

U13 Bench-to-Bedside Conference Sensory Impairment and Cognitive Decline

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Animal models of cognition and cognitive assessment

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➤ **Other Financial Relationships**

none


➤ **Conflicts of interest**

none



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➤ Choose **cognitive tests** where there is a correspondence in behavior across species

➤ Understand **what age is "old"** in the species examined

➤ **Adaptation** in neural systems can facilitate cognitive function - what to 'fix'?

“OLD” for different species

- **Rodents:** the age at 50% mortality has been the definition of “old” in mice and rats – this is **2 years**, for example, in C57B6 mice and Fischer 344 rats
- **Non-human primates:** for macaques, multiply by 3 to obtain the human equivalent age (**22 years** = 66 human yrs)
- **Humans:** in most studies of cognitive aging the transition to “old” is **65 years**



➤ **Spatial Memory**

hippocampus

➤ **Recognition Memory**

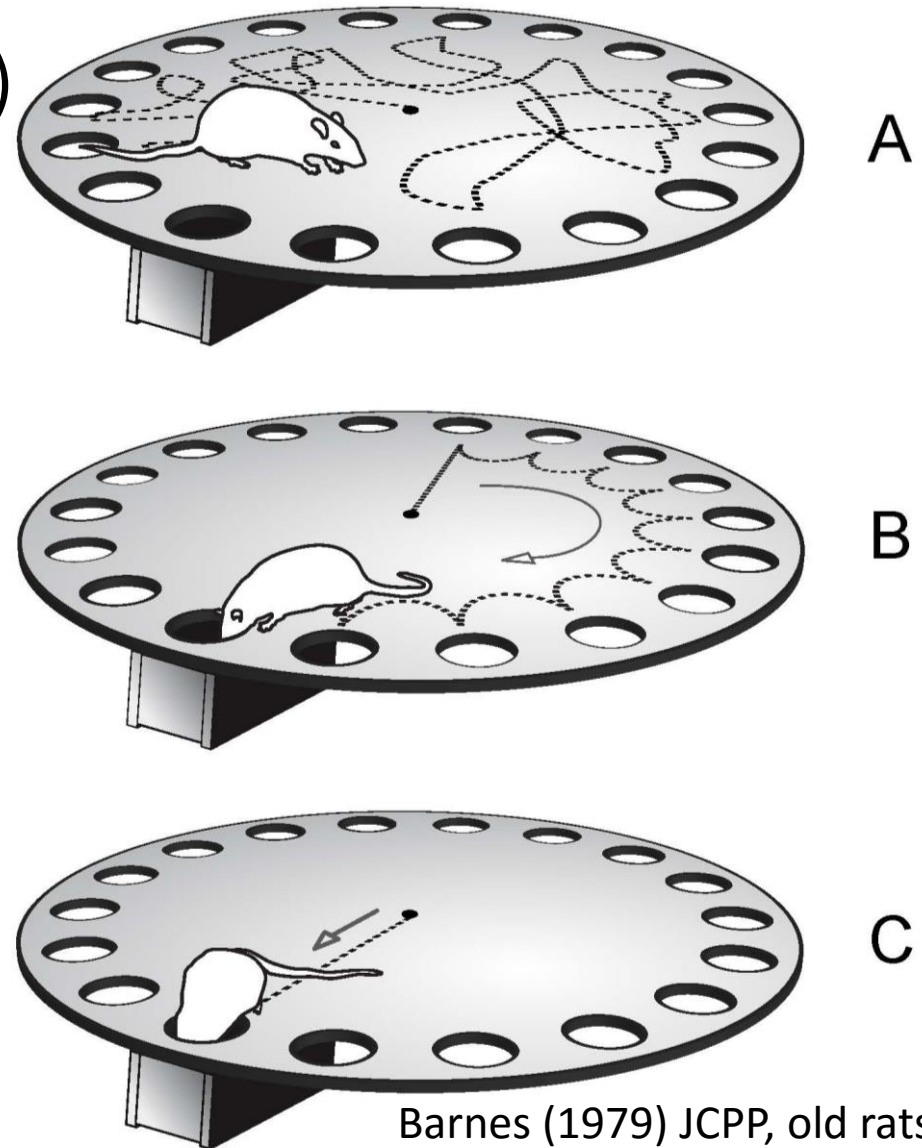
perirhinal cortex

➤ **Working Memory**

frontal cortex

Hippocampus-dependent cognition

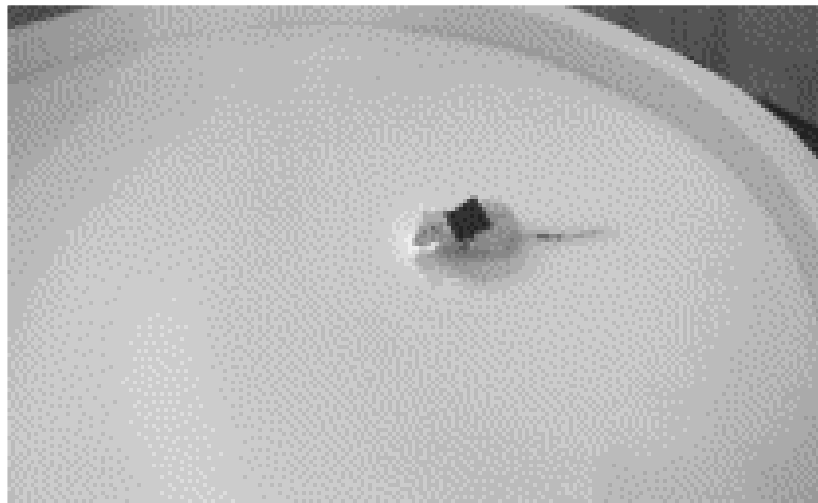
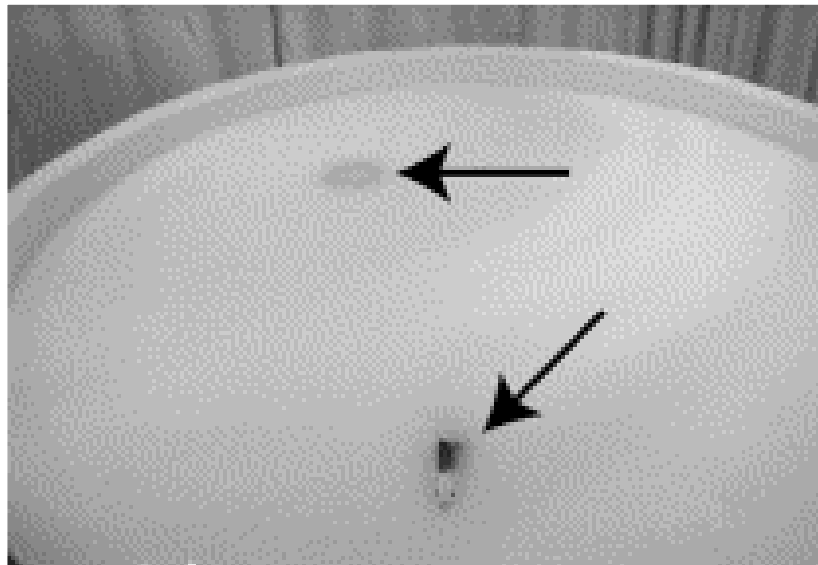
Circular Platform (Barnes Maze)



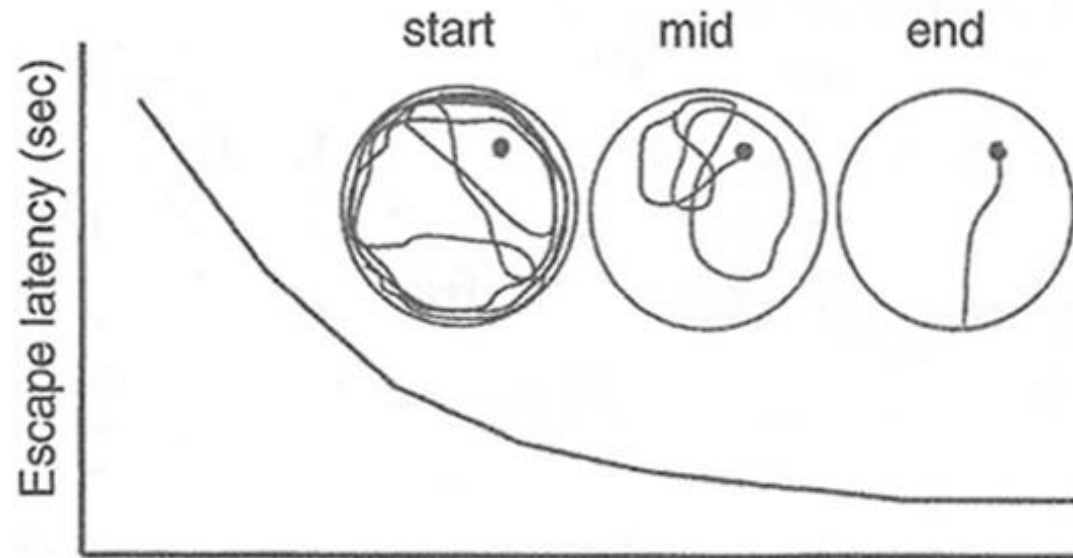
Barnes (1979) JCPP, old rats
Bach et al. (1999) , old mice

