Cognition and Emotion

Week 4 - Class 1
05/12/2016
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2016-2017
Additional ...

Speed reading: no saccades

• [https://www.youtube.com/watch?v=h_o8lfdTqwg](https://www.youtube.com/watch?v=h_o8lfdTqwg) (00:10 -01:10)
• [https://www.youtube.com/watch?v=IrZOvrCh2Yw](https://www.youtube.com/watch?v=IrZOvrCh2Yw)

... breathe good mood every morning
Topics

- Working memory (short-term memory) continued
- Long term memory
- Assignment 4
Last week

Strategies – working memory
• repetition
• chunking/patterns

(example: salience!)
Nice intro (watch at home)

Peter Doolittle: How your "working memory" makes sense of the world

https://www.youtube.com/watch?v=UWKvpFZJwcE
Classic Research on Working Memory

Other early research on the capacity of short-term memory
Between 1950 en 1970 two techniques were often applied in research:

1. **The Brown/Peterson & Peterson Technique**

   Material held in memory for less than a minute is frequently forgotten.
   
   - present some items to be remembered; count backwards by threes (distractor task); attempt recall
   - rehearsal prevented by distraction task

Conclusion: material that is only stored for a few seconds is easily forgotten.
Demonstration 4.2

A Modified Version of the Brown/Peterson & Peterson Technique

Take out six index cards. On one side of each card, write one of the following groups of three words, one underneath another. On the back of the card, write the three-digit number. Set the cards aside for a few minutes and practice counting backwards by threes from the number 792.

Next, show yourself the first card, with the side containing the words toward you, for about 2 seconds. Then immediately turn over the card and count backward by threes from the three-digit number shown. Go as fast as possible for 20 seconds. (Use a watch with a second hand to keep track of the time.) Then write down as many of the three words as you can remember. Continue this process with the remaining five cards.

1. appeal
   - simple 687
   - burden
2. sober
   - persuade 254
   - content
3. descend
   - neglect 869
   - elsewhere
4. flower
   - classic 573
   - predict
5. silken
   - idle 433
   - approve
6. begin
   - pillow 376
   - carton
Classic Research on Working Memory

Other early research on the capacity of short-term memory

2. Serial position effect, the Recency Effect

- *serial-position effect* (U-shaped relationship between a word’s position in a list and its probability of recall)
- *recency effect* (better recall for items at the end of the list)
- *primacy effect* (better recall for items at the beginning of the list). No competition with earlier items, more rehearsal

Counting the number of accurately recalled items at the end of the list is a method for measuring the size of short-term memory -> 3 to 7 items.
Figure 4.2
The Relationship Between an Item’s Serial Position and the Probability That It Will Be Recalled.

Classic Research on Working Memory

Other Early Research on the Capacity of Short-Term-Memory: influence of semantics (=meaning of words and sentences)

**Semantic Similarity of the Items in Short-Term Memory**

- Wickens and colleagues (1976)
- proactive interference (PI): people have trouble learning new material because previously learned material keeps interfering with their new learning
- release from proactive interference:
  - Brown/Peterson & Peterson task- varying semantic similarity on Trial 4 (fruit versus occupations)
**Figure 4.3**

Release from Proactive Interference, as a Function of Semantic Similarity. On Trials 1, 2, and 3, each group saw words belonging to the specified category (e.g., occupations). On Trial 4, everyone saw the same list of three fruits.

Atkinson and Shiffrin's Model, classic information-processing model

Short- and long-term memory are distinctly separate

Items in short term memory are fragile (forgotten in 30 seconds if not repeated)

Control processes: intentional strategies such as rehearsal, used to improve memory

The Working-Memory Approach

Alan Baddeley & Graham Hitch (1974)

What does short-term memory accomplish for our cognitive processes?

