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  Flexible sensorimotor planning in the frontoparietal reach network

  Flexible sensorimotor planning is the basis for goal-directed behavior. We investigated the integration of visuospatial information with context-specific transformation rules during reach planning. A neuronal network model, which could learn such context-specific transformation rules (Brozovic, 2007, JNeurosci:27:10588) showed that gain modulations of spatial reach-goal representations allow flexible visuomotor mappings. We found evidence for such gain modulations within the fronto-parietal network. Neurons in monkey dorsal premotor cortex (PMd) and parietal reach region (PRR) changed their response strength depending on the behavioral context while keeping their overall spatial selectivity for a certain reach goal. Furthermore we compared latencies for motor goal tuning in PMd and PRR to learn about the dynamics of reach goal information within the fronto-parietal network. Specifically we tested the hypothesis if latency differences between both areas support a feed-back or a feed-forward architecture of the network. Our results show that selectivity for the visuospatial goal of a pending movement occurred earlier in PMd than PRR whenever the task required spatial remapping. Such remapping was needed if the spatial representation of a cue or of a default motor plan had to be transformed into a spatially incongruent representation of the motor goal. In contrast, we did not find frontoparietal latency differences, if the spatial representation of the cue or the default plan were spatially congruent with the motor goal. We interpret our findings in support of the hypothesis that latency differences reflect a dynamic reorganization of network activity in PRR. Earlier reach goal tuning in PMd suggest that the reorganization is contingent upon frontoparietal projections from PMd supporting a feed-back architecture within the frontoparietal network.

  Stephanie Westerhoff
  Georg-August University