# Reasoning of dissertation topic and competency of potential supervisor for admission onto joint LSU and TU doctoral studies in 2020

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| **Area of research (title and code)** | Biomedical Sciences |
| **Field of research (title and code)** | 01B Biology |
| **Topic of research** | Health promotion |
| **Institution** | Lithuanian Sports University |

**Potential supervisor**

| **Pedagogical and scientific degree** | **Name, surname** | **Academic position** |
|---|---|---|
| Dr. | Aivaras Ratkevičius | Professor |

**Short reasoning of proposed dissertation topic**

| **Title** |
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| Effects of short-term reduction in physical activity on skeletal muscle function and health |

| **Short research description (including aims and objectives) (maximum 1500 characters).** |
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| **The overall aim** of the project is twofold. Firstly, we will investigate effects of two-week reduction in physical activity (step counts <2500 steps per day) on skeletal muscle function and biomarkers of health. Secondly, we study effect of time restricted feeding on effects of short-term reduction in physical activity. <br> Specific objectives: <br> **Objective 1** is to investigate effects of age and gender on the sensitivity to reduction in physical activity; <br> **Objective 2** is to investigate effects of reduction in physical activity on biomarkers of metabolic health including blood levels of adipokines and myokines in young and old volunteers; <br> **Objective 3** is to investigate effects of time restricted feeding (6 hours feeding/18 hours fasting) on changes in biomarkers of metabolic health and muscle function after reduction in physical activity. |

| **Relevance of the problem, its novelty at national and international level (maximum 1500 characters).** |
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| Restrictions on people movements imposed to order to fight COVID-19 pandemics might pose a danger to people's health since physical activity plays a key role in health. Indeed, low levels of physical activity over prolonged time are associated with increased risk of chronic diseases (Booth et al. 2015). Physical activity levels usually range between 2000 and 10000 steps per day (Kraus et al., 2019). Older people with step counts of 4400 per day had lower risk of death than people completing 2700 steps per day (Lee et al., 2019). However, little attention has been payed to effects of short-term reductions in physical activity. It is known that reduction in step counts to less than 2000 steps per day can reduce insulin sensitivity after two weeks (Devries et al., 2015). Reduction in step count to less than 2000 steps per day is associated with significant deterioration of health and muscle function in older people over the same two-week period (Krogh-Madsen et al., 2010). It is, however, not known how these negative effects of reduced physical activity depend on age and sex of the volunteers. Diet might also have an effect on health and muscle function, but we were not able to find studies where this has been examined in any detail. |

| **Research methods and possibilities for conducting these studies (maximum 1500 characters).** |
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| **1. Muscle strength and activation** <br> We will assess handgrip as well as knee extensor strength since handgrip strength alone cannot be used as a proxy of overall muscle strength (Yeung et al. 2018). We will also measure maximal oxygen uptake (VO2max) as the most important index of aerobic fitness (Loe et al. 2013). We |

also use electrical stimulation to test for effects on skeletal muscle without involvement of nervous system as previous our studies.

## 2. Cytokines, hormones and metabolic health

Cytokine and hormone (IL-6, testosterone, IGF-1, leptin, adiponectin, irisin, resistin) as well as metabolites (total cholesterol, low and high density lipoprotein and cholesterol) have linked to metabolic health. We will assess these in collaboration with Dr. Stuart R Gray (University of Glasgow).

## 3. Physical activity

Questionnaires have often been used to assess levels of physical activity, but they can be inaccurate (Prince et al, 2008). Triaxial accelerometers are better suited for assessment physical activity in older volunteers and will be used in the current study.

## 4. Psychological status and cognitive function

Depression, anxiety and other neuropsychiatric disorders will be measured by the Hamilton Rating Scale for Depression (HAM-D) (Dogdu et al, 2012). Cognition will be measured by a short neuropsychological test-battery: Montreal Cognitive Assessment (MOCA) (Chen et al, 2014). All these tests have been validated in several languages and are culture independent.

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

Health promotion

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**Is the proposed topic for the doctoral thesis related to currently funded research projects?**
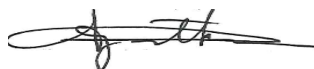No

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**Is the proposed topic for the doctoral thesis related to joint research with a foreign institution?**

This project will involve collaboration with Dr. Stuart R. Gray (University of Glazgow) who has significant experience in assessment of blood cytokine levels under various nutritional and exercise interventions

Currently I am supervisor of **3** doctoral students.

Aivaras Ratkevičius

Supervisor

| (signature) | (Name, surname) |

Date: 2020.03.31