PSYC 336
Developmental Psychology II

Session 1 – Ageing and memory

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Session Overview

- Memory is a significant aspect of our daily lives and helps us to store significant information for future use and retrieve stored information when needed. This session will focus on the types of memory and how ageing affects the memory process. Also, strategies for resisting ageing effects will be highlighted.

Session Outline

The key topics to be covered in the session are as follows:

- Introduction and the working memory
- Long-term memory
- Strategies for resisting ageing effects
- Theories of age-related changes in memory

Reading List

- Read Chapter 7 of Recommended Text – Adult development and aging, Cavanaugh & Blanchard-Fields (2006).

Topic One

INTRODUCTION AND THE WORKING MEMORY

Introduction

- Memory researchers have long focused on three general steps in memory processing as potential sources of age differences:
  - encoding, storage, and retrieval (Smith, 1996)
- Components of memory
  - Short-term memory: short-term capacity and working memory
  - Long-term memory

Memory as we age

- An irony – comparing our own current memory with our past memory requires memory.
- People are less able to accurately report memory lapses as they age (Sunderland et al.,1986)
- Complaints about memory in the elderly are more related to depression than actual memory performance (Rabbit & Abson, 1990)
- Impaired memory is the earliest and best predictor of the onset of Alzheimer's disease.

Working memory

- **Working memory** is the active processes and structures involved in holding information in mind and simultaneously using that information,
  - sometimes in conjunction with incoming information, to solve a problem, make a decision, or learn new information (Zacks et al., 2000)
- Storage of information for additional processing into long-term memory system
- Temporal storage during retrieval
- Has relatively small capacity compared to sensory memory
  - Need action to keep information (rehearsal)

Working memory (WM) and aging

- WM span progressively declines with age
  - But it is a very small decline
  - Effects are larger when tasks involve speed of processing or episodic, long-term memory
- The WM decline may be due to a build up of interference that older adults are less able to inhibit (May et al., 1999)

Working memory (WM) and aging

- Hasher and Zacks' (1988**) Inhibition Deficit Hypothesis of Aging**:
  - A major cognitive effect of aging is the **reduced capacity to inhibit irrelevant stimuli**
- Molander and Bäckman (1989):
  - *Participants & Task*:
    - Older and younger mini-golf players, matched in skill
    - Make golf shots
  - *Results*:
    - Concentration (measured by heart-rate deceleration) increased in the younger adults under competition conditions and performance was maintained, in contrast to a decline in performance in the elderly.
    - In another study, Bäckman and Molander (1986) showed that competition decreased the accurate recall of specific shots, and increased irrelevant recall in the older golfers, but did not influence recall in the young.
  - *Conclusion:*
    - Older adults are less able to shut out potential distractors.