Hippocampus-dependent cognition

Morris Water Maze



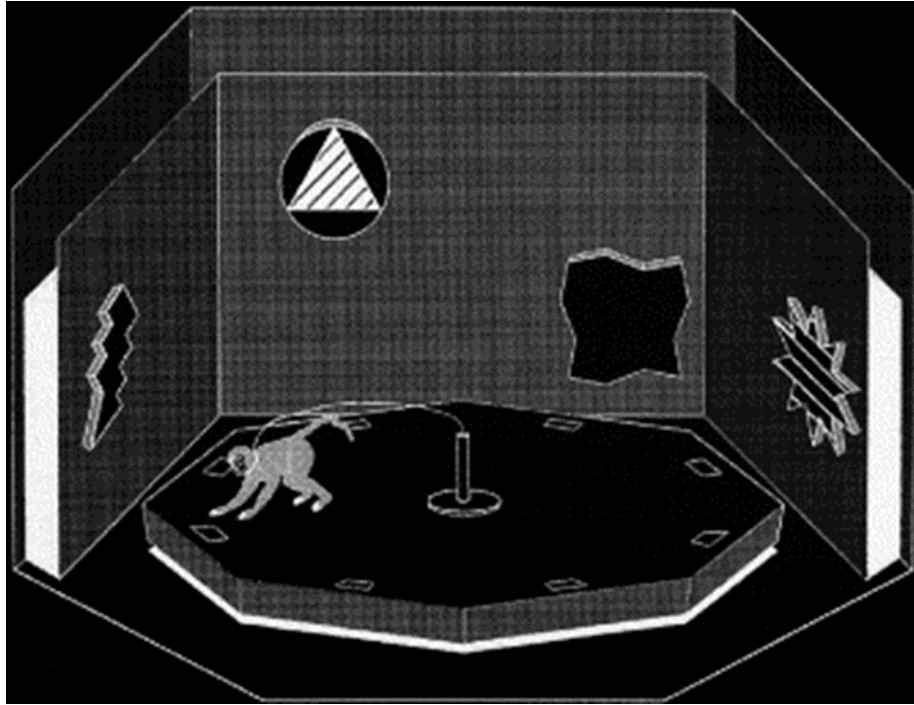
Paths and latency during place navigation



above from Morris (2015) The Maze Book

Morris et al. (1984), task
Gage et al. (1984,) old rats

Hippocampus-dependent cognition

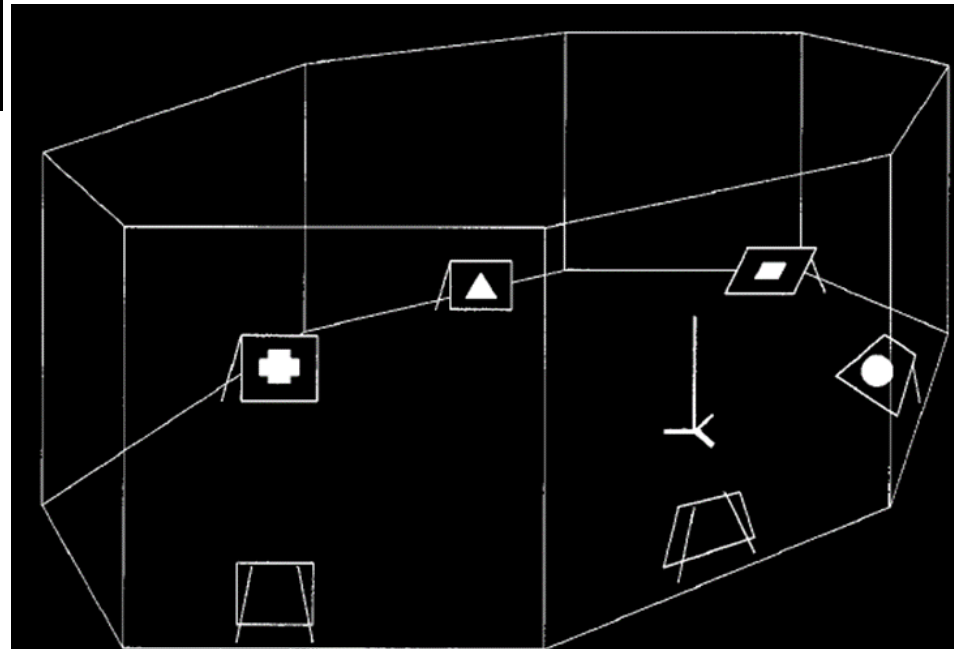


young versus old rhesus
macaques foraging for
food

Rapp et al., 1997

young vs older humans,
performance on a task
analogous to rodent spatial
memory tasks

Newman and Kaszniak, 2000



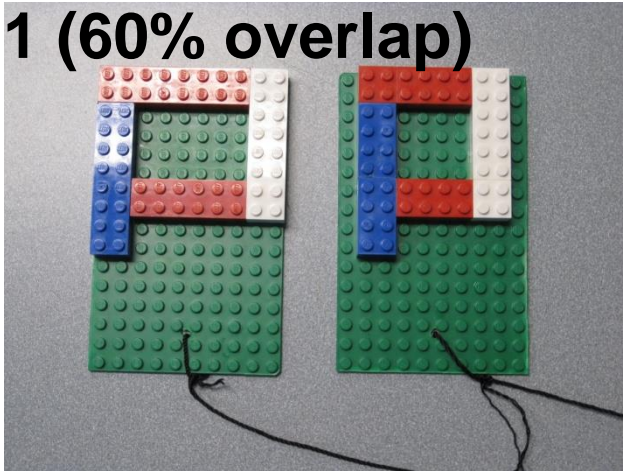
Perirhinal cortex-dependent cognition

Perirhinal cortex: necessary for accurate stimulus recognition

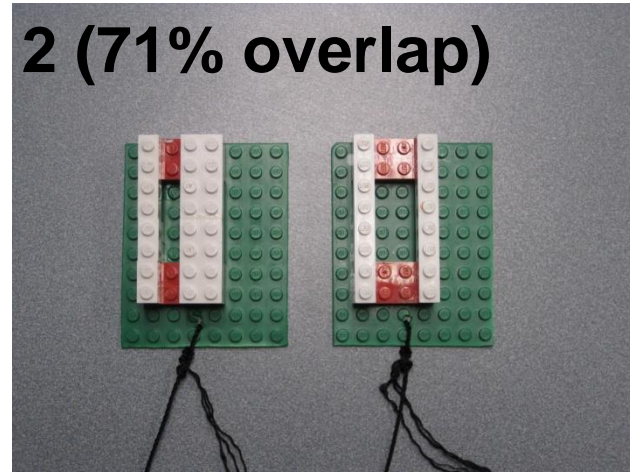
old rats and old bonnet macaques show
pattern separation deficits when objects
share similar features

Perirhinal cortex-dependent cognition

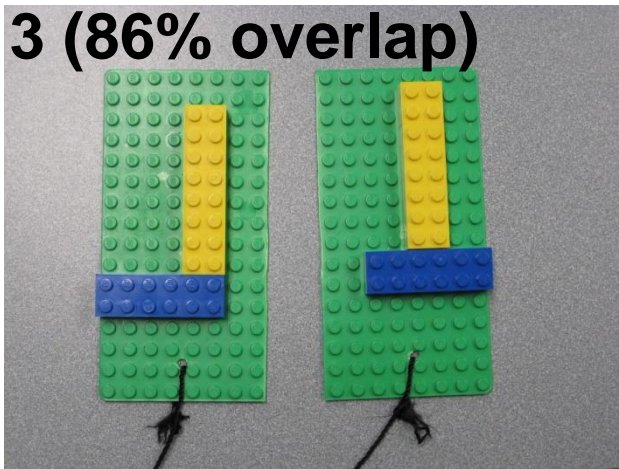
1 (60% overlap)



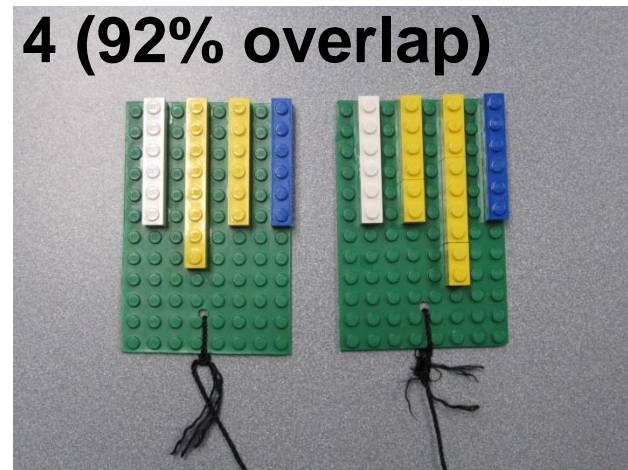
2 (71% overlap)



