Creatures of habit? Examining navigation strategies across the lifespan

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Study Goals
- Examine the neural dynamics through which future experiences are represented in the brain.
- Understand how prospective thought relies on complex interactions between declarative memory, attention, and cognitive control.
- Test how these contribute to age-related memory deficits lending to difficulties with orienting towards goal locations and planning how to navigate to them.

Background
- The MTL is critical for memories of the past, but also for representing spatial locations, goals, and future events.
- Aging affects the function of the MTL and related circuitry, and critically, aging is associated with behavioral patterns that include avoiding less-familiar routes or locations, difficulty taking shortcuts, and a bias towards navigation based on familiar actions rather than memory for goals, even when such strategies are overtly maladaptive.
- A classic example of this is the Y-maze task.

Method

**Older Adults (OA)**
- Ages 65-78
- N = 13 (7 MRI)

**Young Adults (YA)**
- Ages 18-28
- N = 19 (all MRI)

**Day 1**
- Training on familiar route for 6 different environments (guided + unguided)
- 3-hour duration

**Day 2** (24-hours later)
- Testing memory of familiar route (unguided)
- Dual-Solution Paradigm ("probes")
- Inside MRI if eligible

Navigation Probes (Day 2)

"Dual"-Solution task
1. Familiar route
2. Shortcut

"Forward" shortcut
"Backward" shortcut

Frechet Distance Measure* - Mathematical way of describing how one trajectory deviates from another.

What subject did

Optimal shortcut

* "FD" on other panels

Behavioral Results

**Route performance remembering familiar route**

**OA vs. YA (p = .001)**

**Route performance in Dual-Solution task - YA**

YA: Forward vs. Backward (p < .001)

**Route performance in Dual-Solution task - OA**

OA: Forward vs. Backward (p = .01)

Discussion
- Both age groups prefer to follow the familiar route when given the choice between taking a backward shortcut or traveling along the familiar direction.
- When having to backtrack the environment, OAs are more likely to take a sub-optimal shortcut than YAs, who tend to follow the familiar route more closely.
- OAs underperformed in the initial familiar route memory test, likely due to the higher cognitive demand for remembering the longer route sequence.
- Future analyses aim to examine the neural correlates in the frontal and medial temporal circuitry (e.g., using MVPA to measure use of future-oriented representations to make choices).

References
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