Print this Page

Presentation Abstract

Program#/Poster#:	182.14/RR42
Title:	A novel maze task for the study of motor preparation
Location:	Washington Convention Center: Hall A-C
Presentation Time:	Sunday, Nov 16, 2008, 9:00 AM -10:00 AM
Authors:	***M. M. CHURCHLAND**[1], M. T. KAUFMAN[2], K. V. SHENOY[1]; [1]Dept Elec Eng, [2]Neurosci. Program, Stanford Univ., Stanford, CA
Abstract:	Many neurons in dorsal premotor cortex respond during movement preparation. Such responses are usually studied during center-out reaching (although see Hocherman & Wise 1991, Kang & He 2006). The same trial-type is usually also performed a great many times (although see Torres & Andersen 2006). Yet premotor cortex appears non-essential for simple point-to-point reaching, and extensive practice may minimize demands on motor preparation. We developed a novel reaching task, which attempts to more heavily tax both premotor cortex and motor preparation (also see Kaufman et al. in this volume). Reaches were executed using a cursor, displaced above the hand and under its direct control. Start / endpoints could appear anywhere in a 280x180 mm workspace. Reaches had to avoid one or more intervening virtual barriers, and complete within 1200 ms. We imposed a 0-900 ms delay period, with enforced fixation. Training proved challenging, but final performance was excellent. The monkey readily performed novel mazes, so long as the required reach path was fairly simple. Remarkably, velocity profiles were nearly as consistent for curved reaches as for straight reaches (w/ no barrier). Our goal is to use this task to study premotor processing under conditions of increasing difficulty. Here we report three preliminary results, based on 92 recorded neurons, indicating that such an endeavor is feasible. First, preparatory (delay period) neural responses covaried robustly with reach path/curvature. The response range, over all conditions,

averaged 27 spikes/s. Straight and curved reaches (with shared start/endpoints) typically evoked different responses: the mean difference being 47% of the response range. For comparison, straight reaches with different endpoints evoked rates with a mean difference of 29%. Barriers had a modest influence when they did not impede a straight reach: a mean firing rate change of 18%, compared with 15% expected from sampling error (via bootstrap). Second, we found that preparatory responses correlated - on a trial-by-trial basis - with small variations in the movement (e.g., in curvature). Finally, in agreement with our prior results using a center-out task, the across-trial variability of responses declined following target onset, consistent with the progress of motor preparation. In summary, responses were strongly tuned for the key task features, consistent with the expectation that premotor cortex is involved in motor planning during this challenging task. Furthermore, the task evokes sufficiently-consistent behavior (even for novel conditions) to allow meaningful measurement of across-trial neural variability during motor preparation.

Disclosures: **M.M. Churchland**, None; **K.V. Shenoy**, None; **M.T. Kaufman**, None.

Support: Burroughs Wellcome Fund

NSF graduate fellowship

NIH-CRCNS

Stanford-CIS

[Authors]. [Abstract Title]. Program No. XXX.XX. 2008 Neuroscience Meeting Planner. Washington, DC: Society for Neuroscience, 2008. Online.