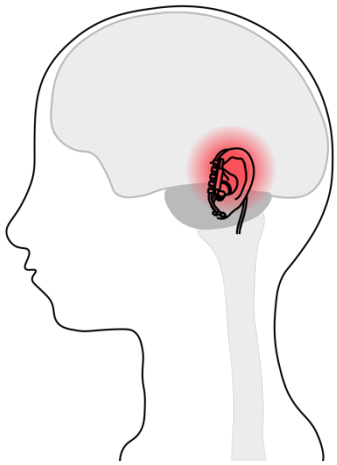
Master Thesis: A computational model of transcutaneous Vagus Nerve Stimulation

Background



Vagus Nerve Stimulation (VNS) is an effective clinical treatment for many neurological disorders, including epilepsy, depression and pain. However, the mechanisms of action between the applied electric fields and the underlying neural circuits remain largely enigmatic, limiting both the clinical efficacy as well as the pace of translational research of VNS. Computational modeling of VNS has recently emerged as a powerful tool for investigating both theoretical mechanisms and techniques to optimize the clinical application of the technology. Thus far VNS modeling has focused on invasive VNS, with only minimal focus on non-invasive VNS.

Aim

The successful student is asked to develop a patient-specific 3D Finite Element Method (FEM) model of the vagus nerve and its surrounding and evaluate the effects of stimulation parameter selection on the electric field generated by transcutaneous VNS. The student is asked to couple the results of the FEM analysis with compartmental cable models of the axon, assess the outcomes of stimulation parameter selection of various neural substrates and optimise stimulation parameters accordingly.

Data

Project type	Master thesis
ECTS	30
Language	English/German
Period	Summer term 2022
Presence time	Virtual and/or at the Chair of Digital Health
Useful knowledge	Finite Element Method, Compartmental Cable Models, Programming, Neuroscience
Work distribution	50 % modeling and 50 % programming
StudOn link	N/A
Registration	E-mail to Dr. Andreas Rowald

Literature

Literature recommendations are provided during the meetings. The candidate is further encouraged to research relevant publications on this topic.

Examination

Final presentation and final report/thesis

Contact

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