

Memory and Consciousness



Christine Bastin



Overview

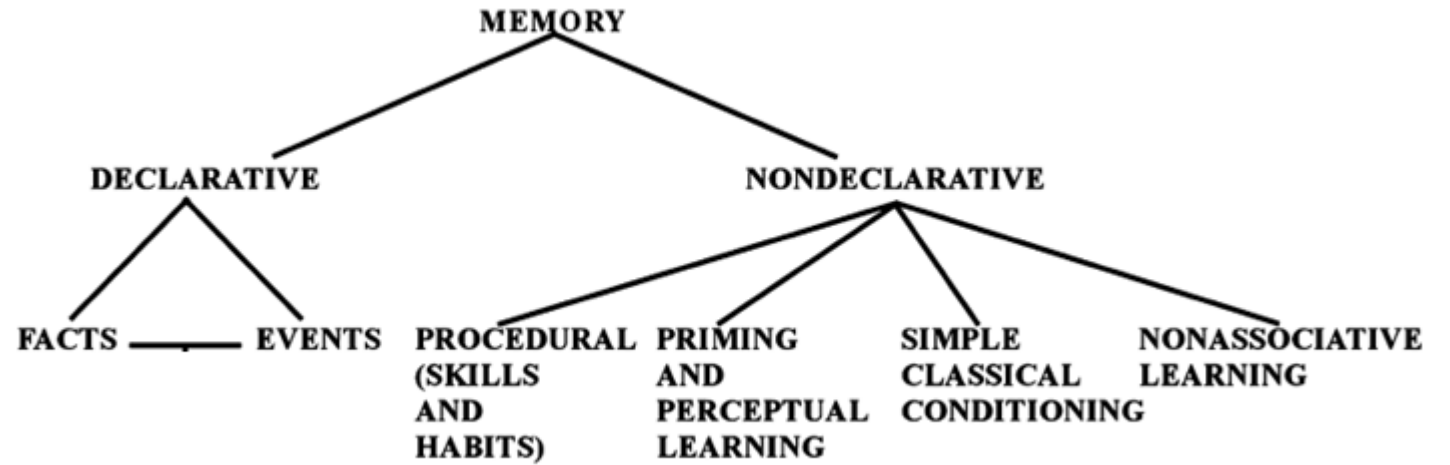
1. Systems of memory and their relationships to consciousness
2. Mental time travel and construction of identity
3. Metacognition



1. Systems of memory

Short-term memory

Long-term memory



Squire et al. (2004)



1. Systems of memory

Short-term memory: to briefly maintain a small amount of information

To retain a phone number while dialing

To make mental calculation

To take notes during a speech

To remember what we just wrote/read in a text

To remember what we were going to pick up in a room



1. Systems of memory

Episodic memory: to remember personally experienced past events

What did I do
yesterday?

Where and when
did that happen?

Autobiographical
memories

Who told me that?



1. Systems of memory

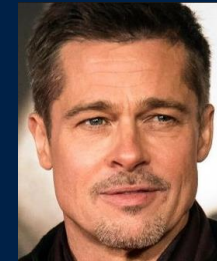
Semantic memory: Knowledge about the world

What is the capital city of Russia?

What must I do when I go to the restaurant?

What means « stamp »?

What is this person famous for?





