

## Planning a movement

Planning a movement, deciding to go, and then computing the forces necessary to implement that movement.

Cells in the motor system often exhibit a “preferred direction” of movement.

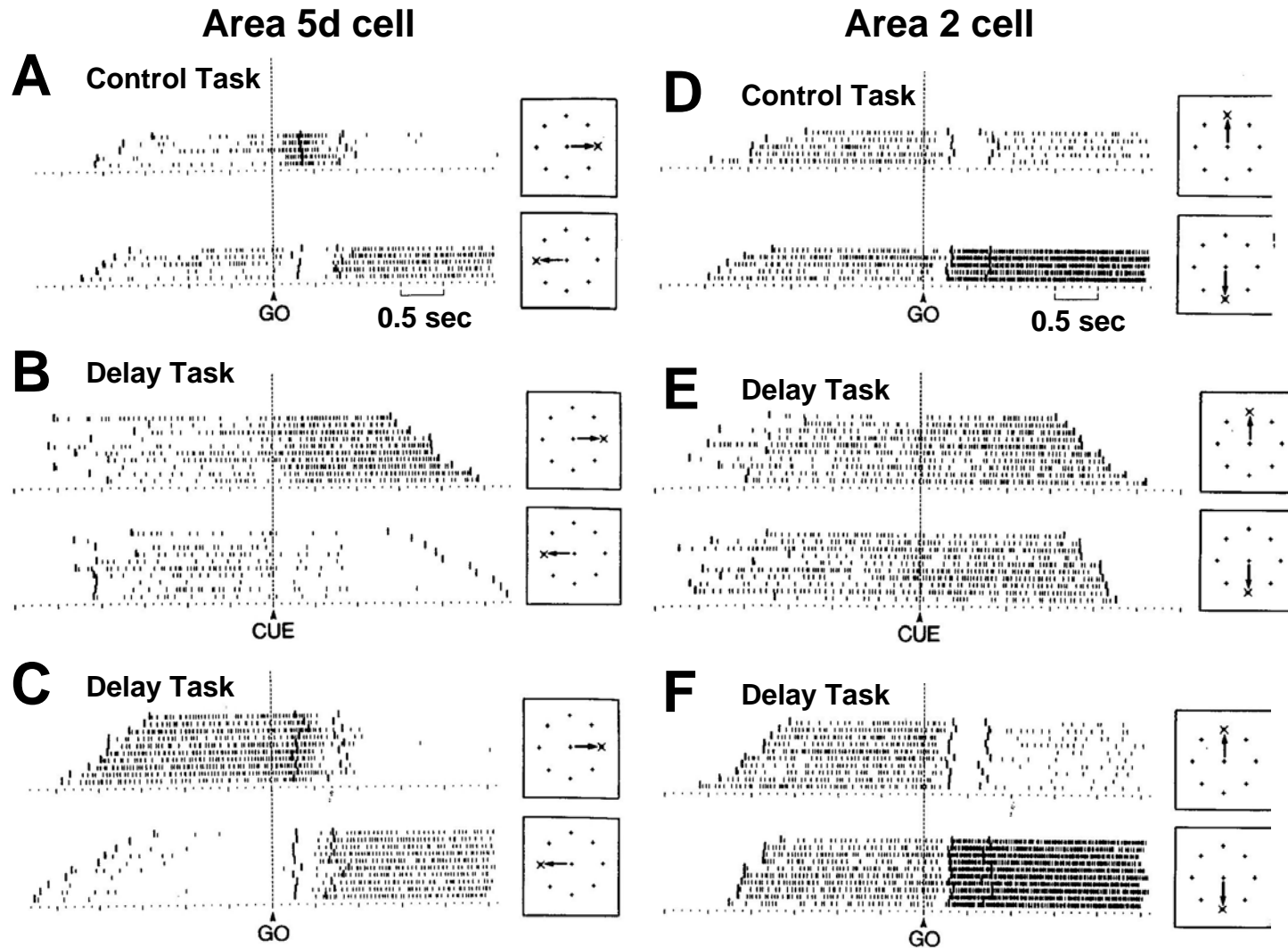
Instruction stimulus; delay period, “go” stimulus.

