Involvement of the frontal cortex, basal ganglia, and cerebellum in voluntary movement

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【Outline of survey】

The frontal cortex, basal ganglia, and cerebellum each play a major role in the performance of voluntary movement. Their crucial involvement is suggested by the fact that dysfunction in any one structure results in the inability to execute smooth, coordinated movement. Recent studies have shown that the frontal cortex is interconnected with the basal ganglia and cerebellum, and that these interactions are crucial. It remains necessary to reveal their specific functions and the interactions between them. This project intends to investigate these issues from structural and functional perspectives. One series of studies will analyze the anatomical organization linking the frontal cortex, basal ganglia, and cerebellum systematically. Another series will examine the functional roles of each structure by comparing patterns of neural activity recorded from subjects performing behavioral tasks. Finally, the results obtained in the two series of experiments will be integrated to reveal the neuronal mechanisms of voluntary movement.

【Expected results】

This project will reveal how networks consisting of multiple brain structures implement voluntary movement. The large-scale perspective will provide a new concept and a new way of thinking about voluntary movement. This study will also lead to the development of new theories concerning voluntary movement. The resulting deeper understanding will allow us to characterize specific phenotypes of movement disorders induced by dysfunction of the basal ganglia, cerebellum, or frontal cortex. Ultimately, this will lead to new diagnosis and treatment methods.

【References】

- Hoshi, E. and Tanji, J. (2007) **Distinctions between dorsal and ventral premotor areas: anatomical connectivity and functional properties.** *Curr. Opin. Neurobiol.* **17**: 234-242
- Hoshi, E., Tremblay, L., Feger, J. Carras, P.L. and Strick, P.L. (2005) **The cerebellum communicates with the basal ganglia.** *Nat. Neurosci.* 8, 1491-1493

【Term of project】 FY2007－2011	【Budget allocation】17,500,000 yen (2007 direct cost)

【Homepage address】

http://www.tamagawa.ac.jp/sisetu/gakujutu/brain/tanji/hoshi/hoshi.htm