

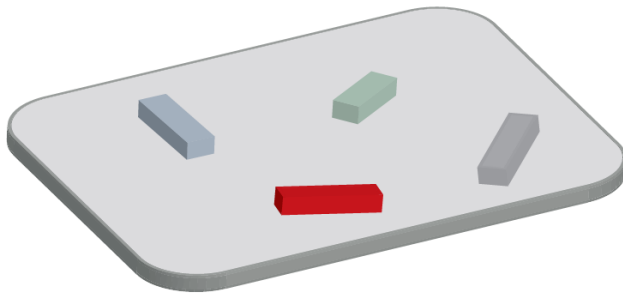


UNIVERSITY OF  
OXFORD

# *Flexibility of representational states in WM*

N Zokaei, S Manohar, E Feredoes & M Husain

# Do all items in working memory exist in the same state?



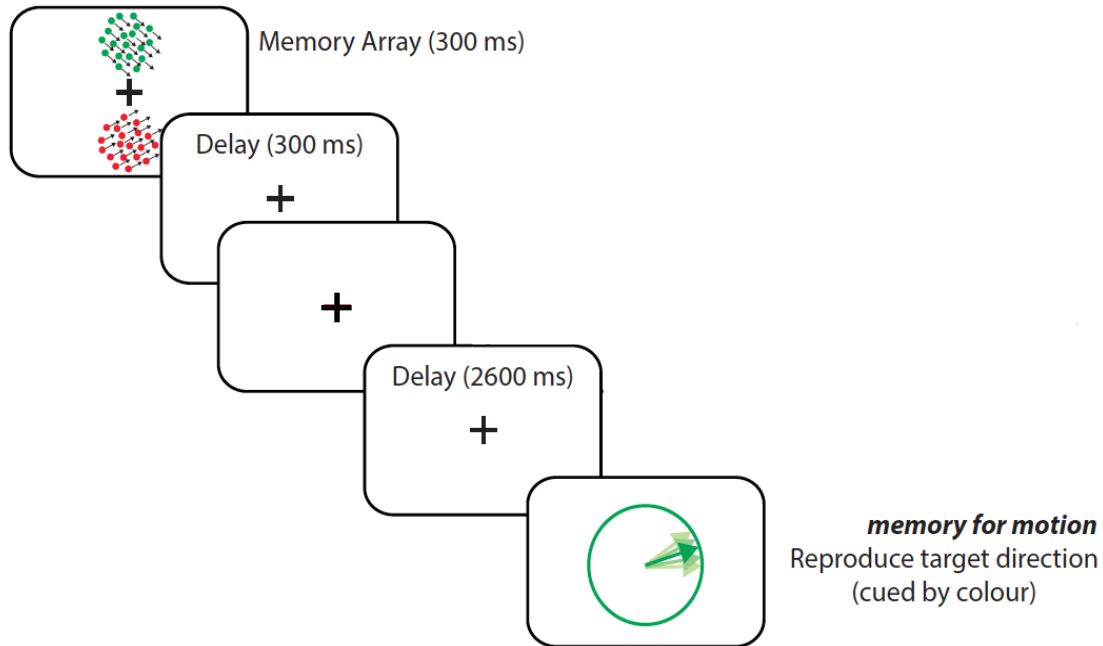
Multiple items can be maintained in WM.

One item might be held in a more prioritized state known as the “focus of attention”

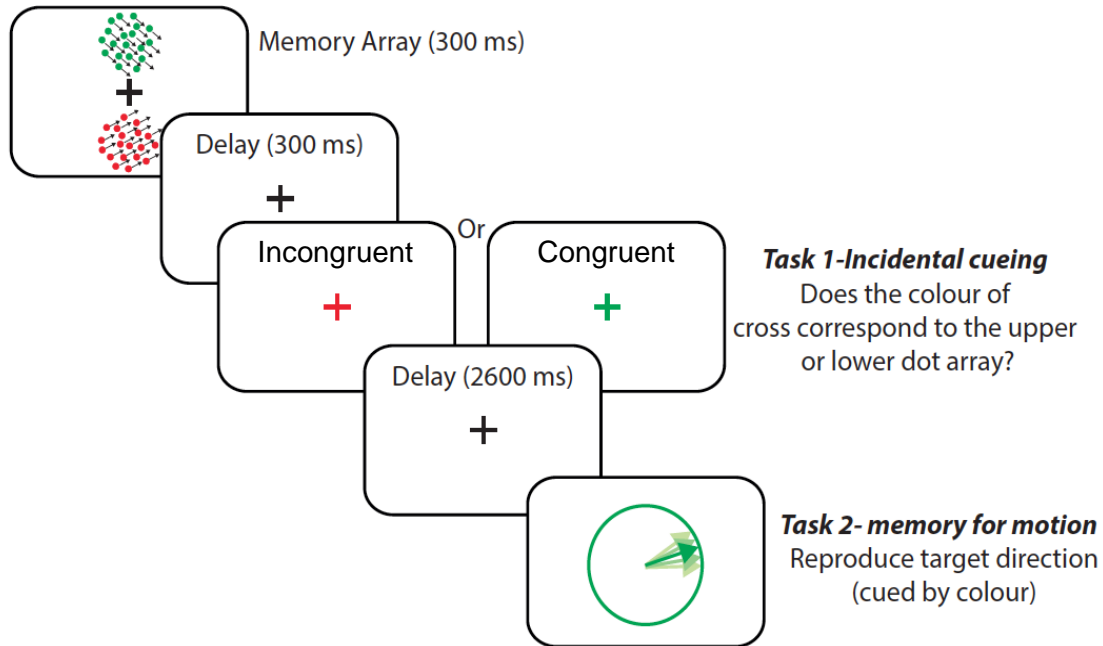
## ***How can we manipulate representational states in WM?***

- 1) Incidental Cueing
- 2) Recency
- 3) Retrospective cues

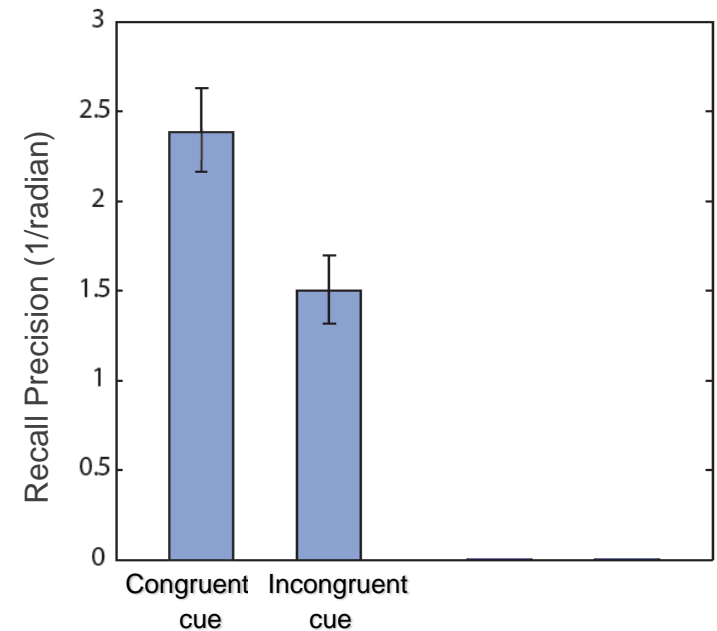
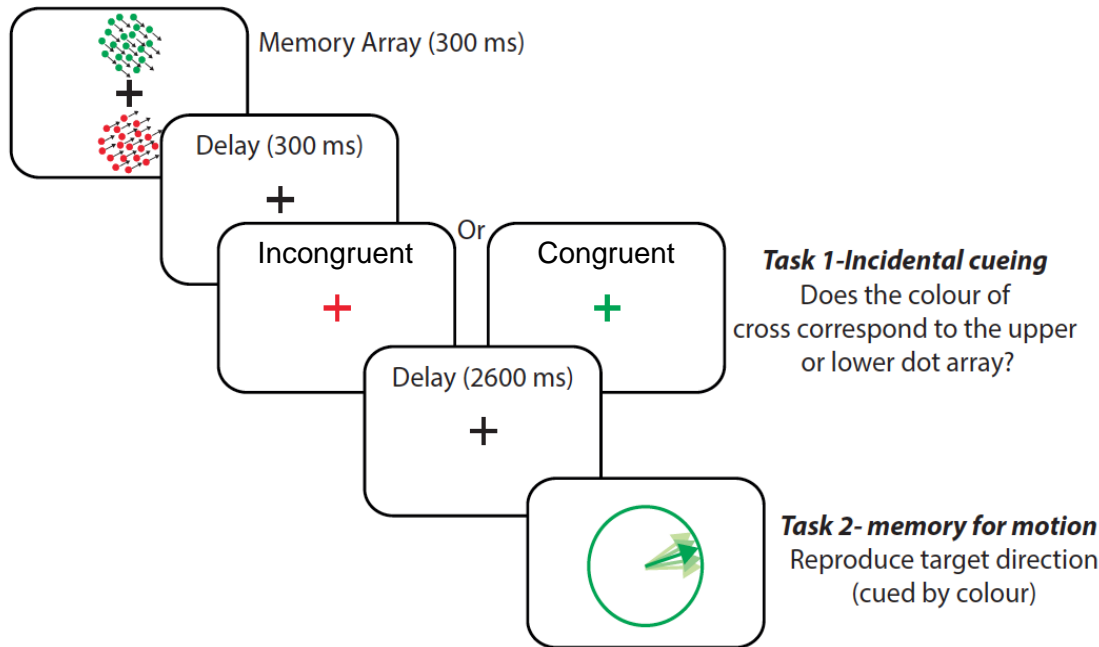
# Incidental cueing as a means to bring an item into the privileged state of focus of attention



# Incidental cueing as a means to bring an item into the privileged state of focus of attention

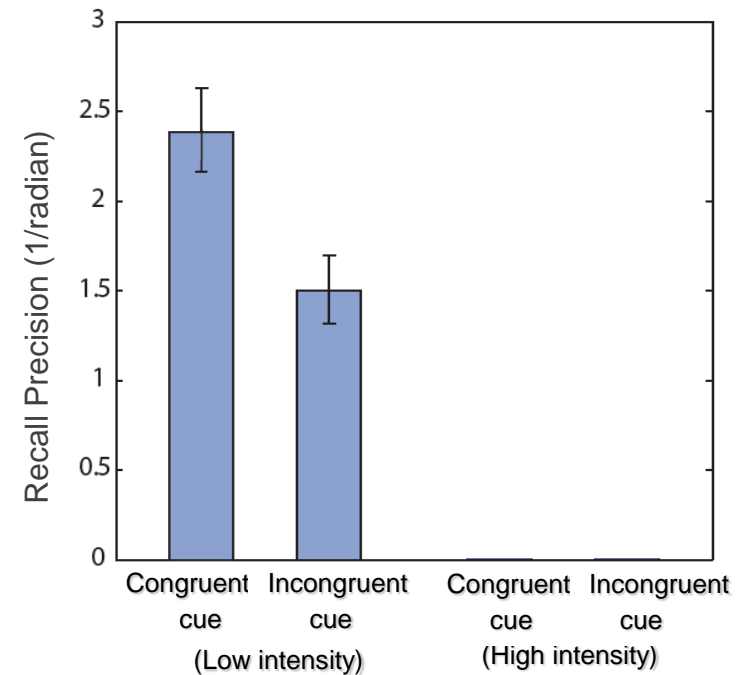
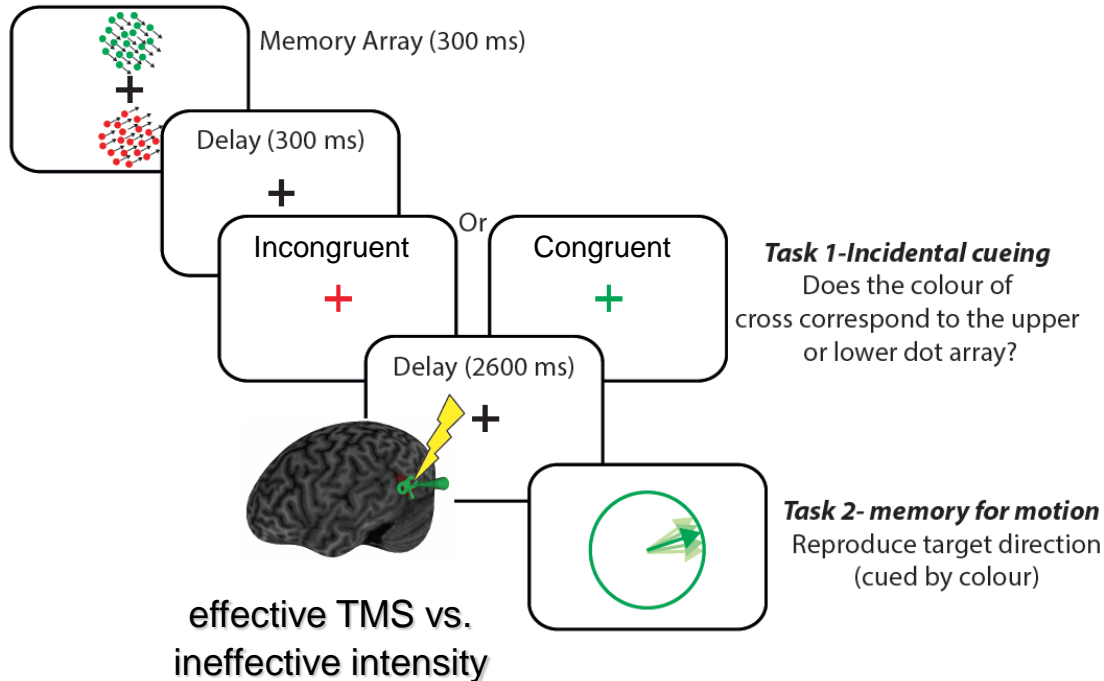


# Incidental cueing as a means to bring an item into the privileged state of focus of attention



***Does maintenance of the item in FOA relies on sensory regions?***

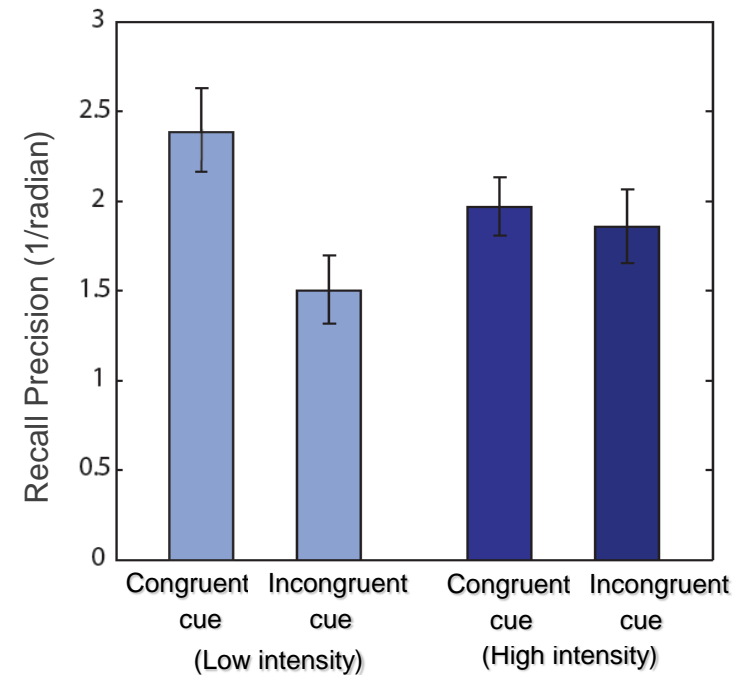
# Incidental cueing as a means to bring an item into the privileged state of focus of attention



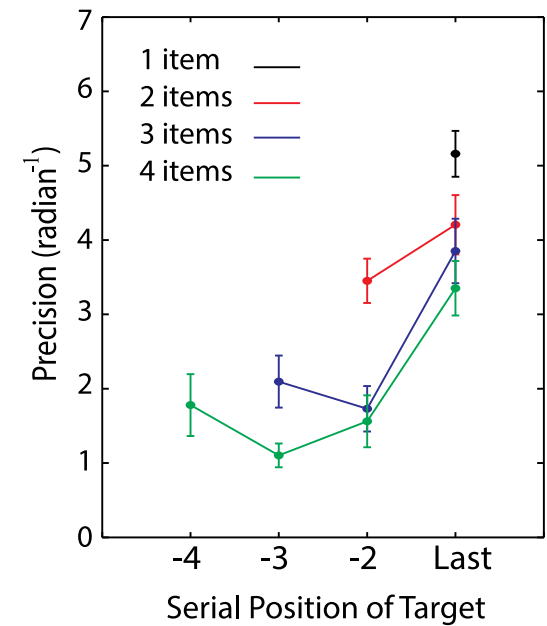
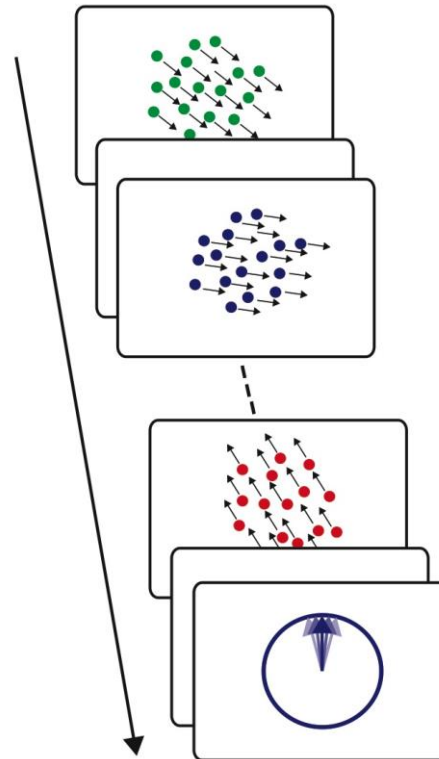
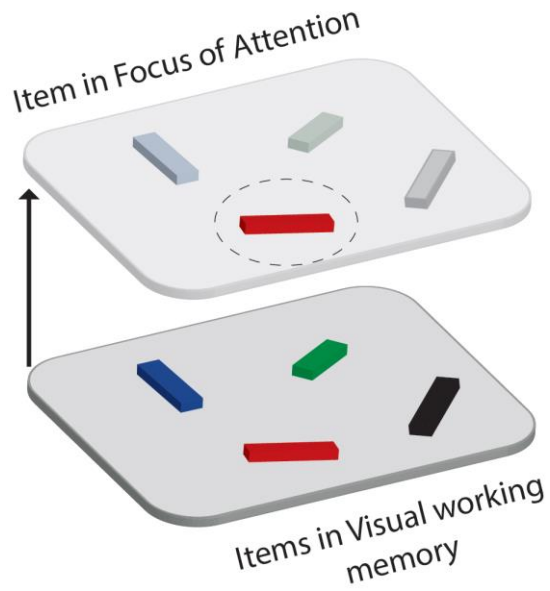
# Incidental cueing as a means to bring an item into the privileged state of focus of attention

*TMS to sensory area MT+:*

*Impaired WM precision for the item in FOA  
Improves recall precision for the “other” item*