Target position may be specified by a light or a sound. The planned difference vector may be the same in the two conditions.

Delay period activity appears to reflect the planned difference vector.

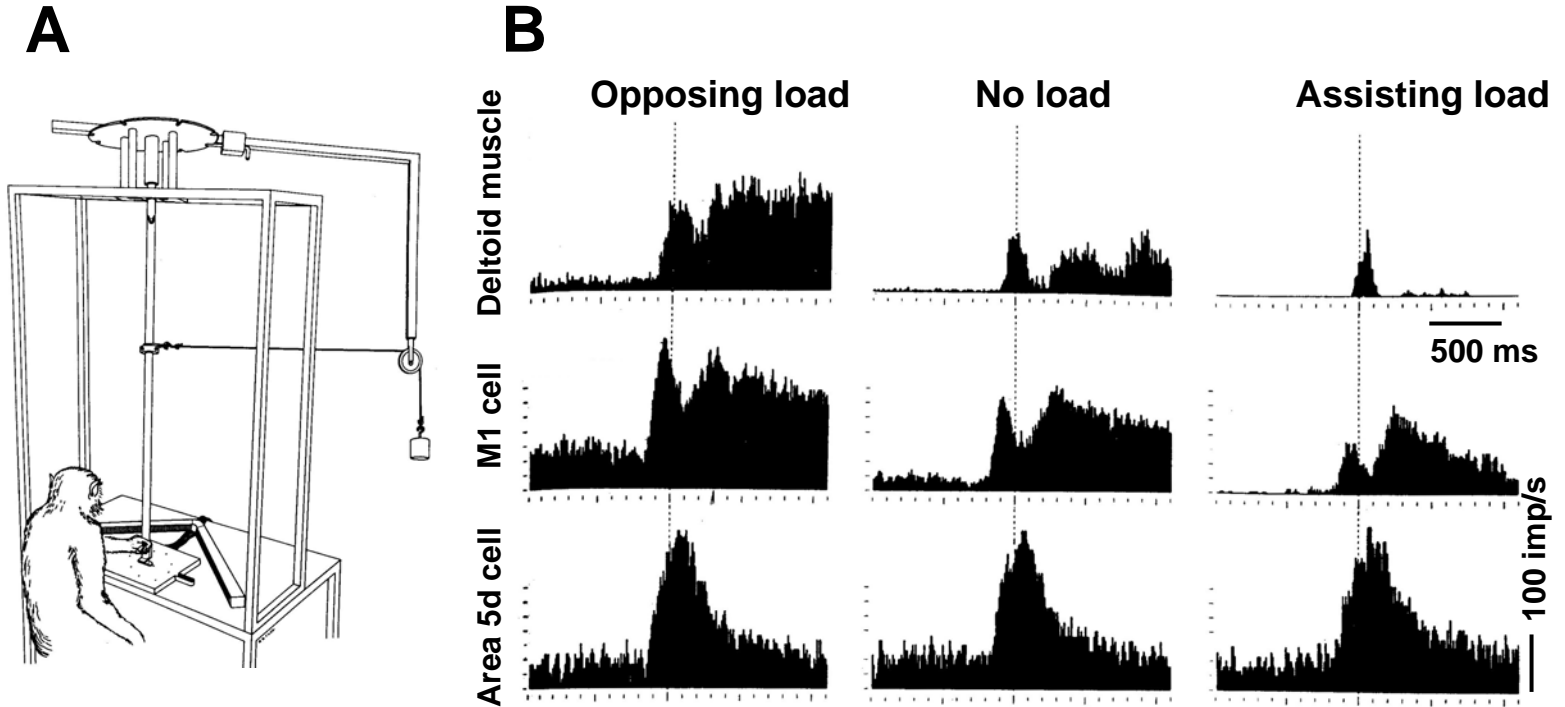
Delay period activity is prominent in PPC and PM, but not M1 and primary somatosensory cortex.

# Directional tuning and delay-period activity in the parietal cortex



Little or no delay period activity in M1.

