

Modlińska Aleksandra, Florczak Aleksander, Krakowska Natalia, Kontowicz Marlena, Lange Hubert, Zwolinski Adrian, Rozmanowicz Ewa, Fortuna Aleksandra, Kwiatkowska Klaudia, Rymarska Olga, Szmelcer Benjamin, Wilczyński Michał, Zaborna Daria, Porada Mateusz, Kędziora-Kornatowska Kornelia. Dizziness and balance disorders in the elderly. *Journal of Education, Health and Sport*. 2019;9(7):281-293. eISSN 2391-8306. DOI <http://dx.doi.org/10.5281/zenodo.3337382>
<http://ojs.ukw.edu.pl/index.php/johs/article/view/7140>

The journal has had 7 points in Ministry of Science and Higher Education parametric evaluation. Part B item 1223 (26/01/2017).
1223 Journal of Education, Health and Sport eISSN 2391-8306 7

© The Authors 2019;

This article is published with open access at Licensee Open Journal Systems of Kazimierz Wielki University in Bydgoszcz, Poland
Open Access. This article is distributed under the terms of the Creative Commons Attribution Noncommercial License which permits any noncommercial use, distribution, and reproduction in any medium, provided the original author (s) and source are credited. This is an open access article licensed under the terms of the Creative Commons Attribution Non commercial license Share alike.
(<http://creativecommons.org/licenses/by-nc-sa/4.0/>) which permits unrestricted, non commercial use, distribution and reproduction in any medium, provided the work is properly cited.

The authors declare that there is no conflict of interests regarding the publication of this paper.

Received: 20.06.2019. Revised: 25.06.2019. Accepted: 16.07.2019.

Dizziness and balance disorders in the elderly

Aleksandra Modlińska¹, Aleksander Florczak¹, Natalia Krakowska¹,
Marlena Kontowicz¹, Hubert Lange¹, Adrian Zwolinski¹, Ewa Rozmanowicz¹,
Aleksandra Fortuna¹, Klaudia Kwiatkowska¹, Olga Rymarska¹, Benjamin Szmelcer¹,
Michał Wilczyński¹, Daria Zaborna¹, Mateusz Porada¹,
Kornelia Kędziora-Kornatowska¹

¹ Faculty of Health Sciences, Department and Clinic of Geriatrics, Ludwik Rydygier Collegium Medicum in Bydgoszcz, Nicolaus Copernicus University in Toruń, Poland

Abstract

Background: Patients in the geriatric age are characterized by the presence of degenerative changes, significantly affecting their daily functioning. One of the most common symptoms accompanying the elderly include dizziness and balance disorders. This is an extremely important issue, because even every third patient can report such ailments. Often, especially in the group of geriatric patients, these problems are related to disorders in the circulatory system, and more specifically to orthostatic hypotension.

Material and methods: Analysis of available literature, articles in the Google Scholar and PubMed database using keywords: geriatrics, dizziness, balance disorders.

Results: In the treatment of dizziness and disorders of the balance we distinguish pharmacological and non-pharmacological methods where kinesitherapy (exercises) looms large. In the case of pharmacological treatment, attention should be focused on causal therapy because symptomatic treatment can cause side effects and should therefore be used as soon as possible. In many cases, pharmacological treatment can be fully replaced by normal and individually conducted physiotherapeutic procedures. Training to which a patient is subjected should consist of many elements, which, however, will be adapted to the conditions that can meet a patient in everyday life. In diagnostics of the above-mentioned problems, research on stabilometric platforms is becoming more and more important. Increasingly, also in the

rehabilitation of patients with a problem with equilibrium, modern technology in the form of virtual reality is used.

Conclusions: Dizziness and balance disorders can result in many problems, which is why correct diagnosis and effective treatment are so important, especially because it is a problem for more and more people. Greater importance should be attached to prevention. Although modern forms of fighting these disorders are being introduced, there is still a need for further research on their effectiveness.

Key words: geriatrics, dizziness, balance disorders

Introduction

The ageing process is natural and irreversible. Its consequence is a decrease in the adaptability of the body. In addition, the efficiency and independence of older people are reduced. These are the main factors that lead to a significant deterioration of the quality of life. Changes occurring in the body of older people in the form of: reduced muscle tone, more and more frequent dizziness and disturbances of balance can have many consequences. The most common of these are falls. In older people, fear and panic arise which can lead to isolation and a significant reduction in activity [1, 2].

Dizziness is one of the most common problems of older people, in people >75 years of age is the main cause of disability. This symptom is defined at around 20% in people >60 years of age, about 30% in people >70 years of age and about 50% in people >80 years of age. Often, in people with dizziness, gait disturbances are additionally found [3, 4].

Balance disorders belong to the so-called Big Geriatric Problems. These are diseases or disorders that affect the functioning of older people. Such conditions have many causes, are chronic and slowly reduce full independence from other people [5].

There are many tests, scales or questionnaires thanks to which it is possible to quickly conduct a test detecting any disturbances in the equilibrium system. It is also important to regularly check the efficiency of older people and their independence in everyday functioning. Thanks to this, medical staff can take action to reduce the consequences of the aging process as much as possible. The effectiveness of interventions in the area of balance disorders and dizziness is limited, but there are solutions that have a positive effect and bring many benefits [6]. Those solutions are the main part of this article.

