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## Tai Chi as a rehabilitation method for patients with Parkinson's disease

**Dariusz Dziarkowski<sup>1</sup>, Aleksandra Białkowska<sup>1</sup>, Blanka Budziejko<sup>1</sup>, Oliwia Cywińska<sup>1</sup>,  
Szymon Gawrych<sup>1</sup>, Daria Kurtyka<sup>1</sup>, Gracjan Różański<sup>1</sup>, Anna Maria Dobosiewicz<sup>1</sup>,  
Nataliia Badiuk<sup>2</sup>**

<sup>1</sup>**Scientific Circle of Exercise Physiology at Department of Hygiene, Epidemiology and Ergonomics. Division of Ergonomics and Exercise Physiology, Nicolaus Copernicus Univeristy in Toruń, Collegium Medicum in Bydgoszcz, Poland**

<sup>2</sup>**State Enterprise Ukrainian Research Institute for Medicine of Transport, Ministry of Health of Ukraine, Odesa, Ukraine**

Corresponding author: Anna Maria Dobosiewicz, [annamdo@gmail.com](mailto:annamdo@gmail.com)

### Abstract

Parkinson's disease is the second most common neurodegenerative disease. It belongs to the group of extrapyramidal system diseases. Nowadays it is an incurable disease, not yet examined in its entirety. With the current state of knowledge it is not possible to fully cure this disease, but it is possible to reduce the severity of the symptoms of this disease. Pharmacological treatment, surgical treatment and broadly understood physiotherapy, including Tai Chi, are the methods of treatment used in the fight against Parkinson's disease. Thanks to these methods, there is a chance to significantly reduce the severity of the symptoms characteristic of this disease, i.e. muscle tension, balance and coordination disorders. The incidence of this disease increases with age, and it is most common for people over the age of sixty. It affects men twice as often. The essence of the disease is a disorder in

the number of neurons in which dopamine is produced, more precisely in the compact part of the black creature. This causes disturbances in the transmission of information in the central nervous system, which results in three basic symptoms: hypertonia, akinesia and tremor. In the treatment of these symptoms an important role is played by rehabilitation, one of the elements of which is Tai Chi. In the latest scientific reports there are many studies evaluating the influence of Tai Chi on the reduction of symptoms in Parkinson's patients.

**Keywords: Parkinson's disease, Tai Chi, therapy, treatment**

### **Characteristic of Tai Chi**

The most basic and general definition of Tai Chi is that it is an old Chinese art of movement. It is also a term used to describe Tai Chi as an art that enables one to self-improve oneself by acquiring the ability to control one's body and mind. This art was created hundreds of years ago in China. Initially it was a martial art, but over time it has had many health effects, resulting from regular training. Nowadays, Tai Chi is often considered to be an original way of physical activity, available to everyone, regardless of age or physical fitness [1, 2].

The essence of Tai Chi training is the movement of the whole body in a strictly defined way, which results from the assumptions of this art. The mind plays a very important role here, because the exercises take place in silence, the attention is fully focused on the current activities. One of the elements of training is also keeping the body in a still position, which is also an element of static training. The training unit usually starts with a warm-up, which includes breathing, stretching and strengthening exercises. A very characteristic feature of Tai Chi, as well as other martial arts, is the existence of sequences of movements in which many different techniques are used, which are called sequences [2].

The basic exercises performed by beginners are:

- stand like a pole (Zhan Zhuang): this is the simplest exercise. It consists in taking the right position: set your feet to the width of your shoulders, bend your knees slightly, pull your head up, hang your hands along your torso. Focus on the interior of the body. Even breathing is controlled. Relaxation should be achieved by the mind and not by the body.
- hand-circulation (Chan Si Gong): a basic exercise that introduces you to most of the more advanced exercises. It involves moving with one hand, along with the movement of the whole body. The weight is transferred from one lower limb to another, but none of them is detached from the ground.