“immediate memory is a multipart system that temporarily holds and manipulates information while we perform cognitive tasks”

• Emphasis on the active manipulation of information in working memory, managing chunks of information so individuals can work with them

• Comparable to a ‘workbench’ with new and old material (from long-term memory)

• Difference with earlier theories: components in memory

Note: This diagram shows the phonological loop, the visuospatial sketchpad, the central executive, and the episodic buffer—as well as their interactions with long-term memory.

The Working-Memory Approach

Evidence for Components with Independent Capacities

Working memory is not unitary (ondsbelbaar) (Baddeley & Hitch, 1974)

Repeat random numbers and spatial reasoning task (push button for specific stimulus)

People performed remarkably quickly and accurately on both of these two simultaneous tasks.

Working memory seems to consist of separate components that operate separately to some extent
The Working-Memory Approach

Phonological Loop

– phonological loop—stores auditory information, processes a limited number of sounds for a short period of time

– language and other sounds you hear/make

– subvocalization (=inner speech, silently pronounce words you are reading)

• Repeating to yourself, learn new words, mathematical calculations, mental echo of a name or melody
The Working-Memory approach

Visuospaitial Sketchpad

- visuospatial sketchpad—processes both visual and spatial information
- also known as: visuospatial working memory, short-term visual memory

Allows you to:

- store visual appearance and relative position of objects
- store visual information encoded from verbal stimuli (for instance: visual images when you are looking for your keys)
- has limited capacity
The Working-Memory approach

Visuospatial Sketchpad

Use of the Visuospatial Sketchpad

• engineering, art, architecture
• retaining image of a scene
• finding your way from one location to another
• track a moving object
• videogames, jigsaw puzzles, mazes
The Working-Memory Approach

Episodic Buffer

- temporary storehouse that can **hold and combine information from the phonological loop, the visuospatial sketchpad, and long-term memory**
- integrates information from different modalities
- manipulates information for interpretation of earlier experience (episodes)
- makes connections between concepts
- limited capacity
- temporary memory system
- under control of central executive
The Working-Memory Approach

Central executive

- integrates information from the phonological loop, the visuospatial sketchpad, the episodic buffer, and long-term memory
- plays a role in: focusing attention, selecting strategies, transforming information, and coordinating behavior
- suppressing irrelevant information
  - plans and coordinates, but does not store information
  - executive supervisor
  - decides which issues deserve attention
  - selects a strategy
  - decides how to tackle a problem
  - limited ability to perform simultaneous tasks

- [http://gocognitive.net/interviews/origins-central-executive](http://gocognitive.net/interviews/origins-central-executive)
- Allan Baddeley: the origins of the central executive
Central Executive as air traffic controller..

https://www.youtube.com/watch?v=KhHo6rgmOg8
Procedural working memory

Recent addition to the concept of working memory is the idea of a procedural working memory.
“Temporary programs”

• For example, how do we remember instructions in an experiment, or the sequence of actions that we need to perform in a new task?

• Alan Baddeley on the procedural working memory

• http://gocognitive.net/interviews/procedural-working-memory?page=1
Long-term memory
The War of the ghosts (class activity)

1. Sit in pairs
2. Student A takes 5 minutes to remember the story
3. Student B opens document on the website (see news) for him/herself
4. Student A tells the story as accurately as possible
5. Student B makes notes: highlight in the story what student A mentions; make notes of new additions and changes
6. Analyze-patterns in the changes?
War of the Ghosts

One night two young men from Egulac went down to the river to hunt seals and while they were there it became foggy and calm. Then they heard war-cries, and they thought: "Maybe this is a war-party". They escaped to the shore, and hid behind a log. Now canoes came up, and they heard the noise of paddles, and saw one canoe coming up to them. There were five men in the canoe, and they said:

"What do you think? We wish to take you along. We are going up the river to make war on the people."

One of the young men said,"I have no arrows."
"Arrows are in the canoe," they said.
"I will not go along. I might be killed. My relatives do not know where I have gone. But you," he said, turning to the other, "may go with them."

So one of the young men went, but the other returned home.

