

Error Statistics Reflect Movement Coding and Prior Movement History

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Introduction

Two possible codes for planned movements:

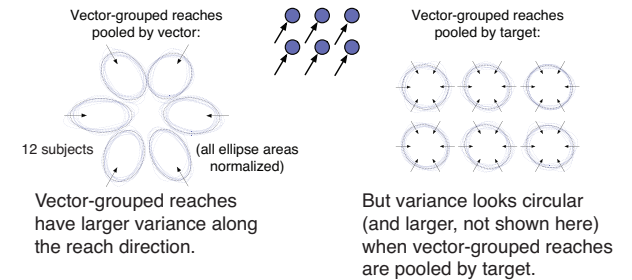
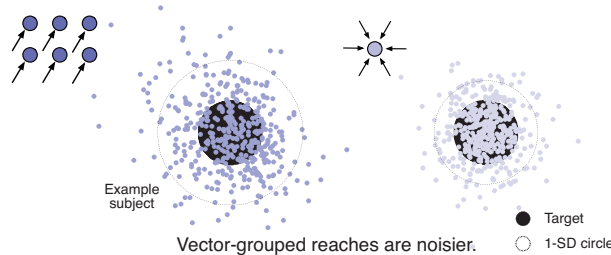
- As a vector (direction and extent, Refs. 1,2)
- As a desired endpoint (x/y-coordinates, Refs. 3,4)

Q1: Are both codes used in human movement planning?

Q2: Can they be distinguished experimentally?

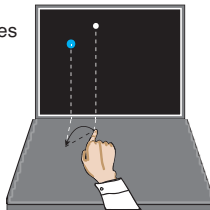
Q3: How do they differ in terms of movement accuracy?

Results

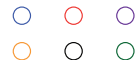


Methods

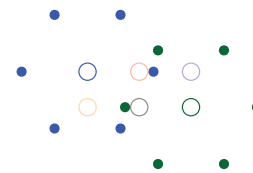
- Point-to-point reaches on a tabletop:



- 6 Targets:

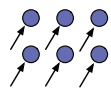


- Each target has 6 associated start positions (only 2 sets shown):



- 2 blocks (run in random order):

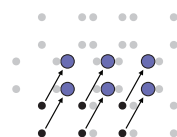
Grouped by vector



With 6 sub-blocks:

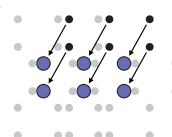
- Sub-blocks in random order
- Each sub-block has 12 repetitions of its 6 reaches (random order)

Block 1



Block 2
Block 3
Block 4
Block 5

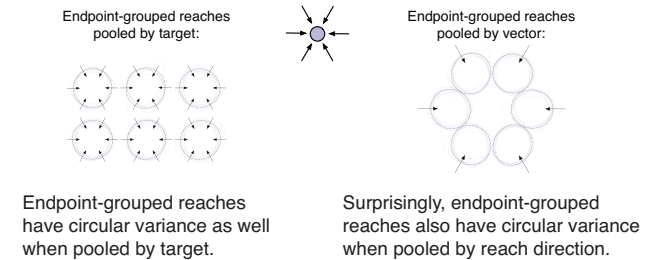
Block 6



Grouped by endpoint



With 6 sub-blocks:



Conclusions

- A1: Yes, both vector and endpoint codes used in human movement planning.
- A2: Yes, they be distinguished experimentally by blocked practice that makes the better-practiced system dominant.
- A3: Yes, they differ in terms of movement accuracy; the endpoint code results in lower, isotropic variance.

References: (1) Krakauer et al., *J Neurosci* 20, 2000. (2) Vindras & Viviani, *Exp Brain Res* 147, 2002. (3) van den Dobbelaert et al., *Exp Brain Res* 138, 2001. (4) Thaler & Todd, *Neurosci* 159, 2009. Support: NIH EY08266