Abstract:

Corticospinal (CS) pathways provide the structural foundation for executing voluntary movements. Although the anatomy of these pathways is well explored, little is known about spinal decoding of parametric information transmitted via this route during voluntary movements. We addressed this question by simultaneously recording cortical and spinal activity in primates performing an isometric wrist task with multiple targets while measuring CS interactions. Single-pulse cortical stimulation effectively produced a short-latency (presumably monosynaptic) spinal response and thus revealed functionally connected CS sites. Spinal and cortical neurons recorded from connected CS sites showed alignment of directional-torque tuning that peaked at torque onset, consistent with the enhanced cortical drive active during this period. This increased tuning similarity was accompanied by an increased trial-to-trial covariability of firing. Whereas functional CS interactions were dynamic, the efficacy of cortical stimulation was unaffected by the motor state. These results suggest that around the onset of motor action there is a period of facilitated information transfer during which cortical command has greater efficacy in recruiting spinal neurons with matching tuning properties. Dynamic alignment of response properties may form the basis for a spinal readout mechanism of descending motor commands in which directional-torque is a parameter that is preserved across interacting CS sites.

Journal:
The Journal of neuroscience : the official journal of the Society for Neuroscience

Volume:
27

Issue:
45

Pagination:
12349-57

Date Published:
2007 Nov 7
UPCOMING EVENTS

Learn more about our exciting upcoming events!

read more

Studying at ELSC

Our Int'l Ph.D. program provides outstanding students with top-notch courses in computational neuroscience.

read more

The Building

The Jerusalem Brain Sciences Building will provide a state-of-the-art research and teaching facility for the Edmond and Lily Safra Center for Brain Sciences.

read more

ELSC Media Channel

Get into our media channel and investigate ELSC's latest videos: seminars, public lectures, courses and video articles.

read more

Source URL: https://elsc.huji.ac.il/prut/publications/connected-corticospinal-sites-show-enhanced-tuning-similarity-onset-voluntary-acti