3 (86% overlap)

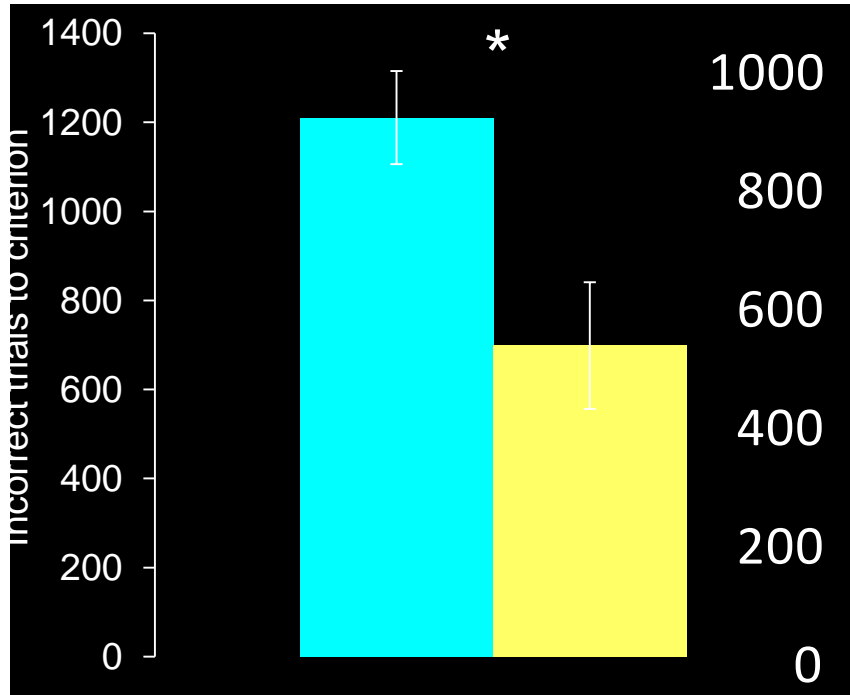


4 (92% overlap)