# Planning in terms of kinematics, not dynamics

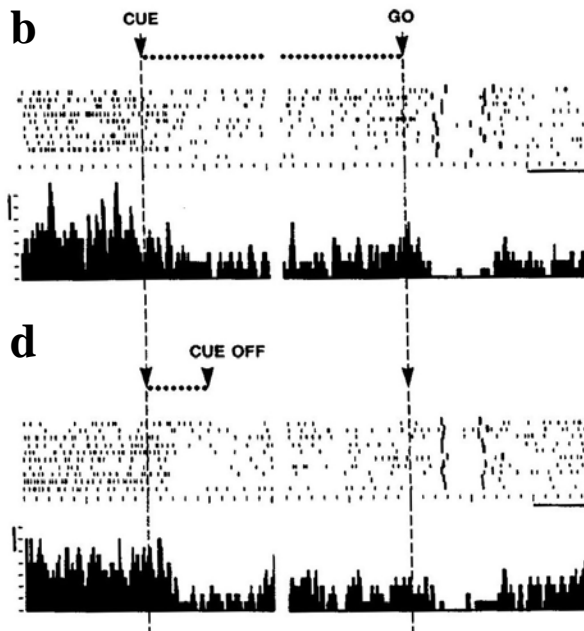
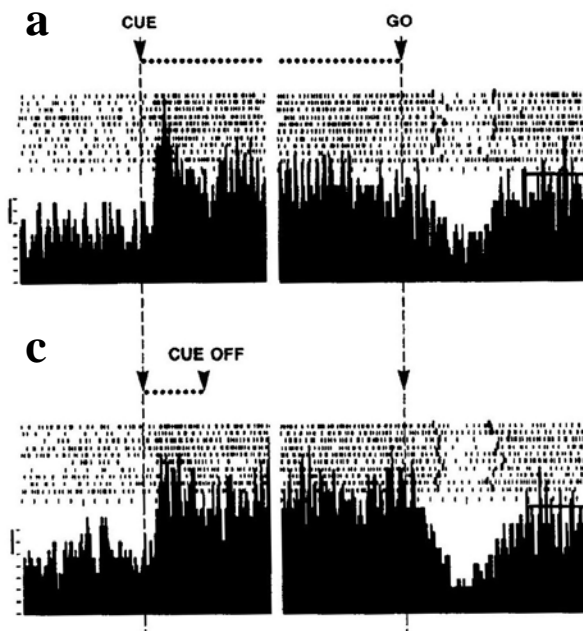


