Cerebellar anodal transcranial direct current stimulation (CB atDCS) to modulate cerebello-cerebral networks in bimanual coordination in young and older adults

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Background

Complex bimanual coordination requires a good coordination between different neurological networks. Despite a crucial role of the cerebellum in motor coordination and motor learning, little is known about the cerebellar role in bimanual coordination, especially in aging. Although the cerebellum is also consistently activated during finger and hand movements in young adults, it is the strongest predictor of bimanual coordination performance only in children and in older adults (Boisgontier et al., 2018). We performed an ALE meta-analysis to determine the cerebellar structures involved in different types of bimanual coordination (in-phase, anti-phase, complex). In addition, we used cerebellar anodal transcranial direct current stimulation (CB atDCS) to investigate the crucially implicated cerebello-cerebral networks in bimanual coordination in young and older adults.

Methodology

ALE meta-analysis

Bimanual tracking task (BTT)

Online CB atDCS

Outcome measure

Target deviation

Difficulty x tDCS *

Age x tDCS *

Discussion

The ALE meta-analysis revealed that the cerebellum is particularly involved in complex bimanual movements, in collaboration with the subcortical structures. By stimulating the cerebellum during a bimanual coordination task, it was shown that this stimulation had a significantly different impact on difficult conditions (3:1 or 1:3 frequency) as compared to easy conditions (1:1). However, the effect of tDCS was not the same for both age groups. While CB atDCS seemed to have a beneficial effect on target deviation in young adults, the opposite appeared to be true for older adults. This pilot study shows that more studies are needed on the exact role of the cerebellum in aging.