

## **Effects of Using Transcranial Direct Current Stimulation (tDCS) with Breathing and Balance Exercise on Balance and Respiratory Muscle Strength in the Elderly**

Panita Thamnithis\* Dr.Wiyada Punjaruk\*\* Dr.Paradee Auvichayapat\*\* Dr.Orathai Tunkammerdthai\*\*<sup>1</sup>

### **ABSTRACT**

Advancing age associated with deterioration of body function such as balance, respiratory function, cardiovascular fitness led to limit of performance and risk of falling. Balance exercise was designed for improve balance ability. However, balance exercise spends a long time to improve balance ability. Using transcranial direct current stimulation (tDCS), which is one of non-invasive brain stimulation. The association of tDCS with other therapy has been shown to facilitate the enhancement of therapy outcomes. Moreover, breathing programs could improve pulmonary function and relate with balance. Therefore, the researchers hypothesized that using tDCS with breathing exercise may improve efficacy of exercise program. The aims of the study are (1) to compare balance and respiratory muscle strength after using tDCS with breathing and balance exercise within group and (2) to compare between sham and active tDCS group after training in the elderly. This study was randomized control trial and pilot study. Participants were divided into 2 groups including sham group (n=7) and active group (n=7). They were stimulated with sham or active tDCS with 20 minutes breathing exercise. Then they performed 40 minutes of balance exercise for 3 times/week, total 4 weeks. Balance test (one-leg stand test; OLST, and Timed-up and go test; TUGT) and respiratory muscle strength test (Maximal inspiratory pressure; MIP and Maximal expiratory pressure; MEP) were assessed before and after the study period with blind outcome assessors. The finding indicated that TUGT was significantly improved in active group ( $p < 0.05$ ). However, there was no significant difference between the two groups. In active group showed a significant increase in MIP after the intervention ( $p < 0.05$ ). Moreover, MEP was trend to significant increase ( $p = 0.099$ ) in active group and significantly different between the two groups ( $p < 0.05$ ). Therefore, 4-week of using active tDCS with breathing and balance exercise can improve respiratory muscle strength in the elderly.

**Keywords:** Older adult; Respiratory muscle; Balance exercise; Rehabilitation; Transcranial direct current stimulation (tDCS)

<sup>1</sup> Corresponding author: Assistant Professor, Dr.Orathai Tunkammerdthai, PhD, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand.

E-mail: [torato@kku.ac.th](mailto:torato@kku.ac.th) for a corresponding author of the paper

\*Exercise and sport sciences program, Graduate school, Khon Kaen University, Khon Kaen, Thailand

\*\*Department of Physiology, Faculty of Medicine, Khon Kaen University, Khon Kaen, Thailand