Balance system – its components

The balance control systems consists of a central part (the cerebral cortex, brainstem, cerebellum), peripheral part (eyes, labyrinth, the proprioceptive receptors in peripheral tissues) and their associated pathways. The sensory epithelium is located in the maculae of the saccule and utricle and in the cristae in the ampullae of the three semicircular canals. Every head movements must be registered by properly oriented semicircular canals and macular hair cells [7, 8].

Typically, when there is no movement of the head, primary afferents fibre in the right and left vestibular periphery discharge constantly with the same frequency. It means that during horizontal head rotation to the right, the rate of stimulation from right vestibulum is faster and this on the left is simultaneously slower. Inputs from the coplanar semicircular canals (from both sides, contralateral and ipsilateral) are transmitted to the vestibular nuclei [9].

The somatosensory system can be divided into the haptic perception and the proprioceptive system. Probably they both are important in proper balance control. Information detected by Meissner's corpuscles, Pacinian corpuscles, Merkel's discs and Ruffini corpuscle end-organ is included to haptic perception. The proprioceptive system

provides to the central nervous system with information of joints movement and changes in position, detected by muscle spindles, Golgi tendon organs and joint afferents [10].

Two primary vestibular effector pathways were described in literature. Firstly, the vestibulo-ocular reflex uses the projections from the vestibular nuclei to the oculomotor nuclei. This reflex stabilizes gaze at point when the head is in the movement. Secondly, there are vestibulospinal reflexes, which use pathways to antigravity muscles located in lower limb, neck and torso. Furthermore, our organism uses two reflexes to stabilizing the head. The vestibulocollic reflex is responsible for the activation of neck muscles in response to vestibular input. The cervicocollic reflex is depended to the response of stretch receptors [9].

Symptoms of vertigo result from a mismatch between the sensory information generated by between visual, proprioceptive and vestibular inputs. The typical autonomic responses, which are frequent accompanying symptoms of vertigo, are probably caused by the vestibulo-autonomic pathways [8].

The vestibular nuclei second-order sensory neurons lead informations to the ipsilateral thalamus. The next important structure is the parietoinsular vestibular cortex, which is in fact multisensory – receiving visual and tactile inputs as well as vestibular [11].

Causes of dizziness and balance disorders

Dizziness and balance disorders are a frequent cause of falls in the elderly. The proper functioning of the entire balance system, which consists of, among others: the vestibular nerve, labyrinth, vestibular nucleus, CNS, the organ of sight and receptors of deep sensory (proprioceptors). Balance disorders can also be indicative of trivial and very serious health problems, they can be a symptom of diseases with peripheral (vestibular) etiology. The occurrence of disturbing symptoms that may lead to disturbances in the balance is associated with the need to undertake further, specialist medical consultation [12, 13].

Finding the cause of imbalance is very important in order to introduce appropriate prevention and treatment. Conducting a detailed interview and physical examination is important in order to recognize the nature of the causes of the imbalance. It is very important to identify the provocative factors and accompanying symptoms and their duration. In the case of older people, a list of recently administered medicines and their possible association with dizziness should be established [14, 15].

Maintaining the balance of the body depends on many factors, i.e.: the appropriate function of the sensory, visual, vestibular, somatosensory structures as well as normal muscle strength and joint mobility. Before the occurrence of dizziness and loss of balance may occur such symptoms as: sight problems (blurred vision, double vision, scotoma), headache, nausea, vomiting, local neurological symptoms (convulsions), hearing disorders (noise, hearing loss or hypersensitivity, ringing) and disturbances of consciousness [14, 15].

There may be a lot of causes of dizziness and balance disorders. The structure of the balance system may be disturbed by diseases related to the peripheral aging process and the central vestibular system. In the case of older people, anomalies may occur as a result of damage to the labyrinth and the vestibular nerve. Most often, central disorders include a transient episode of cerebral ischemia, which arises as a result of abnormal functioning of the cerebral circulation, i.e. cervical insufficiency [13, 14].

In the case of the elderly, one of the most common causes of disturbances of balance and fainting is orthostatic hypotension (decrease in systolic pressure > 20 mm Hg and/or diastolic > 10 mm Hg, within 3 minutes after getting up from the supine position). According to the data, this problem affects about 30% of the population after 75 years of age. Among the predisposition to orthostatic hypotension are, among others, inadequately treated hypertension, diabetes, chronic heart failure or Parkinson's disease. Also in the case of elderly people, orthostatic hypotension may be caused by the intake of certain medications, i.e.:

diuretic, vasodilating agents and the presence of chronic diseases. Orthostatic hypotension leads to increased risk of falls, cardiovascular disease, heart failure and stroke – a major problem for the elderly population [14, 16].

Diagnostics

Diagnosis of dizziness is difficult. Ailments associated with this disease entity are often very diverse. Sick people assess ailments such as the whirling of the surroundings, the uncertainty of posture, collapsing into the ground or floating, stupor, confusion, anxiety or weakness of the lower limbs. Such a variety of symptoms is caused by the fact that the balance depends on many systems and factors such as: the vestibular system, cerebellar system, visual perception, proprioceptive sensibility, and indirectly also the circulatory system, patient's psychological state and metabolism [17].