# Maintaining movement plan after target disappears

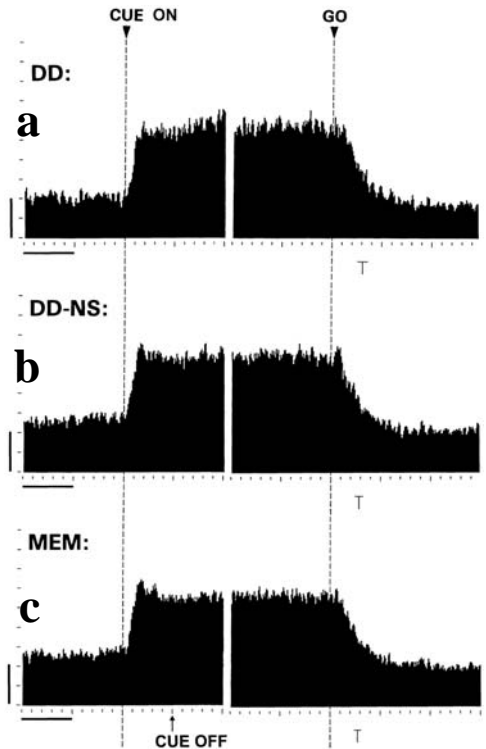
## A Area 5d

Preferred direction

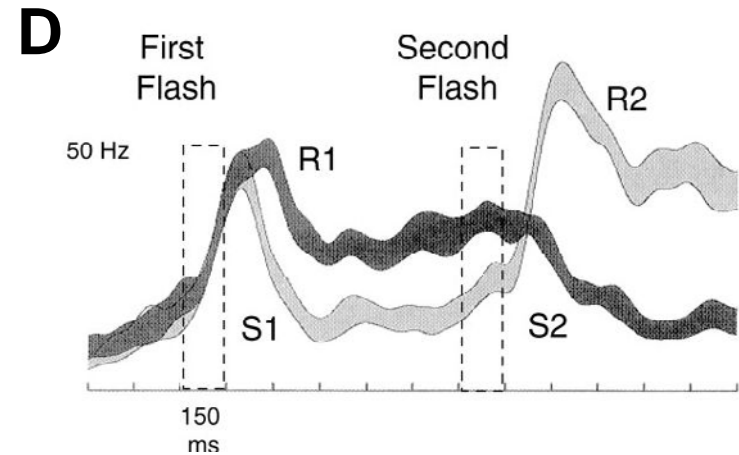
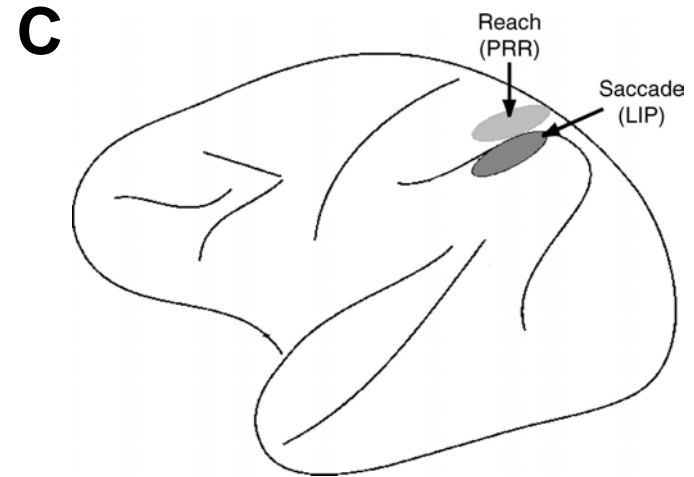
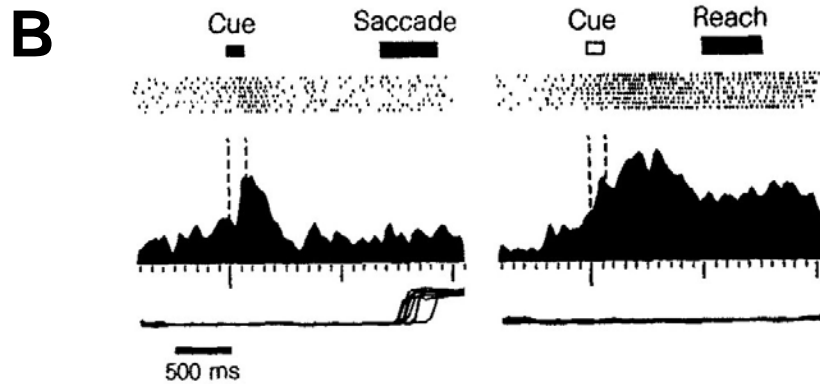
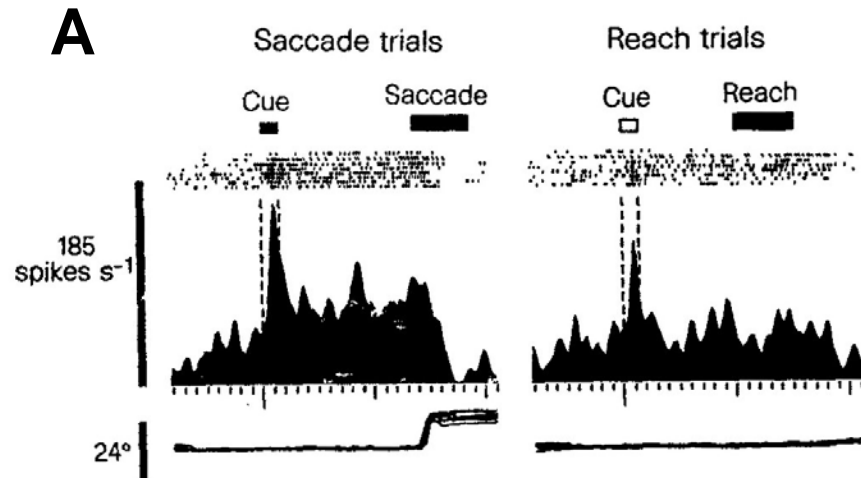
Opposite direction



