Abstract

Comparing two stimuli that occur at different times demands the coordination of bottom-up and top-down processes. It has been hypothesized that the dorsolateral prefrontal (PFC) cortex, the likely source of top-down cortical influences, plays a key role in such tasks, contributing to both maintenance and sensory comparisons. We examined this hypothesis by recording from the PFC of monkeys comparing directions of two moving stimuli, S1 and S2, separated by a memory delay. We determined the contribution of the two principal cell types to these processes, by classifying neurons into broad-spiking (BS) putative pyramidal cells and narrow-spiking (NS) putative local interneurons. During the delay, BS cells were more likely to exhibit anticipatory modulation and to represent the remembered direction. While this representation was transient, appearing at different times in different neurons, it weakened when direction was not task-relevant, suggesting its utility. During S2, both putative cell types showed comparison-related activity modulations. These modulations were of two types, each carried by different neurons, which either preferred trials with stimuli moving in the same direction or trials with stimuli of different directions. These comparison effects were strongly correlated with choice, suggesting their role in circuitry underlying decision-making. These results provide the first demonstration of distinct contributions made by principal cell types to memory-guided perceptual decisions. During sensory stimulation both cell types represent behaviorally relevant stimulus features, contributing to comparison and decision-related activity. However in the absence of sensory stimulation, putative pyramidal cells dominated, carrying information about the elapsed time and the preceding direction.