And the warriors went on up the river to a town on the other side of Kalama. The people came down to the water and they began to fight, and many were killed. But presently the young man heard one of the warriors say, "Quick, let us go home: that Indian has been hit." Now he thought: "Oh, they are ghosts." He did not feel sick, but they said he had been shot.

So the canoes went back to Egulac and the young man went ashore to his house and made a fire. And he told everybody and said: "Behold I accompanied the ghosts, and we went to fight. Many of our fellows were killed, and many of those who attacked us were killed. They said I was hit, and I did not feel sick."

He told it all, and then he became quiet. When the sun rose he fell down. Something black came out of his mouth. His face became contorted. The people jumped up and cried.

He was dead.
Results Bartlett study

Procedure: Several moments of recall (few days, then weeks)

• Story gets shorter, more coherent
• Style, rhythm, and precise mode of construction rarely faithfully reproduced
• Changing order of events
• The general form, or outline, stays constant for a subject after first recall

• Story is rationalized (Westernized); supernatural elements omitted (simple story of a fight and a death.
• Form and items become stereotyped, and then don’t change

• With infrequent reproduction, continuing omission, simplification, and transformation of items into more familiar detail
• In some cases, elaboration, often influenced by images

https://mechanism.ucsd.edu/teaching/philpsych.w03/memory4class.pdf
Bartlett “The War of the “Ghosts

• Human memory is an active, constructive process, in which we interpret and transform the information we encounter
• “Creative reconstruction of the past”
• In reconstructing the story, individuals increasingly borrow from previous knowledge (schemas) and include less information from original story
Het kladblok in je hoofd

- http://www.npo.nl/brandpunt/31-08-2014/KN_1661801 (28.35)
- 31/08/2014 Brandpunt; Douwe Draaisma on memory


- Memory is an instrument that we own, but that does not listen to us very well

- Cees Nooteboom: “de herinnering is als een hond die gaat liggen waar hij wil.”

- http://www.dailymail.co.uk/news/article-2207642/The-boy-forget-Student-remember-did-ate-wore-day-decade.html
Joshua Foer: Feats of memory anyone can do: TED Talk

https://www.youtube.com/watch?v=FF0OmI018-8

Method of loci

https://www.youtube.com/watch?v=t76N00urDIU
Memory according to Inside out

From short term to long term memory / creating memories/ core memory program
https://www.youtube.com/watch?v=pecha-7QOVo (35 sec)
https://www.youtube.com/watch?v=N6w7aXSOkk8
https://www.youtube.com/watch?v=pa2cs9k1ILY
“Memories aren't necessarily accurate. The movie introduces the overnight process of memory consolidation, which converts short-term memories collected each day into long-term memories, stored within Riley's colorful and confusing maze. But when memories are retrieved and remembered, the emotions associated with them can change, as when Sadness turns a gold-colored, joyful memory into a blue-hued one. Though memories may feel completely true and accurate, "on the question of whether we can ever trust our memories: we can — just not 100 percent, because memory is in fact malleable," says John Wixted, psychology professor at the University of California, San Diego, specializing in memory.”
Memories are never fully deleted. The job of the film's "forgetters" is to "vacuum" gray-colored, relatively useless memories, like trivial facts or outdated knowledge. However, they're never completely gone, but just piling up in a dump area of Riley's brain. "Old memories that are not connected with emotions are less likely to stick around," says psychotherapist Judy Rosenberg. Even more, "events plus emotions lock in memories."
Vocabulary

- **working memory**
- **long-term memory** (large capacity)
- **episodic memory** (events that happened to you)
- **semantic memory** (describes your organized knowledge about the world; about words, facts)
- **procedural memory** (knowledge about how to do something)

- **encoding** (coding process information, placing in memory)
- **retrieval** (locate information in storage, acces, recover that information)
Encoding in Long-Term Memory

1. Are we more likely to remember items that we processed in a deep, meaningful fashion, rather than items processed in a shallow, superficial fashion?