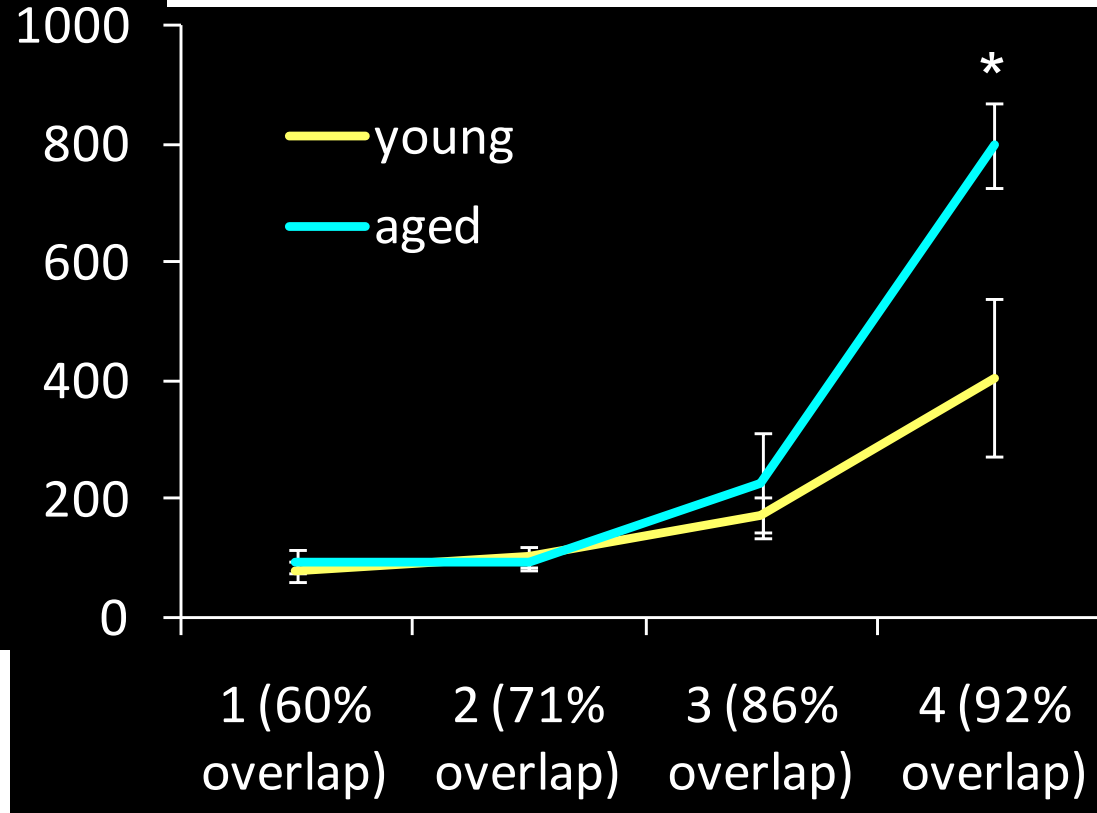
Lego discrimination task

Perirhinal cortex -dependent cognition



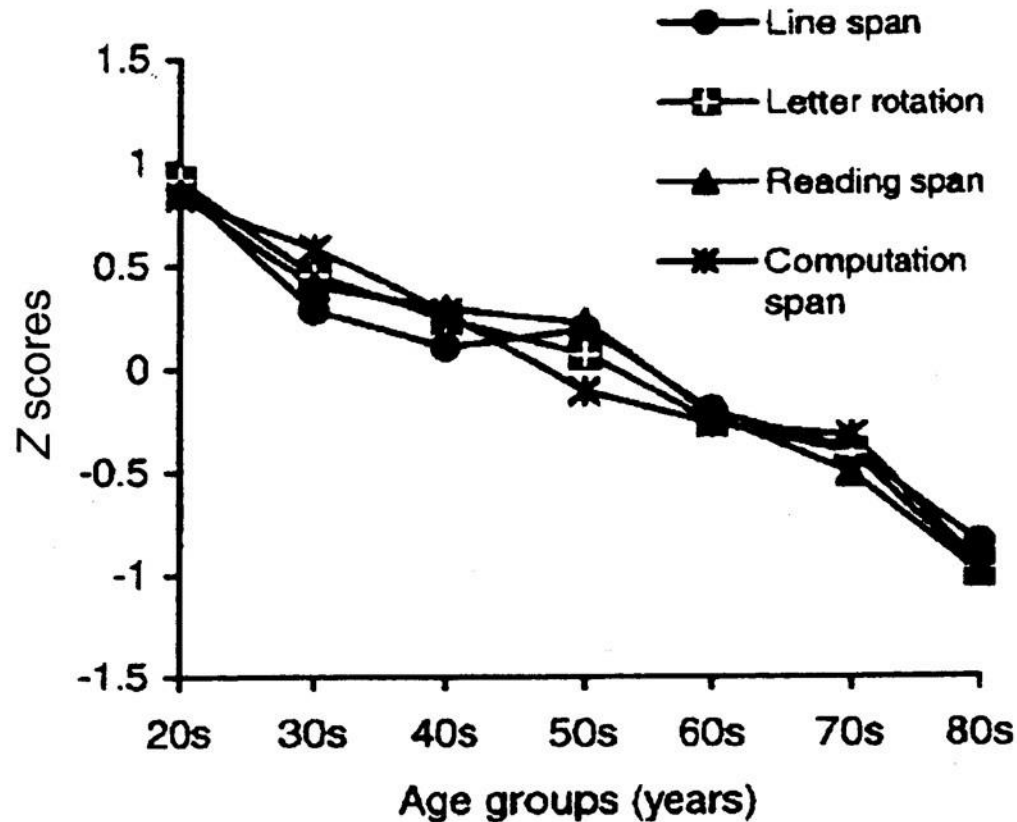
Aged Young

Lego Task



Frontal cortex-dependent cognition

Working Memory



Lifespan performance in frontal lobe-dependent tasks

Frontal cortex-dependent cognition



Radial 8-arm maze

In rats and mice, radial arm and other mazes using food or water motivation have been used to test working memory



Delayed Response Task

In monkeys, delayed response tests have been used to assess working memory

Knowledge Gaps

- cross-species validation of sensory changes [basic science]
- how do age-related changes in central sensory system function impact cognition in aging animal models
- cross-species validation of sensory impact on cognition [translational potential]

Research Opportunities

- rich hypotheses to be tested in experiments across species and across cognitive domains