The Science of Lifelong Learning

Schematic representation of the
• biological (individual learner),
• lifestyle (health and wellbeing) and
• psycho-socio-emotional and environmental (learner within the group) factors that interact with cognitive processes and learning across the lifespan

Goodwill & Chen (2021)
UNESCO ILL, Digital Library
What Changes as we Age?

Cognitive Performance

Fluid Intelligence
Crystallized Intelligence

Park & Reuter-Lorenz, Annu Rev Psychol, 2009

Figure 1
Cross-sectional aging data adapted from Park et al. (2002) showing behavioral performance on measures of speed of processing, working memory, long-term memory, and world knowledge. Almost all measures of cognitive function show decline with age, except world knowledge, which may even show some improvement.
Neuropsychological of Aging: Brain Structure

What Changes as we Age?

Structural Brain Volume

Brain regions that reduce in volume with age.

Brain regions with minimal reduction or stable volume with age.

Figure 2
Cross-sectional and longitudinal aging brain volumes across various brain regions (adapted from Raz et al., 2005). Each pair of line-connected dots represents an individual subject’s first and second measurement. The caudate, hippocampal, cerebellar, and frontal regions all show both cross-sectional and longitudinal reduction in volume with age. The entorhinal, parietal, temporal, and occipital regions are relatively preserved with age.

Science of Lifelong Learning: Neuropsychological Perspectives
Older adults (orange) preferred a direct connection from orthographic inputs (MFG) to phonological lexicons (dIFG) prior to the activation of semantic (vIFG) representations. The shift in reading pathways accompanied by slowed reaction time for the older adults → age-related decline in the efficiency of network connectivity.

Wu et al. (2014) Brain & Language

Miyakoshi, Chen et al (2012) Brain Imaging and Behavior

Archer et al (2016) Brain Connectivity

Red: greater connectivity with age
Blue: less connectivity with age

(n=210; 21-80yrs)

The influence from the anterior salience network to the right ECN increased in middle adults compared to younger adults.
Neuropsychological of Aging: Neuroplasticity

Flexibility

Plasticity

Amount

Childhood
Adulthood
Old age

Annu. Rev. Dev. Psychol. 1:197–222

Science of Lifelong Learning: Neuropsychological Perspectives
Benefits of Lifelong Learning: Cognition and Well-Being

**Cognition**
- Cognitive reserve
- Education

**Well-Being**
- Stress reduction
- Non-formal learning

Protective against
- Cognitive Decline

**Lifelong Learning**

*Education* is associated with greater neural recruitment, thus greater task activation and better task performance even in the face of neural deterioration (*Archer et al., 2018*).

*Education* has an enduring, consistent, and growing effect on health (*Mirowsky & Roth, 2003*).

*Education* is a powerful determinant of health and longevity (*Baker et al., 2011*).
“To grow gracefully with success in age, we need to learn for life
- And that is Lifelong Learning!

SH Annabel Chen
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Thank you / Merci!

Learn more / En savoir plus


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