During the interview, the patient should be asked about everything that indicates problems with balance and dizziness. Thanks to this, it is possible to get a description of how the disease has been going on so far and what ailments have occurred. Furthermore, it is important to know about the scale of the patient assessing the severity of symptoms during specific activities in everyday life. Unfortunately, due to the fact that the symptoms are described in various ways, it is difficult to clearly identify the patient's ailments. The next stage is a physical examination covering various types of diagnostic tests aimed at confirming the problem and diversifying its undertow [18]. The following are some of the tests used to diagnose dizziness and balance disorders.

To start with, DHI questionnaire, Dizziness Handicap Inventory is a disability questionnaire due to dizziness or balance disorder and also one of the most popular questionnaires describing the dynamics of symptoms changes during the existence of vestibular diseases. It is used in patients with labyrinth dysfunction, dizziness caused by the position of the head or due to multiple sclerosis and conditions after brain injury [19].

The other test is VSS, Vertigo Symptom Scale – the scale of the symptoms of vertigo – a questionnaire assessing and differentiating dizziness, balance disorders and emotional disturbances. Detailed subscales include:

- 1 – evaluation of acute dizziness and possible falls
- 2 – assessment of short, isolated dizziness, disturbances of balance
- 3 – assessment of autonomic symptoms
- 4 – evaluation of somatisation or excessive emphasis on health problems [18].

Another very popular test is The Tinetti (Performance-Oriented Mobility Assessment, POMA) balance and gait scale, which is used to assess gait and balance in older people. The tasks that the patient has to perform are divided into two parts: in the first one, the balance is assessed while the patient is sitting, standing and turning. In the second part, the gait parameters are evaluated. The maximum number of points to score is 28. Obtaining less than 19 points means a five times higher risk of falling than the tested one who scored the maximum number of points [20].

In diagnostic, it can be also used BBS – Berg Balance Scale, evaluating the functional balance. It consists of 14 tasks assessed on a five-point scale and includes standing on both legs, on one leg, sitting down, stepping on the step, rotation around the axis and reaching test. This scale has a 98% compatibility, but is less sensitive than the Tinetti test, because it identifies only 53% of patients with a tendency to fall. However, it has a high specificity of identifying people who are not at risk (96%) [21].

The last tool is DGI, Dynamic Gait Index – a test used to evaluate gait. It includes 8 tasks such as walking with the simultaneous turning of the head from side to side, walking at different speeds, walking with overcoming obstacles, descending and climbing stairs, turning while walking [22].

Epidemiology

Elderly people very often complain of dizziness. Women report this problem more often than men because it affects them more frequently [14, 23]. Everyday problem with dizziness concern nearly 1/3 of people who have reached the age of 70. These disorders are burdensome to such an extent that these people decide to visit a doctor because they significantly limit their normal functioning in daily life. Percentage of people in the group above 60 years old who report dizziness to a doctor is figure 20% per year so it is lower. And when it comes to people over 80, almost every second person reports to the doctor at least once a year. It is caused by a significant deterioration of the quality of life resulting from the occurrence of dizziness, which is a key factor hindering the performance of daily activities for the elderly [3, 24].

Dizziness is one of the important internal risk factors for falls in the elderly. Older patients who have dizziness problems that have lasted for a long time also complain about gait disturbances. Dizziness and balance disorders are one of the most important factors predisposing to falling [3, 14, 25]. Balance disorders occur in nearly 85% of the population in the US over 80 years old [3]. Over 1/3 of people living in their own houses experience a fall at least once a year. This number increases to over 50% of the population of nursing homes. In most cases, falls do not have much influence to the deterioration of health, only about 1/10 falls end with intracerebral injuries or fractures that significantly worsen the prognosis [3, 14]. Despite this, falls rank first among the causes of accidental death in the population of people over 65 years of age. And dizziness in this group of people is the main risk factor for disability [23]. In summary, each incident, no matter how serious, is associated with the onset of the post-fall syndrome, resulting in reduced physical activity caused by fear of another fall [14, 23].

Pharmacotherapy for dizziness and balance disorders

In pharmacotherapy of dizziness and balance disorders, we can use causal and symptomatic treatment. Therapy of disorders should be mostly causal. Symptomatic management should last as short as possible. This is due to the fact that vestibule suppressants (drugs that inhibit the activity of the labyrinth) have an anticholinergic effect: they cause disturbances of concentration, memory and delirium, making their longer use unsuitable for the elderly [14, 26, 27].

