# Reasoning of dissertation topic and competency of potential supervisor for admission into LSU biology doctoral studies with a participation of Tartu university 2025

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

#### **Potential supervisor**

Pedagogical and scientific degree	Name, surname	Academic position
Dr.	Oron Levin	Prof.

## Short reasoning of proposed dissertation topic

#### Title

## The mediating role of inflammation on cognitive functions and brain health

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

The research primary aim is to establish mediation models for exploring the relationship among inflammatory factors, BBB integrity, neuroinflammation and neurodegeneration in MCI. Our second aim is to identify relevant biomarkers and signaling pathways that could be valid for diagnostic and prognostic of neurodegenerative disorders triggered by inflammation in older age. The following hypotheses will be examined:

- 1. Increased expression of TNF- $\alpha$  and II-6 are expected to give rise to neurovascular unit (NVU) dysfunction [1], leading to disruption of BBB and upregulation of immune signaling pathways and neuroinflammation. Therefore, we expect to find positive correlations between high levels of TNF- $\alpha$ , high serum levels of claudin-5 (CLD5 a biomarker of neurovascular unit integrity with high serum levels of CLD5, indicating BBB damage) and increased levels of Cho and mIns due to induction of neuroinflammation [2].
- 2. The 24 weeks of resistance training is expected to increase anti-inflammatory activity and decrease pro-inflammatory activity. This, in turn, is expected to restore BBB structural integrity (expressed by reduction in serum levels of CLD5) consequently resulting in reduction of neuroinflammation, and the slowing of neurodegeneration alongside improvements in cognition.
- 3. The project will require processing and collection of neuroimaging data, analysis of blood samples and performance of batteries of cognitive and functional tests [3].

#### References

[1] Hochman, E., et al. Brain, behavior, and immunity, 2023;109:162–167. <u>https://doi.org/10.1016/j.bbi.2023.01.015</u>

- [2] Vints WAJ, et al. Front Psychiatry, 2022;13:859772. <u>https://doi.org/10.3389/fpsyt.2022.859772</u>
- [3] Vints WAJ, et al. Geroscience, 2024;46(4):3971-3991 . https://doi.org/10.1007/s11357-024-01110-6