2. Are we more likely to remember items if the context at the time of encoding matches the context at the time of retrieval?

3. How do emotional factors influence memory accuracy?

https://www.youtube.com/watch?v=HVWbrNIs-Kw
Encoding in Long-Term Memory

Craik & Lockhart (1972)

Levels-of-processing approach/depth-of-processing approach

• argues that deep, meaningful processing of information leads to more accurate recall than shallow, sensory kinds of processing.
• In general, people achieve a deeper level of processing when they extract more meaning from a stimulus.

• Example: word list, questions on capitals, sounds, *versus* questions on the meaning

Deep levels of processing encourage recall because of two factors:

• Distinctiveness (stimulus is different from other memory traces)
• Elaboration (rich processing in terms of meaning and interconnected concepts). Used in memorisation techniques.
Self-Reference Effect

Levels of Processing and the Self-Reference Effect
According to the self-reference effect, you will remember more information if you try to relate it to yourself.

Representative research: Rogers and coauthors (1977).
Processing words according to specified instructions.
• visual characteristics (-)
• acoustic characteristics (-)
• semantic characteristics (+)
• self-reference instructions (++)

Thinking about a word in connection to ourselves develops a memorable coding for that word; requires organisation, elaboration.
Effects of Context

Encoding specificity principle / context dependent learning

• Recall is better if the context during *retrieval* is similar to the context during *encoding*
• When the two contexts do not match, you are more likely to forget the items

NB recall – reproducing items learned earlier, recognition – judge if an item was seen before

Example: walk back to a room when forgotten what you wanted to do
Encoding-Specificity Effect

In real-life, long-delay situations encoding specificity is strong; however in lab inconsistent. Difference between recall and recognition (lab), and short-term. → Encoding-specificity effect especially in memory tasks that

- Assess your recall
- Use real-life incidents
- Examine events that happened long ago.

Physical versus mental context:
In the lab the physical context is manipulated, but the mental context is more important (so how one feels, not how the environment looks).
Emotions, Mood and Memory

https://www.youtube.com/watch?v=dZxGi8eMaw0

Consolidating (emotional) memories by activating stress hormone response
Emotions, Mood, and Memory

Memory for Items Differing in Emotion

Pollyanna Principle—Pleasant items are usually processed more efficiently and more accurately than less pleasant items.

1. More accurate recall for pleasant items.
   • list of words: pleasant, neutral, unpleasant
   • pleasant > unpleasant > neutral
   • Balch (2006) and Demonstration 5.2 in Matlin
Emotions, Mood, and Memory

Memory for Items Differing in Emotion
(More accurate recall for pleasant items, continued)

- Waring and Kensinger (2011)
  - photos of stimuli judged to be positive, negative, or neutral
  - photo backgrounds (neutral, such as river)
  - recognition test

- recognition of neutral stimuli substantially lower than positive or negative
- stimulus/background tradeoffs: negative stimuli-less accurate recall of background

Memory for real-life events: people generally recall pleasant events more accurately than unpleasant events (e.g. drivers quickly forget near-accidents)
How emotion leads to selective memory: neuroimaging evidence.

Waring J.D., Kensinger E.A.
Emotions, Mood, and Memory

Memory for Items Differing in Emotion

• More accurate recall for neutral stimuli associated with pleasant stimuli.
• Bushman (1998)
  • significantly better recall for commercials that had appeared in the nonviolent film (versus a violent film)

• Anger and violence seem to reduce memory accuracy.
Emotions, Mood, and Memory

Memory for Items Differing in Emotion

Over time, unpleasant memories fade more than pleasant memories.

- Walker and coauthors (1997)
- Recording of personal events daily for 14 weeks: pleasantness and intensity ratings
- After 3 months rating of current pleasantness of the events
- Changes in pleasantness ratings over time: positivity effect.
Mood congruence studies

Individuals tend to retrieve information more easily when it has the same emotional content as their current emotional state.

