

# Spatial Attention Tunes Temporal Processing in Early Visual Cortex by Speeding and Slowing Alpha Oscillations

Poppy Sharp, Tjerk Gutteling, David Melcher, Clayton Hickey

Presented by: Sai Zhang

November 8, 2022

# Outline

## 1 Introduction

# Introduction

# Inspiration: The Puzzle of Spatial Attention and Dynamic Stimuli

How spatial attention impacts the neural processing of dynamic visual stimuli

# Inspiration: The Puzzle of Spatial Attention and Dynamic Stimuli

How spatial attention impacts the neural processing of dynamic visual stimuli is **unclear**

See Nobre and Van Ede, 2018 for a review

# Inspiration: The Puzzle of Spatial Attention and Dynamic Stimuli

How spatial attention impacts the neural processing of dynamic visual stimuli is **unclear**

See Nobre and Van Ede, 2018 for a review

2 **opposing** functions in the perception of dynamic visual stimuli

- integration: to form unitary percepts and identify **consistencies**

# Inspiration: The Puzzle of Spatial Attention and Dynamic Stimuli

How spatial attention impacts the neural processing of dynamic visual stimuli is **unclear**

See Nobre and Van Ede, 2018 for a review

2 **opposing** functions in the perception of dynamic visual stimuli

- integration: to form unitary percepts and identify **consistencies**
- segragation: to parse separate objects and identify **changes**

# Inspiration: The Puzzle of Spatial Attention and Dynamic Stimuli

Surprisingly, spatial attention can **flexibly** benefit both:



# Inspiration: The Puzzle of Spatial Attention and Dynamic Stimuli

Surprisingly, spatial attention can **flexibly** benefit both:

**Integration**

**Separation**

# Inspiration: The Puzzle of Spatial Attention and Dynamic Stimuli

Surprisingly, spatial attention can **flexibly** benefit both:

## Integration

- Hein et al. (2006)
- Sharp, Melcher, et al. (2018)

## Separation

- Akyürek et al. (2007)
- Hochmitz et al. (2021)

# Inspiration: The Puzzle of Spatial Attention and Dynamic Stimuli

Surprisingly, spatial attention can **flexibly** benefit both:

## Integration

- Hein et al. (2006)
- Sharp, Melcher, et al. (2018)

## Separation

- Akyürek et al. (2007)
- Hochmitz et al. (2021)

How can spatial attention achieve this?

# Hypothesis: The Measure of Corruption

**Hypothesis:** The impact of spacial attention on temporal processing is instantiated in part through effects on  $\alpha$  **frequency** in **retinotopic visual cortex**.

# Hypothesis: The Measure of Corruption

**Hypothesis:** The impact of spacial attention on temporal processing is instantiated in part through effects on  $\alpha$  **frequency** in **retinotopic visual cortex**.

# Hypothesis: The Measure of Corruption

**Hypothesis:** The impact of spacial attention on temporal processing is instantiated in part through effects on  $\alpha$  frequency in retinotopic visual cortex.

# References I

- Akyürek, E. G., Riddell, P. M., Toffanin, P., & Hommel, B. (2007). Adaptive control of event integration: Evidence from event-related potentials. *Psychophysiology*, 44(3), 383–391.
- Hein, E., Rolke, B., & Ulrich, R. (2006). Visual attention and temporal discrimination: Differential effects of automatic and voluntary cueing. *Visual Cognition*, 13(1), 29–50.
- Hochmitz, I., Hein, E., & Yeshurun, Y. (2021). The effects of spatial attention on temporal integration measured with the ternus display. *Journal of Experimental Psychology: Human Perception and Performance*.
- Nobre, A. C., & Van Ede, F. (2018). Anticipated moments: Temporal structure in attention. *Nature Reviews Neuroscience*, 19(1), 34–48.
- Sharp, P., Gutteling, T., Melcher, D., & Hickey, C. (2022). Spatial attention tunes temporal processing in early visual cortex by speeding and slowing alpha oscillations. *Journal of Neuroscience*, 42(41), 7824–7832.
- Sharp, P., Melcher, D., & Hickey, C. (2018). Endogenous attention modulates the temporal window of integration. *Attention, Perception, & Psychophysics*, 80(5), 1214–1228.

