Journal of Health Study and Medicine
2020, No. 4
pp. 135-149
DOI 10.36145/JHSM2020.31

Prevention of Cognitive Impairment in the Elderly

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Abstract

The growing number of older people in society and the increase in life expectancy contribute to an increase in the number of people with cognitive impairment. The aging process is associated with a natural impairment of cognitive functions. Pathological changes that may occur may lead to mild cognitive impairment, followed by dementia. The deterioration of the cognitive functioning of older people may lead to a decrease in independence in performing daily activities, a decrease in self-esteem and quality of life, and withdrawal from social life. An important element in the prevention of cognitive impairment and its consequences is early prevention, which often allows you to slow down or delay the progression of cognitive impairment. Mental and physical activity support the successful aging of the body, reduce the risk of developing cognitive impairment and improve overall cognitive functioning. Another important element of prevention is proper diet and proper hydration of the body, which has a positive effect on overall health. With age, thirst decreases physiologically, so it is important to control the amount of fluid intake by older people. Preventive actions have a positive impact on the cognitive and functional efficiency of seniors. Management of cognitive functions and dementia is not only a problem for a patient, but also burdens the family and close ones, who take part in the role of caregivers, so one should consider the use of prevention as soon as possible.

Key words: *older adults, cognitive impairment, prevention.*

Introduction

Life expectancy in Polish population is increasing, and as it grows, so does the number of people with cognitive impairment and dementia. The number of elderly people is systematically increasing. According to the Central Statistical Office (Główny Urząd Statystyczny, GUS) data, at the end of 2018, the number of people over 60 years of age reached 24.8% of Polish population and increased by 5.2% compared to 2010. As predicted by the Central Statistical Office, the number of people aged 60 and more in 2050 may increase to 40% of the total population [1]. An important part of everyone's mental health is their cognitive ability. Cognitive processes allow for receiving and assimilating information, its analysis and collection. They affect both the quality of functioning in society and the subjective perception of the quality of life. Deterioration of cognitive functions, including the skills of learning, remembering and thinking, adversely affects the daily functioning of older people, as well as their quality of life. This can lead to a decrease in their independence, lower self-esteem and withdrawal from many areas of activity [2]. The prevalence of dementia in the elderly population is estimated at around 10% [3]. It is estimated that 47 million people worldwide currently suffer from dementia, which could triple by 2050 [4]. So far, effective treatment of cognitive disorders has not been proven, but there is scientific evidence that the progression of progressive changes can be slowed down with non-pharmacological treatments, including exercise, weight normalization, and adequate cognitive stimulation [5,6]. Active participation in social life, support from friends, various forms of activity improve the global cognitive functioning of older people [7].

Aging of the body

The aging of the body is a demographic process and it progresses with increasing intensity. The number of elderly people is increasing every year. With age, more and more physiological changes related to aging appear

in the body. Old age is the last stage of the body's aging process. The age threshold for old age is 60 (according to WHO) or 65 (according to the UN). Old age is divided into three sub-periods: early old age (between 60 and 75 years of age), later old age (between 75 and 89 years of age) and longevity or old age (over 90 years of age) [3, 8].

Changes in the aging process, the so-called involutional changes take place in cells, tissues, and throughout the body. As a result of involutional changes in the nervous system, the number of neurons is reduced, especially in the hippocampus, which affects the transfer of information from short-term to long-term memory [9]. Neuropathological changes can also occur: neuronal filamentous degeneration associated with the formation of intracellular neurofibrillary tangles and senile plaques consisting of extracellular aggregates of beta-amyloid plaques. These changes disrupt the process of neurotransmission, which hinders signal transmission, leading to cognitive impairment [3, 4]. The presence of beta-amyloid in patients with mild cognitive impairment is likely to lead to Alzheimer's disease in the future. Neurological studies show a decrease in the volume of gray matter, which begins to decline after the age of 20, white matter, and a decrease in the level of neurotransmitters in an aging body, which can lead to cognitive impairment [10].

