

Letter to the Editor

Appropriately Designed Studies are Needed to Assess Whether Transcranial Direct Current Stimulation Actually Improves Gait Performance in Older People

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We read with interest the article by Choi *et al.* [1] investigating the effect of transcranial direct current stimulation (tDCS) on walking performance in healthy older adults by using a random-effects meta-analysis of 11 studies. During single-task walking, improvements in step-time variability and functional mobility were observed, and when the primary motor cortex was targeted specifically, single-task walking performance was improved. In dual-task walking, tDCS improved gait speed and dual-task gait-speed effort. Dual-task walking performance was improved when tDCS specifically targeted the dorsolateral prefrontal cortex and multiple areas, including the prefrontal cortex. The study concluded that tDCS could be a promising tool to promote mobility and to reduce walking problems in healthy aging patients. The study is noteworthy, but several points should be discussed.

First, gait performance depends not only on brain function, but also on the function of muscles, peripheral nerves, spinal cord, heart, and gastrointestinal system. Since most ages in the included studies were between 60 and 79 years, it is very likely that sarcopenia had developed in most of the included patients. Sarcopenia is physiological wasting in old age, despite regular physical activity or muscle training. When physiological sarcopenia exceeds a certain proportion of maximal muscle mass, muscle weakness may occur. Therefore, gait analysis may show impairment despite the classification of such individuals as normal.

The second point relates to the definition of “healthy”. The exclusion of neurological and psychiatric diseases does not necessarily mean that these subjects were healthy. Subjects between the ages of 60 and 79 years are generally no longer healthy. The older people get, the more likely it is that they are polymorbid. Since gait performance does not only depend on cortical functions, the subjects in the 11 included studies should have been determined to be really free of factors that negatively influence gait. In addition, subclinical diseases should also have been taken into account.

Third, cerebral imaging before starting tDCS therapy was not included or discussed in the analysis. Although tDCS is generally considered safe [2], the possibility of harmful side effects should be discussed. Especially in the

elderly, there is an increased risk of cerebral disease, including stroke, hemorrhage, dementia, and aneurysm formation [3], so consideration should be given to performing cerebral imaging, including angiography, prior to tDCS to rule out subclinical tumors, atrophy, or vascular malformations.

Fourth, the triggering of seizures was not considered a possible side effect of tDCS in older people. As the prevalence of epilepsy increases with age [4], it is possible that tDCS can trigger seizures, especially if additional risk factors are present. Therefore, an electroencephalogram (EEG) should be taken before using tDCS.

Finally, a meta-analysis is not the appropriate mechanism for determining whether tDCS actually has a positive effect on gait performance in older people. As mentioned, cerebral imaging, including angiography, and recording of an EEG should be considered before using tDCS in older people in order not to miss subclinical cerebral disease and to avoid severe side effects.

Author Contributions

JF was responsible for the design and conception, discussed available data, wrote the first draft, and gave final approval. JF participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

Not applicable.

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Conflict of Interest

The author declares no conflict of interest.

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