Noninvasive brain stimulation for modulating neural network plasticity in stroke rehabilitation

After focal ischemic injury of brain such as stroke, activity of remaining neural network is changed to optimize neural resources for recovery of function. Modulation of neuroplastic activities of perilesional cortex or interconnected network regions may enhance the rehabilitative outcome and functional restoration after stroke, therefore, the methods of modulating neuroplasticity are crucial topics in neurorehabilitation research. Noninvasive brain stimulation (NBS) is a technique to modulate neural plasticity in a noninvasive manner and consequently to enhance neural recovery. The most popular noninvasive methods of neuromodulation include transcranial magnetic stimulation (TMS), transcranial direct current stimulation (tDCS), and transcranial alternating current stimulation (tACS). One of the considerations on the effect of NBS is individual variation of its responsiveness. Diverse factors such as individual skull and cortical morphology, lesion location and severity, genetic polymorphism, etc. are considered as the intrinsic factors affecting individual response variability. The patient-specific neural network modulation by customized brain stimulation methods may provide a novel neurorehabilitation strategy to enhance functional recovery after stroke. The modulating effect of NBS can expand to the interconnected subcortical network areas beyond the site of cortical stimulation. Use of multimodal functional neuroimaging methods such as functional MRI, PET, and functional near infrared spectroscopy can demonstrate the network spreading effect of NBS. Neural plasticity after stroke can be seen from microscopic to macroscopic levels. This process may be spontaneous or induced by training, although the former occurs only within a critical period after injury. Combination of neuromodulatory interventions such as NBS on top of various rehabilitation treatment may enhance successful reorganization of neural network which is utmost important for future researches.

Biography
Yun Hee Kim pursued her PhD in Neuroanatomy (1996); MD (College of Medicine- 1982) respectively from Yonsei University, Republic of South Korea. She is a Board Certified PM&R specialist (1986). Her clinical specialty is neurological rehabilitation and her main research interest is investigating human neural plasticity using functional neuroimaging and noninvasive brain stimulation. She has published more than 200 peer-reviewed articles in famous international and domestic academic journals such as Neurology (2006), NeuroImage (1999, 2008, 2015), NeuroImage Clinical (2017), Stroke (2006, 2011, 2017), Neurorehabilitation and Neural Repair (2009, 2012, 2015), and 10 chapters of books in the field of neurological rehabilitation.

yunkim@skku.edu

Notes: