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)	Natural Sciences, Biology (N 010)
Field of research (title)	Exercise psychology and cognitive neuroscience
Topic of research	Exercise to improve executive function among patient who suffered from Non-alcoholic Fatty Liver Disease
Institution	National Taiwan Normal University, Department of Physical Education and Sport Sciences, Taipei, Taiwan; Lithuanian Sports University, Institute of Sports Science & Innovations, Kaunas, Lithuania.

Potential supervisor

Pedagogical and scientific degree	Name, surname	Academic position
PhD	Yu-Kai Chang	Distinguished Professor
PhD	Marius Brazaitis (co-supervisor)	Professor and senior researcher

Short reasoning of proposed dissertation topic

Title
Effect of Multi-modal Exercise on Executive Function among Patients with Non-Alcoholic Fatty Liver Disease: Mediator and Moderator Roles of Physical Fitness and NAFLD Severity
Short research description (including aims and objectives) (maximum 1500 characters). Sedentary lifestyle has become a global phenomenon, with the World Health Organization reporting that 31% of adults worldwide are insufficiently physically active (Bull et al., 2024). This behavioral pattern is strongly associated with Non-alcoholic Fatty Liver Disease (NAFLD), a key manifestation of metabolic syndrome (Kim & Younossi, 2008; Lonardo et al., 2015; Marchesini et al., 2001) affecting over 32% of the global population (Riazi et al., 2022). As NAFLD progresses, it may evolve from simple hepatic steatosis to non-alcoholic steatohepatitis (NASH), liver fibrosis, cirrhosis, and potentially hepatocellular carcinoma (Paternostro & Trauner, 2022). Current pharmacological interventions for NAFLD include vitamin E and pioglitazone, but these carry potential adverse effects such as hemorrhage, prostate cancer, weight gain, and bone mineral density loss (Chalasani et al., 2018). Given that NAFLD represents a milder manifestation within this disease spectrum, treatment approaches primarily recommend lifestyle modifications, particularly exercise (Hallsworth et al., 2016; Thoma et al., 2012). Research demonstrates that various exercise modalities, including aerobic exercise (Houttu et al., 2022), resistance exercise (Hallsworth et al., 2011), and high-intensity interval training (Kalaki-Jouybari et al., 2020), effectively improve NAFLD symptoms, even without weight loss or dietary control. Beyond hepatic dysfunction, NAFLD is increasingly recognized as a systemic disease with neurological implications (Targher et al., 2021; Mikkelsen et al., 2024). Patients with NAFLD frequently experience neurocognitive decline through multiple mechanisms: hepatic lipid accumulation leads to the release of pro-inflammatory cytokines (Gehrke & Schattenberg, 2020) that can cross the blood-brain barrier (Craft & Watson, 2004), while insulin resistance contributes to cerebral accumulation of advanced glycation end products and glucose neurotoxicity (Hamed, 2017). This neurocognitive decline, particularly in executive function, may significantly impact quality of life (Aye et al., 2023) and occupational performance, particularly since NAFLD patients are primarily working professionals aged 35-65 (Lin et al., 2022). Executive function, as a core component of cognitive processes, consists of three fundamental elements: inhibitory control, working memory, and cognitive flexibility (Diamond, 2013). These elements work in concert to support the development of higher-order executive abilities such as planning, reasoning, and problem-solving.