

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 Sciences
Field of research (title and code)	Biology (01B)
Topic of research	Weight control in athletes and performance.
Institution	Lithuanian Sports University

Potential supervisor

Pedagogical and scientific degree	Name, surname	Academic position
PhD	Nerijus Eimantas	Researcher

Short reasoning of proposed dissertation topic

Title
The effect of sports specialization on glycolytic capacity in response to prolonged fasting
<p>Short research description (including aims and objectives) (maximum 1500 characters).</p> <p>The effects of nutrition on exercise metabolism and performance remains an important topic among sports scientists, clinical, and athletic populations. In this project we aim to investigate whether fasting for 48 h, where the shift from carbohydrate-to-fat oxygenation is expected, can sufficiently reduce the glycolytic capacity in athletes of different sports. If so, the second aim of the present project would be to investigate whether fasting combined with sport-specific exercise at moderate intensity (which would repeatedly stress the energy system to produce required energy, and therefore may induce acute adaptation under fast conditions) can therefore prevent the decrease in glycolytic capacity and would afterward speed-up the return of tolerance to glucose and carbohydrate oxygenation in after-fasting. If the first hypothesis will be confirmed, then, the third aim of the present project is to investigate whether very low (~500 kcal/day) calorie restriction would sufficiently affect glycolytic capacity in athletes of different sports.</p> <p>In this project we will use cross-sectional study design, where four groups of the subjects will be recruited. These subjects will differ in sport energy-system-specific performance i.e., sport events which predominantly involves i) phosphagen system (sprint), ii) glycogen-lactic acid system (middle distance), iii) aerobic respiratory energetic system (endurance, long distance), and iv) controls, recreationally active individuals. The results of the present project would be of great importance in optimizing weight control and glycolytic capacity in athletes and active individuals.</p>
<p>Relevance of the problem, its novelty at national and international level (maximum 1500 characters).</p> <p>Depending on the sport, the weight an athlete can maintain without dieting is typically higher than their competition weight (Manore, 2015). For this purpose, many athletes will restrict energy intake to the zero to achieve their competitive weight (Manore, 2015). In general, most athletes and active individuals who want to lose weight fall into two categories: (i) those who are overfat or obese based on body-fat levels, and (ii) those who are already lean, but desire additional body fat loss. Some of these athletes fall into weight-sensitive (e.g., endurance athletes, rowers), weight-class (e.g., boxing, wrestling), or aesthetically judged (e.g., gymnastics, figure skating) sports (Sundgot-Borgen et al., 2013). One of the most effective way to lose fat and/or weight in short period of time is fasting for a few days. Indeed, fasting for 48-72 h resulted in a significant increase in fat oxidation, but in turn, reduced carbohydrate oxidation (i.e., most efficient substrate in energy production) (Horton and Hill, 2001). This means that fat oxidation compensated for the decrease in carbohydrate oxidation. In addition, the prolonged fast resulted in a profound elevation in postprandial glucose and insulin responses, which in turn demonstrate that the subjects had become glucose intolerant and at same time suggest a decrease in insulin action (Horton and Hill, 2001). Therefore, considering that insulin is the major regulator in turning blood glucose into energy (i.e., helps glucose molecule to enter the cell) (Fery et al., 1998), and that insulin sensitivity to glucose is decreased by fasting (Horton and Hill, 2001), it is plausible to suggest that fasting for 48 h would preferentially affect glycogen-lactic acid energy system, and thus, would sufficiently reduce the efficiency of glycolysis and glycolytic capacity to produce energy rapidly. This action, therefore, is essential there the physical speed and power are needed (Wilk et al., 2021).</p>

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

In this project, research methods involve incremental exercise for VO_{2max} and glycolytic capacity determination; 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 (Ergoline "Ergoselect 100") and/or treadmill (Lode "Katana") and/or rowing machine ("Concept2"); gas analyser (JAEGER® Oxycon Mobile); blood lactate (Arkray "Lactate pro 2"), glucose (Arkray "Glucocard"), fat content (CardioChek), and ketone analyzers (FreeStyle "Optimum Neo"); active-watch with sleep, overall activity, and heart rate monitoring (Garmin "Vivosport"); measures necessary for the collection and storage of blood samples; plate reader (Tecan "Spark 10M") for stress hormone measurement which most likely relates to metabolite control; scales for body mass and composition (Tanita "TBF-400A").

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

No link.

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 exercise metabolism modulation, during this project its planned to collaborate with prof. Robert Antoni Olek from Poznan University of Physical Education (Poland), as he has long-term experience in evaluating metabolism and oxidative stress, which is expected to be affect by fasting.

Currently I'm not supervising any doctoral student.

Supervisor


(signature)


(Name, surname)

Date 2021-04-27