Naturalistic task framing improves older adults' ability to infer and navigate complex associative networks

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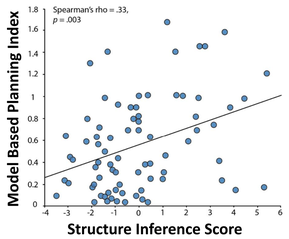
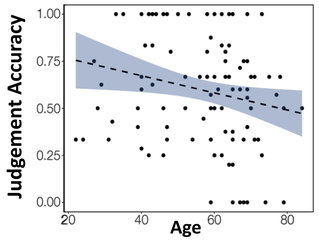
Background

- Humans are able to infer complex associative networks even when specific associations were not directly learned (Rmus et al., 2023)
- This structure inference declines with aging (Noh et al., 2025) and work is needed to remediate age-related deficits
- Familiarity of stimuli minimizes differences in memory performance between older and younger adults (Castel, 2005)
- Framing of tasks can elicit different responses (both positive and negative) in older adults depending on their confidence in accurately completing the tasks (Desrichard & Kopetz, 2005)



(Rmus et al., 2022)



Age:Judgement dist = -0.022, SE = 0.009, t(216) = -2.41, p = 0.017 (Noh et al., 2025)

Research Question

How does task framing impact the ability to create and navigate an associative network across the adult lifespan?

Methods

Participants:

- Abstract Objects: 62 younger adults (18-40) and 53 older adults (65+)
- Naturalistic Flights Framing: 47 younger adults (25-40) and 47 older adults (65+)
- Participants were collected online using Psiturk and Prolific

Task:

- Participants engaged in a study phase, direct memory test, distance judgement, goal directed planning (not on poster), and graph reconstruction (not on poster)

Stimuli:

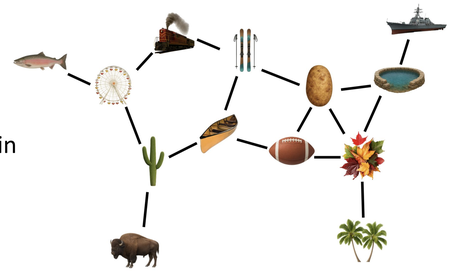
- Both conditions used the same 13 images, with the Naturalistic condition having city names
- U.S. city names were validated to be similar distributions of familiarity (> 3.5/5)

Analysis:

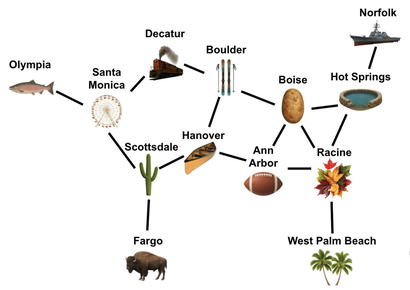
- Conducted a 2 (age group) x 2 (framing) ANOVA on direct memory performance and relative distance judgments.
- ~: p<0.1, *: p< 0.05, **: p < 0.01, ***: p < 0.001

Graph Structure: Task Framing in Graph Navigation

Arbitrary object condition:



Naturalistic framing condition:



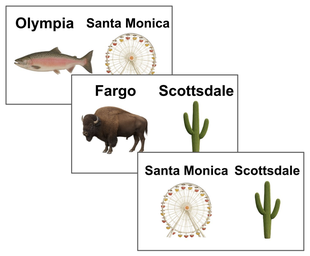
Task Instructions:

"You will be tasked with learning these pairs of objects… a good strategy is to try to imagine a story or image that connects the two objects."

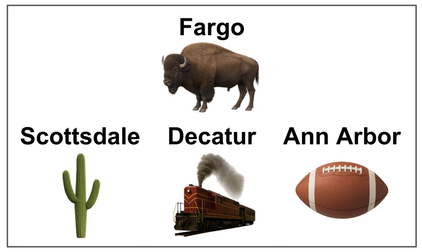
"You are a travel agent who is trying to help your clients make their travel arrangements… your job is to try and learn the direct flights offered by AerBorn Airlines so you can advise your clients to make their travel plans."

Task Structure

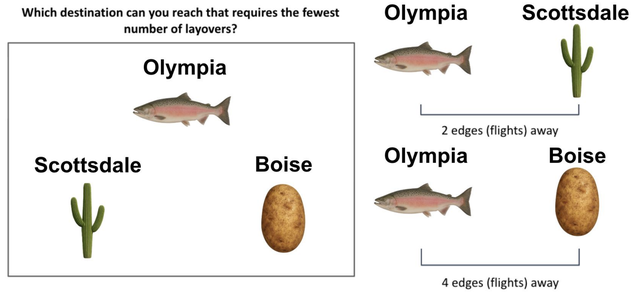
Learning:



Direct Memory:

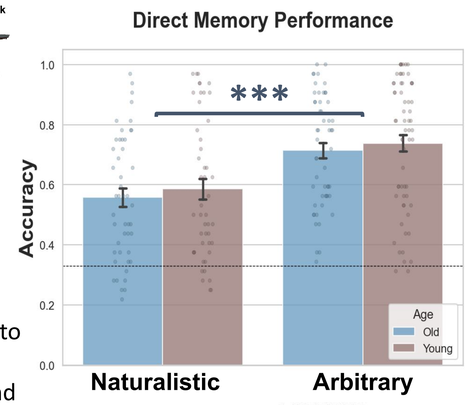


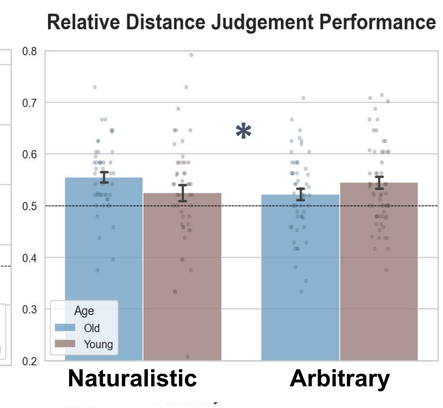
Relative Distance Judgement:



Primary Results

Main Effect of Experiment Type on Direct Memory, Interaction in Judgement





Main effect of Experiment Type
f = 13.611 p = 2.880e-4

Interaction of Age:Experiment Type
f = 4.821 p = 0.029

Interpretation

In direct memory there is an age agnostic effect of naturalistic framing leading to reduced accuracy, but when making judgements there is a significant interaction between age and task framing.

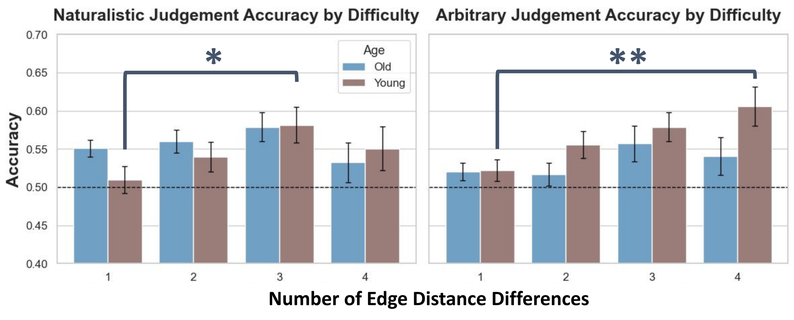
Discussion

- Naturalistic task framing can eliminate age-related deficits in older adults' ability to form and navigate complex associative networks
- Judgement difficulty played a significant role in younger adult performance
- Naturalistic framing may be more difficult to 'connect' than random objects, but are easier to navigate through for older adults
- Lower direct memory performance may be due to an interference effect where prior knowledge of cities and flight paths impair memory, but not when making multi-step decisions
- Provides insight into the contexts where naturalistic framing compared to abstract examples could benefit older adult memory
- We plan to utilize fMRI imaging to compare neural representations between learned associations to evaluate whether they are more similar when task framing matches lived experiences
- We plan to compare task performance with real U.S. cities compared to fictional cities to evaluate potential nuances in naturalistic task framing

Conclusion

Naturalistic task framing improves older adults' ability to infer and navigate complex associative networks, while arbitrary object judgement benefits younger adults.

Relative Distance Judgement by Edge Distance Difficulty



Young Dist Diff 3 vs. Dist Diff 1: t=2.42, p=0.018

Young Dist Diff 4 vs. Dist Diff 1: t=2.868, p=0.005

Younger adults show sensitivity to judgement difficulty in both experiment types, while older adult trends are more ambiguous.

Contact info and Supplements

If you have any questions or insights please contact me at **rapalsul@uci.edu**

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Supplemental Slides

References

Castel, A. D. (2005). Memory for Grocery Prices in Younger and Older Adults: The Role of Schematic Support. *Psychology and Aging,* 20(4), 718-721. https://doi.org/10.1037/0882-7974.20.4.718, Desrichard, O., & Köpetz, C. (2005). A threat in the elder: The impact of task instructions, self-efficacy and performance expectations on memory performance in the elderly. *European Journal of Social Psychology*, 35(4), 537–552. https://doi.org/10.1002/ejsp.249, Noh, S. M., Cooper, K. W., Guo, S., Zhou, D., Stark, C., & Bornstein, A. (2023). Multi-step inference can be improved across the lifespan with individualized memory interventions. https://doi.org/10.31234/osf.io/3mhj6_v2, Rmus, M., Ritz, H., Hunter, L. E., Bornstein, A. M., Shenhav, A. (2022). Humans can navigate complex graph structures acquired during latent learning. *Cognition*, 225, https://doi.org/10.1016/j.cognition.2022.105103

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