- For example it is easier to recall memories that have sad emotions associated with it when the person is currently in a sad mood (Knight, Maines and Robinson 2002).

“Therefore to aid in remembering a certain memory, attempting to put yourself in the same mood as the memory would enhance the retrieval process.”

Drace, S (2013). "Evidence for the role of affect in mood congruent recall of autobiographic memories". Motivation & Emotion. 37 (3)
Mood state dependent retrieval

The retrieval of information is more effective when the emotional state at the time of retrieval is similar to the emotional state at the time of encoding.

the probability of remembering an event can be enhanced by evoking the emotional state experienced during its initial processing.

Learning: in order to enhance memory, encoding information in a similar emotional state to when it will be retrieved will help in the recalling process.

Certain emotions activate certain nodes in the brain where information related to that emotion is stored (Lang, Craske, Brown and Ghaneian, 2001).
Emotion, Mood and Memory

Some other general findings:

• Vividness: memories with high emotive value are remembered more clearly;
• Positive memories have more errors;
• Negative memories have more detail;
• Emotions help gist memory but hinder memory for details.
Retrieval in Long-Term Memory

• Continue Matlin Chapter 5: self-study

• Pay extra attention to difference novices – experts (think of T. Sijbrands)
Learning and virtual training

Why virtual training?
1. Practical: training in real situations dangerous and expensive
2. Offers options for rehearsal, adaptation to individual needs, feedback

Objective: optimal learning effect and transfer of training.

Can a virtual environment:
1. Simulate reality and elicit emotions as in real events? (such as stress, anxiety)?
2. Be used to enhance learning by effects such as context specificity, mood congruence, or impact of emotional stimuli?
   • Can we apply these effects to improve the learning effect of the virtual training?

Experiment:
• Sounds with an emotional effect added to a virtual training scenario
• After 1 week recall/recognition test (of relevant items such as obstacles, open doors, equipment)
Emotions and retention: example (1)

Use of emotionally arousing sounds in a VR training to improve retention (=onthouden van informatie)

• Training application: Rescue Sim, VSTEP
• A simulation platform that allows incident command training in an immersive 3D virtual environment for safety and security professionals.

http://vstepsimulation.com/product/rescuesim/
RescueSim Platform

Prison scenario
Emotions and retention: example (2)

VR training scenarios for company safety training (BHV) in hospitals - “Samen Voorbereid Veilig” (SVV) project

• Procedure training; e.g. fire in operating theatre and evacuation of hospital wards
• Training in reality is costly and impractical
• Virtual training has many didactical advantages (feedback, adapt to individual pace, variation in scenarios etc.)
• Objective: improve learning and retention
Emotions and retention: example (3)

Basic assumption:
• Emotionally arousing stimuli are remembered better than neutral stimuli (e.g. Hamann 2001)
• Emotional stimuli support encoding of adjacent stimuli
• Context dependent learning
• Sound tracks and sound effects can enhance the emotional impact of virtual environments and events
Emotions and retention: example (4)

- Implementation of emotionally arousing sounds in training scenario: fire in hospital kitchen.
- Selection of sounds that elicit high arousal appropriate for the scenario
  Sounds from IADS (International Affective Digitized Sounds) database of 111 standardized, emotionally evocative sounds (car horns, bagpipes, belch, siren, dog, screaming, gun shot, sports crowd, robin etc.)
- Explosion, screaming, crying, dentist drill, glass breaking, vomiting, coughing, etc
- Added to locations/moments in the scenario when trainee should notice important information
- After training, test retention (directly after and one week later).
Emotions and retention: example (5)

**Visual Scene:** Reception room crowded with patients waiting. A patient lies on a bed with a nurse standing beside him. 2 female receptionists are at the receptionist desk.

