S-1-2 Secondary somatosensory area and voluntary movement
Toshiaki WASAKA
Nagoya Institute of Technology

A motor program for controlling one's own movement requires sensory signals from the target body parts that are to be moved. The information for movement is provided by sensory feedback. Recent studies suggested that cortical activity related to sensory response and perception is modified by movement executing mechanisms. However, this raises the question of how this system integrates motor command and sensory information whenever the intended movement is in progress. Preceding and during movement, the motor and higher-order brain systems regulate sensory information at several processing stages.

The presentation begins with an explanation of the somatosensory system and sensorimotor integration. Then, it is followed by research topics of neural modulation in the somatosensory areas during execution of voluntary movement including our own recent findings.

In sensorimotor integration of somatosensory areas, we showed an attenuation of activation in the primary somatosensory area (SI) and enhancement in the secondary somatosensory area (SII). The opposite effects of movement on SI and SII cortices indicated that the motor and higher-order brain systems regulate somatosensory information at several processing stages by the centrifugal process. In addition, we further elucidate the role of SII during movement execution. When subjects viewed unintended visual feedback of body movement, the cortical response showed that neural activation in the SII and parietal cortex was strongly affected by the unexpected visual feedback. These results provided a crucial function of the SII for motor control.

Keywords: sensorimotor integration, MEG, EEG, TMS

S-1-3 Attentional and motor-related modulation of the somatosensory system
Tetsuo KIDA
Waseda Institute for Advanced Study (WIAS), Waseda University

Recent advances in neuroimaging techniques, including electroencephalography (EEG), magnetoencephalography (MEG), positron emission tomography (PET), and functional magnetic resonance imaging (fMRI), have revealed temporal and spatial representations (timing and location) of neural and hemodynamic activations pertaining to a wide variety of functions of the human brain. I talked about neural activations related to attentional and sensory-motor functions in the somatosensory system as revealed by high-temporal resolution neuroimaging studies using magnetoencephalography (MEG) and electroencephalography (EEG).

I briefly reviewed basic concepts of EEG and MEG, and then EEG and MEG studies of attention and somatosensory-motor interaction. An overview of these studies showed that EEG and MEG are helpful to reveal cortical dynamics of attentional and sensory-motor processing in the human brain and potentially a powerful tool to evaluate the pathophysiology of relevant disorders. I also introduced a new technique to examine functional properties of the human brain network using EEG and MEG. This technique is based on complex network analysis, which can be a potential tool in a variety of sub-theme in exercise physiology.