Concept generalization in young and older adults

Caitlin R. Bowman & Dagmar Zeithamova
Department of Psychology, University of Oregon

Brain & Memory LAB

Background

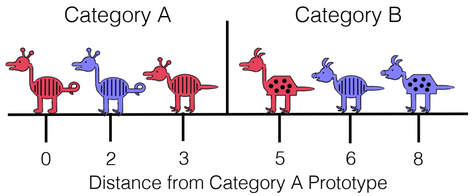
- Two types of proposed concept generalization models:

  Exemplar models[1]: categories represented as individual instances (exemplars). Generalization involves joint consideration of all category exemplars.

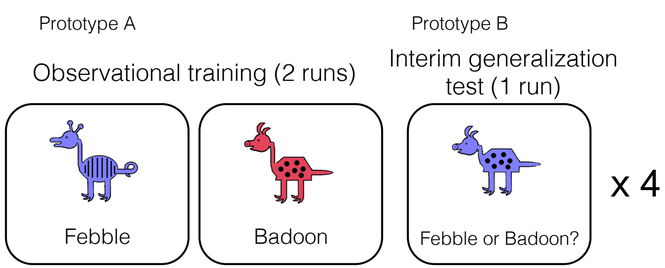
  Prototype models[2]: categories represented as central tendencies (prototypes). Generalization involves comparison to category prototypes.
- Aging often reduces memory for items in episodic memory[3] while concept learning[4] and 'gist'-based memory[5] are often relatively preserved with age.
- Recent evidence that the ventromedial prefrontal cortex (VMPFC) and anterior hippocampus support prototype-based concept generalization in young adults,[6] but unclear how they are affected by age.

Is prototype-based concept generalization preserved in older adults?
Do VMPFC-hippocampal mechanisms support prototype-based generalization across age?

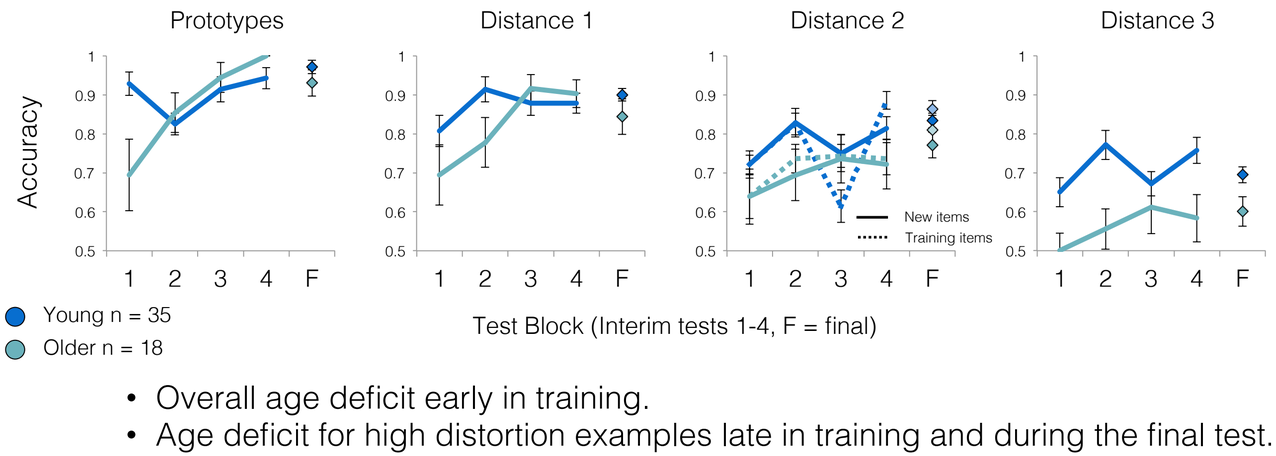
Categorization task



- Stimuli with 8 binary features
- One stimulus = category A prototype
- All other stimuli: 1-8 features different from the A prototype ("distance from the prototype A")
- Stimulus with all 8 features different = B prototype