## B PMd



# Planning saccades vs. reaching movements

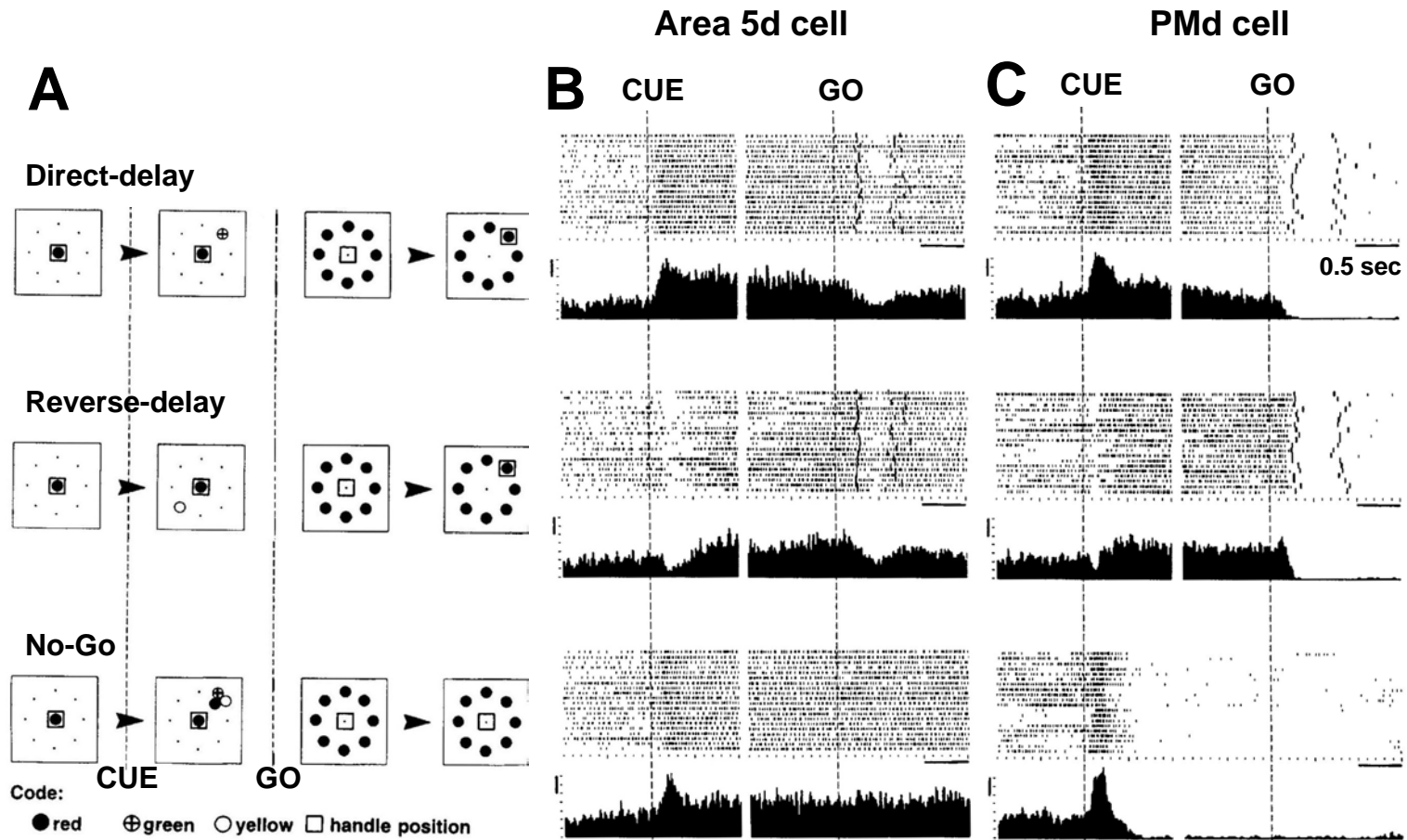


During the delay period, if the target position or hand position changes, the difference vector also changes. Cells in 5d and PM are also responsive to changes in target position and hand position during the delay period.