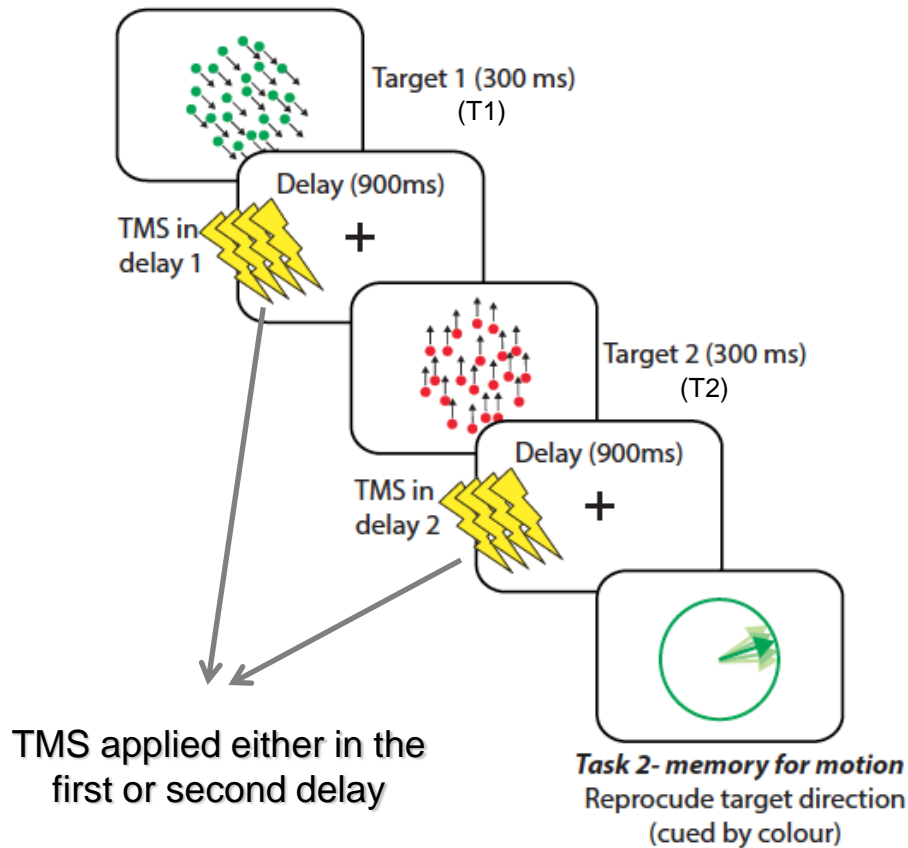


# Privileged state by virtue of recency

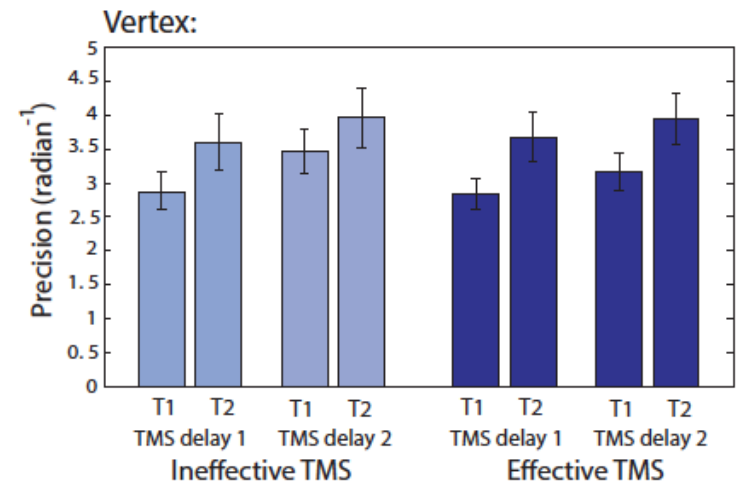
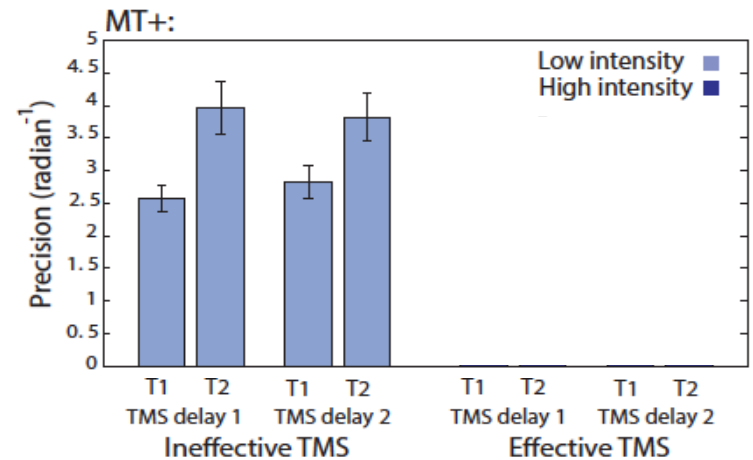
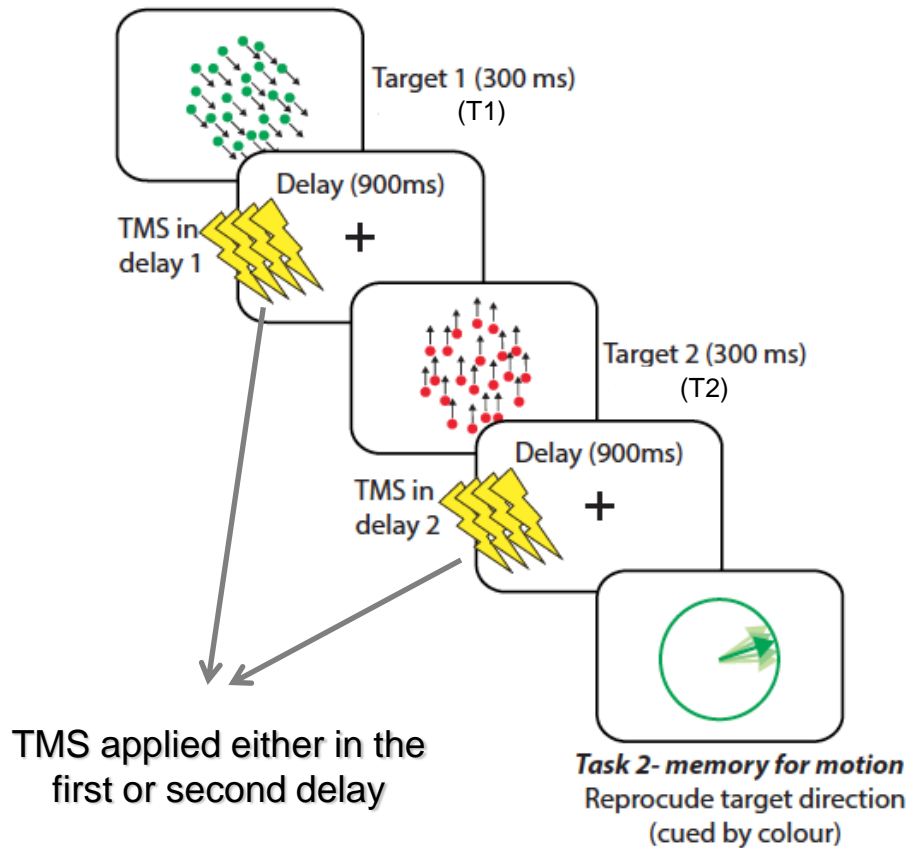




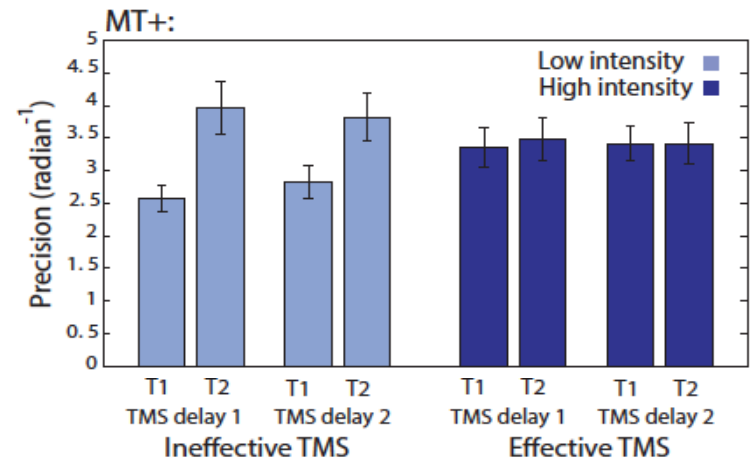
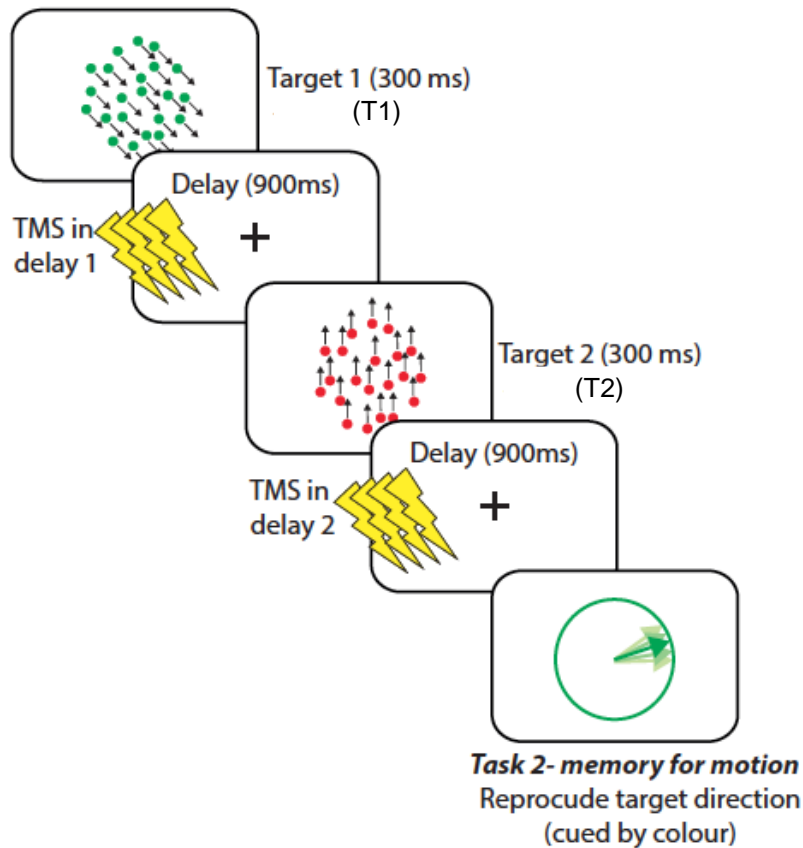
# Recency as a means to bring an item into a privileged state



