

Transcutaneous vagus nerve stimulation facilitates invigoration of effort

Caroline Burrasch¹, Monja P. Neuser¹, Vanessa Teckentrup¹, Martin Walter^{1,2,3}, & Nils B. Kroemer¹

¹University of Tübingen, ²Otto-von-Guericke University Magdeburg, ³Leibniz Institute for Neurobiology, Magdeburg

Introduction

- Activation of the vagus nerve is associated with dopamine release in the substantia nigra¹
- Reward processing and homeostatic regulation modulated by signaling of **vagus nerve** afferents to the nucleus tractus solitarii (NTS) and the forebrain²
- Weight loss as a side effect of vagus nerve stimulation in depressed patients³

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 depression⁴

Research question: Does tVNS modulate reward-related behavior and metabolism?
How are these domains related?

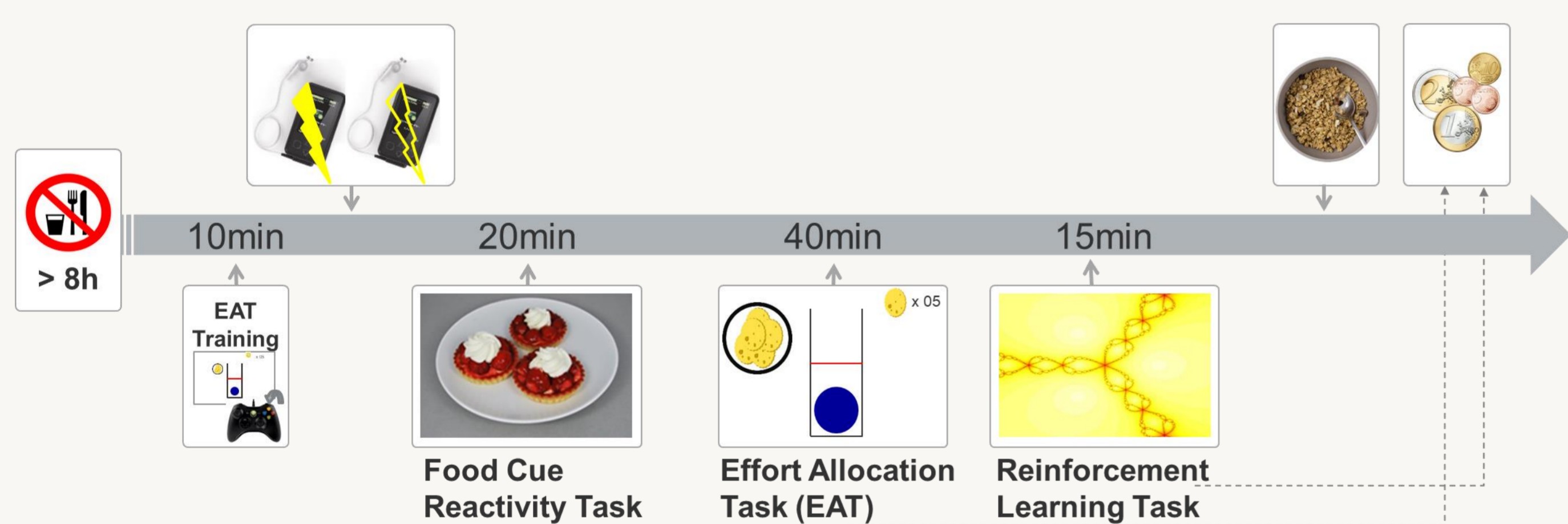
Methods

Sample: N = 41 healthy participants (26 female; $M_{age} = 25.3 \text{ years} \pm 3.8$; $M_{BMI} = 23.0 \pm 2.9$; 17.93 - 30.9 kg/m²)

