

A new cortical area for response control was discovered: primate medial prefrontal cortex dynamically participates in volitional control of action when the task requires selection of response tactics

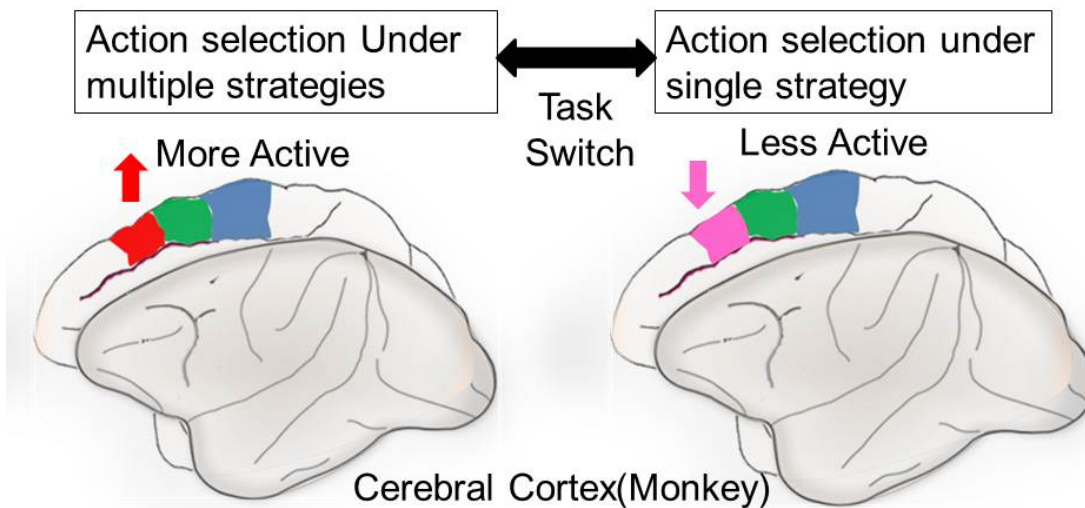
Professor Hajime Mushiake

The research group led by Professor Hajime Mushiake and Assistant Professor Yoshiya Matsuzaka has discovered a new region involved in regulation of actions in the medial prefrontal cortex of primate brain. This region, called the posterior medial prefrontal cortex (pmPFC), lies in the posterior portion of the medial prefrontal cortex, whose function has not been clarified by previous neuron-recording as well as neuroimaging studies. The group discovered that this region functions during the selection of response tactics (internally-developed protocol to select response, as opposed to “rule” that is defined externally) rather than the selection of response itself, indicating that it participates in decision making at more abstract level than simply deciding specific actions. More surprisingly, the group also revealed that its neural representation of task performance was dynamic in that it disappeared when only a single tactic was imposed. This functional reorganization, which did not occur in adjacent cortical areas, was unique to pmPFC. These discoveries are expected to advance understanding of neural mechanisms of decision making. Further, the present results can lead to the understanding of higher brain functions, treatment for dementia, and human-machine interface.



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Multiple behavioral strategies drive the pmPFC neurons -Dynamic reorganization under different conditions-



Red, Pink : Posterior Medial prefrontal Cortex(pmPFC)

Green : Pre-supplementary motor cortex(preSMA)

Blue : Supplementary Motor Area(SMA)

"Neuronal activity in the primate dorsomedial prefrontal cortex contributes to strategic selection of response tactics."

Matsuzaka Y, Akiyama T, Tanji J, Mushiake H.

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