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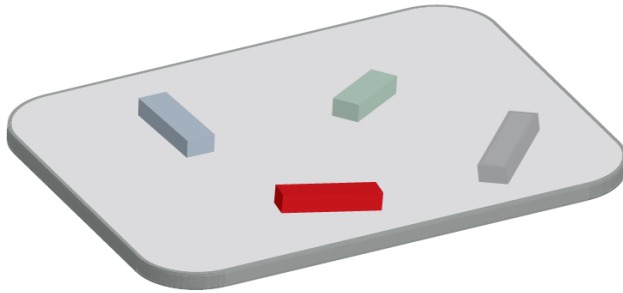


# Recency as a means to bring an item into a privileged state

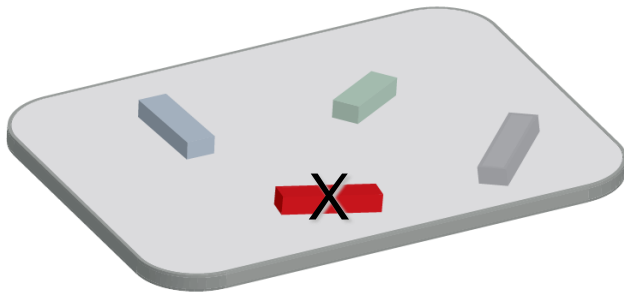


*TMS to sensory area MT+:*

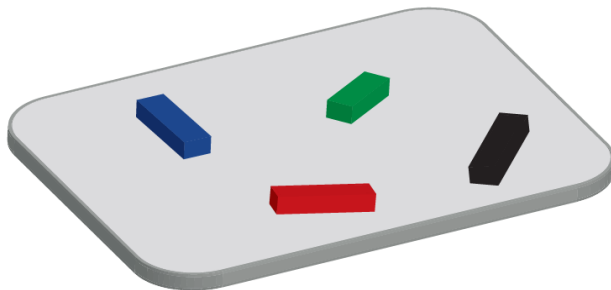
*Impaired WM precision for the item in FOA  
Improves recall precision for the “other”  
item*



- *The item in FOA interferes with memory of the other items in WM*

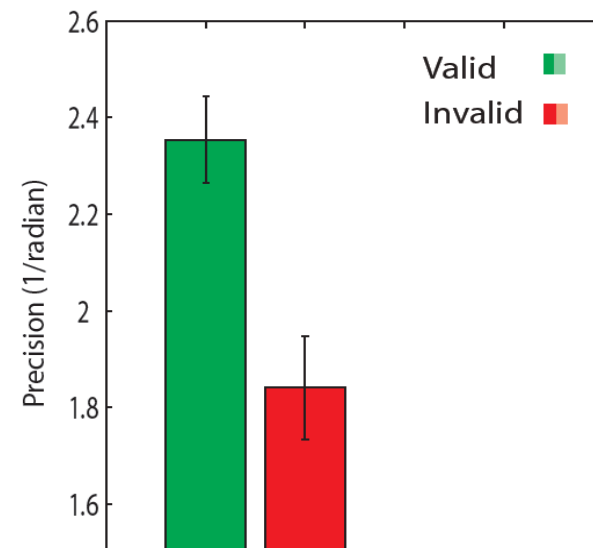
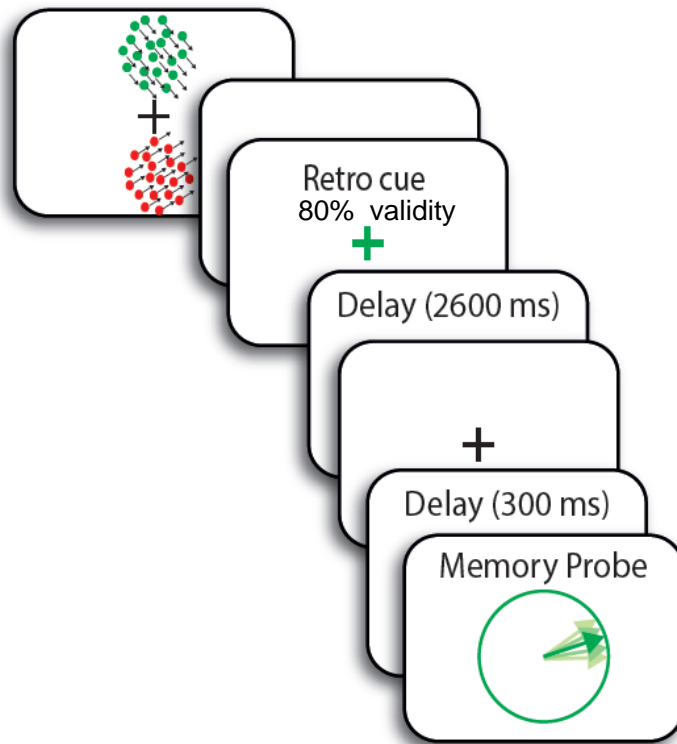


