Single neurons in M1 and premotor cortex directly reflect behavioral interference.

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Abstract:

Some motor tasks, if learned together, interfere with each other's consolidation and subsequent retention, whereas other tasks do not. Interfering tasks are said to employ the same internal model whereas noninterfering tasks use different models. The division of function among internal models, as well as their possible neural substrates, are not well understood. To investigate these questions, we compared responses of single cells in the primary motor cortex and premotor cortex of primates to interfering and noninterfering tasks. The interfering tasks were visuomotor rotation followed by opposing visuomotor rotation. The noninterfering tasks were visuomotor rotation followed by an arbitrary association task. Learning two noninterfering tasks led to the simultaneous formation of neural activity typical of both tasks, at the level of single neurons. In contrast, and in accordance with behavioral results, after learning two interfering tasks, only the second task was successfully reflected in motor cortical single cell activity. These results support the hypothesis that the representational capacity of motor cortical cells is the basis of behavioral interference and division between internal models.

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