss of things and objects with which an old person can identify, which define their personality and make life meaningful (Douglas, 1991).

DO YOU WANT TO KNOW MORE ABOUT...

A TYPOLOGY OF MOVING

Based on their fieldwork, Litwak and Longino created a typology of moving. It indicates that the character of moving and its reasons influence how it is experienced. Above all, an involuntary transition to permanent institutional care is problematic, as it fundamentally affects (restricts) independence (Litwak and Longino call this a dependency move). Also, moving to the vicinity of the adult children's place of residence, or even to their own household, might be precarious, as the need for occasional or temporary help might limit their personal independence (independence maintenance move). Fundamentally different from these two types is migration guided by a free decision to improve the conditions of one's living or of life in old age (amenity migration) (Litwak & Longino, 1987) .

Figure 2.4.6 (Pauliniová, 2022)

4.4.2 Materiality: people and things

A place can be defined through the things that are in it. The things that we somehow handle or come into contact with during our lives are not just ordinary tools that help us "survive" or make this "survival" easier and more comfortable. Things "embody" goals, can present capabilities, and shape our identities.

To understand "what people are" and what/who they might become, we should also try to understand what is the relationship between people and things. What does a person put into them – what meanings, emotions, or memories, what things store, and why. At the same time, we should not forget that things are affecting us as well and have, in this sense, also their own agency (Miller, 2001).

It is easier to stay where "we know it intimately" (Collins, 1981, 996) , in a place where we have possessions and things of often sentimental value, and where we are relatively sovereign individuals thanks to these "anchors of identity" (Sýkorová, 2013). According to Csikszentmihalyi and Rochberg-Halton, who deal with the "world of things" of individual family generations, things can generally fulfil three functions: utilitarian and socializing, but they also carry symbolic meaning (they refer to the specific characteristics of individuals' personalities, their social status, or the integrity) and at the same time form the identity of their users (Csikszentmihalyi & Rochberg-Halton, 1981).

Things from home or its immediate neighbourhood are for older adults a reminder of events, personal achievements, or essential ties. In the latter sense, even things like gifts are directly involved in the development of relationships (Komter, 2001b, 73; Komter, 2001a).

Figure 2.4.7 (Pauliniová, 2022)

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