1. Systems of memory

Procedural memory: Know-how

Typing

To play the piano

To swim

To use of tool

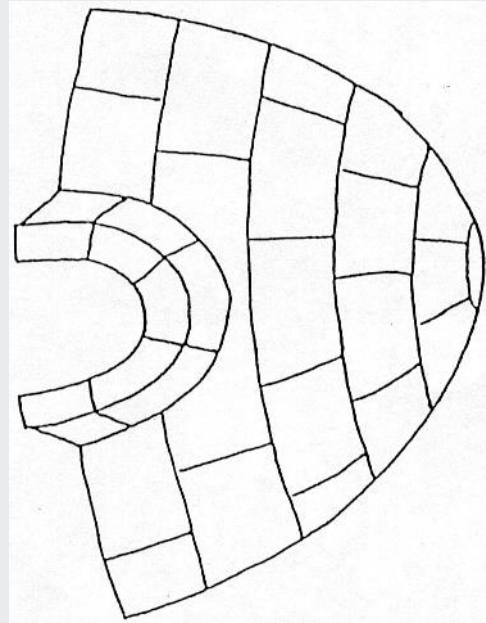
To drive a car

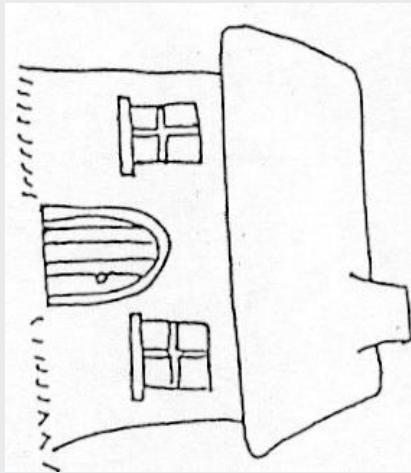
Maths skills

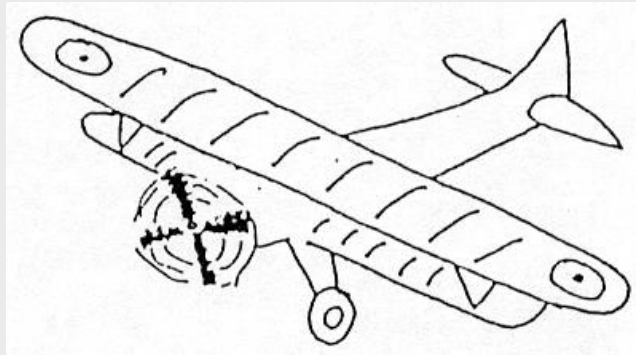


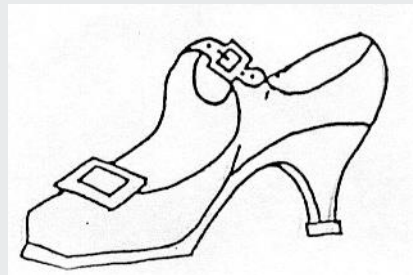
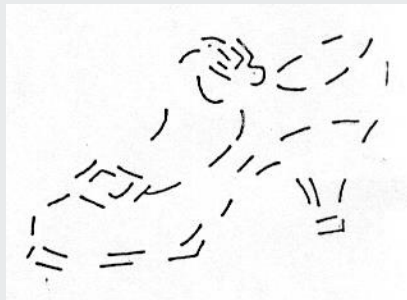
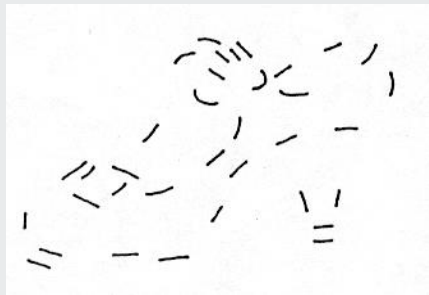
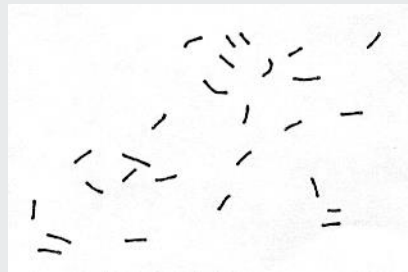
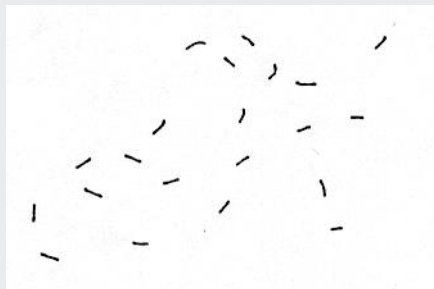
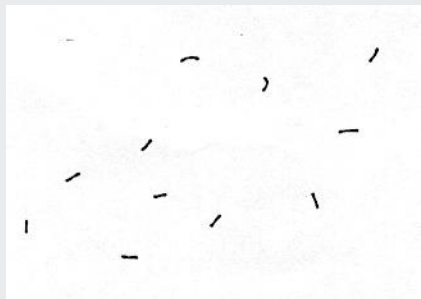
1. Systems of memory

