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LOCAL FIELD POTENTIAL ACTIVITY VARIES WITH REACH DISTANCE, DIRECTION, AND SPEED IN MONKEY PRE−MOTOR CORTEX.

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Local field potentials (LFPs) in motor and pre−motor cortex show 'plan' activity: increased power in the 20−45 Hz frequency band after an instructive cue, but prior to a 'go' cue. Previous research has suggested that LFP plan activity is independent of the specifics of the upcoming movement and does not vary with movement parameters such as distance or direction. In contrast, research in upstream brain areas such as LIP reveals reliable direction tuning of LFP activity. To investigate LFP tuning, we recorded from 16 sites in pre−motor cortex (putatively caudal PMd) and M1 of a rhesus macaque. Recordings were made using 1−5 megaohm tungsten micro−electrodes, simultaneously with the single−unit recordings reported by Churchland and Shenoy in this volume. LFP activity was recorded for reaches to 5 distances in two directions, executed at two speeds. The 20−40 Hz frequency band was analyzed using the Thompson multitaper spectral analysis technique for plan activity. Upon performing an ANOVA ($P < 0.05$), the LFP plan activity of 10 sites showed a main effect of speed, 3 sites showed a main effect of direction, and 3 sites showed a main effect of distance. (A non−parametric Friedman test of the data resulted in a nearly identical set of sites showing significant effects for speed.) The ANOVA also revealed that a small number of sites exhibit an interaction effect between either two or all of the factors. Interestingly, there was no consistent preference across sites for one speed over the other. The size of the effect at each particular site was typically small and reached statistical significance due to the large number of trials collected (e.g., ~200 reaches per speed, if one collapses across direction and distance).
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