- *TMS to sensory areas impairs recall precision only for the item in FOA*

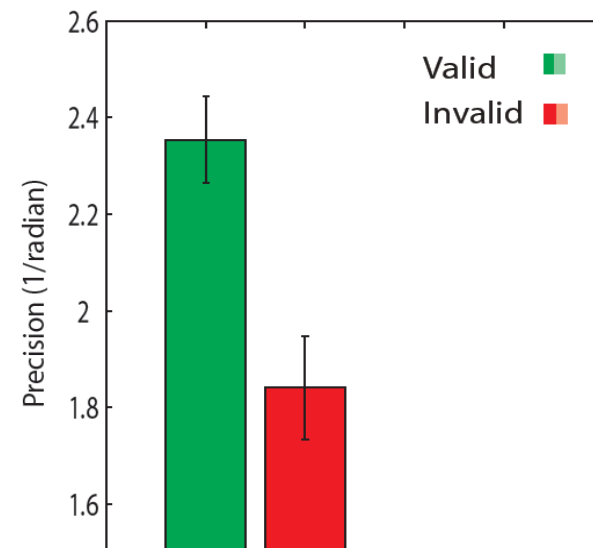
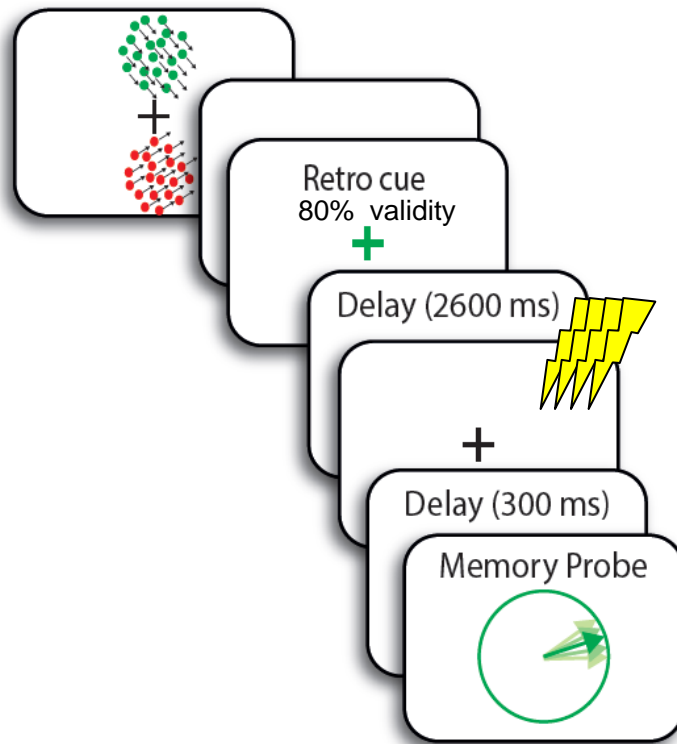


- *As a consequence, precision for the other items improves*

# Retrospectives cues to explicitly direct attention to one of the retained items



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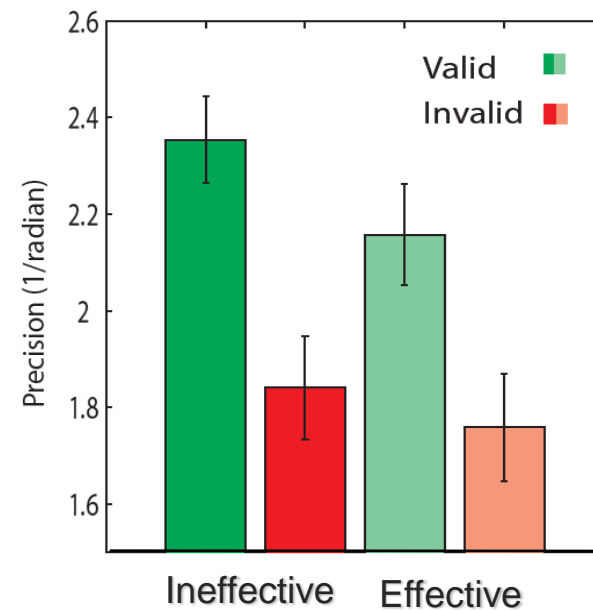


# Retrospectives cues to explicitly direct attention to one of the retained items

*TMS to sensory area MT+:*

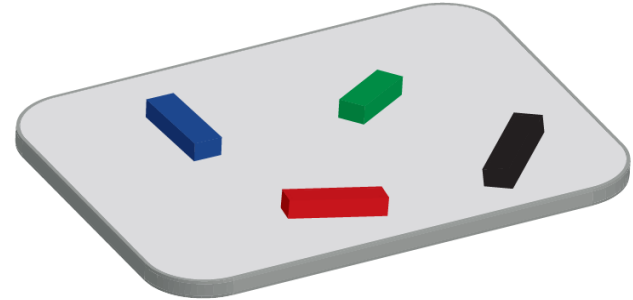
*Impaired WM precision for the item in FOA*

*No influence on the other item in WM*

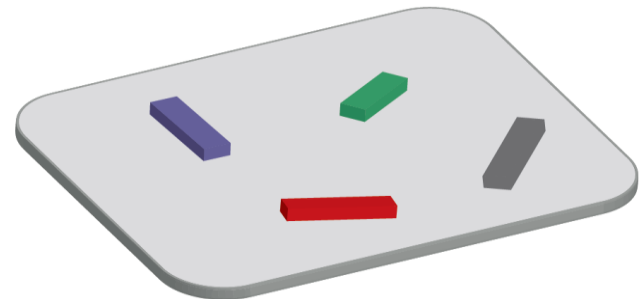


# What happens to “other” items in WM?

- In incidental cueing/Recency the other items in WM remain behaviourally relevant to the task
- Can be later recalled with high precision if interference from item in FOA is diminished

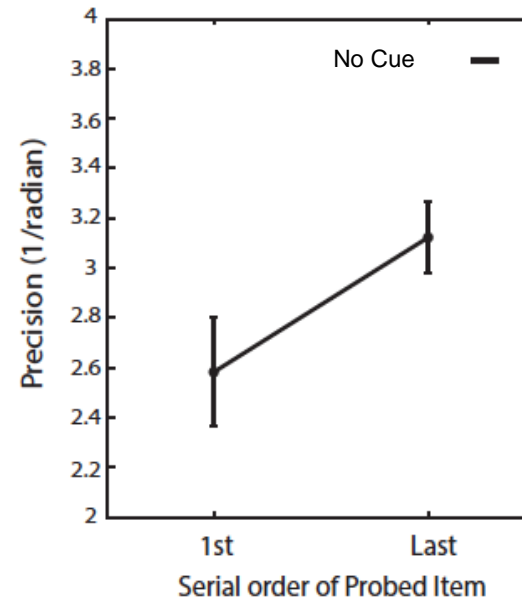
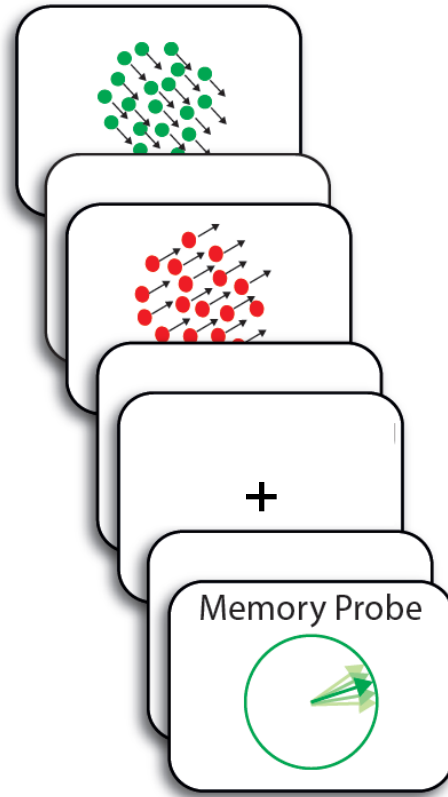


- Probabilistic retro-cues render the other items in WM irrelevant to memory task
- These items are remembered with lower quality and cannot be redeemed even after interference from FOA is disrupted

