Laminar differences in neural activity covarying with action choice in dorsal premotor cortex

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Introduction
We have previously demonstrated that a heterogeneous population of neurons in dorsal premotor cortex covaries with the process of forming an action on the basis of sensory input (SFN '13, '14). Neural activity in PMd covaries with stimulus difficulty, choice and reaction time. Are there laminar differences in activity in dorsal premotor cortex during this decision formation process?

Monkeys can discriminate red-green checkerboards and report their decision with an arm movement

A diverse population of PMd neurons covaries with the decision formation process

PMd neurons in dorsal premotor cortex covaries with the process of forming a decision on the basis of sensory input (SFN '13, '14). Neural activity in PMd covaries with stimulus difficulty, choice and reaction time. Are there laminar differences in activity in dorsal premotor cortex during this decision formation process?

재생

A heterogeneous population of PMd neurons covaries with the decision formation process

PMd

U-probes (Plexon, Inc.) allow sampling of neural populations in PMd at different depths.

Average population selectivity for choice emerges earlier in superficial compared to deep electrodes

Enhanced

Surpressed

Perimove

(Insufficient index)

Units in PMd enhanced and suppressed their activity before checkboard onset. This heterogeneity could be summed by a “Visuomotor Index” which was bimodal (p < .001)

Units in superficial electrodes responded earlier (not shown) than units in deeper electrodes and also signaled choice between 40-96 ms earlier than deeper electrodes (depending on RT).

Population dynamics associated with choice appear earlier on superficial compared to deeper electrodes

Deep electrodes (11-16)

Superficial Electrodes (1-6)

Conclusions

A heterogeneous population of PMd units covaries with the decision formation process.

We see a depth dependence to covariation with the decision formation process.

Units in superficial electrodes signal choice earlier than units in deep electrodes.

This depth dependence suggests laminar differences in neural activity that covaries with decisions in PMd

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