CG16

Optimality of reaches under risk with visually induced motor noise

112459

Hadley Tassinari[1], Todd E. Hudson[1,2] and Michael S. Landy[1,2]

[1]Department of Psychology & [2]Center for Neural Science, New York University

Introduction

In a rapid pointing task under risk, what characteristics of movement variability does the movement planning system take into account?

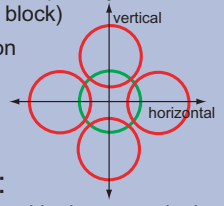
We consider two models:

- Ss account for the 2-d shape of task-relevant motor noise
- Ss use only a circular estimate of noise

Method

Subjects reached to a screen as follows:

- 575 ms movement time limit
- Touches within a green target circle earned either 1 or 2 points for $.08 or $.04 per point, respectively (by subject)
- Touches within a red penalty circle cost 0 or 5 points (by block)
- 1 penalty position chosen on each trial from 4 possibilities:

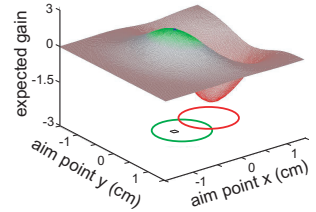


2 Conditions:

- stimulus is replaced by large, vertical sinusoidal grating at movement onset which remains static
- above grating begins to drift randomly left or right at midpoint of reach

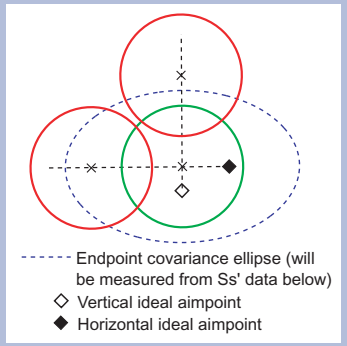
Ideal behavior

Aim point gain landscape:



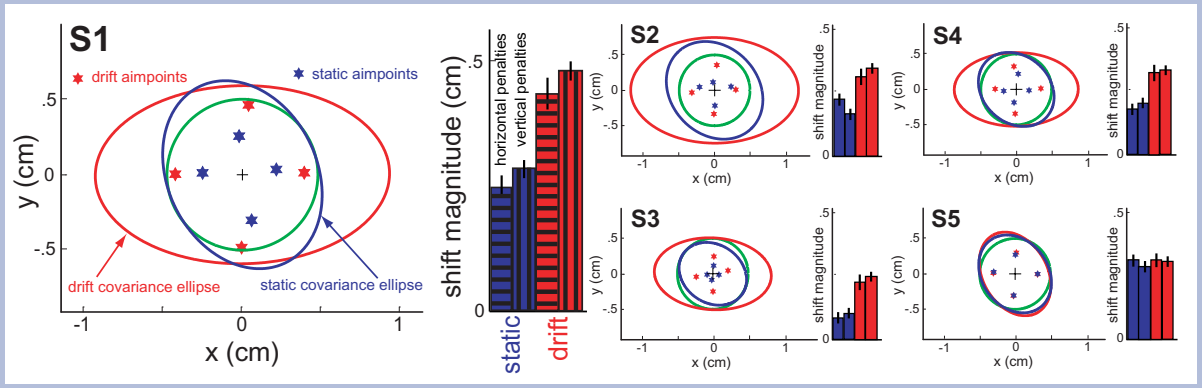
□ Maximum Expected Gain (MEG) aim point

Large field motion (drift) in an unpredictable left or right direction causes Ss' endpoint distributions to extend horizontally:[1]



Thus, the ideal (MEG) aimpoint depends on penalty position

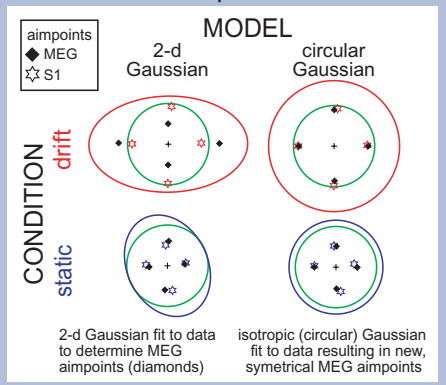
Results



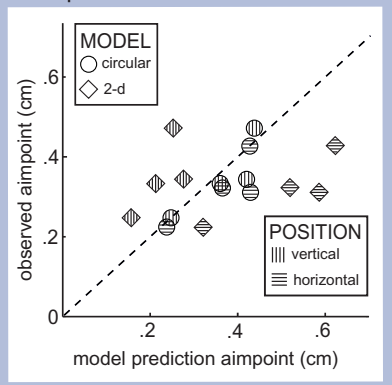
Ss' aimpoints shifted further from the penalties in the drift condition, and these shifts were equal in extent regardless of whether the penalty was in a horizontal or vertical position (relative to the target).

Model comparison

2 sets of MEG aimpoints:



Compare model to data for S1-S4:



Which model best predicts the data? → **circular**

Conclusions

- Ss appear to use the magnitude of their endpoint errors, but not their direction when learning new motor variability.
- In planning movements under risk, Ss perform as if they assume movement variability is isotropic (circular), even when it is not.

[1] Saijo, Murakami, Nishida & Gomi, *J NeuroSci*, 25, 4941-51, 2005

NIH EY08266