

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)	Biomedical sciences B000
Field of research (title and code)	Biology 01B
Topic of research	Health promotion, physiotherapy
Institution	Lithuanian sports university

Potential supervisor

Pedagogical and scientific degree	Name, surname	Academic position
Prof. Dr.	Nerijus Masiulis	Prof.
Co-supervisor Dr.	Martin Krssak	Assoc. Prof.
Co-supervisor Dr.	Oron Levin	Prof.

Short reasoning of proposed dissertation topic

Title
The effect of resistance training on muscle fat infiltration and its relationship with circulating blood biomarkers for older adults
<p>Short research description (including aims and objectives) (maximum 1500 characters). Age-related decline in muscle mass and strength is often associated with accumulation of adipose tissue. The latter triggers oxidative stress and chronic inflammation, which progressively induces muscle loss. It is well established that muscle mass loss and adipose tissue gain (infiltration of skeletal muscle by adipose tissue (termed myosteatosis)) can eventually lead to physical impairment and disability (Baumgartner, 2000; Correa-de-Araujo et al., 2020). There is growing evidence that resistance training (RT) can substantially improve muscle quality, strength and concurrently promote adipose tissue loss in older adults (Otsuka et al., 2022). For this reason, we will use non-invasive Magnetic Resonance Imaging and Spectroscopy (a functional technique that provides biochemical information on human small metabolites according to their chemical-shift properties) to measure intramuscular fatty infiltration following resistance training in older adults. Current body of knowledge on muscle fat infiltration and its relationship with circulating blood biomarkers for older adults is limited.</p> <p>References: Baumgartner, R. N. (2000). Body composition in healthy aging. <i>Annals of the New York Academy of Sciences</i>, 904(1), 437-448. Correa-de-Araujo, R., Addison, O., Miljkovic, I., Goodpaster, B. H., Bergman, B. C., Clark, R. V., ... & Rosen, C. J. (2020). Myosteatosis in the context of skeletal muscle function deficit: an interdisciplinary workshop at the National Institute on Aging. <i>Frontiers in physiology</i>, 11, 963. Otsuka, Y., Yamada, Y., Maeda, A., Izumo, T., Rogi, T., Shibata, H., ... & Hashimoto, T. (2022). Effects of resistance training intensity on muscle quantity/quality in middle-aged and older people: a randomized controlled trial. <i>Journal of cachexia, sarcopenia and muscle</i>, 13(2), 894-908.</p>
<p>Relevance of the problem, its novelty at national and international level (maximum 1500 characters). Weight gain due to sedentary life style can result in an increase in adipose tissue, which may promote secretion of inflammatory factors such as IL-6, C-reactive protein and TNF-α, creating a state of low-grade inflammation. It can cause several diseases that collectively represent the leading causes of disability and mortality worldwide (Furman et al., 2019). Blood flow restriction training (BFRT) when compared to regular RT is expected to reduce inflammatory response (Da Silva et al., 2020) reduce blood lipids (Razi et al., 2022) and body fat percentage (Sun et al., 2022). Therefore, it is hypothesized that BFRT in comparison to regular RT will mitigate or halt myosteatosis and this will affect low-grade inflammation in older adults. We will focus specifically on chronic effects of BFRT and RT on muscle fat infiltration and its moderation with inflammatory</p>

blood biomarkers and their associations with functional outcome measures relevant for daily life activities (e.g., sit-to-stand).

References:

Furman, D., Campisi, J., Verdin, E., Carrera-Bastos, P., Targ, S., Franceschi, C., ... & Slavich, G. M. (2019). Chronic inflammation in the etiology of disease across the life span. *Nature Medicine*, 25(12), 1822-1832.

Da Silva, I. M., Santos, M. A., Galvão, S. L., Dorneles, G. P., Lira, F. S., Romão, P. R., & Peres, A. (2020). Blood flow restriction impairs the inflammatory adaptations of strength training in overweight men: a clinical randomized trial. *Applied Physiology, Nutrition, and Metabolism*, 45(6), 659-666.

Razi, O., Mohammadi, M., Zamani, N., Hackney, A. C., Tourny, C., Zouita, S., ... & Zouhal, H. (2022). Walking exercise and lower-body blood flow restriction: Effects on systemic inflammation, lipid profiles and hematological indices in overweight middle-aged males. *Research in Sports Medicine*, 30(1), 41-49.

Sun, L. (2022). Effects of blood flow restriction training on anthropometric and blood lipids in overweight/obese adults: Meta-analysis. *Frontiers in Physiology*, 13, 1039591.