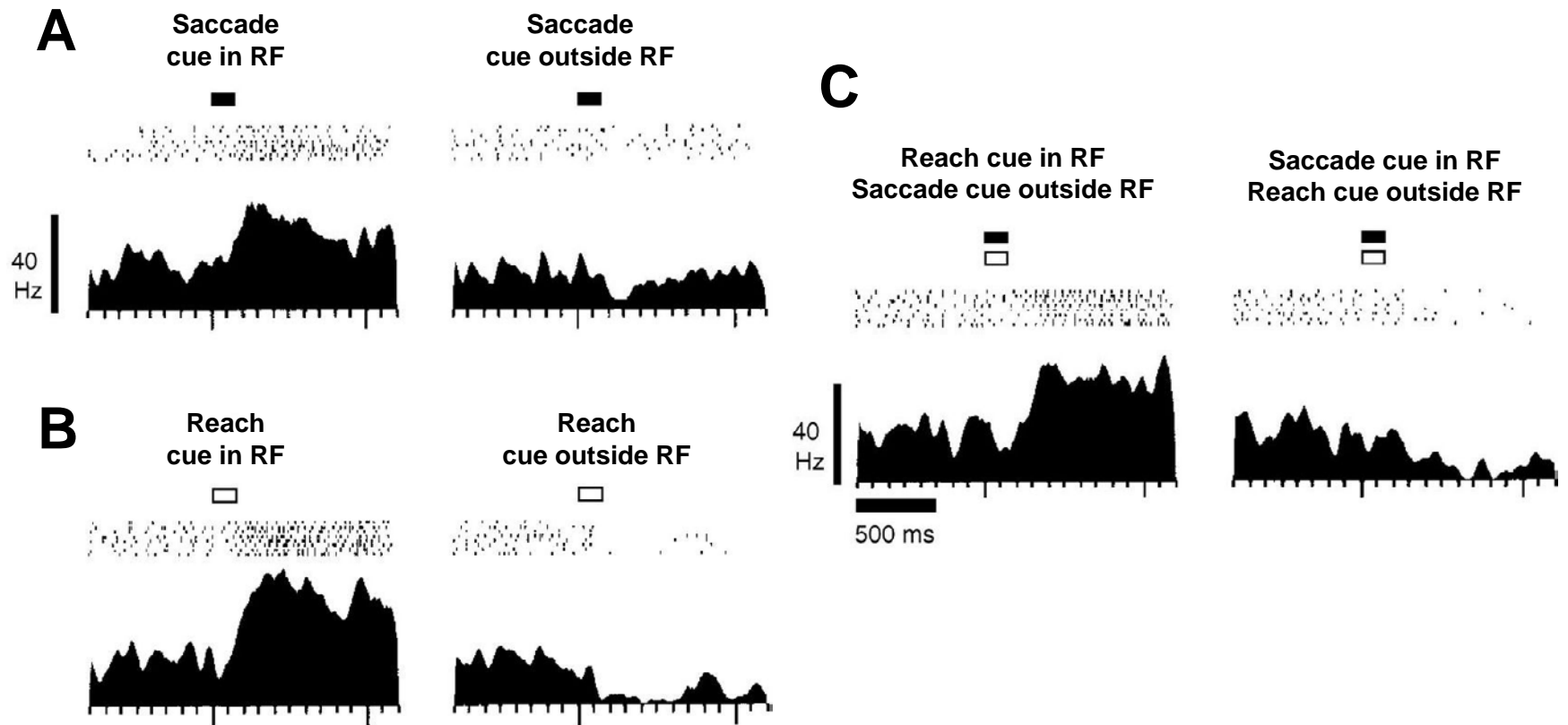
Reaching with an end-effector: if a monkey is trained to move a cursor to a target, the difference vector is the same regardless of whether the monkey uses its right or left arm. Preferred direction of PM cells often does not change in this task.

Planning movements based on a non-spatial cue: one can imagine where the target of the movement should be from an instruction that has no implicit spatial information. For example, one can learn to associate a green cursor to movement to the right, a red cursor to a movement to the left.

# Planning a movement away from a stimulus or aborting the plan



# Planning potential movements but not performing them





# In PPC, planning takes place for only the next movement in a sequence

