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# **Segregating targets & nontargets in depth eliminates inhibition of nontargets in Multiple Object Tracking**

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# Overview

A decorative graphic at the top of the slide features six circles arranged in a horizontal row. The first and second circles on the left are partially overlapping. The first circle is solid light blue, and the second is a white circle with a light blue outline. The third and fourth circles are also partially overlapping. The third circle is solid light blue, and the fourth is a white circle with a light blue outline. The fifth circle is solid light blue. A thick, solid light blue horizontal line spans the width of the slide below the circles.

- Attention, inhibition, and visual indexes.
- Multiple Object Tracking (MOT) paradigm.
- Results from the current study on inhibition in a 3D MOT display.
- Conclusions and future direction.

# Attention & Inhibition



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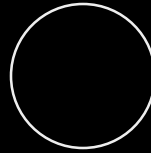
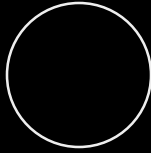
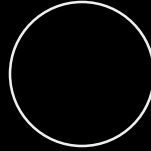
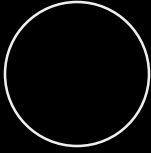
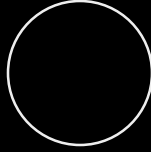
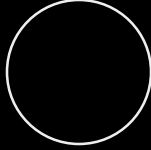
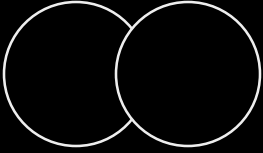
- Various studies suggest that while attention can be *directed* towards items of interest, **inhibitory processes** also act upon irrelevant objects.  
(Ogawa, Takeda, & Yagi, 2002; Theeuwes, Kramer, & Atchley, 2001; Tipper, Driver, & Wheeler, 1991; Watson & Humphreys, 1997)
- Inhibition appears to be object-based and task-specific.
- Inhibition may occur bottom-up through the visual marking of irrelevant objects.

# Visual Indexes & MOT



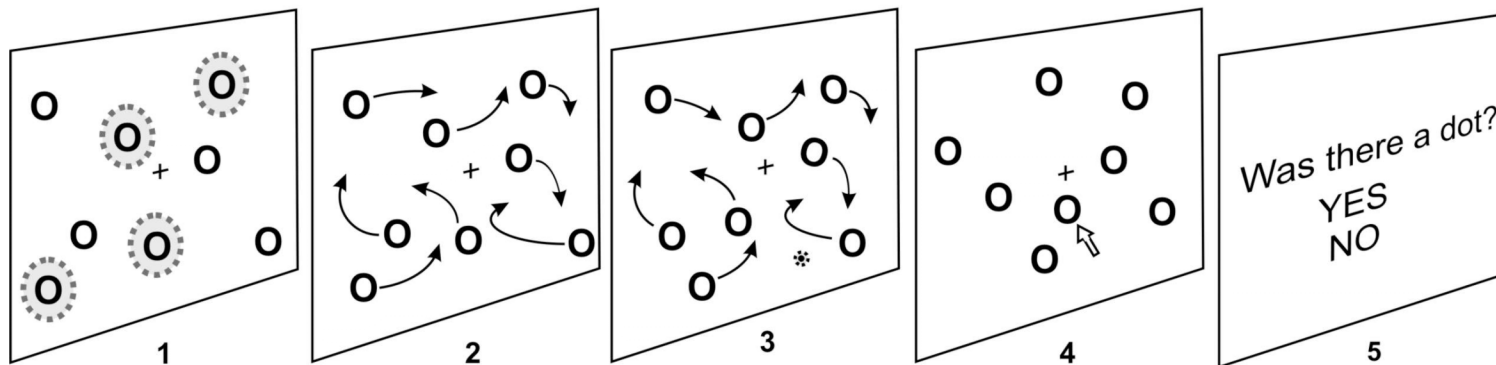
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- The Visual Indexing mechanism individuates objects and facilitates the ability to attend to objects. (Pylyshyn & Storm, 1998; Pylyshyn, 2001)
- Multiple Object Tracking (MOT) experiments provide support for these indexes.
- Inhibitory processes can be observed in MOT experiments.



