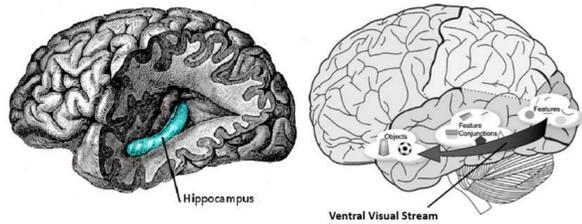
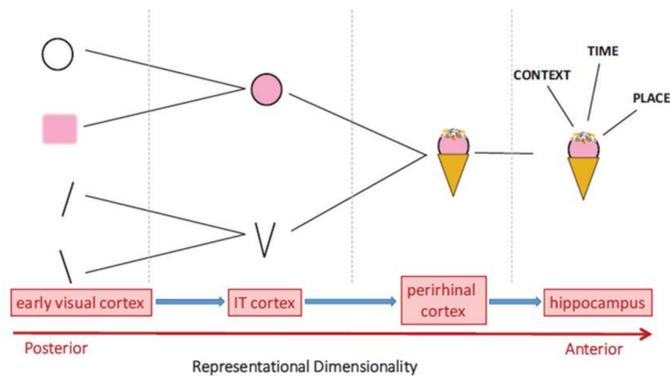


Introduction

- Traditional views: memory & perception are separate cognitive processes in separate brain regions
- Hippocampus (HC) = “memory”



- Visual information in Ventral Visual Stream (VVS) builds up in complexity



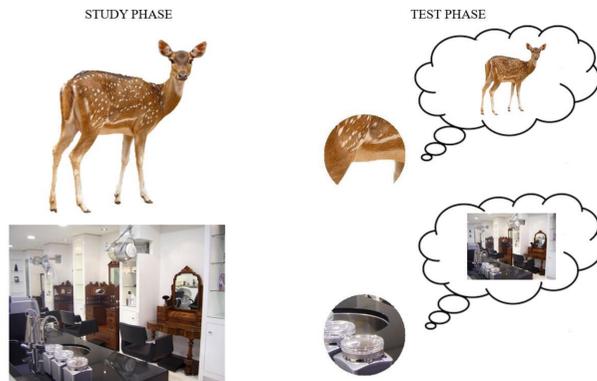
- Propose HC as extension of VVS—binding whole objects w/time, place, & context
- Brain regions not engaged by *processes* but by content being processed
- HC declines with age
 - Damage to the HC → not loss of “memory” but loss of the content that HC processes
- My experiment: Memory Recall Task
 - Images of objects (should not require HC) and scenes (should require HC)
 - Older adults (HC damage) and younger adults (no HC damage)

Prediction

Memory recall performance will reveal an interaction between *stimulus type* and *age group*. Older adults will be more impaired for scene recall, relative to younger adults, than for object recall.

Methods

- Memory Recall Task
- Participants: 63 adults aged 18-27; 36 adults aged 60+
- 240 images of object and scenes
- Whole images shown at study
- Small circular apertures of images shown as memory cues at test



- Test blocks: both studied (“old”) and novel (“new”) items
- Recognition test phase:
 - Viewing apertures, participants make REMEMBER/NEW decision
- Recall test phase:
 - Participants are asked to type in the name of the image.
- Recall answers manually scored
 - Object names must be specific
 - Scene names must describe whole scene – not just what visible in aperture

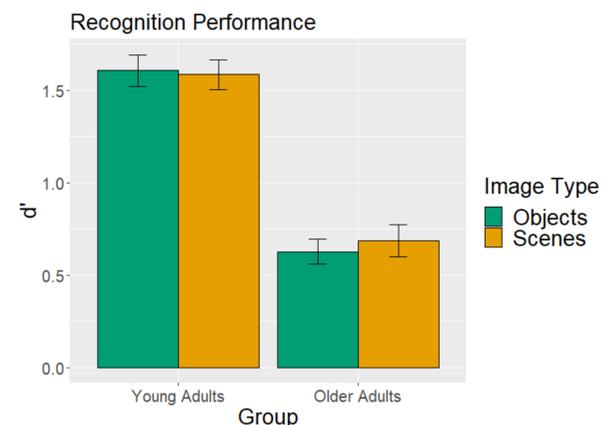


e.g., “garden” not accepted. Correct answer would be some version of “pool.”

Data Analysis

- Recognition data:
 - $d' = z(\text{HITS}) - z(\text{FAs})$
- Recall data:
 - Visual Learning Score = $z(\text{prop correct studied}) - z(\text{prop correct unstudied})$

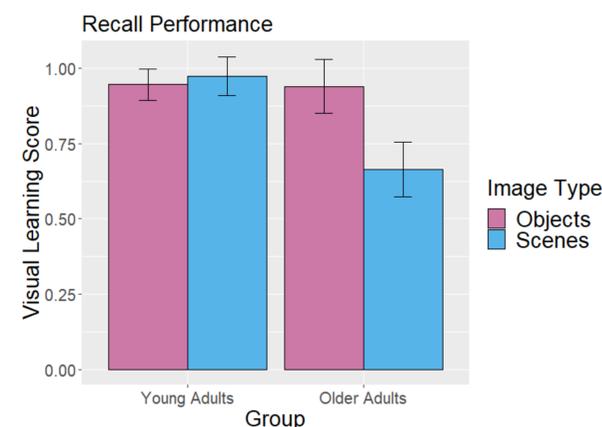
Results



Two-way ANOVA revealed no significant interaction between the effects of age and image type on d' ($F(1,168) = 0.24, p = 0.63$).

Simple main effects analysis showed image type did not have a significant effect on d' ($p = 0.90$)

Simple main effects analysis showed age did have a significant effect on d' ($p < 0.001$)



Two-way ANOVA revealed a significant interaction between the effects of age and image type on visual learning score ($F(1,168) = 4.33, p < 0.05$).

Simple main effects analysis showed image type did not have a significant effect on visual learning score ($p = 0.18$)

Simple main effects analysis showed age did have a significant effect on visual learning score ($p < 0.05$)

Discussion

- Recognition data:
 - Poorer performance by older group on both objects and scenes
 - No difference objects vs. scenes.
- Recall data is unconstrained by recognition answer → recall results represent IMPLICIT visual memory performance.
- Recall data support hypothesis:
 - Older adults impaired in memory for scenes
 - consistent with hippocampal degradation.
 - Older adults NOT impaired in recall of objects
 - Object recall may not require hippocampus.
- These results contradict traditional views that memory is impaired uniformly by hippocampal damage
 - Damage causes loss of the content that HC processes
 - Memory content in VVS still preserved
- Brain regions are engaged based on content being processed.
 - Memory (and perception) can occur at any point along VVS and HC – depends on the content of the memory/percept
- Applications for diagnosis and treatment of Alzheimer’s Disease and dementia

References

- Raz, N., Rodrigue, K. M., Head, D., Kennedy, K. M., & Acker, J. D. (2004). Differential aging of the medial temporal lobe: A study of a five-year change. *Neurology*, 62(3), 433–438. <https://doi.org/10.1212/01.wnl.0000106466.09835.46>
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