Transcutaneous vagus nerve stimulation facilitates invigoration of effort

Caroline Burrasch1, Monja P. Neuser1, Vanessa Teckentrup1, Martin Walter1,2,3, & Nils B. Kroemer1
1University of Tübingen, 2Otto-von-Guericke University Magdeburg, 3Leibniz Institute for Neurobiology, Magdeburg

Introduction
• Anhedonia: prevalent symptom in mental disorders such as schizophrenia and major depression1
• Defined as ‘inability to experience pleasure’: no clear distinction between wanting (incentive salience) and liking (consummatory pleasure)1
• Alternative view: motivational deficit to work for reward
• Reward processing and homeostatic regulation modulated by signaling of vagus nerve afferents to the nucleus tractus solitarii (NTS) and the forebrain2

Transcutaneous Vagus Nerve Stimulation (tVNS):
• Non-invasive approach to manipulate signaling of the auricular branch of the vagus nerve
• Application in the treatment of Major Depression3

Research question: How are perceived costs and benefits modulated by tVNS?

Methods
Sample: N = 41 healthy participants (26 female; M_age = 25.3 years; M_BMI = 23.0 ± 2.9; 17.93 - 30.9 kg/m²)
Procedure: 2 morning sessions after overnight fasting
• Application of tVNS/sham stimulation during tasks
• State ratings (VAS: hunger, satiety, and mood) before/after tasks
Session protocol: 2 sessions single-blind randomized cross-over

The Effort Allocation task (EAT):

Results
Analysis: 2-level hierarchical models for task / IVNS effects

Invigoration
Maintenance

Discussion
• EAT: a suitable task to study effort based decision making over time
• tVNS increases invigoration, but not maintenance of work specifically for food rewards

Conclusion
• Anti-depressant effects of tVNS by enhancing incentive salience conferred by rewards ➠ potential tool to treat motivational disorders and obesity
• Invigoration might be shaped by vagal inputs modulating the dopaminergic NTS circuits that influence homeostasis

Further research objectives:
• Identification of underlying physiological and neural mechanisms using EGG, REE & fMRI

References

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e-mail: caroline.burrasch@uni-tuebingen.de