

Prolonged high intensity interval training (HIIT) modulates inflammation through the specific microRNAs level changes in the serum of patients with idiopathic Parkinson's disease

Idiopathic Parkinson's disease, except Alzheimer disease is one of the most common neurodegenerative disorders. Loss of 50% dopaminergic neurons in the *substantia nigra pars compacta* causes hallmarks such as bradykinesia, tremor, dysarthria and movement difficulties. Disease's etiology is still not well known. One of the hypothesis postulates that increased neurons' neurodegeneration might be caused by increased oxidative stress in the brain. Many factors are responsible for the highest level of reactive oxygen species, however one of them might play an important role in the Parkinson's disease. As the result of the mutation in the gene coding α -synuclein, or epigenetic disturbances may lead to accumulation of that protein and appearance of Lewy bodies in the brain. Released protein from the dead neurons causes the microglia activation and increased production of pro-inflammatory factors. Chronic activation of microglia leads to astrocytes activation, increased pro-inflammatory factors expression as well as higher level of reactive oxygen species. Chronic activation of microglia and astrocytes causes blood-brain barrier damage, as well as the activation of the peripheral immune system. Many research presents that physical activity has a positive effect on the inflammation by decreasing its level in the brain as well as in the peripheral system, leading to the decreased level of oxidative stress. Previous research shows that 8 weeks moderate intensity interval training improves tonus in the skeletal muscles and clinical status of Parkinson's disease patients. Another factor that change after the physical activity is miRNA. Those small non-coding molecules, postranscriptionally regulate gene expression among others pro-inflammatory cytokines. Increasing expression of specific miRNAs in the skeletal muscles and its releasing into the bloodstream may have a positive effect on the regulation of gene expression in other cells. It is well known, that miRNAs are transported in exosomes to the other parts of the body and due to its possibility to cross the blood-brain barrier, they might have a positive effect on the gene regulation in the brain. The main objective of the project is to investigate if the high intensity interval training modulates inflammation through the changes in the specific microRNAs level in the serum of patients with idiopathic Parkinson's disease. The detailed objectives include: 1. To investigate if the high intensity interval training has influence on the level of chosen inflammatory factors in the serum of patients with idiopathic Parkinson's disease. 2. To investigate if the high intensity interval training has an influence on chosen microRNAs, which are connected with the regulation of inflammatory and apoptosis processes. 40 patients with idiopathic Parkinson's disease (Hoehn&Yahr scale 1-2) will be involved in this research (PD group). PD group will be divided into two subgroups: 20 patients who will perform 12 weeks training (TR-PD) group and 20 patients who will not perform the training (NTR-PD) as the control group. 20 aged-matched individuals without neurological disorders will be involved as an additional control group. TR-PD will perform the training on cycloergometr 3 times a week for one hour. Blood samples will be obtained before training, 1 week after the training and 3 months after the training. Study about the influence of 12 weeks high intensity interval training would let to determine if any changes of pro-inflammatory cytokines level, GFAP and 100Sbeta as an inflammatory markers and levels of SOD, CAT and GSH as a oxidative stress markers are detectable. The additional factor, which might be involved in the decreased level of those molecules are specific miRNAs. Present knowledge about the influence of this specific physical activity on the miRNAs level would help to introduce the chronic and systematic physical activity as a rehabilitation as pharmacotherapy support. So far the golden standard in the pharmacotherapy used in Parkinson's disease, L-dopa does not cure the disease, only alleviates the symptoms. Patients does not intake anti-inflammatory medication what causes that no pharmacological therapy has an influence on stopping these pathological processes. Results obtained in this study may help in faster introduction of high intensity interval training as a rehabilitation, causing decreasing costs of pharmacotherapy, minimalizing of side effects caused by medication and possible improvement of the quality of life.