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http://www.oslobrains.no

# Areas of Investigation with Respect to Reserve and Resilience

- Population Studied:
  - Lifespan (ages 0-100 yrs),
  - Mainly healthy + persons with biomedical risk
  - Combined cross-sectional and longitudinal

- Methods:
  - Natural variation
  - Experimental interventions
  - MRI (structural, diffusion weighted, functional)
  - Experimental and standardized cognitive test paradigms, emphasis on episodic memory
  - Genetics
  - Registry data from different life stages

- Investigate how brain and cognition change throughout the lifespan
  - Aim to explain and promote cognitive function from birth to old age
  - Emphasis on timing of effects and early vs later life factors

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# Concepts Used In Research

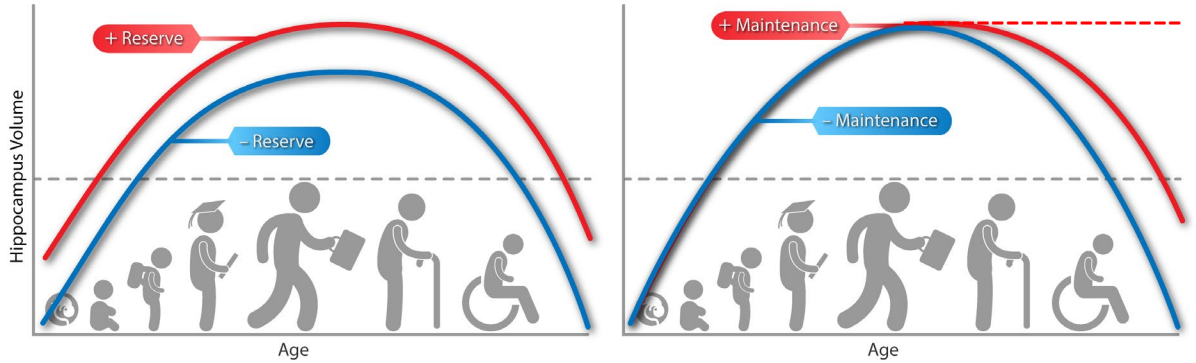
- **Neuroplasticity** → Change in brain structural brain characteristics with experience, i.e. learning, as opposed to maturation or aging. Changes are related to increase of cognitive performance by being observed only during training relative to period(s) of rest, or other control condition.
  - Note: relative absence of change w/ age in older adults can be observed with training; BM?

- **Brain Reserve (BR)** → Individual variation in structural brain characteristics that are related to cognitive function, and that hence in part will allow people to stay above a functional threshold for a longer part of life. Since the brain is made mostly in utero, BR is at least partly innate, and factors *affecting brain development will affect the development of BR.*

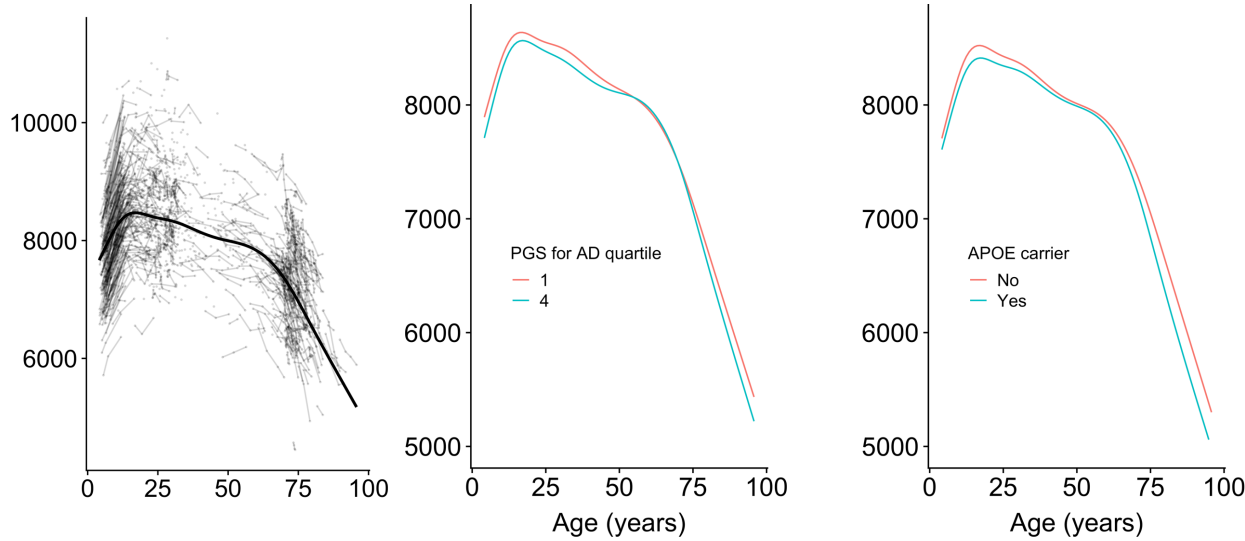
- **Brain Maintenance** (BM) → Individual variation of *change in brain characteristics with age*. Requires longitudinal measurement. Upholding brain structure and function (MRI) more similar to in younger adulthood associated w/ better performance/outcome at older age.

# Example of Data that Address One Concept

- Concept: Brain Reserve
- Example design that may dissociate Brain Reserve and Maintenance
- Measures: Polygenetic Score (PGS; IGAP) for risk for Alzheimer´s Disease, Apolipoprotein E (APOE) e4 status, MRI hippocampal volumes (HCV) and their change
- N = 1181 cognitively healthy 4-95 yrs of age; 2690 scans, followed for up to 11 yrs.




- Operational definition: effect of genetic risk for AD on HCV
  1. present throughout the lifespan, as an offset effect, for evidence that this affects brain reserve
  2. present as differences in slope, for evidence that this affects brain maintenance




- Results: significant (p <.05) negative effect on hippocampal volume of AD-PGS and *APOE* e4. Offset effects present in hippocampal development, differences in slope not consistently observed.

*http://biorxiv.org/cgi/content/short/711689v1*

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