Effect of Speed Overestimation On Manual Hitting at Low Luminance

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Introduction

Perceived speed increases as the luminance decreases. (Vaziri-Pashkam & Cavanagh 2008). We want to investigate how this illusion affects our motor performance.

Perceptual task: Speed Adjustment

Task: adjust the speed of the “match” to be the same as the “target”
Conditions:
• Target at low luminance (screen covered with 2.7 log unit ND filters)
• Target at high luminance
Results:
- Luminance↓ speed↑

Motor task: Manual Hitting

Motor system’s estimate of the speed (Slope of the red line) = \( \frac{x_2-x_1}{t_2-t_1} \)

Results:
- High/Slow
- High/Fast
- Low/Slow

Question

Does Speed Overestimation at low luminance affect manual hitting?

Setup

To remove visual feedback from the hand, subjects looked at the stimuli in a mirror and made hand movements underneath the mirror.

Discussion

Manual hitting at low luminance follows the real speed of moving objects rather than the perceived speed. This results provides further evidence for a dissociation between perception and action (Goodale & Milner 1992)

Conclusion

Speed Overestimation at low luminance does not affect manual hitting.

References

Motor task: Manual Hitting

High/Fast
Low/Slow

Hand speed (degree/S)
Hand x – Target x at hit point (Degree)

Results:
- Hand movement position and speed profile at low and high luminance is the same if the real speeds are the same.

Hand x – Target X at hit point (Degree)
Hand y – Target Y at hit point (Degree)

Target location
Hand final hit position relative to the target is the same for all three conditions

Pooled data from all subject

Data from one subject

Right:

 match speed

Target speed

Match speed (degrees/Second)

Target High lum
Target Low lum

Target speed

High lum
Low lum

Match Speed
(degrees/Second)