

David Bartrés Faz, PhD

University of Barcelona



Areas of Investigation with Respect to Reserve and Resilience

- Population Studied: Healthy older adults, MCI-AD, cross sectional, longitudinal.
- Methods: Neuropsychology, Neuroimaging (MRI), non-invasive brain stimulation (TMS, tES)

TWO MAIN AREAS:

- Investigate how proxies of CR and engagement in different lifestyles relate to brain structure, function and cognitive performance in patients and controls, suggesting evidences of reserve and resilience.
- Experimentally modulate cortical plasticity mechanisms through the use of non-invasive brain stimulation to investigate how this predicts clinical/cognitive progression and relates to 'classical measures of reserve'.

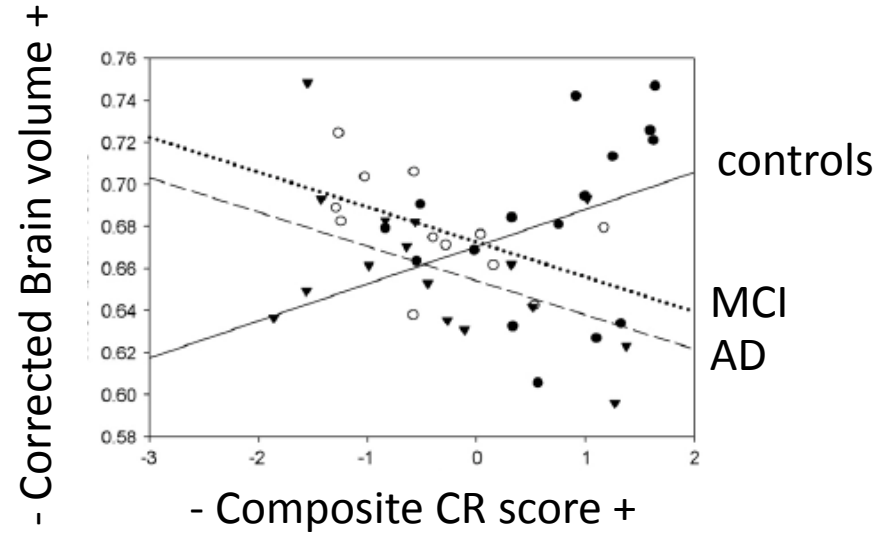
Concepts Used In Research

- **Reserve** → It is a brain characteristic (i.e. better structural configuration, more efficient functional brain or cognitive processing) with environmental and genetic determinants. Related to optimal cognitive performance (particularly in aging), as well as with high capacity to sustain better-than expected cognitive performance in the face of pathology (**resilience**). Classical measures of reserve (i.e. education) are not CR, they are common proxy indicators of this brain characteristic.
- **Compensation (mechanism)** → Within the context of reserve it is the capacity of the brain to functionally reorganize in the face of pathology or age-related changes to maintain performance. It might not be necessary linked to a common CR proxy. Broadly understood, it may be a dynamic process (i.e. in the face of sleep deprivation amongst younger individuals) and variable across individuals and cognitive tasks.
- **Brain Maintenance** The preservation of neural resources with age, and of a one-to-one association across time (longitudinal studies) between brain status and cognitive function, within the context of stability of this latter one (not applicable to cognitive decline).

Example of Data that Address One Concept

- **Concept:** Compensation
- **Operational definition:**

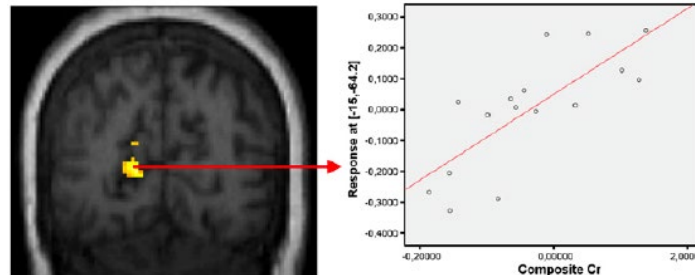
Changes in fMRI activity in AD and MCI patients as a function of a CR proxy that may explain better than expected cognitive status, in the face of brain atrophy.



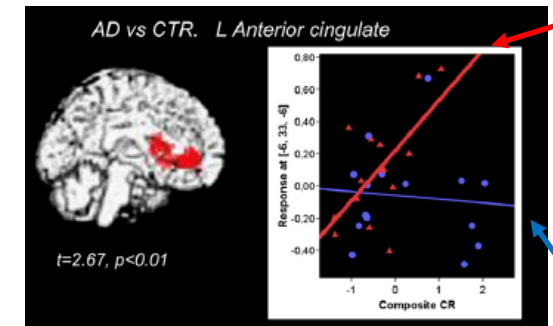
a) Greater brain atrophy amongst MCI and AD patients as composite CR proxy measure.

fMRI Visual encoding task

Alzheimer's disease



fMRI language task



AD

controls

b) Provided the same level of clinical and cognitive performance (adjusted), greater fMRI activity as a function of the composite CR proxy.