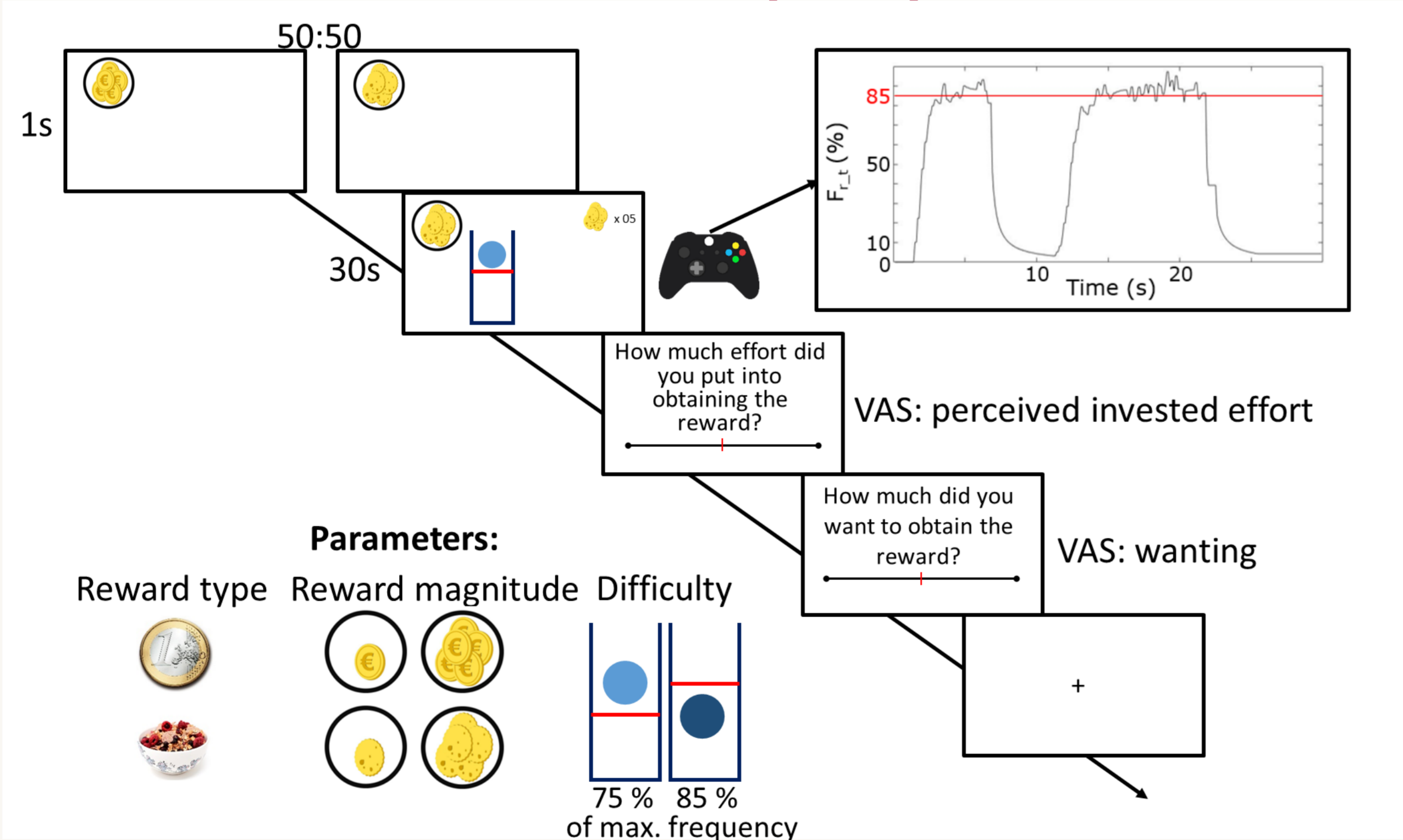
Procedure:

- 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):