- the exercise is similar to the above, but it is extended by the ability to combine hand movements with steps, which gives more dynamic exercises.
- circling with two hands without steps: returning to the exercises with the exception of steps gives the possibility to focus again on the movements of the hands and correct any mistakes. Attaching the second hand increases the difficulty of training, but also increases the awareness of the body and the movements it makes.
- the next stage of learning is the movement of both upper limbs and lower limbs. The whole body is already involved in this exercise, so it is possible to learn how to balance the body properly while taking the next steps. The movement style becomes smoother and more stable.
- step backwards: the exercise that develops the most movement coordination. It is important that the heel load is greater than the front of the foot and that the shoulders are not raised in any movement [3].

### **Parkinson's disease – etiopathogenesis and symptoms**

Parkinson's disease is one of the most common neurodegenerative brain diseases. The incidence of this disease is on average 100 to 200 cases per 100.000 people [4]. No studies have so far been able to fully confirm these theories, so the disease is still considered to be spontaneous. The reason for the symptoms is a deficiency of the neurotransmitter dopamine. This is associated with a disorder of information transmission in the central nervous system [5]. An erroneous statement is that extrapyramidal diseases affect only the locomotor system. They are often associated with mental disorders such as depression. Depression is diagnosed in up to 60 percent of patients, which unfortunately rarely involves treatment [6].

The three most common symptoms of this disease are: hypertonia, akinesia and tremor. Hypertonia, which is an increased muscular tension, is examined by passive movement in the joints. A characteristic feature differentiating this symptom from spasticism is that resistance is constant and has no relation to the rate of stretching [7]. Another symptom of this disease is akinesia. It is a general motoric slowdown, which is noticeable when the reaction to the stimulus is slowed down or when it is difficult to start the movement. Walking disorders are also visible, manifested by the slowdown of steps, shortening of steps, cramping of feet on the ground. Complex movements are problematic for patients, they can only do one activity at a time. The third main symptom is tremor. This is the most common neurological symptom, affecting almost 70% of patients [8].

There are many drugs and treatments available to reduce the severity of symptoms. The most effective pharmacological treatment currently available is levodopa [9, 10]. Surgical procedures are another non-pharmacological method of treatment. The most common procedure is deep brain stimulation, which consists in reducing the activity of excessively active brain structures [11, 12].

Rehabilitation in Parkinson's disease should be introduced as soon as the disease is diagnosed. The patient, but also his or her family, should be educated and paid attention to the benefits of regular physical activity. Systematic training and perseverance significantly increase the effects of the therapy. The intensity of the rehabilitation is adjusted to current fitness, but includes exercises to keep the abilities strongly limited as the disease progresses, such as removing the keys from the pocket while walking, answering the phone, getting up from the chair and climbing stairs. The groups of exercises used in rehabilitation are stretching, strengthening and resistance exercises. Respiratory therapy or autogenic training also give positive results [15]. The positive influence of Tai Chi on people with Parkinson's disease is reported in many scientific studies. The greatest effects of exercise are achieved by improving such abilities as walking, motor functions, balance, mobility, cognitive abilities and oxygen capacity [16].

#### **Tai Chi in Parkinson's disease**

Madeleine E. Hackney et al (2008) investigated the impact of Tai Chi on balance and mobility of people with Parkinson's disease. The patient group consisted of 33 people over the age of 40 with Parkinson's disease diagnosed. They were accidentally divided into two groups: one who had undergone a series of Tai Chi training sessions with a trained trainer and the other who had not undergone any intervention. The study group attended a one-hour training session twice a week for 13 weeks. After the intervention, the subjects were re-tested. Comparing the results of these two groups, a significant improvement in the Berg scale was observed in the study group compared to the control group and the results before the intervention. The Tai Chi trainee also improved UPDRS score for motor skills, the Timed Up and Go test and the Six-Minute Walk Test (6MWT), where the results differed slightly in the study group and were beneficial to that group. The test of standing on one leg and the test of walking backwards was not better in any of the groups [17].