Changes in the cardiovascular system, pathologies of which lead to vascular dementia, are also important for cognitive functioning. With the aging of the organism, arterial vessels expand, the walls thicken, and their elasticity and flexibility decrease due to stiffening. Changes in the structure of the heart also occur in older people. Physiologically, there is an enlargement of the ventricular walls, i.e. septum of the left ventricle and the dimensions of the left atrium increase [8]. Research shows that people with left ventricular hypertrophy have poorer cognitive functions than people without left ventricular hypertrophy, especially in two areas, memory and executive function [11]. The aging process of the organism is also associated with the formation of functional and structural changes in the kidneys, the weight and size of the kidneys decrease, the blood flow through the kidneys and glomerular filtration decrease [8]. These

changes affect cognitive functioning, the SPRINT study showed that patients with a higher glomerular filtration rate scored worse in assessing cognitive functioning [12]. With age, changes in the respiratory system also occur, the chest stiffens, and the strength of the intercostal muscles and the diaphragm weakens. Forced vital capacity (FEV) and forced expiratory volume in one second (FEV1) are reduced [8], which affects the risk of cognitive dysfunction [13]. By means of preventive measures, it is possible to delay the emerging involutional changes.

Prevention of cognitive functions disorders

During the aging process, many cognitive functions are naturally impaired, which is known as cognitive aging. Particularly significant defects can be observed in certain aspects of memory and attention, processing speed, executive functions, and reasoning [14]. The consequences of the deterioration of the cognitive functioning of older people may be: a decrease in their independence, lower self-esteem, withdrawal from many areas of activity (e.g. professional, social, educational) due to the feeling of reduced mental competences [15]. That is why various strategies for the prevention of cognitive disorders are so important. Therefore, various types of interventions are undertaken to improve the cognitive functioning of older people.

Mental activity

Cognitive training is one of the possible interventions [16] and is still under research. Research on cognitive function training indicates an improvement in at least one of the measures of cognitive function used in cognitive interventions conducted among healthy elderly people [17] and a positive impact on global cognitive functioning, selected cognitive domains and psychosocial functioning of cognitive training in the elderly. In the case of people with mild cognitive impairment [18]. Some researchers point out that the effectiveness of such interventions in healthy

elderly people and people with mild cognitive impairment may have some limitations in their impact on the improvement of trained tasks, as well as the lack of transfer of this improvement to other cognitive tasks [19], but other analyses indicate the possibility of transferring the improvement of functioning in various areas and tasks. However, it is rather a close transfer, that is, a transfer to similar tasks, involving the same cognitive functions as the trained tasks [20]. This transfer can also take place among the elderly. The analysis by Karbach et al. [21] indicates not only a significant improvement in the performance of trained tasks, but also the effects of close and long transfer as a result of executive functions and working memory training conducted among older people (over 60 years of age). Elderly people more and more often use the Internet and available cognitive training programs, which, according to research results, may protect against the deterioration of cognitive functions in normally aging people [22]. It seems rational to take care of the mental activity of the elderly for as long as possible, the more so as most sources describe the improvement of cognitive functions in the elderly participating in mental training. Perhaps this could prevent or delay the onset of cognitive decline.

Physical activity

Maintaining physical activity in the elderly is as important as maintaining mental activity. World Health Organization (WHO) recommends people over 65 to exercise at moderate intensity for at least 150 minutes per week, suggesting that increasing this time to 300 minutes per week increases the health benefits [23]. Participation in physical activity is believed to contribute to successful aging and maintaining psychomotor performance [24]. Guure et al. indicates that physical activity reduces the risk of dementia from various causes, especially Alzheimer's disease [25]. More and more scientific publications seem to confirm that a lifestyle that includes physical activity significantly increases the chance of successful aging also in terms of cognition [26]. This indicates the usefulness of endurance (aerobic), strength (resistance), stretching and equivalent