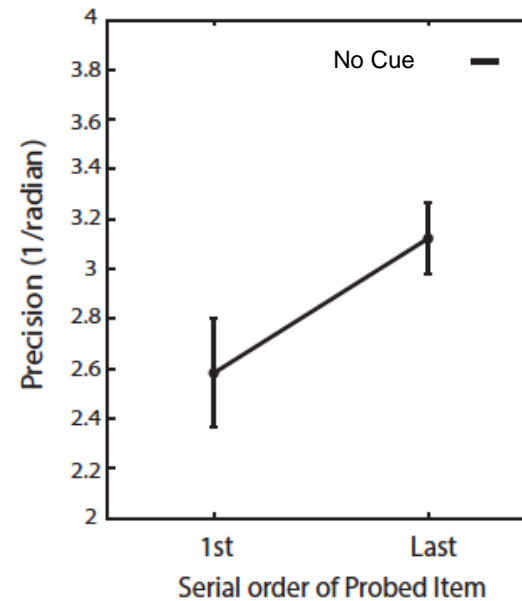
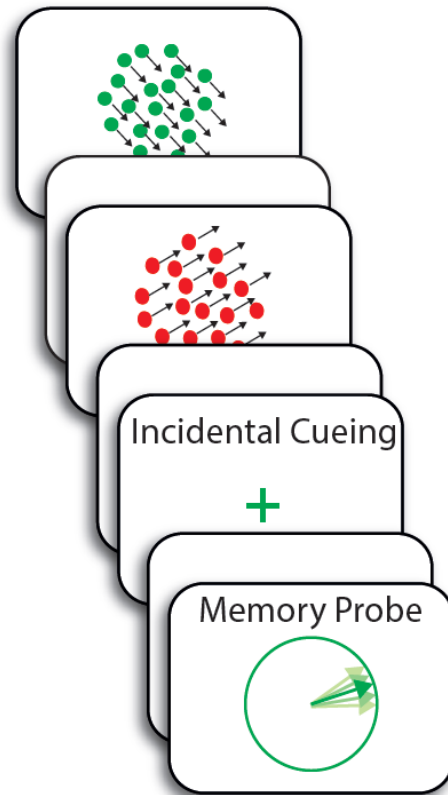




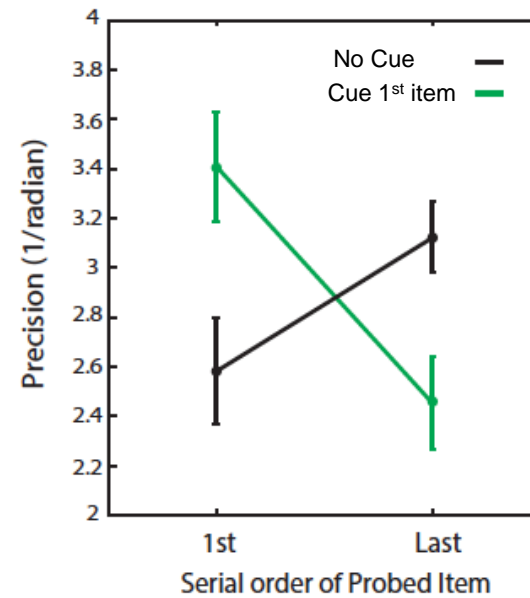
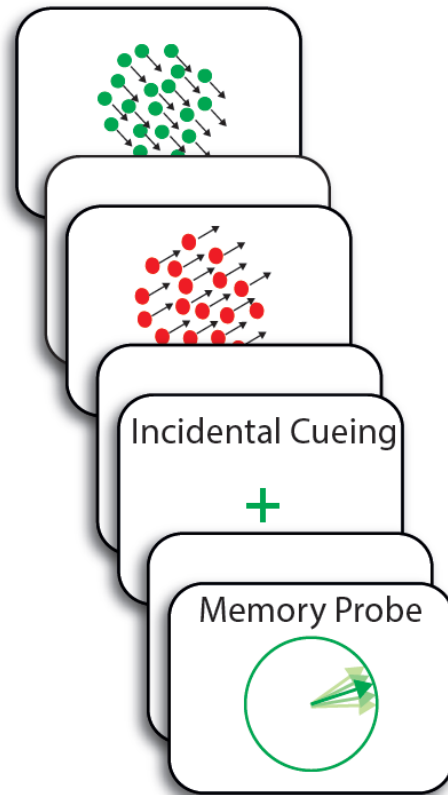
# Flexibly move items inside/outside the FOA



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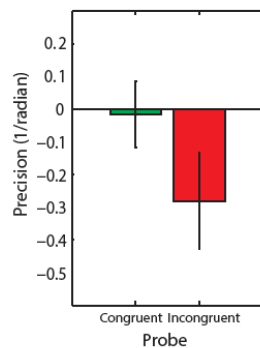
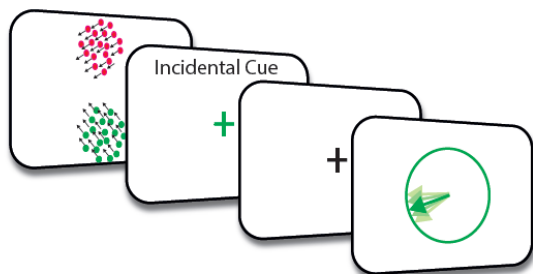
# Summary

- Causal evidence for at least two different representational states in WM with an item can be held in a privileged state, within the focus of attention (FOA)
- Item in FOA, regardless of how it achieves its privileged state, is susceptible to disruptive effects of TMS to sensory regions (MT+)
- The fate of the non-privileged items however is dependent on their relevancy to the WM task:
  - If they remain relevant they can be brought into the FOA, and improve in their recall precision
  - If rendered irrelevant, they are maintained with lower WM resources and focusing attention on them does not improve their recall precision

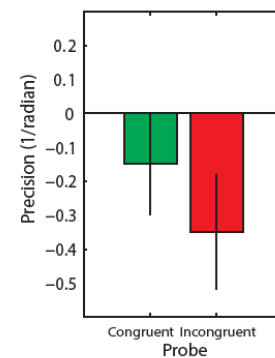
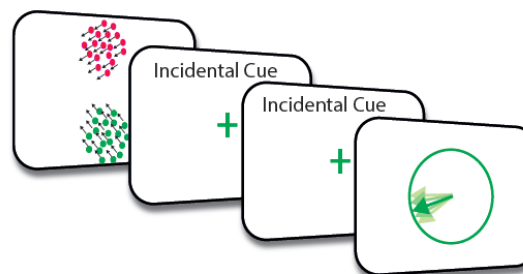
Thank you!