**Task:** Navigate ERO avatar to enter the reception hall

**To-Be-Remembered Objects:** -

**Arousing Sound:** -

**Environmental Sound:** People chatting on the phone, telephone ringing, footsteps, distant conversation sound
Visual Scene: Reception Room, people in the reception room rushed outside because of the sound of the explosion, except the receptionists.

Task: When realizing an explosion occurs, navigate ERO avatar to the reception desk where the ERO equipment is located.

To-Be-Remembered Objects:
A patient lying in a bed near the receptionist, as it would be considered people who will need special assistance during emergency incident/evacuation.

Arousing Sound: Explosion (626), followed by Glass Break (730).

Environmental Sound: Crowd rushing outside, footstep.
Visual Scene: ERO enters 2nd floor and comes across a crowd that is running from 2nd floor. One male patient is walking in a rush when suddenly he vomits. Emergency exit sign is on the wall of 2nd floor

Task: Navigate ERO to the emergency location (2nd floor)

To-Be-Remembered Objects:
1. Vomiting patient (would need help during evacuation)
2. Emergency Exit Sign

Arousing Sound: Vomit (255), Panic Crowd (310)

Environmental Sound: Footsteps
Emotions and retention: example (8)

**Visual Scene:** A big sign in front of the room “Baby Room” (Dutch=Kraamafdeling). A water spill is in front of the baby room. The door in front of the baby room is open.

**Task:** Navigate ERO to the emergency location (2<sup>nd</sup> floor kitchen)

**To-Be-Remembered Objects:**
1. Babies will need help during evacuation
2. The water spill is a dangerous thing in a fire incident
3. There is an open door (which is not supposed to happen in a fire incident)

**Arousing Sound:** Babies Crying (260)

**Environmental Sound:** Footsteps, ERO’s heavy breathing
Emotions and retention: example (9)

Scene 10

**Visual Scene:** A female victim lying down in the kitchen floor. Fire is coming from an exploded microwave.

**Task:** There is a fire in the kitchen, the ERO should do what is necessary to save the victim and contain the fire

**To-Be-Remembered Objects:**
The female victim from the incident

**Arousing Sound:** Femscream 3 (277)

**Environmental Sound:** Footsteps, ERO’s heavy breathing
Arousal-valence (dominance)
IADS database

- International Affective Digital Sounds
- The IADS provides normative ratings of emotion (pleasure, arousal, dominance) for a set of acoustic stimuli for use in experimental investigations of emotion and attention.
<table>
<thead>
<tr>
<th>Description</th>
<th>Sound No.</th>
<th>Pleasure Mean</th>
<th>Arousal Mean</th>
<th>Dominance Mean</th>
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<tr>
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<td>Female Cough</td>
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</table>

Figure 20. Sound description from IADS considered appropriate for fire accident in hospital setting
Procedure and conclusions

Experiment:
- SAM (Self Assessment Manikin), before and after training scenario
- Presence questionnaire
- Questions on appreciation of the sounds
- Memory recall/recognition questionnaire after 7 days

- Number of participants (10, 5 with arousing sounds, 5 with only environmental sounds)
- Many confounding factors (navigation, environment)
Assignment week 4
Emotions, memory and learning

1. Select the e-learning application on the immune system or the virtual training scenario for fire fighters.

2. Select 2-3 effects: Levels-of-processing approach/depth-of-processing approach; Self-reference effect; Encoding specificity principle/ context dependent learning; Mood state dependent retrieval; Mood congruence; Memory for items differing in emotion.

3. For each effect, give a concise description that includes:
   a. An explanation of the expected benefits in this case and for the intended user group;
   b. any existing examples to support your assumption that the guideline would be effective;
   c. cautionary remarks based on literature: for instance that the effects depend on individual differences, are not tested outside the lab, etc.;
   d. references to literature.

4. For each effect describe in detail how you intend to implement it in the application and how this implementation will lead to a more successful application.
Literature for this week – A LOT!!

Matlin Chapter 8 (p.273-293); 11 and 12.
