Reasoning of dissertation topic and competency of potential supervisor for admission onto joint LSU and TU doctoral studies in 2021

Area of research (title and code)	**Biomedical science**
Field of research (title and code)	**Biology (01B)**
Topic of research	**Exercise and fasting as a way of life for health**
Institution	**LSU**

Potential supervisor

Pedagogical and scientific degree	Name, surname	Academic position
Professor, PhD	Marius Brazaitis	Senior researcher

Short reasoning of proposed dissertation topic

Title

The effect of different fasting and exercise strategies on weight-loss, and changes in psycho-emotional state, and daily working cognitive and motor capacity

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

In this project we aim to investigate the effects of fasting and exercise on weight-loss, and changes in psycho-emotional state, and daily working cognitive and motor capacity. For each study aim, we will use cross-sectional study design, including control and experimental randomize visits. The study will involve non-active healthy people without health complaints, aged 18-40 years old men and women. The project involve three main aims: i) The first aim of the study would answer to the question whether fasting for 48-h would negatively (greater decline in attention and working memory) affect continues mental work during simulated 8-h working day; ii) The second aim of the proposed study would be to answer the question whether fasting combined with moderate exercise can sufficiently preserve glucose tolerance and improve insulin action; iii) and the third and final aim of the project would be to answer to the question whether intermittent (most popular, 5:2 program) fasting combined with moderate exercise (e.g., 150 min/week (WHO); Bull et al., 2020) continuum for four 4-weeks has any adaptive responses to weigh-loss, cognition, stress, and motor performance. For 8-h mental work, the subjects will be instructed to perform simulated 8-h work in which cognitive tasks requiring simple attention (simple reaction time tasks), attention distribution (complex reaction time tasks), spatial perception (Matching Sample tasks), working memory (mathematical data processing) will be performed with the help of ANAM4 program (USA), and response suppression control (Go/NoGo, response suppression task). For moderate aerobic exercise, the subjects will be instructed to cycle for 60 min medium intensity load (70% from the determination of the maximum oxygen consumption during the aerobic capacity assessment) (WHO, 2020).

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

Interestingly, the worldwide popularity of different calorie control modalities has led in the total number of persons exposed to a food restriction programs, and do so, not only in obese or overweight but also in persons with normal body weight. However, despite of its popularity, it remains unclear to what extent these calorie restriction modalities effects our mental and physical working capacities met in our daily activities. Recently various calorie restriction technologies were popularized in order to decrease weight and improve health; specifically, intermittent fasting where individuals go extended time periods (e.g., 16–48h) with little or no energy intake, with intervening periods of normal food intake (Mattson et al., 2017). In fact, intermittent fasting has been shown to improve post-fasting related mood, cognitive and motor functions (Longo & Mattson, 2014). However, despite its post-fasting beneficial effects, fasting on his own is a stressful event, which is strongly associated with increased anxious, and decreased mood and overall motivation (Solianik et al., 2018). In most fasting studies, however, the researchers performed short-lasting testing on cognition and motor performance, and did so at respective targeted time points (Solianik et al., 2018), where the subjects could mobilize they efforts to a greater extent to perform these tasks, and thus, results of which cannot be directly applied to long-lasting (8-h) working day. Therefore, we hypothesize that fasting for 48-h would negatively (greater decline in attention and working memory) affect continues metal work during simulated 8-h working day (which is relevant to real-life condition). It is also known, that the fasted subjects for 48-72-h had become glucose intolerant and had a decrease in insulin action (Horton and Hill, 2001), while exercise has shown to have an opposite effect, and therefore, remains

unknown if fasting combined with moderate exercise can sufficiently preserve glucose tolerance and improve insulin action **(Simpler et al., 2020)**. Finally, it is not known if intermittent (most popular, 5:2 program) fasting combined with moderate exercise (e.g., 150 min/week **(WHO); Bull et al., 2020**) continuum for four 4-weeks has any adaptive responses to weigh-loss, cognition, stress, and motor performance.

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

In this project, research methods involve incremental exercise for VO_{2max}; blood analysis; measurement of body composition, overall daily activity, and sleep quality. In the present project we will use the equipment which is available at LSU i.e., veloergometer (Medline); gas analyser (Cortex); blood glucose, fat content, and ketone analyzers; active-watch with sleep, overall activity (Garmin), and heart rate monitoring (Garmin or Polar); measures necessary for the collection and storage of blood samples; plate reader for stress hormone measurement; scales; blood pressure monitoring device (Microlife); Self-Assessment Questionnaires; Measurement of cognitive performance (ANAM); Electroencephalography (brain vision); torque measurement (Biodex 4 system); reflex recordings (Biometrics); speed-accuracy task (DPA-1).

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

Present project is not related to any of proposed topics.

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 external funding is available for this project.

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

Considering that in our present study we would deal with metabolism modulation, during this project its planned to collaborate with prof. PhD Perikles Simon and PhD Elmo Neuberger from Mainz University (Germany), as they has long-term experience in evaluating metabolism, oxidative stress and cfDNR related stress-release, which is expected to be affect by fasting and exercise interventions.

Currently I am supervisor of ___4___ doctoral students.

Supervisor _____ Marius Brazaitis

(signature) (Name, surname)

Date 2021 04 26