Emergency treatment

During an acute episode of dizziness the following medicines should be administered parenterally. The patient should be placed in a position that minimizes problems associated with dizziness and also be provided with silence. In the treatment of dizziness among neuroleptics, promazine and haloperidol are used. These drugs are blockers of the dopaminergic, cholinergic, alpha-1, H1 and serotonergic receptors. They act calming and antiemetic, they also reduce the vegetative symptoms associated with dizziness. However, they can cause anxiety symptoms in patients, so they should not be taken longer than 1-2 days. Metoclopramide is also used, which has an inhibitory effect on the central nervous system and has an anti-emetic effect. Among the anxiolytics, benzodiazepines such as diazepam and midazolam are most commonly used. They work calming and sedative, which is particularly important due to the fact that dizziness can be of psychogenic origin. However, one should bear in mind the side effects of the use of benzodiazepines, which include physical and mental dependence, balance disorders and memory disorders. Among the first generation antihistaminics, prometasin, dimenhydrin, hydroxyzine and clemastine are used to treat vertigo. These drugs act cholinolytic by blocking muscarinic receptors and inhibit the central nervous system [14, 17, 26, 27, 28].

Causal treatment

Depending on the cause of the disease, vasodilators (calcium and methylxanthine antagonists), alpha-blockers, antiplatelet agents, Gingko biloba, as well as steroids and diuretics are used. Calcium antagonists counteract cerebral vasoconstriction, thus also vasoconstrictor spasms and improve microcirculation. One of the most important roles is the drug blocker of H3 receptors and the inducer of H1-betahistine. It increases the release of histamine in nerve endings, inhibits the activity of vestibular neurons, and also improves blood flow in the labyrinth. It also reveals the fewest side effects of these long-term drugs [17, 26, 27].

One of the causes of dizziness may be Meniere's disease, in which diuretics, low-sodium diet and betahistine are used. In labyrinthitis, the use of steroid therapy – methylprednisolone. In migraine dizziness, in addition to medications listed for emergency treatment, triptans and methylprednisolone may be used. In presbyastasis (multisensory dizziness associated with old age) – betahistine, Gingko biloba, piracetam. However, the most important in the treatment of dizziness is the fact that a significant proportion of patients do not require medication but a proper physiotherapy [14, 17, 27].

Kinesitherapy

The approach to dizziness and balance disorders in the elderly should be holistic. One of the elements of comprehensive treatment is kinesitherapeutic and vestibular rehabilitation, introduced for the first time in 1946 by Cawthorne and Cooksey [29]. This type of training consists of three parts, which are individually matched to each elderly person: eye movements in a sitting and standing position and changing the position of the body [30].

When planning a rehabilitation program, the general health of older people and comorbidities should be taken into account. Training starts with static movements, gradually increasing the difficulty. It is also important to change the support surface during the exercise. It is essential to perform such tasks and exercises that an elderly person can meet in everyday life. One of the complications of dizziness is falling. Fear of a possible fall causes that physical activity of older people is very limited [30, 31].

The main part of the kinesitherapy procedure are balance exercises. They improve the ability of the elderly to verify information that comes from the external environment. When carrying out all the exercises, an elderly person has to be provided with indemnification that does not fall. In order to improve the spatial orientation, mainly walking exercises are performed on various substrates, as well as with closed eyes [32]. For exercises on unstable ground, among others: rehabilitation pillows and Swiss balls are used. With such training, deep muscle stabilizers are activated. The example of posture control exercises is: standing on one leg, walking on toes. The purpose of these exercises is to improve the proprioceptor function [32]. Exercises can be hindered, for example, by closing the eyes by the patient, which will further strengthen the effects of the therapy [30, 31, 32].

Systematicity and duration of physiotherapy are the key to achieving the best possible element of therapy. Available studies also confirm the positive effect of vestibular rehabilitation in reducing dizziness and improving the balance [29, 30].

Stabilometric platforms and their use in balance disorders

Posturographic tests using stabilometric platforms are included in objective methods for assessing the functioning of the postural control system as well as for detecting balance and fall risk. The posturographic platform consists of a small size plate (50x50cm) equipped with strain gauges recording pressure forces and moments of forces exerted on the ground by the feet. Then the collected data goes to the computer, where they are visible as a graphic presentation of the test results [34, 35].

During the measurements made during free standing, COP (center of foot pressure) is observed in the main planes, which is a determinant of the stability of the standing posture. Determining the exact position and displacement of COG (center of gravity) in postural control tests is possible only through the use of complex measurements of body segments and mathematical calculations. Therefore, in clinical trials COG is replaced by a parameter called COP – the center of foot pressure, which is a projection of the body's center of gravity on the plane of support [34, 35].

Present balancing platforms allow for various measuring possibilities. There are single-plate devices that record the average foot pressure measurement on the ground, and double-plate platforms that collect separate parameters of the left and right limb pressure forces. Due to the possibility of recording parameters separately for both limbs, it is possible to detect the asymmetry of lower limb load and analyze the rest of the parameters for each limb [34, 35, 36].

Parameters belonging to the group most frequently studied in the posturographic study [35]:

- area of COP road graph plotted over time,
- path length (a total distance of displacement of the COP within the prescribed time, expressed in millimeters),
- average speed of displacement of the COP in the frontal or sagittal plane (expressed in mm/s),
- maximum deflection of the COP from point 0 in the anterolateral or lateral direction.
- medium deflection of the foot pressure center from point 0 towards the anteroposterior direction or side.

