GAZE-CENTERED DECISION MAKING

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Background: In value-based decision-making tasks, we tend to perform overt search of visual offers to sample available options, alternate between them, until committing to a choice. For this kind of tasks, neurons in orbitofrontal cortex (OFC) have been reported to encode offer value, bringing up questions about value-based computation. However, the neural basis of how gaze aids value-based decisions is unknown.

Aims: Examine the dynamics and neuronal basis of gaze-centered decision-making. Determine the neural gating and reactivation of gazed content in the prefrontal cortex of non-human primates. Test a sequential-processing theory of decision making.

Method: We adopted a previously assessed reward gambling task (Strait et al., 2014) with two alternative reward offers sequentially presented at opposite screen sides (offer1/2), each followed by blank screen time (delay1/2). After re-fixation, subjects report the choice via saccade. Stimuli colors cue to medium (blue) or large (green) reward size (m). The height of blue/green bars cues success probability p, topped by red bars for miss probability. The variables m and p were randomized across trials. The expected value was defined as EV=mp. The presentation order is randomized, but we mirrored data where first offer was on right side prior to pooling (n=5971 trials, 8 sessions, 2 subjects). We used logistic regression to predict the choice as a function of EV, std. (σ=$mp(1-p)$), and the fraction of time spent on right screen time (fR). We applied linear regression to assess the fraction of n=248 cells showing modulation of their activity by the two EVs, applying spike count in 200 ms time windows starting each 10 ms. We consider trials to be LookL(R) if average eye position is negative (positive). Empirical results are assessed via permutation tests, the null distribution is built via trial-order shuffles.

Preliminary results: Factoring out value-related variables, we find that more time was devoted to the most valuable, to-be-chosen offer (p < 0.001, F-test of regression weight for fR). Interestingly, this also holds during delay times, despite the screen being blank. We find that EV encoding mainly occurrs during offer1/2, or at delay1/2, before and during choice report (p < 0.05, F-test of EV weights). In addition, we find that the respective offer is encoded if and only if gazing to ipsilateral screen side. Strikingly, we also find that if subjects looked back at first offer location (LookL) during delay2, its encoding is reactivated.

Keywords: Value-based decision making, Orbitofrontal cortex, Neural encoding of value, Gaze-centered neural encoding

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