Introduction

Is mental rotation akin to “motor rotation in the mind” (Cooper & Shepard, 1973; Wexler, Kosslyn, & Berthoz, 1998)? Shepard and Metzler (1971) had Ps make same-different judgments for pairs of rotated abstract block figures

These classic results showed the angular disparity effect (ADE) – a linear increase in RT based on angle of rotation

The ADE has been interpreted as supporting “motor rotation in the mind,” but how might people complete this perceptual judgment task when they can physically rotate the figures?

Primary Questions:

• How are mental and physical rotation similar?
• How do they differ?
• What can physical rotation reveal about mental rotation?

Methods

Materials:

• 3D models of 30 Shepard-Metzler figures (Peters & Battista, 2008)
• Experiment and stimuli presented in Vizard VR Toolkit
• Figures physically rotated by handheld Intersense InertiaCube

Sample & Procedure:

• n = 32 undergraduates: 16 male; Mage = 19.47
• Spatial Questionnaires & OSPAN (Turner & Engle, 1989)

Mental and Physical Rotation Blocks

2 figures, both randomly rotated
Same/different judgment
Speeded response

Results: Angular disparity effect

Mental and physical rotation both show ADE
No gender effect for mental or physical rotation

ADEs suggest mental rotation is like “motor rotation in the mind”

Results: RT and Accuracy

Speed Accuracy Tradeoff
Physical Rotation slower but more accurate
No gender effects

Results: Items Analyses

Stimuli differences impair physical rotation to greater extent

Discussion

ADE suggests shared processes between mental and physical rotation.
Within-trial rotation behavior suggests distinct processes.
Results call into question the assertion that mental rotation is “motor rotation in the mind.”

Mental and physical rotation both demonstrate classic angular disparity effect
Physical rotation is slower, but more accurate
Physical rotation data suggest different processing strategies when making same vs. different judgments
No individual difference effects (gender, WMC)

References