In addition, it is possible to carry out dynamic computer posturography – CPD. CPD is a study that records the body's response to external stimuli and makes it possible to assess them. Platforms allowing CDP to be carried out allow the analysis of postural reactions in conditions of sensory conflicts caused by movements of the support surface and changes in the moving visual environment. Among the available protocols there are: organization test-SOT, motor control test – MCT, adaptation test – ADT and postural evoked responses – PER [18, 36, 37].

The study of dynamic and static posturography allows increasing the detectability of diseases of the vestibular system. Balance disorders, dizziness, which have not disappeared after the use of pharmacotherapy and rehabilitation, are pathological conditions, in the diagnostics of which a test should be considered using a stabilometric platform [18, 37].

Virtual-reality programs as a physiotherapeutic method

In addition to traditional solutions, physiotherapeutic methods also take into account the use of virtual reality in which artificial images and situations that show the real world are generated through a computer. They are enriched, among other things, by giving the sound and a feeling of translocation of movements, which provides many stimuli and improves the functioning of the nervous system. People using such devices can interact with the created reality through the movements of their own body, having the impression that they are in it [38, 39, 40, 41, 42].

Under the slogan of virtual reality, there are special games that combine fun with improved health and are increasingly used in rehabilitation proceedings. Such modernity may delay the processes of nervous system regression in the elderly. In addition, it is not expensive and easy to use. It also allows elderly people to join the digital reality, from which they are often separated [39, 41].

The most popular virtual reality hardware is the Nintendo Wii, which uses the Wii Balance Board. Standing on it, you get the ability to control what is currently shown on the TV screen that has a connection to this equipment. A 4-week study conducted on a group of

people over 65 using this platform showed that there was an improvement in the balance of 9 points assessed on the Berg scale [39].

The use of such a program is extremely beneficial for older people who have balance problems and have dizziness. They are the result of falls, peripheral damage to the vestibular system or strokes. The last condition brings with it many consequences, which are the cause of anxiety, fears and a decrease in the quality of life for the elderly person. These include the aforementioned imbalances, dizziness, but also unsteady and unstable gait, vomiting and nausea. If they occur, it is necessary to stimulate the central nervous system to function properly [38].

One of the studies evaluating the effectiveness of using the virtual reality program was carried out on a group of 40 patients from the city of Łódź, having peripheral damage to the vestibular system and described ailments. Physiotherapeutic treatment lasted 5 days after 2 series and consisted in creating situations in which patients had to comprehensively connect the eyes, deep sensory receptors and the vestibular organ, in order to be able to maintain balance and reduce the accompanying ailments. The training was also used, in which it was necessary to balance your own body during a special game based on virtual reality, as well as analysis of body movements on the posturographic platform. The entire study was conducted under the control of a physiotherapist. The results of the applied physiotherapeutic method showed that the patients who underwent the examination had a reduced intensity of dizziness. In addition, body deflections on the posturographic platform have been reduced [38].

The need to improve locomotion and coordination of movement also exists among patients after stroke. The main problem of these people is the difficulty in movement, limited due to existing paresis, as well as balance disorders, stable body maintenance and general motor skills. These activities are influenced by the nervous system, the stimulation of which is necessary to eliminate these disorders. The research conducted on a group of 22 people, which were people after a stroke, showed an improvement in the balance measured using the Berg's scale and the Timed Up and Go test. During the tests, patients used such games as ski jumping and ski slalom. In the test Timed Up and Go, the results improved by an average of 1.33 seconds, while on the Berg's scale by 4 points [40].

The use of the virtual reality method is a variety for the elderly, because it motivates to take action and effort, and also improves concentration. It also triggers the desire to improve their results, striving to achieve even better, as well as to analyze their own achievements. Another convenience is the opportunity to buy a game that is used in it, using it at home and combining it with exercises. The variety of games and the environments generated in them provides new stimuli and does not cause feelings of discouragement or boredom. However, it is necessary to continue research on the effectiveness of this method, which will be significantly extended over time [38, 40, 42].

Discussion

Dizziness and balance disorders in the elderly are often a topic in medicine. These problems are usually characterized by a complex cause and affect, among others, people with neurological, cardiological and musculoskeletal disorders [32, 43, 44]. In the literature, the issue of dizziness and disturbances of balance is the subject of both review and research papers [45]. In the research work, among others, the influence of rehabilitation on the balance disorders and the frequency of occurrence of given causes in the balance and vertigo disorders are analyzed [31, 46, 47, 48].

The complexity of the causes of balance disorders and dizziness. Ahearn et al. conducted a study in Manchester, UK in 2015, for 41 people aged 65 to 93, in which they showed that:

- 16 people had mild paroxysmal dizziness, including 13 people with peripheral vestibular dysfunction,
- 26 people suffered from general medical or cardiological diseases that affected balance and dizziness, such as hypertension.

The studies emphasized that elderly people have many risk factors that may also indirectly affect their health. 32 participants of the study admitted that they take more than four medicines daily. Polypragmasy and the use of psychotropic drugs may have an effect on the balance and dizziness [46].

What is more, the research carried out in 2010 at Collegium Medicum in Bydgoszcz showed that dizziness does not usually result from the popular disease entity, i.e. benign paroxysmal positional vertigo. 100 people have been examined with dizziness and not even one person has suffered from this disease. The authors of the study emphasize that the diagnosis of otolaryngological disorders is very complicated, therefore it has to be carried out very precisely [47].

