Reasoning of dissertation topic and competency of potential supervisor for admission onto joint LSU and TU doctoral studies in 2022

Area of research (title and code)	Natural Sciences Biology – N 010
Field of research (title and code)	Biology – N 010
Topic of research	Monitoring of functional state in athletes and health training
Institution	Lithuanian Sports University

Potential supervisor

Pedagogical and scientific degree	**Name, surname**	**Academic position**
Habil. Dr., Professor	Jonas Poderys	professor

Short reasoning of proposed dissertation topic

Title

Cardiovascular adaptation to multimodal exercise programs in individuals with back pain syndrome.

Short research description (including aims and objectives) (maximum 1500 characters)

The aim of this research is to define the influence of different types, as well as multimodal physical exercise programs in the presence of back pain syndrome on the cardiovascular system. Objectives of the study: 1. To define the effects of exercising on musculoskeletal and cardiovascular systems while the aerobic or strength training was applied. 2. To define the effects of exercising on musculoskeletal and cardiovascular systems while the multimodal exercise programs were applied. 3. To define the peculiarities of musculoskeletal and cardiovascular adaptations in the presence of back pain syndrome. 4. To define the specificity of musculoskeletal and cardiovascular adaptations in dependence of localization of the back pain.

The research focuses on the specifics of exercise types and the effects of rehabilitation measures (physiotherapy in the gym and water, therapeutic massages, physiotherapy) on muscular and cardiovascular adaptations in the presence of back pain syndrome, as this is not often considered in practice but has a significant impact on patient health as an important ingredient for complete recovery of health.

Relevance of the problem, its novelty at national and international level (maximum 1500 characters).

Rehabilitation programs for the treatment of back pain are usually focused on pain relief, but little attention is paid to the cardiovascular system, which is affected by rehabilitation measures no less than skeletal muscle. The impact of these measures in the scientific literature on SCIs is not sufficient, although in practice the consequences are often met, as insufficient attention to the evaluation of all systems can cause irreversible harm to humans.

Back pain symptoms can derive from many anatomic sources, such as nerve roots, muscles, fascial structures, bones, joints, intervertebral discs, and organs within the abdominal cavity. It has been shown that pain has an effect on cardiovascular control through an increase in heart rate. In some studies, was shown as an increase in the sympathetic indices of cardiac control, such as low frequency (LF) power, and a low to high frequency power ratio (LF/HF) of heart rate variability. Thus, cardiovascular variability analysis and the detailed analysis of ECG signals may be a useful tool to quantify and objectify the beneficial effects of training as well as in case of spinal training.

Research methods and possibilities for conducting these studies (maximum 1500 characters).

The study should evaluate the musculoskeletal system in patients undergoing exercising and rehabilitation measures for back pain syndrome. Part of the research would be performed in the laboratories of the LSU Institute of Sports Science and Innovations, and part – in the medical institution. Exercising and rehabilitation measures should include aerobic and strength training and the physiotherapy will be given in the gym as much water as possible, physiotherapy as much as possible, therapeutic massages.

Questionnaires, the mesurements of muscle tone, ECG parameters, parameters of pulsometry, oxygen desaturation and arterial blood pressure measurements will be used for to assessments and monitoring. The data of registered parameters will be analyzed by applying new methods of analysis such as algebraic data cointegration. Continuous monitoring of the functional status of the cardiovascular system would be performed during all procedures.

The research team of the Kinesiology Laboratory of the Institute of Sports Science and Innovation of LSU has all the necessary equipment for research.

Please indicate the links between the proposed topic for the doctoral thesis and biomechanics / physical therapy / sports study programs.

The topic is especially relevant and important to the two study programs, i.e. “Physiotherapy” and “Physical activity and public health”. The knowledge’s about diagnostics and monitoring of cardiovascular system while exercising are directly the field of actions for sport coaches, health instructors, physiotherapists.

Is the proposed topic for the doctoral thesis related to currently funded research projects? Please indicate the links between the proposed topic for the doctoral thesis and funded research projects

No

Is the proposed topic for the doctoral thesis related to joint research with a foreign institution? Please indicate the links between the proposed topic for the doctoral thesis and research with a foreign institution

No

Currently I am supervisor of 4 doctoral students.

Jonas Poderys

Supervisor _____ _____

(signature) (Name, surname)

Date: *2022-04-29*