Visuomotor Strategies for Grasping a Rotating Target

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Introduction

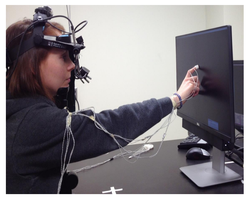
Previous research has shown that we tend to look at the centre of an object when performing a perceptual judgement[1]. However, when we reach out to grasp a stationary object, we tend to look towards the eventual landing position of our index finger[2,3,4].

This year, we continue our investigation of moving objects[5] by examining how a rotating block affects eye-hand coordination.

Would participants initially look towards the top of the block and then follow that "graspable edge" as the block rotated? Would the speed of rotation affect the frequency at which a new potential "grasp position" was fixated?

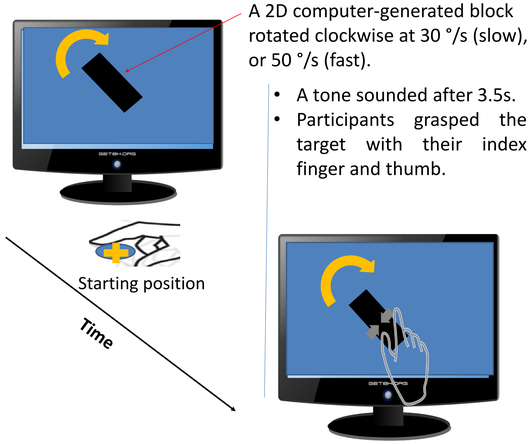
Method

Participants: Fifteen (11 female) right-handed undergraduate psychology students with normal or corrected-to-normal vision between the ages of 18 and 33 years (*M* = 22).



Eye position was recorded using an Eyelink II and grasp movements were recorded using an Optotrak Certus. This data was integrated into a common reference frame via Motion Monitor software (Innovative Sports Training).

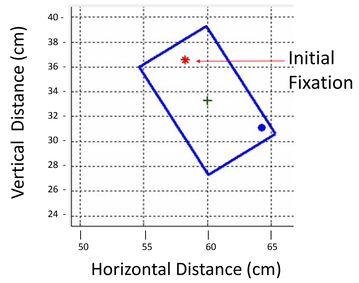
Experimental Task



A 2D computer-generated block rotated clockwise at 30 °/s (slow), or 50 °/s (fast).

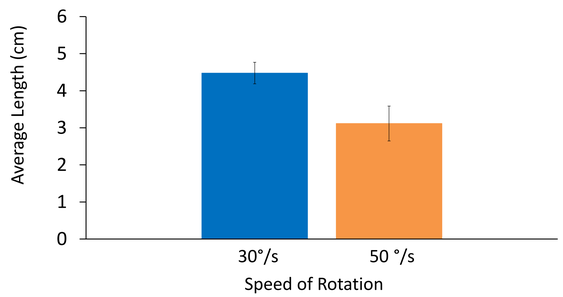
- A tone sounded after 3.5s.
- Participants grasped the target with their index finger and thumb.

Initial and Tracking Fixations



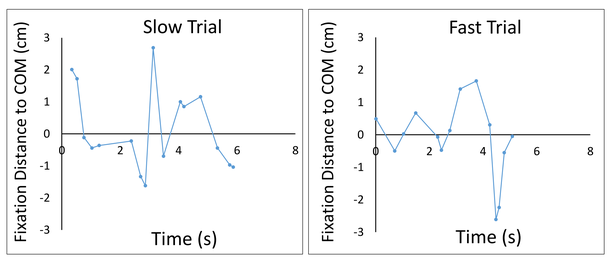
- Initial fixation was located towards the top of the block (2.9 cm above the COM).
- Initial fixations showed no effect for speed of rotation ($p > .05$).

Average Horizontal Distance that a Position was Tracked

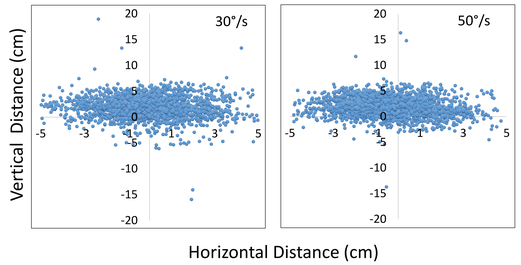


- Participants switched to a new fixation position more frequently during the fast rotation condition ($p < .05$).

Sample Trials of Tracking Patterns Along the Horizontal Dimension



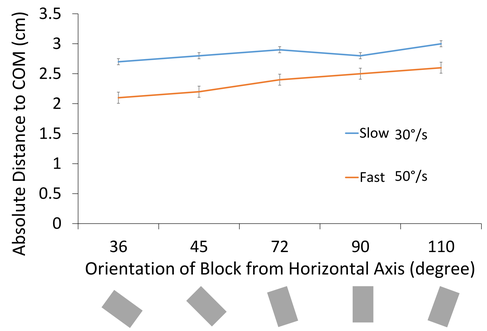
Tracking Patterns



All fixations: COM represented by origin.

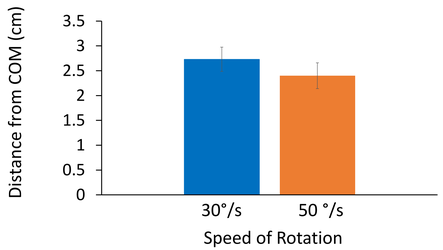
- Fixations were more frequently located above the horizontal axis ($p < .05$).

Fixations at Pre-Selected Orientations of Interest



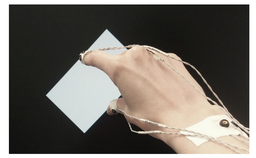
- Fixations were closer to the COM during the fast speed of rotation ($p < .001$).
- No main effect across the block orientations ($p > .05$).

Fixations During the Grasp



- An examination of fixation location at grasp onset and final contact revealed no main effect of time point but did show an effect of rotation speed. Fixations were closer to the COM during the fast rotation condition ($p < .001$).

Fixations During Grasp



At final contact, speed of rotation had no significant effect on the distance of the final fixation to the index finger ($p > .05$), nor the distance of the index finger to COM ($p > .05$).

Conclusion

- As with stationary objects, initial fixations landed towards the top of the block.
- Tracking fixations changed to a new position more frequently during the fast rotation speed, than during the slow rotation speed.
- This difference in fixation strategy may contribute to the finding that fixations were closer to the COM during the fast rotation condition. Fixations may have moved towards the COM during a shift to maintain fixation on the quickly rotating block.
- Rotation speed had no effect on the final grasp location.

References

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