別紙様式６

平成18年度　博士課程学位論文要旨

学位論文題名（注：学位論文題名が欧文の場合は和訳をつけること）

Neural mechanism of finger movement when initially and triggered externally.
手指対立運動における自発運動と外的刺激運動時の脳内メカニズム

学位の種類：　博士（保健科学）
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During rehabilitation for Parkinson's disease, physical therapists often utilize visual or auditory guidance to facilitate movement in patients. However, the neural mechanism involved in these procedures is unclear. Goldberg (1985) proposed a hypothesis of an internal and external loop of motor control. However, brain imaging studies are insufficient to verify this hypothesis. In this study, we scanned eleven right-handed healthy subjects by functional magnetic resonance imaging while they performed (1) self-initiated finger-to-thumb opposition movements once every second and (2) identical movements externally triggered by the paced sound of a metronome.

During the voluntary movement of the right hand, among the 11 subjects, the cerebellum was found to be activated in 7, the temporal gyrus in 6, the SMA in 6, the PMC in 5, and the parietal lobule in 5. During the voluntary movement of the left hand, among the 11 subjects, the cerebellum was found to be activated in 8, the temporal gyrus in 6, the SMA in 7, the PMC in 8, and the parietal lobule in 4.

Auditory guidance resulted in a decrease in the activation of the cerebellum, temporal gyrus, and SMA. Thus, the cerebellum activation in 7 subjects with right hand and 4 subjects with left hand during voluntary movements were reduced in 7 and 4 subjects respectively after auditory guided. Similarly, following auditory guidance, the activation of the temporal gyrus in 6 with right hand and 6 with left hand were decreased in 5 and 4 subjects respectively. Finally, the activation of the SMA in 6 with right hand and 8 with left hand were decreased in 5 and 4 subjects respectively.

Conversely, auditory guidance resulted in an increase in the activation of the PMC and parietal lobule. Following auditory guidance, the activation of the PMC increased or occurred in 5 and 6 of the 11 subjects during the voluntary movement of the right and left hand, respectively. The activation of the parietal lobule increased or occurred in 4 and 7 of the 11 subjects during the voluntary movement of the right and left hand, respectively.

Our results were in line with Goldberg's hypothesis, except with regard to the cerebellar activation pattern. However, if cerebellar activation depends on cognition, simple tasks such as those that were performed in the present experiment may not activate the cerebellum.