exercises in health training of the elderly [27, 28, 29, 30, 31]. The optimal type of intervention is the use of all exercises. Interventions with the use of various types of exercise not only improve cognitive functioning, but also increase muscle strength, reduce the risk of depression and have a positive effect on the quality of life [30]. The researchers' attention is also drawn to other, less popular forms of physical activity in terms of possible improvement of the cognitive functioning of the elderly. Research conducted on a group of people over 55 years of age practicing yoga has shown a significant improvement in memory as well as an overall improvement in cognitive functioning [32]. Cognitive functioning was also improved by researchers who used an intervention with aerobic dance exercises, in patients with mild cognitive impairment. After the training, episodic memory and processing speed were particularly improved [33]. Physical activity contributes to the increase in vascularity and reduces the negative impact of oxidative stress on the body and a decrease in energy metabolism. Physical activity, like mental activity, protects against cognitive impairment [34]. Physical activity, while often beneficial, may not always be effective in fighting dementia. Not all studies support a reduction in the risk of developing vascular dementia associated with exercise [29]. There are also suggestions that aerobic training does not significantly affect cognitive performance [35]. However, most scientific research seems to confirm the beneficial effects of exercise on cognitive and functional functions in seniors. Regular exercise appears to have preventive effects on the brain, both in terms of physiological and pathological aging. The availability and low costs associated with the introduction of physical activity as a form of prevention and therapy make it a very attractive means of influencing health.

Diet

Proper nutrition is one of the main components of maintaining cognitive well-being. A proper diet slows down the aging process of the body, reduces the risk of developing neurodegenerative diseases by acting as

an anti-inflammatory. Moreover, it slows down the process of the formation of atherosclerotic plaques in the arteries of the brain and increases blood flow and stimulates the immune system [34, 36]. The Mediterranean diet and the DASH diet used in the treatment of hypertension have a neuroprotective effect. They are particularly rich in omega-3 acids, antioxidants and polyphenols [37], which positively influence the inhibition of oxidative stress and the reduction of neuroinflammatory processes [38, 39]. The Mediterranean diet is characterized by high consumption of vegetables and fruits, legumes, nuts and olive oil, along with low intake of saturated lipids and meat, moderate consumption of fish, low to moderate consumption of dairy products, and regular to moderate alcohol consumption (usually wine). The DASH diet is also rich in fruit and vegetables, foods low in saturated fat, and low-fat dairy products [40]. These diet regimens provide essential micronutrients, fiber, and other plant-based foods that are believed to promote health. Adherence to the Mediterranean diet and DASH lead to a reduction in the risk of cognitive dysfunctions and a slower process of their deterioration, and improvement in the global cognitive functioning of the elderly [37, 41, 42].

An important element of prevention of cognitive disorders is adequate hydration of the body, which should be especially paid attention to by the elderly. Adequate hydration of the body reduces the feeling of fatigue and improves well-being and mood. It has a positive effect on cognitive functioning, especially in the field of short-term memory, attention and reaction [43]. Dehydration increases the risk of developing dementia, including Alzheimer's disease and vascular dementia. These patients show greater dehydration of the organism than without dementia [44].

Summary

The growing number of elderly people in society and the extension of life expectancy lead to an increase in the number of people with cognitive impairment. Physiological aging of the organism leads to the formation of involutional changes that occur with varying intensity. Changes in the

bodies of older people lead to a decline in cognitive functions. The aging of the body and the brain, is an inevitable process, but scientific research shows that the preventive measures taken delay the aging process and reduce the risk of developing cognitive disorders. Important elements of prevention include mental and physical activity as well as a diet with adequate hydration. One of the ways to improve cognitive functioning is also a cognitive training. All these affect not only the improvement in selected domains, but also the global cognitive functioning, the effect of close and far transfer is also noticed, improving functioning in everyday life and its quality. In addition to mental activity, physical activity is also important to promote successful aging and reduce the risk of dementia. The analysis of the presented studies allows to confirm the beneficial effect of mental and physical activity, as well as changes in eating habits on the cognitive performance of the elderly. As many activities as possible should be undertaken to improve the functioning of the elderly, because progressive cognitive disorders lead to difficulties in performing everyday activities, which becomes a big problem not only for the sick person, but also for their relatives. Dementia diseases are a great challenge for every country in terms of providing adequate medical care, also institutional, and in economic terms, which is why their prevention is so important.

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