Rehabilitation of balance disorders and dizziness. Programs for improving patients suffering from dizziness and balance disorders are matched to the causes of the disorder. There is a wide range of physiotherapeutic procedures. It includes appropriate exercises, such as:

- balance exercises,
- posture control exercises,
- exercises improving spatial orientation,
- hand-eye coordination exercises on a stabilometric platform,
- habituation exercises [31, 32, 48].

The confirmation of the effectiveness of the aforementioned exercises is studies conducted by Jung et al., whereby using 240 people it was showed that the vestibular vestment exercises help in the rehabilitation of dizziness in the elderly [49]. Rossi-Izquierdo et al. during the research in 2017 applied physiotherapy using visual-motor coordination on the stabilometric platform. 139 people took part in the research and the authors of the study showed that the group using the stabilometric platforms improved significantly the parameters of stability, which was statistically significant in relation to the control group [50].

In the rehabilitation of people with impaired balance and dizziness, virtual reality programs are also used. Duque et al. in a study of 60 people showed that the balance parameters improved in the group that used the BRU console in virtual reality technologies. Training with the use of BRU is an effective and well-accepted intervention in order to improve the balance, increase trust and prevent falls in the elderly [51].

In conclusion, dizziness and balance disorders are an important topic that is widely analyzed by scientists. This issue is complicated and requires further research and analysis, and the rightness of dealing with it is supported by the fact that dizziness and imbalance result in falls of older people. Rehabilitation of this problem affects the quality of life of older people and reduces the risk of injuries or fractures [31, 49, 50].

Summary

Balance problems can be caused by a variety of disorders in the functioning of the body. Both problems associated with structures, sensory, vision as well as muscular strength or joint mobility, may be factors causing these problems. The research conducted so far shows that orthostatic hypotension is also the main cause of disturbances in people over 75 years of age [14, 15].

In the case of dizziness, we can use emergency treatment in the case of acute episodes associated with dizziness. Therefore, neuroleptics, promazine and haloperidol are used. These drugs reduce vegetative symptoms associated with dizziness and have a calming and

antiemetic effect. We also treat disturbances of the balance by eliminating the cause of their formation, most often vasodilators [17, 26, 27].

An important element in the comprehensive treatment of people with an impaired balance is kinesitherapy. Properly carried out especially in the elderly, it can significantly improve their motor skills and balance. In the diagnosis of balance disturbances, among others, stabilometric platforms are used, they have many functions to assess the development of the disease, as well as improve the condition as a result of the treatment. There are also many available physiotherapeutic methods that improve the condition of a patient with balance problems. The most modern physiotherapeutic techniques include the virtual reality program, thanks to which the therapist activates patients by means of artificial images and situations [38, 39].

Conclusions

Dizziness is one of the common ailments among adult patients, especially in the elderly. The balance is maintained by a balance system consisting of a proprioceptive sensibility, responsible for the feeling of the body's position in space, the vagus system and the sight organ. The information received by these systems is transported to the central nervous system.

Dizziness is a heterogeneous group of ailments perceived by patients as postural uncertainty, anxiety, centrifugation, collapse, disorientation, stunning, floating, visual disturbances, weakness of lower limbs. Therefore, you should carefully look at the patient and examine him or her, not just on the basis of an interview.

In aetiology, there are many divisions of dizziness, which simplify the classification of symptoms reported by the patient to specific syndromes, determining the probable aetiology of ailments.

After learning the etiology of dizziness and imbalance in older people, we can proceed to a treatment that includes both pharmacology and physical activity, especially important for older people. Stabilometric platforms are used to help patients with imbalances.

Moreover, performing physiotherapeutic methods using artificial images and situations that correspond to the real world is essential. To make it happen in the enriched way the sound and the feeling of the nervous system functioning could play a role. People using these devices can work in a way that ensures their better functioning. It is called a virtual-reality technology (VR). In virtual-reality the patient can do everything.. Providing new stimuli and lack of feelings of discouragement and recording that ensure diversity of games and environments helps a lot. It is important to continue research on this method.

Last, but not least, the rehabilitation program should introduce prevention to the patient to prevent or reduce the frequency of imbalances and dizziness, as they can lead to a fall, resulting in harm to the patient, or in the worst case, end in death.

Bibliography

1. Krajewski K., Rosiak O., Szczepanik M., Walak J., Woszczak M., Gawrońska A., Józefowicz-Korczyńska M. (2018). Rehabilitation in elderly patients with dizziness and balance unsteadiness. *Otolaryngologia polska (The Polish otolaryngology)*, 72(1), 5
2. Januszko L.: *Rehabilitacja w geriatrici. Rehabilitacja Medyczna*. Wrocław, Urban & Partner, 2003: 541-549
3. Jahn K., Kressig R. W., Bridenbaugh S. A., Brandt T., Schniepp R. (2015). Dizziness and unstable gait in old age: etiology, diagnosis and treatment. *Deutsches Ärzteblatt International*, 112(23), 387