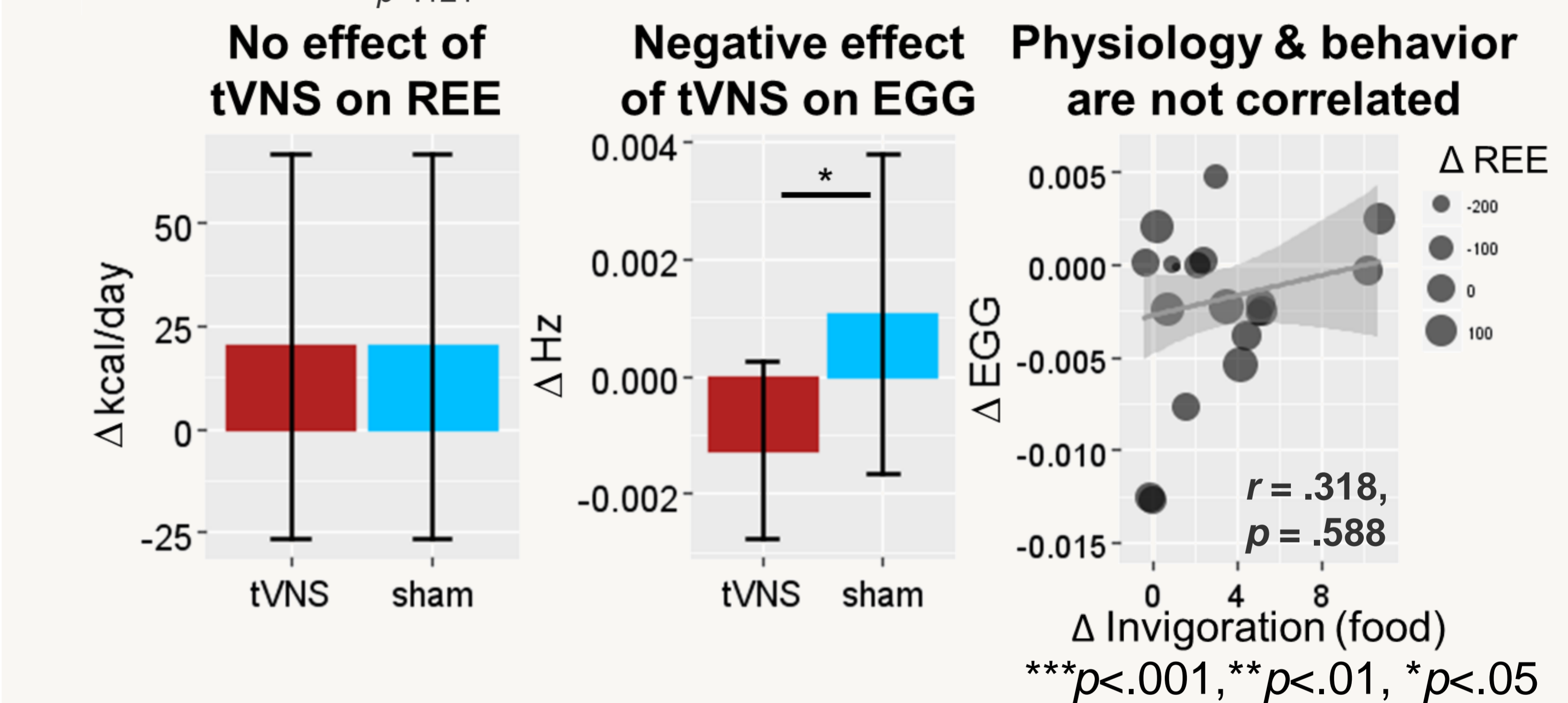
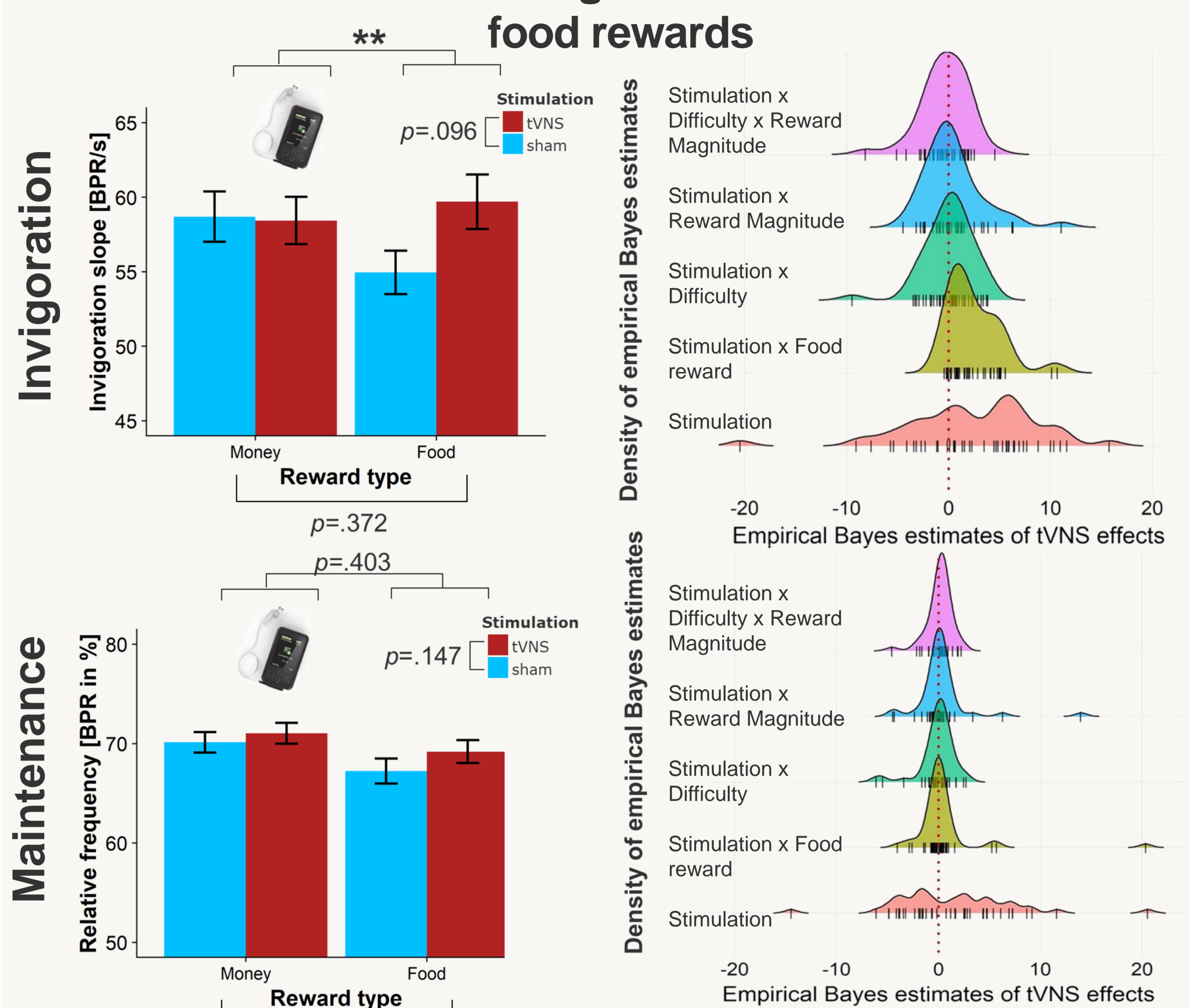


Physiology sessions (N=19)

- Resting Energy Expenditure (REE) and Electrogastrogram (EGG) under tVNS vs. sham on two consecutive days with returning participants

Results

Analysis: 2-level hierarchical models for task / tVNS effects
tVNS enhances effort vigor but not maintenance for food rewards



Discussion

- tVNS increases invigoration, but not maintenance of work → dopaminergic NTS circuits → Potential increase of homeostatically induced reward signals by tVNS
- tVNS induces gastric slowing → Gastric slowing is related to feelings of fullness
- No association of task and physiological effects → Weight loss effects of VNS might be mediated by lower gastric motility

Conclusion:

- Invigoration for food might be shaped by vagal inputs modulating the

References

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