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Presentation Abstract

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Abstract:	Lesion and physiological studies suggest that dorsal premotor cortex (PMd) is involved in decisions based on visual cues. We previously demonstrated that subpopulations of PMd neurons may reflect a candidate decision variable in decision making tasks (Chandrasekaran et al., Peixoto et al. SFN 13, 14). However, in these studies, the perceptual decisions were explicitly linked to real or potential action plans. Here we focused on dissecting the degree to which neural dynamics in PMd reflect the processes of perceptual decision making and action selection. We trained monkey T to reach to a target whose color matched the dominant color in a central red-green checkerboard. To dissociate between perceptual decision (regarding the dominant color) and action selection (reach to either the left or right target), we used two task design manipulations. First, on a trial-by-trial basis we randomized the target configuration so that on some trials, the left target was red and the right target was green, and vice versa. Second, we

used two types of trials which were interleaved. One was the classic design in which targets appeared first, followed by the checkerboard ("TargFirst"). In the new design, the presentation was reversed, so the checkerboard appeared first, followed by the targets ("StimFirst"). In the time period after the checkerboard is presented and the targets have yet to appear, there is not enough information to form an action plan because the target configuration is randomized. Psychophysical thresholds were largely similar in the two conditions (signtest, $p = 0.16$). We recorded from 33 units in PMd (9 single units, 24 multiunits; single electrodes). Consistent with our previous reports, in the TargFirst condition, PMd did not respond after target onset, and had properties consistent with a candidate decision variable after checkerboard onset. In contrast, in the StimFirst condition, we found the reverse: PMd did not respond after checkerboard onset ($p > 0.05$), but did become choice predictive in a lawful manner after target onset. Stated differently, information from the targets and from the checkerboard were each necessary, but not sufficient, to modulate PMd neurons; only when both types of information were available did PMd activity change. Several studies have suggested that both premotor and parietal areas are involved in decision making. By using task designs that separate perceptual decisions from action selection, we suggest that PMd is engaged only when concrete actions are available and it is not involved in forming purely perceptual decisions. Thus, unlike parietal areas, neural dynamics in PMd might be more tightly linked to action selection processes.

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PREMOTOR

REACHING

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