

Progress in the treatment of mild to moderate depressive disorder by tVNS

Major Depressive Disorder (MDD) is one of the most popular mental disorders, the treatment of which is far from satisfactory. One present treatment that has emerged is vagus nerve stimulation (VNS), an FDA approved physical treatment for depressive disorders, while the expensive surgery has limited VNS only to patients who have failed to respond to multiple treatment options.

Recently, supported by the National Natural Science Foundation of China, National Science and Technology Support Program and Beijing Natural Science Foundation of China, Prof. Rong Peijing and Fang Jiliang's group at China Academy of Chinese Medical Sciences have conducted a multi-center clinical study by utilizing transcutaneous VNS (tVNS) to treat Mild to Moderate Depressive Disorder with their collaborators. The work was published in *Biological Psychiatry*, an international authorized psychiatric journal, entitled "Transcutaneous Vagus Nerve Stimulation Modulates Default Mode Network in Major Depressive Disorder".

This study adopts the international general Hamilton depression rating scale to measure patients' status. The effect of default-mode network (DMN) was assessed by fMRI. DMN plays an important role in the self-control of psychological states, which is connected functionally by several correlating cerebral regions maintaining metabolic activity when brain is under rest state.

This study discloses a similar effect with VNS when stimulating the body surface branches of vagus nerve on concha and external auditory meatus. Since abnormal function connection (FC) is a default condition for depressive patients, the evident modulation on DMN and obvious relationship between clinical symptoms and some changes of FC strong level by tVNS prove the clinical effect and broaden the understanding of the central mechanism of tVNS on depression. This non-invasive, safe and low cost method of depression treatment will be improved greatly in future.

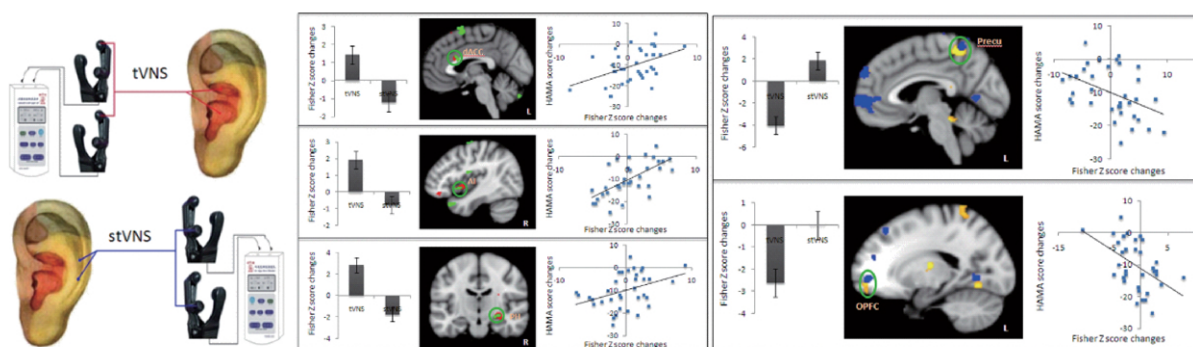


Figure Left: Locations of the stimulation electrodes on the auricular surface for transcutaneous vagus nerve stimulation (tVNS) and sham transcutaneous vagus nerve stimulation (stVNS). Middle: Red (top row) indicates brain regions that showed significant functional connectivity decrease with the default mode network in the transcutaneous vagus nerve stimulation group as compared with sham transcutaneous vagus nerve stimulation. Green color (bottom row) indicates brain regions whose default mode network functional connectivity changes (post treatment minus pretreatment) were positively associated with the corresponding Hamilton Depression Rating Scale score changes across all subjects. dACC, dorsal anterior cingulate cortex; Ins, insula. Right: Yellow indicates brain regions that showed significant functional connectivity increase with default mode network in the transcutaneous vagus nerve stimulation group as compared with sham transcutaneous vagus nerve stimulation. Blue indicates brain regions whose default mode network functional connectivity changes (post treatment minus pretreatment) were negatively correlated with the corresponding Hamilton Depression Rating Scale score changes across all subjects.