Topic Two

LONG-TERM MEMORY

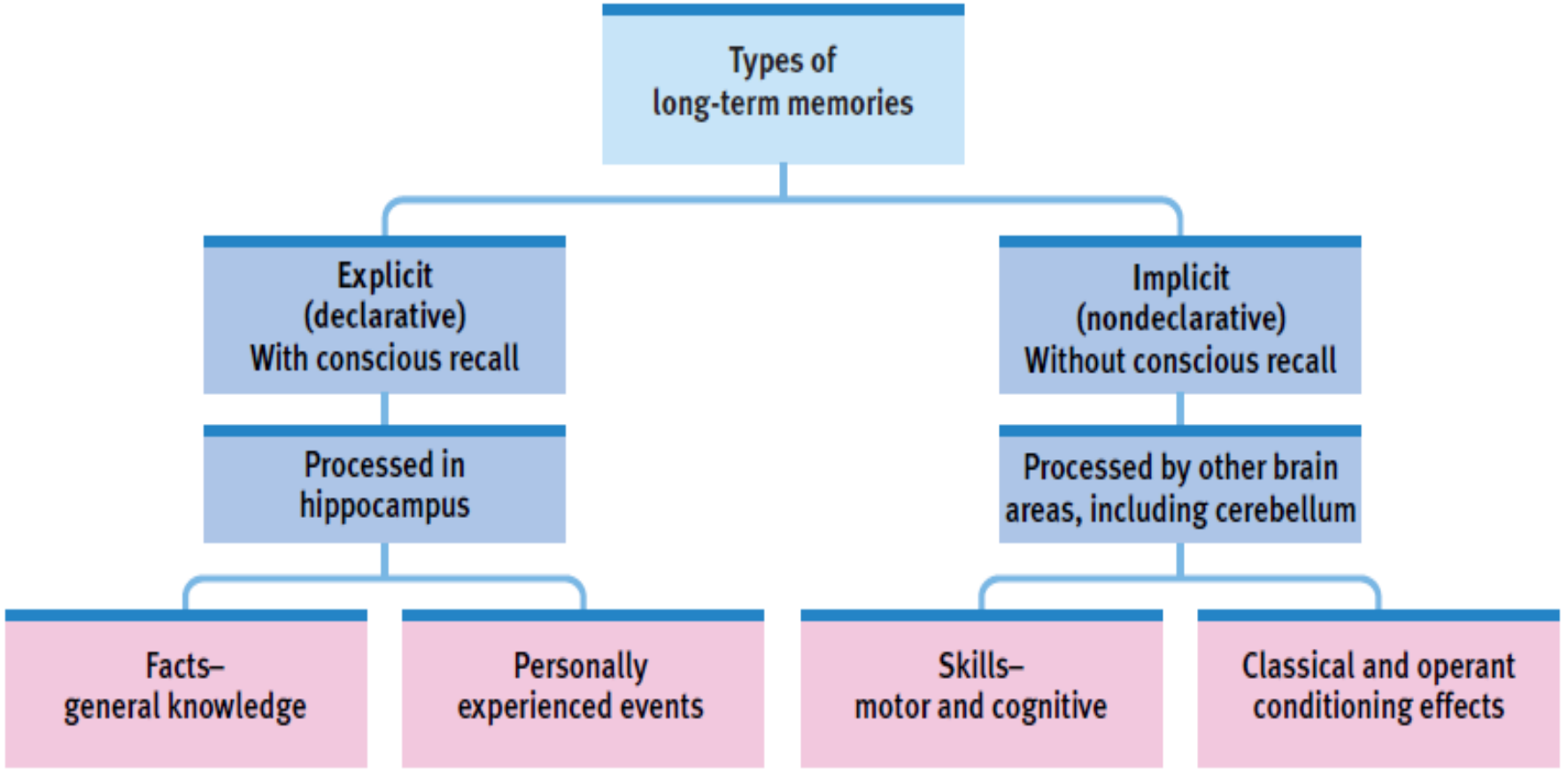
Long-term memory

- LTM is the ability to remember rather **extensive amounts of information** from a few seconds to a few hours to decades.
- Research has shown that LTM has relatively large-capacity store in which information can be kept for long periods
- Consists of **distinct multiple systems** (Gabrieli, 1998) that are **functionally different** and are **served by different brain structures**
- **Explicit memory: deliberate and conscious** remembering of information that is learned and remembered at a specific point in time
  - Episodic and semantic

Long-term memory

- **Episodic memory:** general class of memory having to do with the **conscious recollection** of information from a **specific event or point in time**.
  - E.g., learning the content of this course for exams
- **Semantic memory** concerns learning and remembering the **meaning of words and concepts** that may **not be tied to specific occurrences of events in time**.
  - E.g., definitions of words
- **Implicit memory**: involves retrieval of information **without conscious recollection**

Types of long-term memories



Aging and Episodic Memory

- Episodic memory declines steadily through the adult years, across the board:
  - Recall and recollection tests
  - Verbal and visual materials
  - Everyday memory situations
  - Doors and People Test (people's names, locations)
  - Memorizing passages
  - Memory for conversations
- The magnitude of the decline depends on the nature of the task and the method of testing (recall vs recognition).

Declines in Episodic Memory

- **Modulating Factors (Craik, 2005)**
- The overall decline in episodic memory is modulated by:
  - *Processing capacity* of the learner
    - Elderly take longer to perceive and process materials
    - Elderly are less likely to develop and use complex learning strategies
  - Level of *environmental support* provided during retrieval
    - Age effects are largest in tests lacking external cues (e.g. free recall)

Declines in Episodic Memory

- **Limited Attention or Capacity?**
- Naveh-Benjamin (2000)
  - *Task*:
    - A recognition test for word pairs that were either semantically related or not
  - *Results*:
    - The older group had difficulty for unrelated items, but not for related
  - *Initial Conclusion*:
    - Elderly are less able to form new associative links

Declines in Episodic Memory

- *Follow-up* (Naveh-Benjamin et al., 2003):
  - Gave younger group a concurrent task, which resulted in impairment for both related and unrelated items—
  - this didn't match the elderly group's results –
  - so it isn't that the elderly are just slower at processing information.
- *Final Conclusion*:
  - **Associative Deficit Hypothesis**: The differences between young and old are attributable to ***basic learning capacity***, rather than to attentional or strategic differences related to processing speed.

Declines in Episodic Memory

- **Associative Deficit Hypothesis**
- An age-related difficulty in binding together unrelated things
  - Simply recognizing old faces or names is unaffected by age
    - However, a concurrent task does reduce performance
  - Recalling which name went with a face, *is* diminished in the elderly, as this requires binding
    - This decline is even more pronounced in the divided-attention condition
- **Self-Performed Task Effect**:
  - Age effects are minimized by asking elderly to perform an action associated with a to-be-remembered item
    - This deepens encoding, providing auditory, visual, manual, and self-related codes for the memory

Declines in Episodic Memory

- **Level of Environmental Support at Retrieval**
- Age effects are clearest in **recall tests**, which lack external cues, while **recognition** tends to be relatively preserved in the elderly.
    - This difference may reflect a combination of:
        - Fewer retrieval cues in the recall task
        - A greater involvement of association in free recall
    - Whether recognition is impaired or not depends on the nature of the task:
        - If familiarity ("knowing") is sufficient—no deficit
        - If recollection ("remembering") is necessary—some impairment

Declines in Episodic Memory

- **Prospective Memory in the Laboratory**
- **Prospective Memory**: Remembering to carry out an intended action in the future without explicit reminders
  - *Test*:
    - Participants perform an ongoing task and respond either
      - After a specified time
      - After a cue occurs
  - *Results*:
    - An age-related decrement for both time-based and event-based tasks

Declines in Episodic Memory

- Prospective memory requires:
  - Encoding the action to be performed
  - Encoding the time when it should be performed
  - Maintaining the information over a delay
    - More difficult in real-life situations with divided attention
    - Through rehearsal and/or periodic retrieval from LTM
      - An external retrieval cue helps
  - Actually performing the task when appropriate

Declines in Episodic Memory

- **Prospective Memory in Real Life**
- Unlike laboratory situations, in real-life prospective memory scenarios, the elderly often perform *better* than younger adults.
  - *Example Tasks*:
    - Ask participants to make a telephone call or send a postcard at a specified time.
  - *Rationale*:
    - Older people are more aware of their memory limitations and compensate with various strategies, such as:
      - Diaries
      - Reminders
    - Older people live more ordered and structured lives, making it easier to form plans.
    - Older people may have been more motivated to perform well on a memory task; younger people can explain memory slips by "being too busy".

Semantic Memory and Aging

- In the **absence of disease**, semantic memory **does not decline** with age
  - It **actually expands with age** in some areas:
    - Vocabulary
    - Historical facts
  - Speed of access (a more sensitive measure) does decline, however.
    - illustrated in word-finding deficits
    - Older adults typically have more trouble retrieving a target word when presented with a definition of the word, and they tend to encounter more "**tip-of the-tongue**" experiences

Implicit Learning and Memory

- Results are mixed, due to the wide range of implicit processes
  - Moderately impaired with advanced age:
    - Priming tasks involving response production (e.g. stem completion)
  - Small/no impairment in the elderly:
    - Identification tasks (e.g. lexical decision)

Implicit Learning and Memory

- Stronger implicit effects in the elderly
  - **False Fame Effect**:
    - Participants first see unfamiliar names
    - Then are asked to mark names that are famous
    - Previously processed, unfamiliar names are judged as more famous
      - Especially true for elderly participants
        - » Due to impaired recollection, forcing them to rely on familiarity
  - The elderly may be more susceptible to false information and leading questions

Implicit Learning and Memory

- **Motor Skills**
- Motor *performance* declines with age
  - Speed of perception and movement decline
    - Leads to slower learning rate on time-based tasks
  - However, young and old adults show comparable rates when learning:
    - A sequence of motor movements
    - To navigate a computer maze

