Reasoning of dissertation topic and competency of potential supervisor for admission into LSU biology doctoral studies with a participation of Tartu university 2024

Area of research (title and code)	Natural sciences
Field of research (title and code)	Biology (N 010)
Topic of research	Thermal acclimation, health and cognition
Institution	Lithuanian sports university

Potential supervisor

Pedagogical and scientific degree	**Name, surname**	**Academic position**
Assoc. prof. PhD	Rima Solianik	Senior researcher

Short reasoning of proposed dissertation topic

Title

Adaptive responses in humans during a brief repetitive acute cold stimulus, and its effect on health-related indicators and cognition

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

Current cold interventions improving health and evoking acclimation requires a rather long ≥ 60 minutes of repeated cold stimulus, and the use of brief repetitive cold exposures can be an atractive alternative strategy. Thus, primary aim of this project is to determine whether brief acute cold exposure over 14 days develop cold adaptation by remodeling thermoregulatory (rectal, skin and muscle temperature), metabolic (oxygen consumption and carbon dioxide production, metabolic heat production), cardiovascular (blood pressure (BP), heart rate (HR) and HR variability) and physiological responses (saliva and blood stress), and the secondary aim is to determine if current cold acclimation has any effects on physical and mental health-related markers (body weight and composition, subjective psychoemotional state, sex hormones, complete blood count, cytokines, tryptophan and kynurenine metabolites, glucose tolerance and insulin resistance; BP, HR and HR variability), and cognition.

Thus, the project involves three objectives: i) to determine time course of the adaptive responses of 14 sessions of brief (10-min or 3-min) whole-body exposure to cold, ii) to determine response in health-related markers, and (iii) to determine effects on cognitive processes.

The expected results:

- 3 articles for therapeutic and health-related peer-reviewed journals that fall under at least a second quartile and have an impact factor of >3.
- At least 3 international scientific conferences.

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

In recent years, cold interventions have attracted considerable interest from athletes, doctors and health enthusiasts (Espeland et al 2022; Allan et al 2022). In practice, acclimation to the cold using ≥ 60-min cold stimuli is used to adapt the body to the changing temperature (Launay & Savourey 2009; Brazaitis et al 2014; Jones et al 2017; Gatteteter et al 2021; Allan et al 2022) and to improve health (Allan et al 2022; Carona & Marques 2023). Cold therapies may improve psychoemotional state (Shevchuk 2008; Carona& Marques 2023), but the mechanisms are not understood. Furthermore, cold therapies may be used as a potential tool to combat obesity and associated metabolic complications, it can increase energy expenditure and glucose and fatty acid utilization, improve insulin sensitivity and lower fasting glucose and insulin concentrations (Lichtenbelt et al 2015; Hanssen et al 2016; Ivanova & Blondin 2021). Cold interventions also affect immune system (Brazaitis et al 2014; Solianik et al 2014; Lans et al 2015; Espeland et al 2022), however therapeutic/preventative relevance of these changes remain to be determined. However, cold interventions may not be so attractive, as they require a rather long ≥ 60 min of cold stimulus. Thus, the use of brief repetitive cold exposures can be an alternative strategy to improve health and evoke acclimation to cold, and acclimation may favor improvement in cognitive distractions that are observed upon exposure to cold (Jones et al 2017).