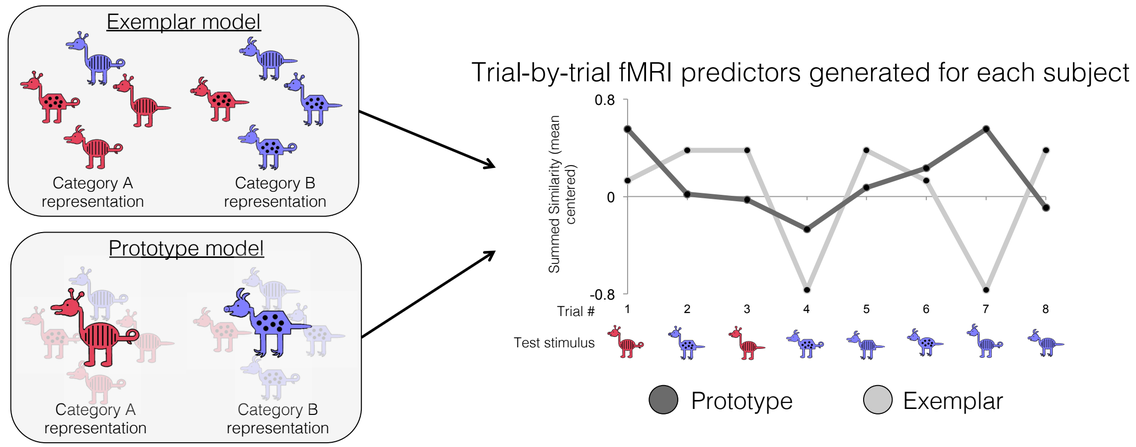


- 8 training items, all distance 2
- 3 repetitions per item, per run
- All training items + 2 new items at each distance
- All training items + 8 new items at each distance

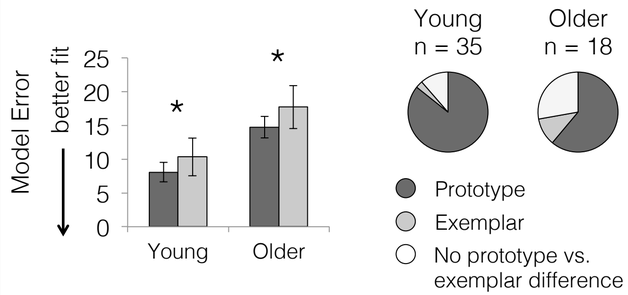


- Overall age deficit early in training.
- Age deficit for high distortion examples late in training and during the final test.

Categorization models

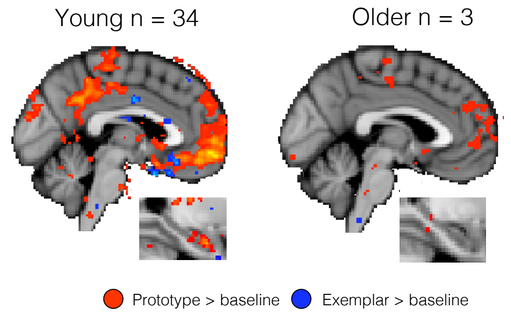


Behavioral Model Fits



- Better prototype than exemplar fit in both young and older adults.

Pilot Neural Model Fits



- Similar to young adults, older adults show mostly prototype correlates, including in medial PFC.

Conclusions

- Early in learning, age deficit in concept generalization for all items.
- Late in learning, no age deficit for items close to prototypes.
- Consistent age deficits across phases for examples with few prototypical features.
- Prototype representations support concept generalization across age groups.
- Preliminary evidence of medial PFC prototype representations across age groups.

References

(1) Nosofsky (1986). *JEP: General.* (2) Smith & Minda (1998). *JEP: LMC.* (3) Balota, Dolan, & Duchek (2000). *The Oxford handbook of memory.* (4) Fera et al. (2005). *Jneuro.* (5) Koutstaal & Schacter (1997). *J. Mem. & Lang.* (6) Bowman & Zeithamova (2018). *Jneuro.*

Acknowledgements

Funding for this work was provided in part by the Lewis Family Endowment that supports the Robert and Beverly Lewis Center for Neuroimaging at the University of Oregon (DZ) and by the National Institute of Aging grant F32 AG054204 (CRB).
Correspondence to: cbowman@uoregon.edu