The positive effect of Tai Chi on Parkinson's disease has also been studied by Li and others. 195 people were divided into 3 randomized groups with different interventions: the first group underwent Tai Chi training, the second group underwent resistance training, and the third group underwent stretching training. The measurements that were performed were:

the effects reported by the patient, the clinical examination and the evaluation of whether the patient wants to continue the training. The study was completed by 176 people. After 6 months of exercise, 123 people expressed their willingness to continue training (47 from the Tai Chi group, 41 from the resistance group and 35 from the stretching group). Patients from Tai Chi group and resistance exercises group reported significant improvement compared to the results before the intervention. The results of the clinical trial were not as noticeable as those reported by the patient. However, these studies show that Tai Chi's training and resistance training have changed the perception of exercise. Although the improvement in patient outcomes was poorly correlated with the improvement in clinical outcomes, the effects of these training sessions, in the form of awareness of the benefits of regular physical activity, significantly improved the quality of life of these patients [18].

Tian-Yu Zhang and others also undertook research into the impact of Tai Chi on people with Parkinson's disease. They compared the results of the improvement in two groups: one taking up Tai Chi's training and one taking up multimodal training. The study included 40 people who were accidentally divided into the two groups mentioned above. The training session lasted 12 weeks. Balance was studied with the Berg Balance Scale and motor activity was evaluated with motor skills, length and speed of steps. The results they obtained were surprising and opposite to those obtained earlier. The improvement in the function of the participants was small or close to zero. However, in the group of multimodal exercises, during post-intervention studies, changes were much more visible. They achieved better results in the tests when compared with the Tai Chi group [19].

Kurt et al (2017) studied the influence of Ai-chi on motor abilities of patients. Ai Chi is the carrying out of Tai Chi, but under water conditions. They conducted a randomized study on 40 people with Parkinson's disease. Patients were randomly divided into two groups, one with Ai-Chi in water and the other with basic general fitness exercises without immersion in water. The study lasted 5 weeks. The balance was evaluated by Berg Balance Scale, the mobility tested by the Timed Up and Go Test. Additionally, quality of life and motor activity were studied using the Parkinson's Disease Questionnaire-39 and the Unified Parkinson's Disease Rating Scale-III scales. The results showed that the ability of static equilibrium was significantly improved in the group of people with land-based activities. However, the improvement in dynamic balance was incomparably higher in the Ai-chi group than in the standard onshore group. The aquatic environment provides many positive conditions, such as displacement, hydrostatic pressure and resistance, which allow many positive effects to be

achieved in the subjects. They develop deep sensations and provide a safe environment for exercise, where the risk of falling and the associated injuries are negligible [20].

Hye-Jung Cho has studied the impact of Tai Chi on the physical performance and everyday activities of people with Parkinson's disease. Participants in the study were patients with Parkinson's disease diagnosed as idiopathic. Twenty patients were divided into two randomized groups: control and study. The study group underwent a 12-week training session with Tai Chi. The trainings took place twice a week at the clinic and once a week at the participants' home. The trainings consisted of a ten-minute warm-up, 30 minutes of Tai Chi exercises, 10 minutes of meditation and 10 minutes of stretching exercises. The daily routines were examined with a standardized Parkinson's disease evaluation scale (UPDRS) and walk was evaluated with 6MWT and TUG Test. Upper body strength was assessed by the number of repetitions of bending of the elbow joint with resistance within 30 seconds. The lower body strength was assessed using the stand up and sit down test, resulting in a number of repetitions per 30 seconds. Balance was assessed by standing on one leg with open eyes. The result was a time to stand on one leg. The results in the study group improved in all tests except the TUG Test. Particularly noteworthy is a significant improvement in the balance test, where the results improved from an average of 3.34 seconds to 5.91 seconds. These studies show that Parkinson's disease patients, thanks to Tai Chi's training, were able to improve the strength of the whole body muscles, balance, which is an effective against falling therapy. They also confirm that Tai Chi has a positive effect on physical fitness and everyday activities [21].

### **Conclusions**

Introducing Tai Chi to the therapy of people with Parkinson's disease brings positive health effects, both mental and physical. Patients achieved better results in the tests after Tai Chi training than before. Tai Chi could be a safe form of physical activity that reduces stress and increases the awareness of the body of Parkinson's disease sufferers. By using Tai Chi, the symptoms of the disease are reduced and the quality of life of the patients improves.

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