Spatial cueing and planned saccade tasks in the marmoset
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Background

The marmoset is a growing model in visual neuroscience for many reasons:
- High acuity fovea
- Anatomical similarities to other primates
- Smooth cortex with access for imaging and array recordings in visual and somatomotor areas
- Advantages for genetic manipulation

But much remains unknown about their behavior in trained tasks. Here we test their ability to use central cues at fixation to direct saccades to peripheral targets.

Spatial Cueing Task

4 Alternative Choice Cueing Task:

Training Regimen

Varying cue length over training:

Varying delay over training:

Over months of training the length of the line cue was reduced from full length, connecting fixation to the target, to a shorter length, less than 2 degrees at fixation. Later we also attempted to introduce a delay between the line cue and the offset of fixation that prompted a delayed saccade to the target in one animal.

Performance

Both marmosets use line cue to guide saccades with limited spatial bias.

Both marmosets can use shorter line cues.

A single marmoset could not hold for delays over 300ms.

Pursuit

Eye movements in a single trial:

Both marmosets exhibit low gain pursuit along the direction of target motion:

Eye velocity still distinguished target motion when the stimulus was removed before saccade landing (pre-saccadic selection)

Conclusions

- Marmosets can learn a central spatial cueing task.
- Saccades to motion apertures reveal low gain pursuit for target motion directly after saccade offset.
- Pursuit persists when the motion is removed during saccade flight, indicating pre-saccadic motion selection.
- Future studies will investigate pre-saccadic motion selection across neural populations in area MT.

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References:


