**ATTENTION AND MEMORY OVERVIEW**

CHAPTER 6

**THEORIES FOR AGE DIFFERENCES IN COGNITION**

- Speed of processing or General slowing hypothesis
  - Reduction in speed of processing (RT decline)
  - Cause: changes in neuronal connections or information loss
- Processing resources hypothesis
  - Limit in attentional resources
  - Expect larger age differences on complex tasks
  - Not clearly defined: Why is there capacity decline?
- Inhibition hypothesis
  - Irrelevant information takes up capacity
- Attentional resources hypothesis
  - Age effects depend on task complexity and practice
  - Automatic vs. effortful processing – effect on capacity
- But…Cohort confound: cross-sectional studies

**DEFINITIONS OF ATTENTION**

- Requires effort or resources
  - The mental process of concentrating effort on a stimulus or a mental event.
- A limited mental resource
  - The limited mental energy or resource that powers the mental system.
- Involuntary or voluntary
  - Stimulus-driven or implicit or exogenous or automatic
  - Goal-driven or explicit or endogenous or controlled
- Many forms of attention…

**HOW DO COGNITIVE PROCESSES CHANGE WITH AGE?**

- Perception, attention, memory, language, deciding, … thinking...
- Salthouse (2004), What and when of cognitive aging.
- What are the changes in memory as we age?
  - What are the different types of attention/memory that change?
  - What are the (practical) implications of changes?
- When do the changes take place?
  - What are the age trajectories?
- Why do the changes take place?
  - What is responsible for the change?
- Where do the changes take place?
  - Where in the brain?
- How do the changes take place?
  - What is the mechanism responsible?

**AN INFORMATION PROCESSING MODEL**

- Information is processed through series of stages
- Examine which stage is affected by aging process

**CONTROLLED ATTENTION**

- Deliberate, voluntary allocation of attention
- Selective attention
  - Attend to one source, ignore or filter distractions
  - Tasks: Stroop, visual search, spatial cueing
- Divided attention
  - Attend to multiple tasks simultaneously
  - Tasks: Dual-tasks, Walk & Talk, span tasks
  - Real world task: Driving
- Sustained attention
  - Maintain attention over time
  - Vigilance performance: accuracy to detect target
  - Vigilance decrement: decrease in performance over time
STROOP TEST
SAY THE COLOR OF THE STIMULUS

GLPD XTPB RSLJ ZMQ
BAR ROD CUT HEAD
RED BLUE GREEN BROWN
BLUE BROWN RED GREEN

STROOP

- Stroop (1935)
  - Congruent (same word/color): 63s/100 items
  - Incongruent (diff word/color): 110s/100 items
  - Measure interference: Reaction time or errors
- Explanation for Stroop effect?
  - Automatic processing (reading) interferes with controlled processing (name color)
  - Selective attention
- Other examples
  - 333 4444 22 333 4444
  - 33 222 44 2222 44

WEST (2004)

Aging and the Stroop effect
Larger interference effect in time and accuracy for Stroop effect with age

VERHAEGHEN & DE MEERSMAN (1998)
AGING AND THE STROOP EFFECT: A META-ANALYSIS

Stroop; not age-sensitive; differences are due to just a general age effect (e.g. general slowing)
OlderRT = YngRT*1.8

VISUAL SEARCH
FIND THE “T”

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Feature search

Conjunction search

VISUAL SEARCH
- Feature search:
  - RT not affected by increase in # distractors
  - Pop-out effect
- Conjunction search:
  - RT increased as the # of distractors increased
  - Focused attention search

SCIALFA, JENKINS, HAMALUK, & SKALOUD (2000)
- Older adults slower overall
- No age-specific deficit in visual search

KRAY & LINDENBERGER (2000)
- Task switching method

GENERAL SWITCH COSTS
- Score is difference between having 2 sets of instructions versus 1 set of instructions
- Young: open circle
- Middle aged: solid circle
- Older: Solid triangles
- Age diffs on figure and word conditions

SPECIFIC SWITCH COSTS
- Score is difference between switch trials and non-switch trials (for task where you have 2 sets of directions)
- Young: open circle
- Middle aged: solid circle
- Older: Solid triangles
- No age diffs

TA= target absent
TP=target present
Y=younger adults
O=older adults

TRANSITION COSTS

Computer screen with successive geometric figures

Task Set A: Classifying Figures

Task Set B: Classifying ‘Color’

△ left button right button □
VERHAEGHEN, STEITZ, SLIWINSKI, & CERELLA (2003). AGING AND DUAL-TASK PERFORMANCE: A META-ANALYSIS

- Older adults are slowed beyond what would be predicted by general slowing on dual-tasks
- May be dependent on the type of combinations of tasks (e.g., similarity)
- Depends on task complexity and practice

ATTENTIONAL BLINK

- Attention functions differently in older vs. younger adults

ATTENTIONAL BLINK

- General loss of attentional resources—deficit for single and dual-task versions

AUTOMATIC VS. CONTROLLED PROCESSING

- Automatic processing
  - Requires little attentional demand
  - Task can become automatic through practice
  - Little or no age differences when automatic task
- Controlled processing
  - Requires attentional capacity
  - Effortful processing
  - Larger age differences when effortful task

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MEMORY

- Memory performance depends on three stages
  - Encoding: learning
  - Storage: retention
  - Retrieval: finding information when needed
  - Tip-of-tongue experience
- Code of information in memory
  - Verbal (acoustic)
  - Visual-spatial (picture)
  - Semantic (meaning)
Working Memory

- Autobiographical
- Prospective
- Other types: source memory, false memory, meta-memory, memory for discourse, memory for pictures, everyday memory, recent vs. remote LTM ...

MEMORY DISSOCIATIONS

- Short-term memory vs. working memory vs. long-term memory
- Pure storage vs. storage plus processing
- Semantic vs. episodic memory
- Knowledge vs specific learned event
- Vocab test vs list recall test
- Implicit vs. explicit memory
- Effortful and conscious recollection vs memory without awareness
- Recognition test (multiple choice) vs perceptual identification

Salthouse (2004)

What and When of Cognitive Aging

YOU WILL SEE ONE NUMBER AT A TIME. WHEN I SAY “GO”, WRITE DOWN THE NUMBERS IN THE ORDER YOU SAW THEM.

5
2
9
1
4
8
7
3
6

MEMORY SPAN

- Measure of capacity of Short-Term Memory
- General method
  - Present increasing number of stimuli to repeat
  - 2 or 3 trials for each length
  - Increase to next length if 1 correct
  - Stop test when all trials are wrong
  - “Span” is longest string of stimuli can successfully reproduce
- Tasks
  - Forward digit span
  - Verbal: Alphabet span, Word span
  - Visuo-spatial: Picture span, Location span (“corsi blocks”)
  - Reordering: Backward digit span

WORKING MEMORY TASK: OPERATION SPAN

- Respond Y or N if math is correct; then remember the word
  - Is (6 x 2) - 2 = 10? BEAR
  - Is (3 x 4) - 4 = 9? SPOT
  - Is (5 x 4) - 4 = 19? TRAIL
  - Is (3 x 6) - 2 = 16? LOW
  - Is (4 x 2) - 1 = 6? TEAR
  - Is (3 x 3) - 3 = 5? GOOD
- Recall the words
  - BEAR, SPOT, TRAIL, LOW, TEAR, GOOD
BOPP & VERHAEGHEN (2005): META-ANALYSIS OF SPAN TASKS

Short-term memory (STM): Forward span
Backward Span (BS)
Working memory (WM)

Greater age-related decline on WM span tasks compared to STM span tasks

READ PAIRS

- BALANCE – CHAIR
- MOLD – BREAD
- KIND – STICK
- RIPE – APPLE
- DELICATE – FRAGILE
- COVERING – BLANKET
- KNEE – BEND
- JAIL – STRANGE
- BED – SHEET
- DRYER – BLOCK
- TABLE – WOOD
- CUP – MOVIE
- DOOR - BOOK

MEMORY TESTS

Explicit tests
- Free recall
- Paired-associate recall
- Recognition

Implicit tests
- Stem-completion (answer is first word that comes to mind)
- Perceptual identification (word is flashed, just identify it)

WARRINGTON & WEISKRANTZ (1970)

READ THESE NON-FAMOUS NAMES

- Valerie Marsh
- Sebastian Weisdorf
- Linda Whalen
- Adrian Marr
- Lucca Richards
- Daniel Tucker
- Harold Evans
- Kylie Shea
- Charlie McFadden

- White Graham
- Simon Hodges
- Adam Barnier
- Marilyn Lipsius
- Amanda Robbins
- Tyler Anastasio
- Kemp Bundy
- Pat Ward
- Akira Miyake

FAMOUS OR NON-FAMOUS?

- Don Imus
- Lucca Richards
- Minnie Pearl
- Sebastian Weisdorf
- Valerie Marsh
- Bonnie Blair
- Tim Robbins
- Daniel Tucker
- Harold Evans
- Roger Clemens
- Charlie McFadden
- Linda Whalen
- Pierce Brosnan
- Adrian Marr
- Chris Rock
- Jon Secada
- White Graham
- Simon Hodges
- Adam Barnier
- Marilyn Lipsius
- Amanda Robbins
- Tyler Anastasio
- Kemp Bundy
- Pat Ward
- Akira Miyake

Jacoby, et al. (1989)

Probability judge as famous:
- New famous: 63%
- New nonfamous: 32%
- Old nonfamous: 38%
**Ironic Effects of Implicit Memory**

- False fame effect
  - Mistakenly identify non-famous name from study phase as famous at test phase
  - Study phase exposure increases familiarity
  - Older adults: implicit memory intact and explicit deficit so required to rely on familiarity
- Explicit and implicit memory can work together for better memory
  - Or can work against each other to create errors

**How Do Cognitive Processes Change With Age?**

- It depends...
- Depends on type of task
  - Type of cognitive process used
- Depends on type of information being tested
- Depends on how much practice
- Depends on capacity available
- Depends on ability to allocate resources
- Depends on strategies and beliefs about ability
- Depends on time of day tested
- And so on...

**Episodic and Semantic Memory**

- Ronnlund, Nyberg, & Backman (2005)

- Cross-sectional (Education adjusted)
- Longitudinal (Practice adjusted)

**Why? Sources of Age Differences in Memory**

- General slowing / Speed of processing
  - 1.5 to 1.7 times slower than younger adults
  - Each operation on memory info takes longer so...
  - Info decays or not encoded
- Processing resources
  - Encoding deficit – poor use of strategies (e.g. rehearsal)
  - Controlled (vs automatic) retrieval deficit – use familiarity not recollection
- Inhibition theory
  - Irrelevant information takes up processing resources
- Retrieval deficit
  - Accessibility of Information (TOT)
  - Source memory deficit
- Working memory or executive function deficit
  - How much info we can simultaneously store and manipulate declines
  - Degraded information or info only partially integrated into LTM