Implicit Learning and Memory

- Generally:
  - When the response is obvious and performance is measured in terms of speed improvements
    - The elderly perform well
  - When the response is non-obvious, novel associations must be learned
    - Older adults are impaired
      - This is often the case for learning about new technologies

Topic Three

STRATEGIES FOR RESISTING AGEING EFFECTS

Strategies for resisting age effects

- Factors tending to correlate with resistance to memory impairment:
  - Good physical health
    - Appropriate diet
    - Regular exercise
    - Nonroutine, challenging daily activities
  - Continued mental activity
    - But rates of decline don't differ across professors/blue-collar workers (Christensen et al., 1997)
    - Meaningful material may allow the active learner to compensate for declining episodic memory (Shimamura et al., 1995)
    - Explicit memory training (e.g. mnemonics) can help
      - But young participants gain substantially more from training than the elderly

Strategies for resisting age effects

- Provide meaningful organization and structure to tasks
- Allow adequate time for encoding and retrieval
- Minimize distractions, keep tasks simple
- Provide extensive practice on new tasks, continued practice on old skills

Strategies for resisting age effects

- **Memory Training Programs—Worth It?**
- Ball et al. (2002)
  - *Participants*:
    - 2,832 older adults, divided into four groups
  - *6-week Training Program*:
    - Group 1: Strategy training; practice on words and shopping lists
    - Group 2: Practice on verbal reasoning tasks
    - Group 3: Speed training on visual search and divided attention tasks
    - Group 4: Controls (no training)
  - Final testing all the task types and on everyday tasks

Strategies for resisting age effects

- Results:
  - Groups 1 to 3 improved on the skills trained
    - Despite being tested on novel materials
  - No change occurred for untrained skills,
  - However improvements did not generalize to everyday tasks either
- Conclusion:
  - Only specific skills can be trained; no generalization
  - It's possible that training had some protective effects

Topic Four

THEORIES OF AGE-RELATED CHANGES IN MEMORY

Speed theory-Salthouse (1996)

- Many of the cognitive effects of aging are caused by reduced processing speed
  - Based on extensive correlational data
  - The rest of the decline could be caused by a more general decline in cognitive functioning (Salthouse & Becker, 1998)
- Problems with the theory:
  - Measures that correlate with age deficits aren't *pure* speed tests
  - Many other physical and cognitive capacities that decline with age could have a causal effect
    - Speed measures don't always explain the most variance (Baltes & Lindenberger, 1997)

Frontal lobe deficits

- The frontal lobes deteriorate with advanced age
  - Tasks thought to be supported by the frontal lobe also tend to decline with age
    - These tasks typically rely on the executive component of working memory and/or inhibition
  - However, the correlation between frontal lobe atrophy and age-related cognitive decline is weak and the theory is not well-specified currently

The aging brain: Neurotransmitters

- **Dopamine**
  - Related to numerous cognitive functions
    - Agonists (e.g. bromocriptine) improve spatial working memory
    - Antagonists (e.g. haloperidol) diminishes spatial working memory
    - Levels correlate with episodic memory performance (Bäckman et al., 2000)
  - Decreases 5–10% per decade of life
    - According to both post-mortem and PET studies, depletion is associated with cognitive deficits in Parkinson's and Huntington's diseases
  - Covarying out dopamine level nearly eliminates the effect of age on memory performance (Erixon-Lindroth et al., 2005)

Normal changes with aging

- **Normal changes with age:**
  - Slower thinking.
  - Difficulty paying attention.
  - Need more cues - like words, pictures, smell, etc. - to recall information.
  - Using fewer memorization skills like visualization and organization.
  - Associations are more difficult.
  - Decline in vision and hearing.

Normal changes with aging

- **Common causes:**
- **Health related:**
  - High blood pressure
  - Prescription drugs
  - Bad nutrition
  - Low Blood Sugar or diabetes
  - Depression
  - Anxiety
  - Taking multiple prescriptions
- **Lifestyle –** lack of sleep, lack of activity, stress

Sample Questions

- _____ memory refers to deliberate and conscious remembering of information that is learned and remembered at specific point in time.
- _____ is the active processes and structures involved in holding information in the mind and simultaneously using that information.
- Describe how ageing affect the worming memory.

References