ELECTROCEUTICAL ENHANCEMENT OF SELF-COMPASSION MEDITATION TRAINING USING TRANSCUTANEOUS VAGUS NERVE STIMULATION

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Background: Physiological signals conveyed by the vagus nerve generate quiescent psychological states conducive to contemplative practices and (self-)affiliation. Indeed, complex interpersonal-motivational states such as 'compassion' are thought to rely on the vagus.

Aims: Here, we tested whether vagal neurostimulation alone generated contemplative states or if such stimulation enhanced these states during self-compassion meditation.

Methods: Community-dwelling adults (*n*=120) were assigned to transcutaneous vagus nerve stimulation (tVNS) or sham stimulation *plus* self-compassion training *or* control mental imagery training in a fully-factorial randomised controlled trial. We assessed self-reported state self-compassion, self-criticism, mindfulness and heart rate variability (HRV). Acute effects were typically evaluated on the first of eight daily sessions (Session-1) before (T1) and during (T2) stimulation and again after the combination of stimulation (tVNS versus sham) *plus* training (self-compassion versus control training; T3). The sustained effects of stimulation *plus* training were assessed after each daily stimulation plus training session.

Results: Acutely, during Session-1, a significant Timepoint x Stimulation x Training interaction (p=0.025) reflected a larger acute T1→T3 increase in state self-compassion following tVNS + self-compassion meditation training, with similar rapid effects observed on state mindfulness. None of the other groups showed this additivity between stimulation and training. Additionally, significant Session x Training and Session x Stimulation interactions ($p \leq 0.027$) on state mindfulness (but not state self-compassion), suggested that the effects of tVNS *plus* self-compassion training on state mindfulness accumulate across repeated daily episodes of vagal stimulation and compassion meditation training. Notably, HRV, a putative biomarker of vagal activity, was unaffected by stimulation or training condition.

Conclusion: tVNS augmented the effects of a self-compassion meditation training. Given that the affected outcomes (compassion and mindfulness) are associated with well-being and are increasingly valorised in Western societies, the findings suggest that, in addition to potential clinical applications, such combinations of neurostimulation and meditation may be employed in 'virtue engineering'. Assuming our findings are replicable, whether they are desirable and can be used safely and ethically remains to be determined.

Keywords: Compassion, Mindfulness, Vagus nerve, Transcutaneous vagus nerve stimulation (tVNS)

Publications:

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