



Dance as an Element of Prevention and Treatment of Falls, Depression and Dementia in the Geriatric Population

Submitted: 25 May 2023 Accepted: 08 May 2023 Published: 28 June 2023

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Abstract

Background: *Due to increasing life expectancy, the number of elderly people is increasing. This contributes to the increased incidence of geriatric syndromes, which lead to a loss of mobility, independence and worsens the quality of life.*

Aim: *The aim of this article is to review the literature on the use of dance training as a factor in reducing the risk of falls, depression and dementia in the elderly, and also in reducing the effects of these conditions.*

Material and Methods: *40 articles were reviewed using PubMed, Google Scholar and ResearchGate databases published between 2008 and 2022.*

Conclusions: *Dancing can be an element of training, which, by improving coordination, balance and muscle strength, reduces the risk of falls among the elderly. By positively influencing the mood, creating opportunities to build new relationships or reducing the feeling of loneliness, it is one of the factors preventing the occurrence of depression and alleviating its symptoms. Although dancing increases the level of neurotrophic factors and increases the volume of the hippocampus, its effects on cognitive and executive functions are not fully understood. However, there are reports that it can reduce the risk of Alzheimer's disease and alleviate anxiety in people with dementia, so the use of dance interventions seems to be a beneficial form of exercise among the elderly, especially since it does not require the use of specialized equipment and costs are not high.*

Key words: *physical activity, falls, depression, dementia*

Background

Nowadays, the aging of the population is becoming an increasing problem, as the percentage of elderly people is growing very fast. At the beginning of the 1950s, the average life expectancy was 47 years, and there were approximately 200 million people aged 60 years in the world. Currently, the average life expectancy is 65 years, while the number of people who have turned 60 years of age exceeds 500 million worldwide. In addition, it is estimated that in 2025 there will already be 1.2 billion elderly people, and by 2050 the average life expectancy will increase by another 10 years [1].

The aging of the organism is a phase of life in which the functional reserves of individual organs and systems are gradually reduced. Biological and psychological aspects in the aging process play an important role in the emergence of geriatric syndromes, i.e. chronic and multi-causal disorders associated with limited activity or mobility, leading to dependence on third party help and negatively affecting the quality of life of elderly patients. Major geriatric problems include urinary and fecal incontinence, dementia syndromes, depression, falls and locomotion events, visual and hearing impairment, and multiple medications [2]. The aging process depends on many factors, i.e. genetic conditions, environmental conditions and existing pathologies in the body, and may be individual and may appear at any age. The most common ailments in the elderly are disorders of the nervous, circulatory and musculoskeletal system.

In the aging process, it is very important to maintain social relations and prevent the isolation of the elderly [3]. In the psychological aspect, it is very important because it can prevent many depressive states. Depression in the elderly very often occurs during isolation and loneliness. Treatment of many diseases of the elderly is based on drug treatment. The use of many types of medications by the elderly without health control and with the disagreement of many specialists may lead to various complications. Many disease states are a complication of excessive pharmacology and might even lead to iatrogenic drug syndromes [4]. Therefore, the challenge for many specialists is the use of non-pharmacological treatments that can have a significant effect on improving health or delaying the course of many diseases.

Physical activity and a healthy lifestyle are indispensable forms of support for the progressing aging process. Properly dosed physical activity plays an important role for the elderly because it can prevent many diseases and delays the aging process [3].

One of the forms of physical activity among the elderly is dancing. Dance therapy is inscribed in the holistic paradigm of human treatment and is recommended worldwide as effective and useful in many medical specialties [5]. It is a form of rehabilitation that combines many physical exercises. Scientific research shows that the acquisition of dance skills by the elderly is a significant cognitive effort for them and has a very beneficial effect not only on balance but also on the mental state of the elderly [6]. Movement exercises performed during various forms of dance may contribute to the inhibition of progressive changes and their delay. Classes held in a group format reduce the feeling of loneliness and give the possibility of social integration [7]. Common group activities contribute to a pleasant way of spending free time. In addition, the world of sounds improves self-esteem and supports self-acceptance, reveals and reduces the level of anxiety, undesirable behavior, hyperactivity and aggression [8].

Aim

The aim of our article is to present dance as a form of physical activity that can play an important role in both preventing and alleviating the symptoms of large geriatric syndromes. In our review, we describe the use of dance therapy in patients at risk of or suffering from falls, depression and dementia.

Material and Methods

40 articles published between 2008 and 2022 were reviewed using the PubMed, Google Scholar and ResearchGate databases. The following keywords were used during data collection: "physical activity" or "falls" or "dementia" or "depression". We focused on articles that concerned the elderly over 60 years of age.