4. Barin K., Dodson E. E. (2011). Dizziness in the elderly. *Otolaryngologic Clinics of North America*, 44(2), 437-454
5. Czerwiński E., Białoszewski D., Borowy P., Kumorek A., Białoszewski A. (2008). Epidemiologia, znaczenie kliniczne oraz koszty i profilaktyka upadków u osób starszych. *Ortop Traumatol Rehabil*, 10(5), 419-427
6. Salzman B. (2010). Gait and balance disorders in older adults. *Am Fam Physician*, 82(1), 61-68
7. Ham R. J., Sloane P. D., Warshaw G. A., Potter J. F., Flaherty E. (2014). *Ham's Primary Care Geriatrics E-Book: A Case-Based Approach (Expert Consult: Online and Print)*. Elsevier Health Sciences, 243-257.e3
8. Murdin L., Davies R. (2008). Dizziness. *Medicine*, 36(10), 535-539
9. Minor L. B., Hullar T. E., Zee D. S. (2003). Anatomy and physiology of the vestibular system. *Clinical Neurology: Disorders of hearing, balance, and the facial nerve*, 37-54
10. Hijmans J. M., Geertzen J. H., Dijkstra P. U., Postema K. (2007). A systematic review of the effects of shoes and other ankle or foot appliances on balance in older people and people with peripheral nervous system disorders. *Gait & posture*, 25(2), 316-323
11. Mtui E., Gruener G., Dockery P. (2015). *Fitzgerald's Clinical Neuroanatomy and Neuroscience E-Book*. Elsevier Health Sciences, 202-206
12. Narożny W., Siebert J., Wojtczak R.; "Epidemiology of vertigo and balance problems"; *Forum Medycyny Rodzinnej* 2010, vol. 4, no 5, 356–365
13. Edbom-Kolarz A., Marcinkowski J.T.; "Falls of the elderly - causes, consequences, prevention"; *Hygeia Public Health* 2011, 46(3): 313-318
14. Gryglewska B. Zawroty głowy i upadki u osób w starszym wieku – wybrane zagadnienia praktyczne. *Aktualności Neurologiczne* 2018; 18 (1), 40-46
15. Zamysłowska-Szmytko E., Szostek-Rogula S., Śliwińska-Kowalska M.; "Functional assessment of patients with vertigo and dizziness in occupational medicine"; *Occupational Medicine* 2018;69(2):179–189
16. Stańczyk A., Gielerak G.; "Syncope in elderly patients"; *Medycyna po Dyplomie* 2011(20); 7(184): 109-115
17. Litwin T., Członkowska A. (2008). Zawroty głowy w praktyce neurologa-diagnostyka i leczenie. *Polski Przegląd Neurologiczny*, 4(2), 78-86
18. Szostek-Rogula S., Zamysłowska-Szmytko E. (2015). Przegląd skal i testów dla oceny czynnościowej pacjenta z zawrotami głowy i zaburzeniami równowagi. *Otorinolaryngologia*, 14(3)
19. Szostek-Rogula S., Zamysłowska-Szmytko E. (2018). Walidacja polskiej wersji kwestionariusza Dizziness Handicap Inventory. *Otorinolaryngologia*, 17(3)
20. Borowicz A. M. (2014). Problem upadków u osób starszych. *Kinezyterapia*, 2, 21-26
21. Błaszczak J. W., Czerwos L. (2005). Stabilność posturalna w procesie starzenia. *Gerontologia Polska*, 13(1), 25-36
22. Szot P., Golec J., Szczygieł E. (2008). Przegląd wybranych testów funkcjonalnych, stosowanych w ocenie ryzyka upadków u osób starszych. *Gerontologia Polska*, 16(1), 12-17.
23. Balatsouras D.G., Koukoutsis G., Fassolis A., Moukos A., Apris A. Benign paroxysmal positional vertigo in the elderly: current insights. *Clinical Interventions in Aging* 2018;13 2251–2266
24. Gazzola J. M. Dizziness in the elderly. *Revista Brasileira de Geriatria e Gerontologia*, 2018, 21(1), 5-6

