Cortical Activities for Overground Walking, Treadmill Walking, and Feet-Stamping: An fNIRS Pilot Study

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THIS experiment was to investigate cortical activities for three types walking such as overground walking, treadmill walking, and feet-stamping. We used a functional near-infrared spectroscopy (fNIRS) to map cortical activities of walking by measuring relative changes in local hemoglobin oxygenation. We performed the fNIRS study with 31 channels measurements in every 14 Hz sampling using FOIRE-3000 (Shimadzu Co., Japan). We calculated the map of cortical activities with the level of significance at a *p*-value of < 1% using NIRS-statistical parametric mapping (NIRS-SPM). One healthy volunteer at the age of 31 with no history of neurological, physical, or psychiatric illness underwent this study. Overground walking was to walk along the corridor about 70 meters at 3km/h. On the treadmill, the subject walked at 3km/h. He stamped his feet at 3km/h. Each trial was repeated five times. The protocol for each condition was as follows: rest (15 s), task (30 s), and rest (15 s). Task and rest were cued by beep sound at every start.

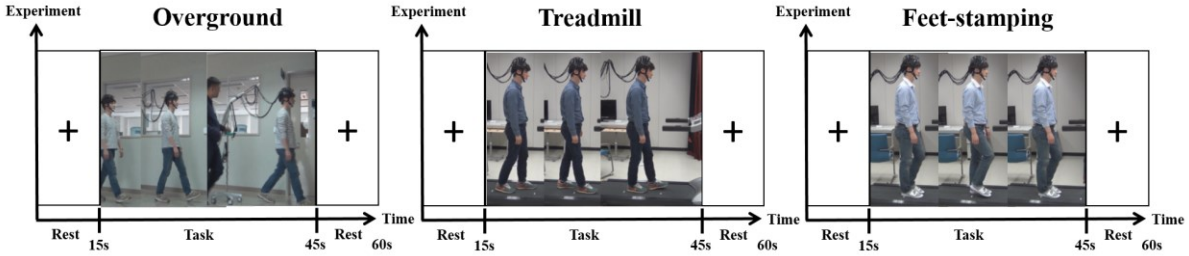

Figure1. Experimental protocol of three walking patterns; overground walking, treadmill walking, and feet-stamping

Results demonstrated that all walking patterns commonly activated the medial primary sensory motor cortices [1]. Overground walking had the overall *t* values much higher than treadmill walking and feet-stamping. During feet-stamping, the supplementary motor areas were very slightly activated while they were predominantly activated during overground walking and treadmill walking. These findings supported that the overground walking could more facilitate motor function than treadmill walking.

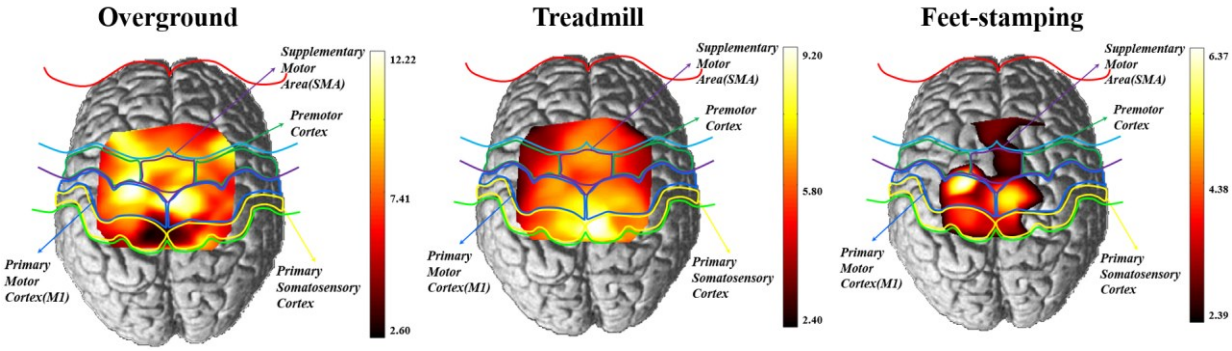

Figure 2. Cortical activities for three walking patterns; overground walking, treadmill walking, and feet-stamping

REFERENCES

[1] Ichiro Miyai, "Cortical Mapping of Gait in Humans: A Near-Infrared Spectroscopic Topography Study," *Neurorehabilitation Research Institute*, vol. 14, pp. 1186-1192, 2001.

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