Dance and prevention of falls

Adults older than 60 years have the highest risk of death from a fall. The reasons are physical, sensory, and cognitive changes developing with increasing age. According to WHO 20–30% of elderly people who fall have moderate to severe injuries as a result of falls including bruises, hip fractures and head trauma [9]. It should be noted that falls account for 90% of hip fractures, frequently leading to disability and death [10]. Furthermore, studies suggest that 10% of older adults from 68 to 85 years fall at least twice a year [11]. Besides physical injuries, after a fall elderly people can develop a fear of falling, anxiety syndrome or depression [12]. Guidelines emphasize the importance of an indication of older people prone to falls. Increased risk of falling applies to elderly people who have a previous history of falls or need assistance in everyday activities. Polypharmacy, using psychotropic drugs, issues with gait or balance, hearing and vision problems and pain are additional risk factors. After comprehensive fall assessment, individuals at risk of falls should be offered multifactorial interventions based on the identified risks [13, 14].

One of the ways to prevent future falls is to provide an individually tailored exercise program. A comparison of different fall-prevention strategies showed that a combination of exercise and vision assessment and treatment was associated with the lowest risk of injurious falls among the elderly [15]. It is proven that exercise reduces the rate of falls by 23% in people aged 60 years and over living in the community [16]. Guidelines recommend especially strength and balance training for older people at high risk of falls [17]. Thus, dance can be considered as an effective intervention for fall prevention. Studies show that dance practice has good potential to promote benefits related to mobility and balance in the elderly. It is known that maintaining a physically active life improves motor abilities and reduces the risk of injuries and falls. The effects of dance are possibly associated with an improvement in balance, muscle strength and endurance, coordination, rhythm, and body awareness, contributing to the reduction of the occurrence of falls [18]. The positive effect of dance was demonstrated in a study in which a group of people aged 60–94 attended 6-month dance classes for 1h per week. Among the many

benefits, participants improved in postural performance, analyzed by using a force platform and in reaction times. Enhancement of both of these parameters can be assessed as contributing to fall prevention [19]. Another study evaluated the results of an 8-weeks creative dance program, whose main aim is to encourage participants to create their own movement. It was indicated that dancing may improve dynamic balance and mobility more than regular stretching training [20]. By improving the mentioned physical factors, dancing has the potential to prevent falls among older adults.

Influence of dance on mental health

In today's world, the elderly are burdened with many mental disorders, among which depression is one of the main health problems. Depression in the elderly is a complex state of mental health and may be caused by factors such as: loneliness, chronic diseases, low socio-economic status, mourning, family dramas, impaired cognitive functions and decreased physical fitness [21]. Depression is often not diagnosed in time and has a number of consequences. We can distinguish major and subliminal depression. In the adult population, 18–28% of depression is subthreshold depression, such as dysthymia, mild depression, and minor depression that can be treated non-pharmacologically. Standard depression therapy includes antidepressants and psychological therapies. The existing barriers to medical care, i.e. low socio-economic status and limited access to health care, increase the number of people suffering from depression [22].

After the age of 65, physical and professional activity most frequently decreases, and this is the main contributor to depression in the elderly. Physical activity has a positive effect on the physical and mental state by increasing serotonin and brain neurotransmitters, i.e. dopamine and norepinephrine. Through exercise, endorphins are also released, which influence one's mood. Depression is often associated with mild cognitive impairment, dementia and Alzheimer's disease. Preventing depression in the elderly may contribute to the onset of dementia. The alternative to depression has become increased physical activity and exercise. Physical activity has a protective effect against

the occurrence of depression symptoms, but it can also be an effective way of treating it [23, 24].

Preventative element is used by selected geriatric teams. Furthermore, it is a non-pharmacological intervention that may affect the cognitive functions of the elderly and prevent depression, for example among nursing home residents [25, 26]. Dance, as a type of group physical activity, is a form of social interaction, which establishes social bonds through synchronization with the partner, the group and the music. Dancing among the elderly can reduce symptoms of depression, improve mood and functional capacity [21]. It also alleviates the effects of cognitive degeneration and engages visual, spatial, cognitive and motor functions. Group exercises promote social interaction, reduce or eliminate loneliness and contribute to the formation of new acquaintances and friendships [26]. Dance is a multimodal activity that increases neuroplasticity and activation of the vast cortical, subcortical and cerebellar layers [27]. It is a form of supportive intervention for the elderly suffering from depression and an exercise mode that can improve physical condition and reduce disability [28].

As an element of prevention in geriatric groups, dance classes contribute to ameliorate mood, increasing physical fitness and social interaction, which may have an impact on depression. An analysis of the studies performed suggests that dance interventions are helpful in treating and preventing depression if they are applied for a longer time [26].

Dance and cognitive dysfunction

Dementia is a significant problem globally as it is estimated that it will affect approximately 130 million people worldwide by 2050. The most common form of dementia is Alzheimer's disease, which is predisposed to: age over 65, family history, low level of education or the presence of mild cognitive impairment. The clinical picture of the disease is dominated by such changes as incorrect judgment, memory problems, impaired autopsychic orientation or mood swings [29]. The 2019 WHO guidelines recommend introducing physical activity in patients with normal cognitive functions in order to

reduce the risk of deterioration of these functions and indicate that a similar intervention can be used in patients with mild cognitive impairment [30]. In one study it was proved that people exercising every day had half the risk of Alzheimer's disease than people who did not undertake such activity.

