

Episodic memory enhancement in aging: The role of cognitive training combined with (bilateral) tDCS in the medial-temporal cortex and cerebellum on episodic

ABSTRACT:

Background

Cognitive training (CT) has been widely implemented and it is currently accepted as the most promising method to alleviate cognitive decline. Several techniques have been combined with CT to explore the synergetic effects and, recently, a beneficial effect has been shown after the combination with transcranial direct current stimulation (tDCS).

Aims

Here we combined multiple sessions CT with tDCS to assess verbal episodic memory improvement in healthy elderly subjects, compared with sham and a wait list group.

Method

We tested whether CT and excitatory tDCS over the left dorsolateral prefrontal cortex (IDLDFC) or right cerebellar cortex (rCC) facilitates verbal episodic memory, compared with sham stimulation and a wait list control group. CT was applied daily for 1 hour, after 20 minutes of tDCS, over 12 sessions. Performance on memory and other cognitive tasks was evaluated at baseline and postintervention, using behavioral and neuroimaging tools. Participants were healthy elderly, ≥ 60 years, right-handed, without history of neuropsychiatric disease.

Results

Data suggest an improvement in verbal episodic memory tasks in the groups receiving CT + tDCS. Interestingly, there is a greater improvement and consistency in the group receiving CT+tDCS in the rCC. Neuroimaging data supports the results from the neuropsychological assessment. Specifically, tDCS over the right cerebellum + CT increased the functional connectivity in the left hippocampus.

Conclusions

These data suggest that CT and neuromodulation hold promise as a means to enhance cognitive functions in healthy elderly. Greater light is also shed on the role of the cerebellar cortex in cognitive processing.

Keywords

Aging, Cognitive enhancement, tDCS, fMRI, Cerebellum

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