Effects of cognitive training in aging in MRI/fMRI studies
Hippocampus
brain area critical for learning and memory
especially vulnerable to damage
in early stages of dementia and Alzheimer’s disease

Credit: Alzheimer’s Association
Credit: Wikimedia Commons


Subjects
Mean age 61 years, subjective memory impairment (SMI, n=19), healthy controls (HC, n=42), groups: SMI-training, HC-training, HC-no training.

Training
8 weeks, 1/week, 90-min supervised class sessions (verbal recall memory), 5 weekly homework assignments (25-30 min).

Measures
One week before and after training (approx. 65 days apart).
Longitudinal increases in cortical volume in SMI- and HC-training groups following training.
Memory training was associated with increased hippocampal volume in HC-training group (but not in SMI-training)

**Subjects**
Aged 65-89 years, mild cognitive impairment (MCI), groups: training (n=55, n=38 fMRI), no training (n=58, n=25 fMRI).

**Training**
Multi-domain cognitive training + physical exercises + music therapy, classes of 7-10 subjects, 7 months, 3/week, cognitive training 2 x 60-min sessions, physical training 60 min in a gym, music therapy 1/week, film 1/month; cognitive sessions - stimulating acoustic and visual attention, various forms of memory, imagination, orientation, etc.

**Measures**
Before training (T0) and at the end of 7 months after training or usual life (T7).
Training maintained neural efficiency as measured by task-related fMRI

L MT, left middle temporal motion-related region; L IPS, left intraparietal sulcus; L PMC, left premotor cortex
Major functional networks in the human brain

Wakeful rest, internal self-reflective functioning, self-referential mental activity

Cognitively demanding activity, externally oriented attention


**Subjects**
Healthy adults, age 65-75 years, training group (n=23), no training group (n=17).

**Training**
Supervised multi-domain cognitive training, 3 months, 2/week, 60-min session; training targeted: memory, reasoning, problem-solving, handcraft-making, healthy living, etc.

**Measures**
Baseline before training and at 1 year after training ended (fMRI).
Resting-state functional connections within the three networks were increased or maintained after training (and decreased in the control group).
Conclusion
Multi-cognitive training in older adults can mitigate age-related structural and functional alternations in the brain, thereby helping to reduce or delay age-related cognitive decline, which in turn supports accomplishments of everyday tasks and independent living.

Credit: NeuroPlusBrainSupplement.org