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Areas of Investigation with Respect to Reserve and Resilience

- **Population Studied:** A total of 39 cognitively-normal older adults who were enrolled in the Synapse Study
- **METHODS**
  - 210 people participated in either a High Challenge Intervention Condition where participants actively engaged in new learning (quilting or photography) or a Low Challenge Condition where they engaged in social activities or a home-based placebo group with minimal new learning--all for 15 hours/week for 12 weeks.
  - 39 of 210 participants in the behavioral study received task-based functional MRI's at pretest and posttest where they performed a living/nonliving judgment task on items that were easy (book, dog) vs. hard (ghost, virus).
- **Question.** Could we find evidence for **neuroplasticity** using task-based fMRI? Did high challenge engagement improve ability to **modulate** brain activity to task difficulty when compared to low challenge? (McDonough et al., 2014)

Concepts Used In Research

Neuroplasticity → Change in brain structure or function in response to experience.

Brain Efficiency → Brain activity characterized by patterns typical of young adults, including high lateralization, lower activation in critical regions, and regional segregation (differentiation) of brain activations.

Brain Modulation → Ability to vary magnitude of brain activity in response to task demands (characteristic of brain efficiency).

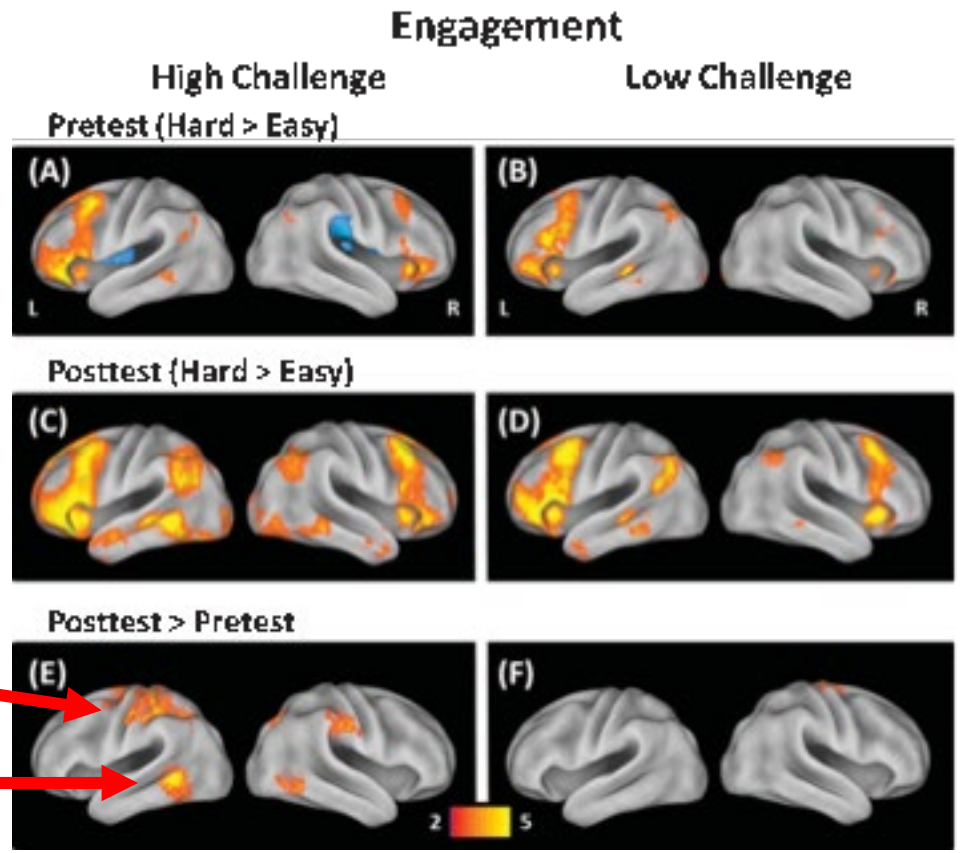
Brain Reserve → A pool of brain resources resulting from experience that can be stored and drawn upon with age to maintain or enhance cognitive function.

Example of Data that Address One Concept

Concept → Plasticity: Enhanced brain efficiency due to experience

Measure → Differences in brain modulation score (contrast of Hard minus Easy) between pretest and post-test.

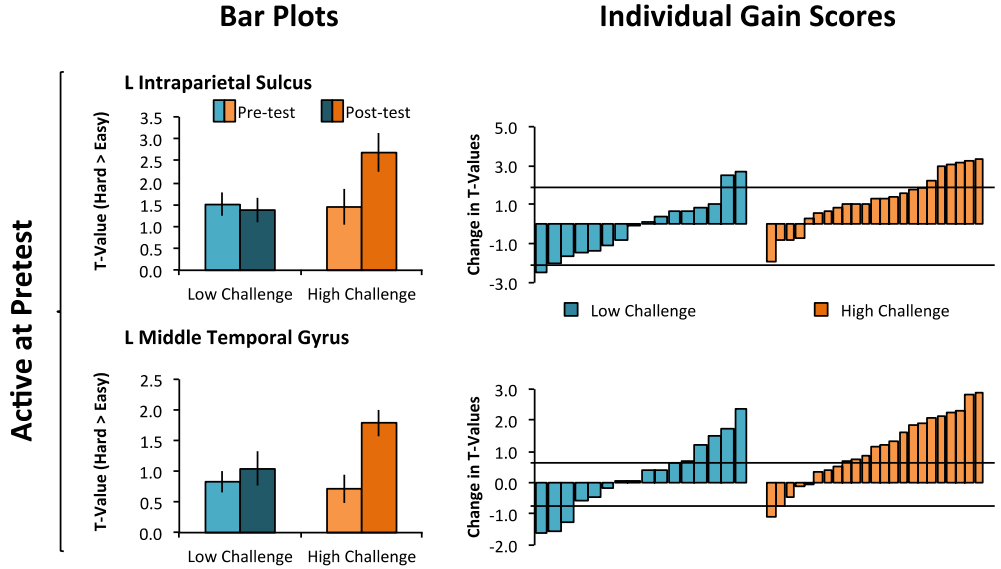
Operational definition→ Flexible deployment of brain activation to match task demands as they increase or decrease.



Regions with enhanced modulation

The High Challenge Group showed regions of increased modulation when Posttest was contrasted with Pretest, but the Low Challenge showed no difference.

The gain in **modulation** was characteristic of most participants.



Aging brain shows **neuroplasticity** as a result of challenging engagement and tentative evidence for development of **experience-based reserve**.