Physical effort induces various mechanisms within the brain tissue, positively influences the metabolism of lipids or glucose, increasing blood flow or stimulating the secretion of neurotrophic factors [31]. Among these factors, BDNF (brain-derived neurotrophic factor) plays a key role in the process of neurogenesis, the reduction of which is noted in Alzheimer's disease. It is worth noting that the aging brain also shows a certain neuroplastic potential, which can be used to alleviate the symptoms associated with the aging process of the nervous system. One study found a significant increase in BDNF levels among participants aged 63 to 80 after the dance intervention. Probably this brain factor took part in increasing the volume of the brain areas involved in cognitive processes [32].

Another study looked at the effect of three months of aerobic dance on hippocampal volume in people with mild cognitive impairment, which may be a transitional stage to Alzheimer's disease. There was an increase in total hippocampal volume by 4.5% and an 11.2% increase in volume in the right part of the hippocampus, which is responsible for spatial memory. An improvement in episodic memory has also been demonstrated, which is explained by the cognitive effort necessary to recreate the sequence of various dance steps [33].

The question of the influence of dance on cognitive and executive functions is not fully understood. In one of the interventions, a positive correlation was found between dance and global cognition, as well as the improvement of individual cognitive domains such as language, visuospatial perception and memory. However, no such relationship was observed with regard to attention or executive functions [26]. On the other hand, there are reports that in the subjects aged 47–70 years who participated in salsa training for at least six months, a beneficial effect was shown in the area of executive functions, such as working memory, inhibition and cognitive flexibility, with no significant effect on spatial memory improvement [34].

Moreover, dance interventions can be a way to alleviate agitation and anxiety among people who already suffer from dementia, through the presence of social interactions that reduce the feeling of exclusion and the possibility of expressing one's emotions in a physical way [35, 36].

Analyzing the above reports, the influence of dance on individual cognitive functions has not been fully explained, however, it seems beneficial to conduct further research in this area, because the use of dance interventions does not entail high costs, does not require specialized equipment and is characterized by a relatively low probability of injury [32].

Discussion

The aim of our article is to present dance as a form that can be part of the prevention and treatment of major geriatric syndromes. These syndromes seem to be particularly important in the face of data that show that life expectancy continues to increase. In one of the studies conducted in 2015–2019 among Missouri residents who were 65 years of age or older, it was found that as many as 41% of the 11,344 participants met the criteria for pre-frailty, 30.4% frailty and 28% dementia [37].

In our review, we found that dance interventions improved mobility and balance, which is consistent with the results of a study of participants in Sao Paulo over the age of 60, which also showed amendments in mobility outcomes and standing balance [38]. Regarding the influence of dance on cognitive functions, the data are mixed, especially regarding in terms of executive functions and spatial memory. A study by The University of Nevada showed that participation in jazz dance classes in healthy women aged 52–88 had a positive effect only on balance, with no effect on mood or cognition [39].

In our article, we discussed the issue of selected geriatric teams, but it seems that training with elements of dance can also be used in the treatment of other diseases belonging to this group, such as urinary incontinence. In a 2014 study by researchers from Canada and Switzerland, a statistically significant improvement was noted in the context of urinary incontinence symptoms in women, thanks to the use of a virtual game with dance elements to

train the pelvic floor muscles. Although the number of participants in this study was small, the use of such technology seems to be an interesting alternative to traditional exercise [40].

Although dance training is associated with a relatively low risk of injury, the possibility of spine, knee or foot injuries, as well as falls, should not be forgotten. Before proposing this form of physical activity, the benefits should be weighed against possible undesirable events. It is also worth emphasizing that dance should be seen as a complementary element in the treatment of depression or dementia, because pharmacotherapy plays a key role in these diseases.

Future research should focus on a more in-depth definition of the relationship between dance and cognitive functions, but also on using dance as part of the treatment of other geriatric syndromes such as urinary incontinence.

Conclusions

An aging population will undoubtedly be one of the major social challenges in the coming years. The medical sector must therefore focus increasingly on management of geriatric health problems and consequently improve older people's quality of life. In addition to the development of geriatric care and treatment, the use of non-pharmacological interventions can be recommended in older people with specific diseases. Increasing physical activity is especially recommended as a way of prevention of many diseases associated with age. Studies have shown that dancing can improve both the physical and mental condition of older adults and thereby be a helpful tool to reduce the risk of development of geriatric symptoms such as falls, depression and dementia. Older people at risk of falls can benefit from dancing by improving balance, mobility and muscular strength. Meanwhile, social interactions that take place while dancing positively affect the treatment and prevention of depression by improving mood and reducing feelings of loneliness in the elderly. Some studies among the older people have also shown a positive effect on cognitive functions and episodic memory. Therefore, dancing can

be considered a means of preventing Alzheimer's disease and mild cognitive impairment and may also contribute to reducing disease in people already suffering from dementia.

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