**BACK UP SLIDES**

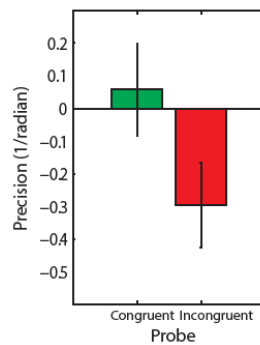
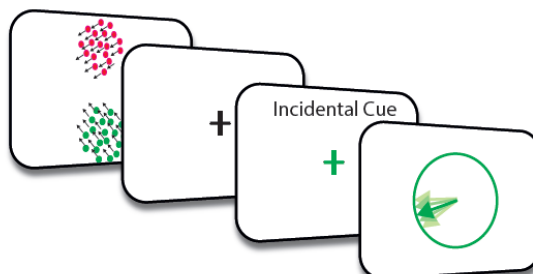
A. Cue, first position



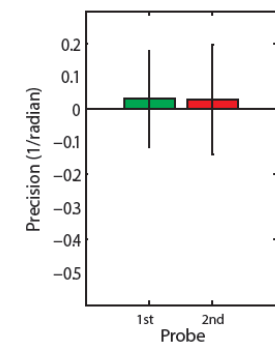
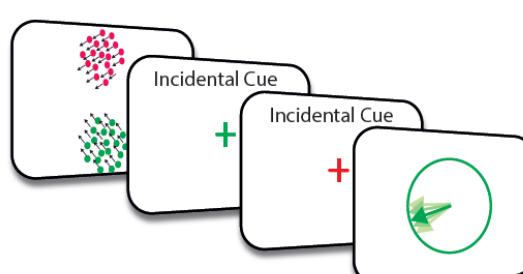
C. Cues, same



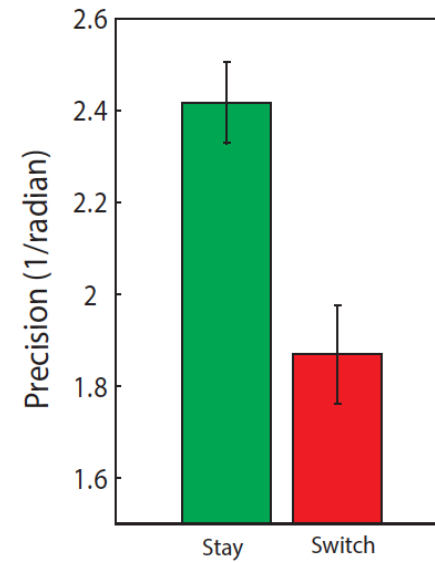
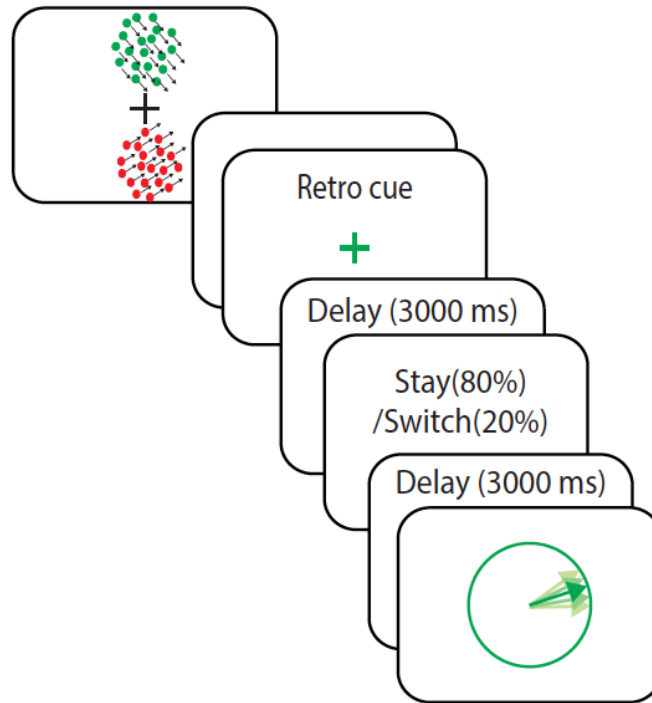
B. Cue, second position



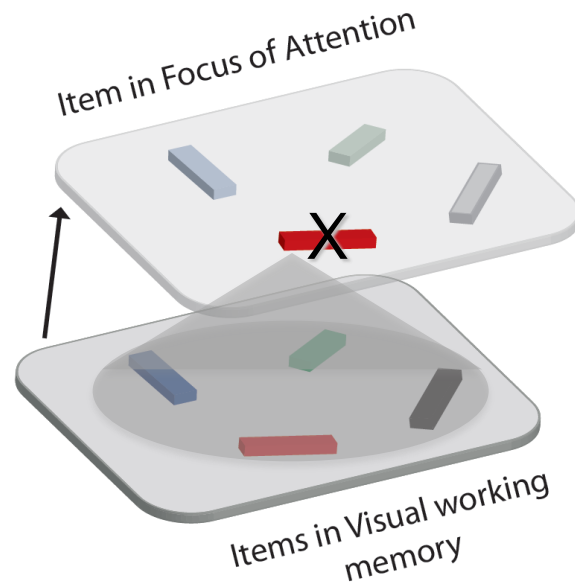
D. 2 Cues, different



# Items cannot be brought into FOA once rendered irrelevant

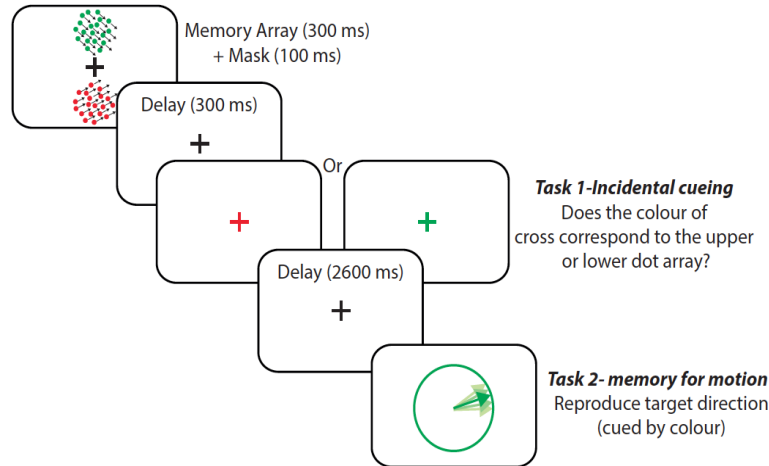
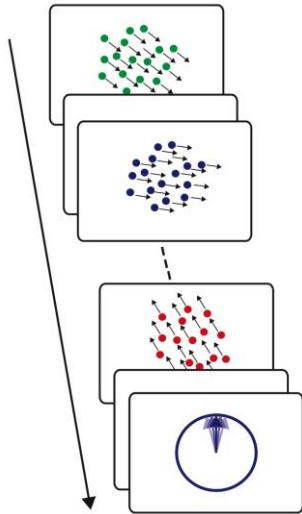




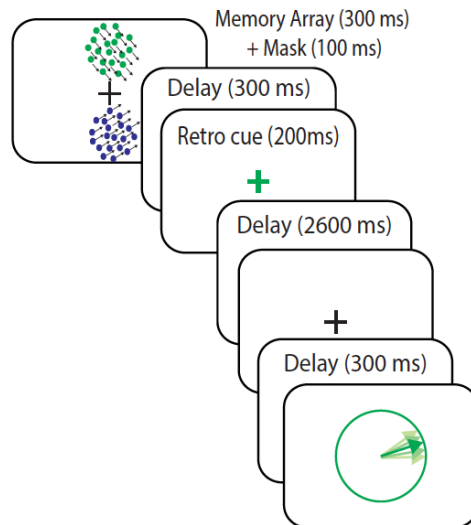


- *The item in FOA interferes with memory of the other items in WM*
- *TMS to sensory areas impairs recall precision only for the item in FOA*
- *As a consequence, precision for the other items improves*

# What happens to “other” items in WM?



*In incidental cueing/Recency the other items in WM remain behaviourally relevant to the task*



*Predictive cues render the other items in WM Irrelevant to memory task*