Visual search asymmetries in 3D scenes with motion-defined targets

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Questions

1) *Is axis-of-rotation a basic feature in visual search?*

2) *Is there a search asymmetry for targets defined by axis of rotation?*

Background

Determining direction of 2D rotation is very attentionally demanding (Thornton & Gilden, 2001)

Many simple feature searches are asymmetric:

- Finding targets that move faster (Ivry & Cohen 1992) or that change direction more than distractors (Horowitz, et al., 2007) is more efficient than the reverse (but see Rosenholtz, 2001)

Methods

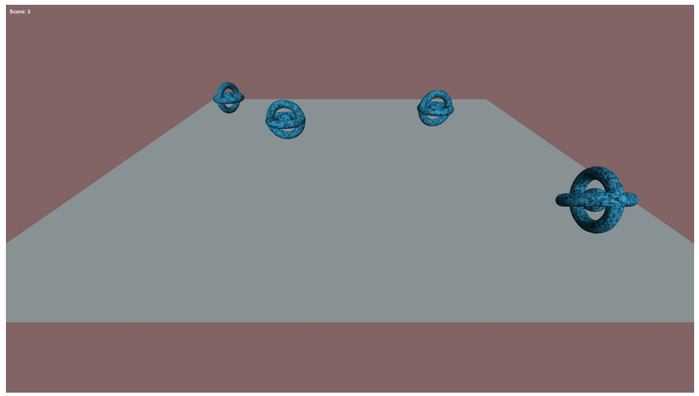
Participants searched for targets defined by their axis of rotation:

- Rolling—rotation about a horizontal axis
- Spinning—rotation about a vertical axis

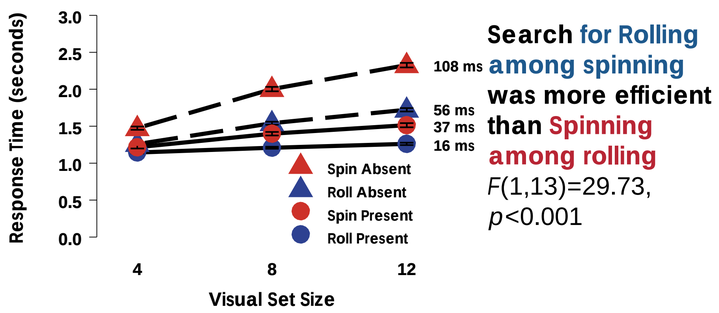
1 block (150 trials) of each target type, order balanced across participants

Response was present/absent

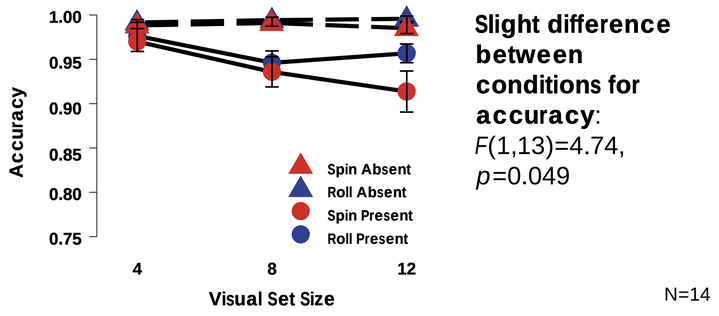
Experiment 1: Complex Objects



Search for rolling targets is *fairly* efficient



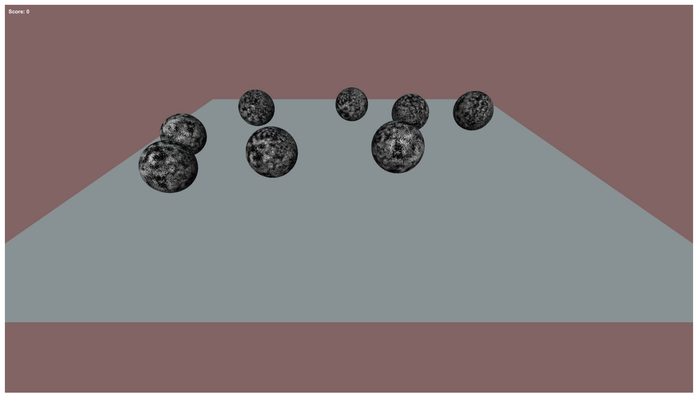
Search for Rolling among spinning was more efficient than Spinning among rolling
$F(1,13)=29.73$, $p<0.001$



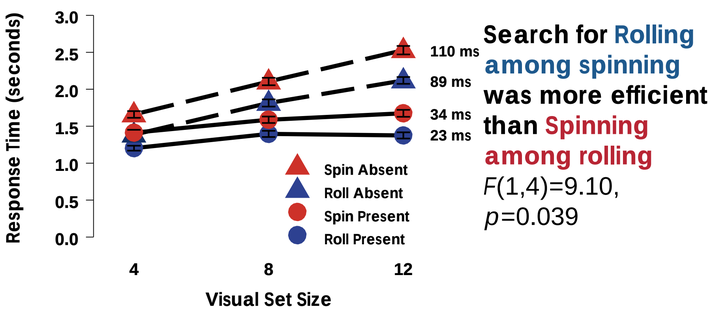
Slight difference between conditions for accuracy:
$F(1,13)=4.74$, $p=0.049$

N=14

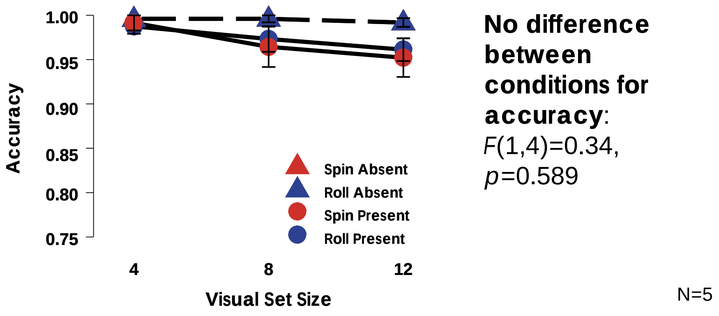
Experiment 2: Spheres



Preliminary replication (different shapes)



Search for Rolling among spinning was more efficient than Spinning among rolling
$F(1,4)=9.10$, $p=0.039$



No difference between conditions for accuracy:
$F(1,4)=0.34$, $p=0.589$

N=5

Summary

Axis of rotation is, at best, a fairly weak feature for guiding attention in visual search

Search for rolling among spinning was more efficient than search for spinning among rolling

- Probably not a speed-accuracy tradeoff
- True for both spheres and complex objects
- Not obvious why this should be true

References

Horowitz, et al. (2007). Visual search for type of motion is based on simple motion primitives. *Perception*, 36, 1624–1634.

Ivry & Cohen (1992). Asymmetry in visual search for targets defined by differences in movement speed. *JEP:HPP*, *18*(4), 1045–1057.

Rosenholtz (2001). Search asymmetries? What search asymmetries? *Perception and Psychophysics*, *63*(3), 476–489.

Thornton & Gilden, (2001). Attentional limitations in the sensing of motion direction. *Cognitive Psychology*, *43*(1), 23–52.

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