# Tracking Studies on Inhibition

- Probe-dot detection design allows to further explore how attention and inhibition operate.  
(Watson & Humphreys, 1997, 1998)
- Typical set-up of MOT with probe-dot task:



# Tracking Studies on Inhibition

- Tracking targets benefits from the inhibition of identical distractors (nontargets). (Pylyshyn, 2006; Reilly, Pylyshyn, & King, 2005)
  - Moving *square* and *circle* nontargets are both equally inhibited (since both interfere with tracking task).
  - Static nontargets in MOT are not inhibited.

# What Is Inhibited?

A decorative graphic at the top of the slide features five circles in a row. The first, third, and fifth circles are filled with a light blue color, while the second and fourth circles are hollow with a light blue outline. Below the circles is a solid horizontal blue line that spans the width of the slide.

- Is inhibition required if distractors are **pre-attentively separable** in early vision?
- Is such inhibition **task-specific**?



# What Is Inhibited?



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- To test for pre-attentive separation of objects, the current study incorporated **stereo depth cues** in a 3D tracking and probe-detection task.
  - Experiment was programmed using MatLab 6.5 with Psychtoolbox 2.54 on a Windows-based PC.
  - Crystal Eyes shutter glasses.

# Experimental Design

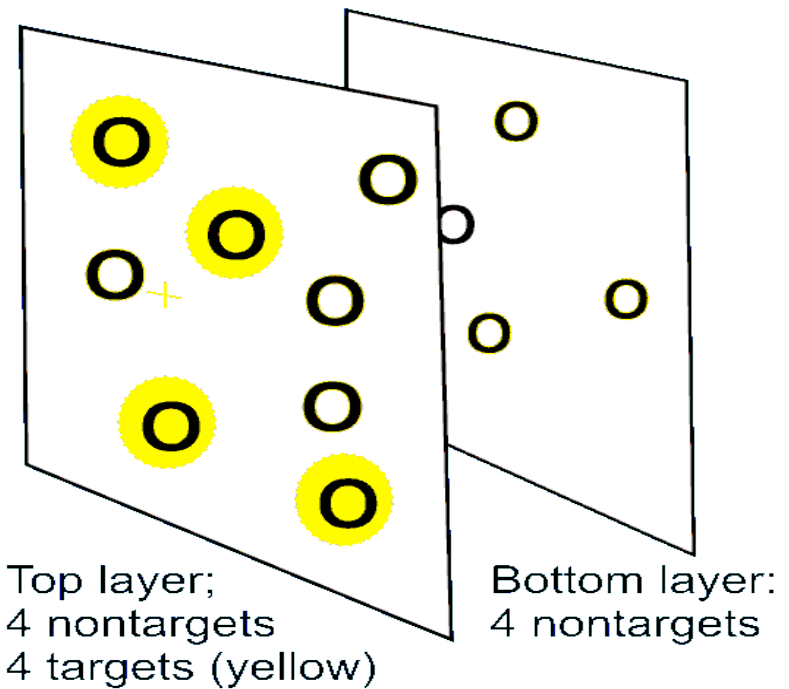
- 12 objects per trial; 4 targets/4 nontargets on front plane, and 4 nontargets on back plane.
- DV = Probe detection; probe dot occurred in 50% of trials:

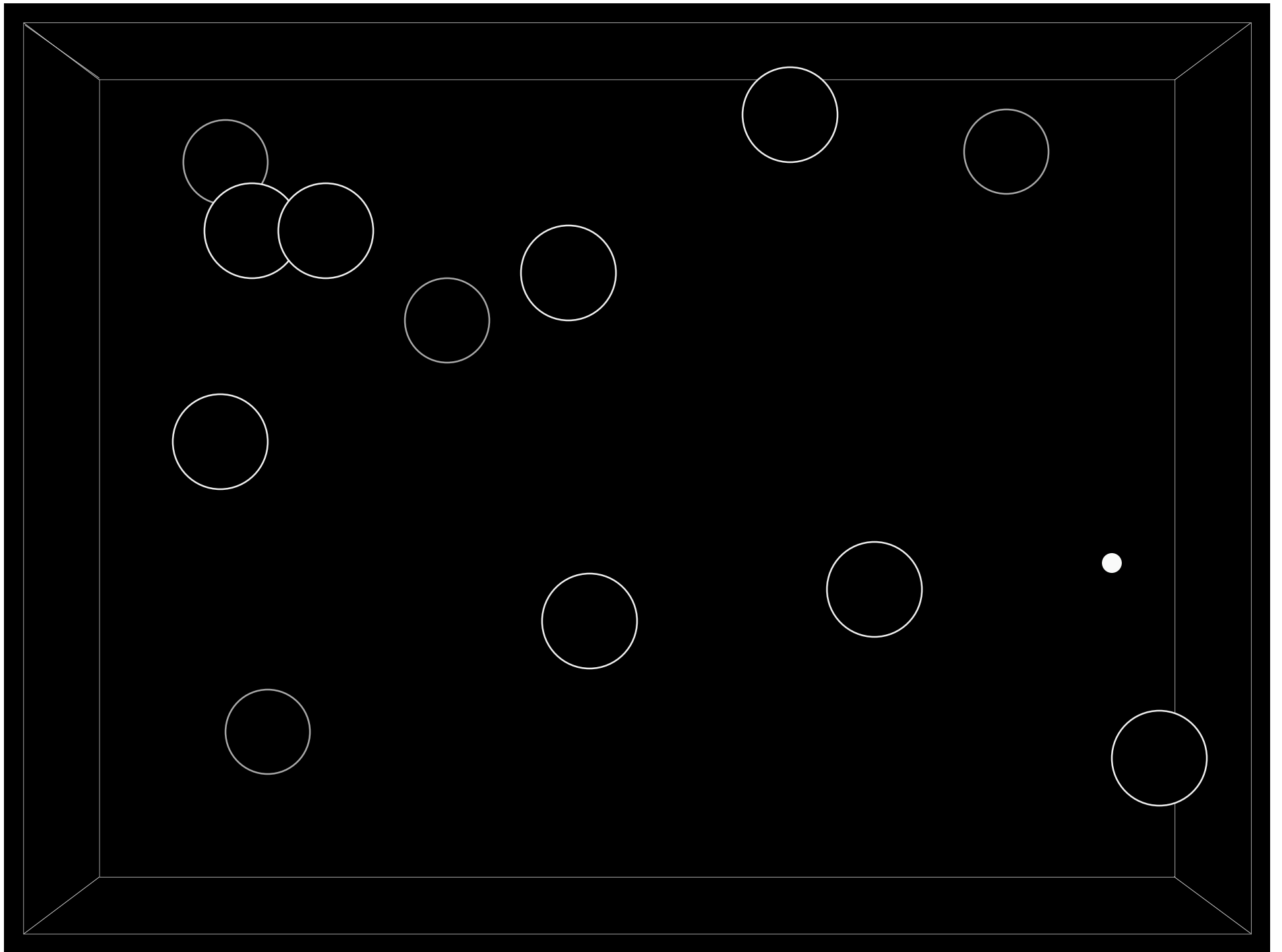
📁 Front Targets

📄 Front Nontargets

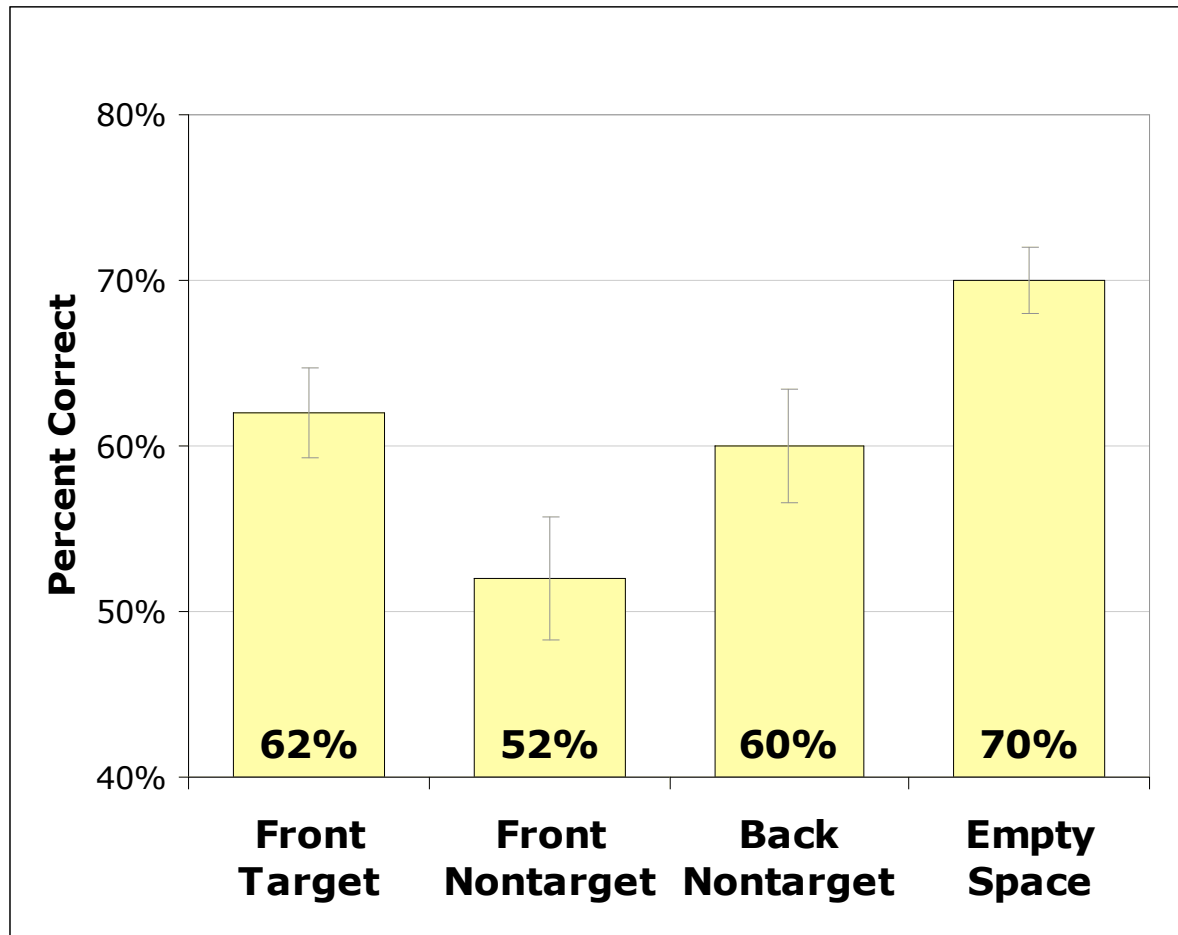
📄 Back Nontargets

📄 Empty Space

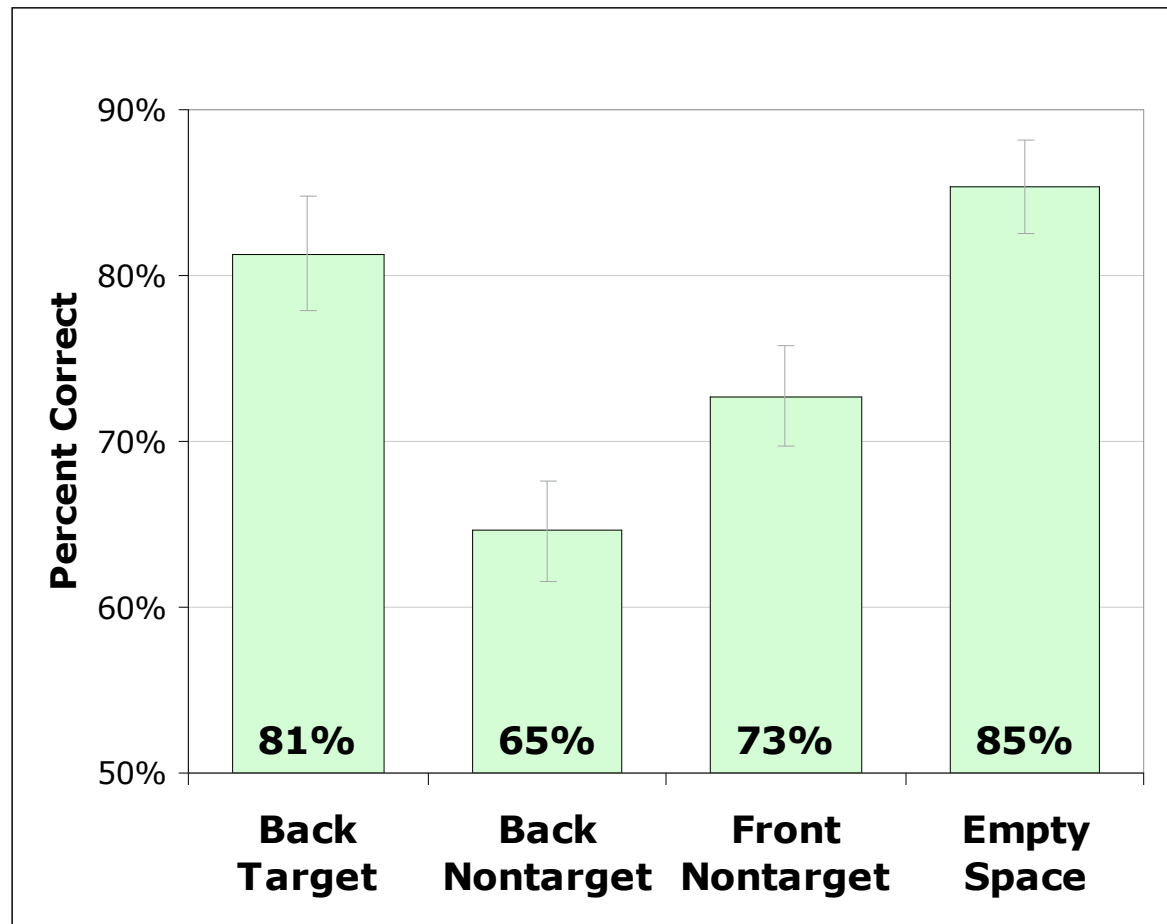




# Probe Detection Results (n=15)



# Alternate Plane - Probe Detection Results (n=13)



# Conclusion

A decorative graphic at the top of the slide features five circles in a horizontal row. The first circle is solid light blue, the second is a white outline, the third is solid light blue, the fourth is a white outline, and the fifth is solid light blue. Below the circles is a thick horizontal blue line that spans the width of the slide.

- Probe-dot detection was significantly lower on the distractors (nontargets) that appeared on the same depth plane as the targets; **nontargets on a different depth plane did not exhibit inhibition.**
- Inhibition is not required when nontargets can be pre-attentively separated from targets.
- This finding supports the view that **inhibition can be task-specific.**

# Concluding Remarks

A decorative graphic at the top of the slide features five circles of varying shades of light blue and white, arranged horizontally. Below the circles is a solid blue horizontal line that spans the width of the slide.

- Inhibition is not required when task-irrelevant objects in a visual scene can be segregated pre-attentively in early vision.
- Future studies:
  - How does inhibition spread during tracking task of targets on two depth planes?



**Thank you!**

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