**Reasoning of dissertation topic and competency of potential supervisor for admission onto joint LSU and TU doctoral studies in 2021**

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| **Area of research (title and code)** |  |
| **Field of research (title and code)** |  |
| **Topic of research** | **Physiotherapy** |
| **Institution** | **LSU** |

**Potential supervisor**

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| **Pedagogical and scientific degree** | **Name, surname** | **Academic position** |
| Assoc. Prof. dr. | Vilma Dudoniene | Director of physiotherapy study programme |

**Short reasoning of proposed dissertation topic**

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| **Title** |
| **COMPARATIVE EFFECTIVENESS OF LAND VERSUS WATER BASED EXERCISE ON FUNCTIONAL STATUS IN ELDERLY** |
| **Short research description (including aims and objectives) (maximum 1500 characters).**  A large number of systematic reviews and meta-analyses have now been published on aquatic therapy in the elderly (with a disease): since 2015 on stroke, Parkinson's MS, neurology general and elderly general. Neurological disorders (Stroke, Multiple Sclerosis, Parkinson disease) significantly affect the functional status and activities of daily living of patients.  Neuroplasticity is the nervous system's ability to respond and adapt to environmental conditions. This includes a series of functional and structural mechanisms involving neural and neurovascular reorganization: synaptogenesis, neurogenesis and angiogenesis. Exercise is an important stimulus for angiogenesis and exercise in water has an added value because of the aforementioned effects on the cerebral circulation.  Despite the widespread use of aqua therapy in rehabilitation and emerging evidence that aquatic therapy is effective with moderate effect sizes to land therapy for some specific treatment outcomes, questions still remain:  Question 1 – Can motor learning in the pool be beneficial for the tasks (up and go, functional reach, gait parameters, balance, muscle strength, functional independence) performed on land?  Question 2 – Can water provide an enriched environment and speed up the recovery?  Question 3 – Is motor learning in the pool beneficial only for the pool tasks? Can elements of motor-cognitive therapy in water help to increase the expression of neuroplastic factors.  Question 4 – Can aqua-aerobics (40-66% of HRR according to Karvonen) improve executive functions? “what is good for the heart is good for the brain” |
| **Relevance of the problem, its novelty at national and international level (maximum 1500 characters).**  Different physiotherapy techniques (Bimanual therapy, Constraint induced movement therapy, Bobath or Motor Relearning Programme, task specific therapy, non-task exploration therapy) are applied in neuro-rehabilitation to improve patients’ functioning. Aquatic therapy has been used to treat different diseases from the antique era. The aquatic environment has unique properties, such as buoyancy, turbulence, hydrostatic pressure and resistance that can be used to gain a range of exercise benefits. Buoyancy reduces body weight and helps people who have difficulties to move on land. Turbulent water can provide an environment for static and dynamic balance training with minimal risk of injury. Resistance is important for strength training in water.  Exercise on dry land and in water with the same intensity (on a bicycle ergometer)  results in a significantly higher blood flow in water in the two cerebral arteries (with a higher  flow rate). Exercise in water also increases anti-inflammatory cytokines and BDNF, along with a decrease in pro-inflammatory cytokines. BDNF has a central role in brain plasticity due to physical activity and environmental enrichment, which increase the amount of BDNF in the serum as well as in the brain.  Aquatic therapy is applied widely in various therapeutic fields, but there is still unclear if it can be beneficial in improving executive functions and functional status in elderly. |
| **Research methods and possibilities for conducting these studies (maximum 1500 characters).**  Elderly patients will be randomly divided into two groups: Aqua therapy and Land therapy. Functional status at a baseline and after different interventions (least 8 weeks of duration) will be evaluated using: Up and go test; Mini mental test; functional reach test; static and dynamic balance, muscle strength; cognitive functions, Ashworth spasticity scale, Stroop test, and functional independence tests.  Procedures: Aqua therapy will combine elements of Aqua jogging, Halliwick, Ai chi and Bad Ragaz Ring methods in which executive functions will be included.  Land therapy will be based on functional training and exercises performed on land.  Expected outcomes: Aqua therapy should be superior to land therapy increasing executive functions in elderly people (with disease). |
| **Please indicate the links between the proposed topic for the doctoral thesis and biomechanics / physical therapy / sports study programs.**  Proposed topic is directly related to physiotherapy. |
| **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. |
| **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**  Consultant Johan Lambeck - Association International Aquatic Therapy Faculty (IATF)  LambeckJ, Gamper U, Pöyhönen T, Einarsson I, HallJ, Daly D. Aquatic research muscle recruitments patterns in the bad ragaz ring method: a preliminary study. *Turkish Journal of Physiotherapy and Rehabilitation* 2013;24(2):S98  Waller, B., Lambeck, J., & Daly, D. (2009). Therapeutic aquatic exercise in the treatment of low back pain: a systematic review. *Clinical rehabilitation*, 23(1), 3-14.  Lambeck, J., & Gamper, U. (2009). The Halliwick concept. *Aquatic exercise for rehabilitation and training*, 45-72.  Bayraktar, D., Guclu-Gunduz, A., Yazici, G., Lambeck, J., Batur-Caglayan, H. Z., Irkec, C., & Nazliel, B. (2013). Effects of Ai-Chi on balance, functional mobility, strength and fatigue in patients with multiple sclerosis: a pilot study. *NeuroRehabilitation*, 33(3), 431-437.  Jorgić, B., Dimitrijević, L., Lambeck, J., Aleksandrović, M., Okičić, T., & Madić, D. (2012). Effects of aquatic programs in children and adolescents with cerebral palsy: systematic review. *Sport science*, 5(2), 49-56. |

Currently I am supervisor of \_\_\_\_\_\_ doctoral students.

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| Supervisor |  |  |  | Vilma Dudoniene |

(signature) (Name, surname)

Date 29th of April, 2021