The Aging Mind & Brain: Implications for Language Learning

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Conclusions

• Aging changes many, but not all, aspects of mind & brain
• Changes vary widely across people, and are partially under individual’s control
• None present major impediments to language learning
• But taking changes into account can inform learning & teaching
Aging Mind & Brain

• Snapshots of the Aging Mind & Brain
  – What changes and what doesn’t?
  – People differ
  – Compensation
  – Lifestyle matters, e.g.,
    • Exercise
    • Bilingualism

• Maximizing learning & memory
Different Patterns of Change

- Gradual across adult years
- Some functions spared

Adapted from Park & Gutchess,
*Current Directions in Psychological Science*, 2006
The Iceberg of Learning & Memory

Theodule Ribot (1882) *Diseases of Memory*

Learning Vocabulary

“Psychological Memory”
Explicit
Declarative
Conscious & Intentional

Learning Syntax

“Biological Memory”
Implicit
Procedural
Non-conscious & Unintentional

Theodule Ribot (1882) *Diseases of Memory*
Memory systems of the brain: A brief history and current perspective

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Minireview

Age Impairs

Iceberg’s Tip

Age Spares (Some of These)

Iceberg’s Body
Implicit Memory for Word Pairs is Spared

Study: hamper-dragon
Test: hamper-dra____ ?

Based on Howard, Fry, & Brune,

*Journal of Experimental Psychology: Learning, Memory & Cognition*, 1991
• What is spared?
  – Some forms of implicit learning & memory
  – Vocabulary & World knowledge
  – Emotional regulation

• What declines?
  – Declarative/explicit learning
  – Speed
  – Executive control /Working memory capacity

  – BUT EVEN HERE. . . . . People Differ
People Differ . . . Variability

Processing Speed

*Figure 1.* Relation between age and a composite measure of processing speed (data from Salthouse, 1993b, Study 1).

Salthouse, *Psychological Review*, 1996
People Differ . . . Variability

Prefrontal Cortex Volume

From Cabeza, *Handbook of Functional Neuroimaging of Cognition*, 2001; Data from Raz et al 1997
Compensation Occurs

Study word pairs (outside scanner): tree – lawyer

Test (while scanning): Tree-

(Cabeza, Psychology & Aging, 2002)
Lifestyle Matters: Exercise

Aerobic vs. Non-aerobic:
- **Blue regions:** Gray matter volume increased
- **Yellow regions:** White matter volume increased

From Colcombe, Erickson... Kramer,
*Journals of Gerontology: Medical Science*, 2006
Lifestyle Matters: Exercise

From Hillman, Erickson, & Kramer, *Nature Reviews Neuroscience*, 2008 meta-analysis
Lifestyle Matters: Bilingualism

Failure of Executive Control

Bialystok, Craik, Klein, & Viswanathan, *Psychology & Aging*, 2004
Good News & Bad News

• Some functions impaired, but others spared
• People differ—much overlap across ages
• Compensation is possible, common
• Lifestyle matters--examples
  • Exercise (well established)
  • Bilingualism
Aging Mind & Brain

• Snapshots of the Aging Mind & Brain

• Maximizing learning & memory
  – Time of day matters
  – Attitude matters (stereotype activation)
Time of Day Effects: Declarative Memory

From May, Hasher, & Stoltzfus, *Psychological Science*, 1993
Time of Day Effects: Procedural Learning

Older Adults

Amount of Learning

Epoch

Harris, Negash, Howard, & Howard, *Cognitive Neuroscience Society Meetings*, 2003
Attitude Matters

• Stereotype Activation
• Subliminally prime with either:
  – Positive primes: \textit{sage, learned, wise}
  – Negative primes: \textit{dependent, confused, slow}
Stereotype Activation
Declarative Memory

From Hess, Hinson, & Statham, *Psychology & Aging*, 2004
Stereotype Activation
Procedural Learning

From Ari, Filak, Howard, Howard, & Hess,
*Association for Psychological Science Meetings*, 2006
Implications

• Aging changes the mind & brain
  • But not drastically & not all components
• Some means of maximizing learning same for all ages
  • Mnemonics
  • Spaced retrieval
• Awareness of differences can inform learning & teaching, e.g.,
  • Time of day
  • Attitudes of teacher and learner