25. Paiva S.F., Silva C.M.B., Brito O.E.O., Soares A.C.S., Fraga W.S. The Risk of Falling Associated to Dizziness in Elderly. *Journal of Otolaryngology-ENT Research* 2017, 9(4): 00293
26. Zatonski T., Temporale H., Holanowska J., Krecicki T. Current Views on Treatment of Vertigo and Dizziness. *J Med. Diagn Meth.* 2014; 3(1)
27. Prusiński A. Klasyfikacja, obraz kliniczny i leczenie zawrotów głowy. *Pol. Przegl. Neurol* 2011; 7(1):11-19
28. Narożny W., Kocić I. Współczesna terapia zawrotów głowy i zaburzeń równowagi. *Otorynolaryngologia.* 2016; 15(2): 87-93
29. Iwaski S., Yamasoba T.: Dizziness and Imbalance in the Elderly: Age-related Decline in the Vestibular System. *Aging Dis.* 2015 Feb; 6(1): 38–47
30. Gębska M., Weber-Nowakowska K., Malinowska J., Żyżniewska-Banaszak E.: Presbyastasis – balance disorders and postural control therapy. *Pomeranian J Life Sci* 2016;62(2):53-57
31. Rottermund J., Knapik A., Zbożna-Lichoń J.: Health improvement procedure in the elderly with balance disorder and vertigo of vestibular origin. In Pop T, editors. *Wartości rehabilitacji w świadomości współczesnego człowieka.* Rzeszów: Wyd. Uniwersytetu Rzeszowskiego; 2013
32. Gębska M., Wojciechowska A., Rakowiecka M., Janik M., Żyżniewska-Banaszak E.: Vestibular rehabilitation in patients with chronic balance disorder and dizziness. *Family Medicine & Primary Care Review* 2014; 16, 1: 39–43.
33. Mętel S., Jasiak-Tyrkalska B.: Effect of physical exercises performed on unstable surfaces with the use of elastic bands for resistance exercises on physical performance and the quality of life in elderly persons. *Rehabilitacja Medyczna* 2006, Tom 10, Nr 3, 35–46
34. Błaszczyk J. W.: *Biomechanika kliniczna,* Wydawnictwo Lekarskie PZWL, Warszawa 2004; s. 192-232
35. Held-Ziółkowska M. Równowaga statyczna i dynamiczna ciała. *Mag Orl.* 2006; 5(2): 53-57
36. Wiszomirska I., Kaczmarczyk K., Zdrodowska A., Błażkiewicz .A, Ilnicka L., Marciniak T. Ocena równowagi statycznej i dynamicznej kobiet młodszych, starszych i z dysfunkcją narządu wzroku. *Postępy rehabilitacji* 2013; (3), 33-39
37. Olejarsz P., Olchowik G. Rola dynamicznej posturografii komputerowej w diagnostyce zaburzeń równowagi. *Otorynolaryngologia* 2011, 10(3): 103-110
38. Józefowicz-Korczyńska M., Walak J., Szczepanik M., Grzelczyk W., Rosiak O. Evaluation of the use of virtual reality as a method of physiotherapy in peripheral damage of the vestibular organ. *Otolaryngologia* 2014; 13(1): 51-57
39. Żak M., Krupnik S., Puzio G., Staszczak-Gawęłda I., Stopa A., Czesak J. (2014). Making use of virtual reality and console gaming in falls prevention among the elderly. *Gerontologia Polska,* 22(1), 9-13
40. Banaś A., Majchrzycki M., Stryła W., Kruszyński M., Piotrowska S. Virtual reality technologies in the process of improving the gait function and balance in people after a stroke. *Dysfunction of motor organs,* Uniwersytet Medyczny im. Karola Marcinkowskiego w Poznaniu; 113-120
41. Cho K.H., Lee K.J., Song C.H., Virtual-Reality Balance Training with a video-game system improves dynamic balance in chronic stroke patients, *Tohoku J. Exp. Med.* 2012, 228, 69-74
42. Cho G.H., Hwangbo G., Shin H.S., The effects of virtual reality based balance training on balance of the elderly, *J. Phys. Ther. Sci.* 2014, 26, 615-617

43. Guccione A., Wong R., Avers D., Śliwiński Z., Żak M., Fizjoterapia kliniczna w geriatrici, Wydawnictwo Elsevier Urban & Partner, Wrocław 2014, str. 389-419
44. Kasprzak W., Fizjoterapia kliniczna, Wydawnictwo Lekarskie PZWL, Warszawa 2010, str. 442-443
45. Chau A. T., Menant J. C., Hübner P. P., Lord S. R., Migliaccio A. A. (2015). Prevalence of Vestibular Disorder in Older People Who Experience Dizziness. *Frontiers in neurology*, 6, 268
46. Ahearn D. J., Umapathy D., Vestibular impairment in older people frequently contributes to dizziness as part of a geriatric syndrome. *Clinical Medicine* 2015 Vol 15, No 1: 25-30
47. Włodarczyk K., Pawlak-Osińska K., Rehabilitacja w zespole zawrotu szyjnego. *Otolaryngologia* 2010, 9(2): 55-61
48. Józefowicz-Korczyńska J. Rehabilitacja zawrotów głowy i zaburzeń równowagi. *Otolaryngologia*, 2010, 9, 1, s. 7-12
49. Jung J. Y., Kim J.-S., Chung P. S., Woo S. H., Rhee C. K. (2009). Effect of vestibular rehabilitation on dizziness in the elderly. *American Journal of Otolaryngology*, 30(5), 295–299
50. Rossi-Izquierdo M., Gayoso-Diz P., Santos-Pérez S., Del-Rio-Valeiras M., Faraldo-Garcia A., Vaamonde Sánchez-Andrade I., Lirola-Delgado A., Soto-Varela A., Short-term effectiveness of vestibular rehabilitation in elderly patients with postural instability: a randomized clinical trial. *Eur Arch Otorhinolaryngol.* 2017 Jun; 274(6):2395-2403
51. Duque G., Boersma D., Loza-Diaz G., Hassan S., Suarez H., Geisinger D., Suriyaarachchi P., Sharma A., Demontiero O. Effects of balance training using a virtual-reality system in older fallers. *Clinical Interventions in Aging*, 2013, 8, 257-263