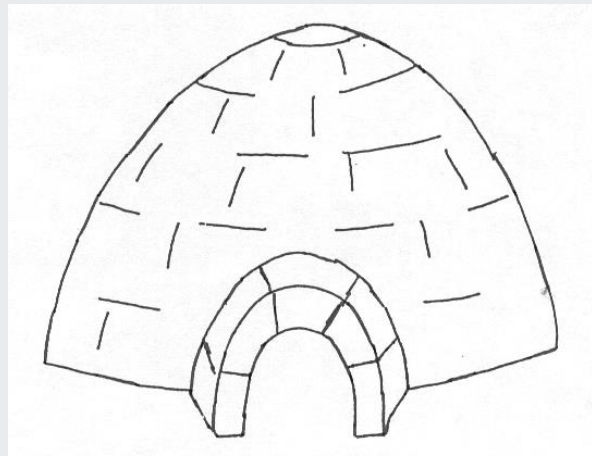
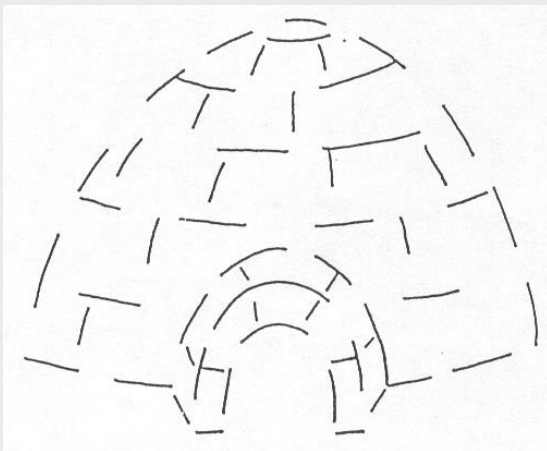
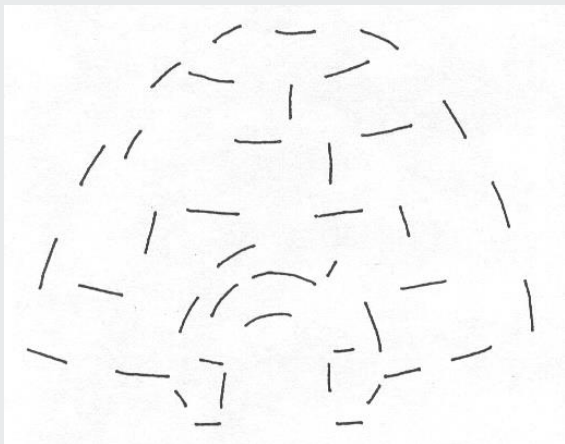
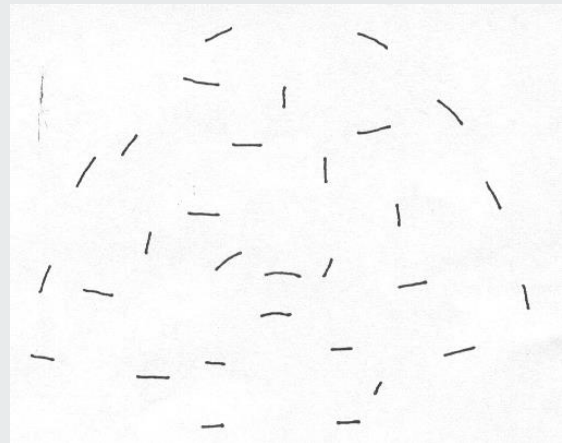
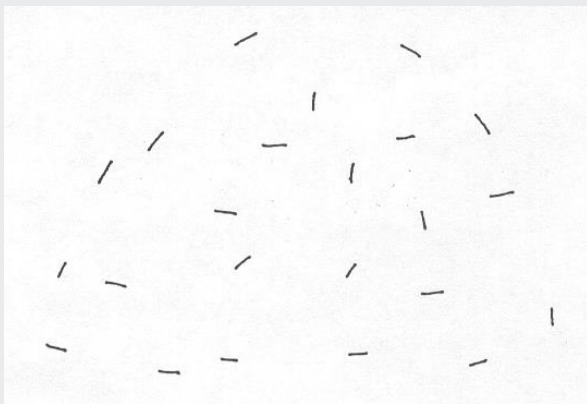
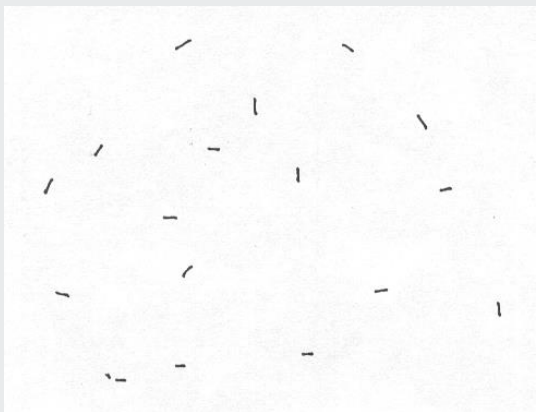
Priming (Perceptual Representation systems): To store the shape of words, objects, faces...

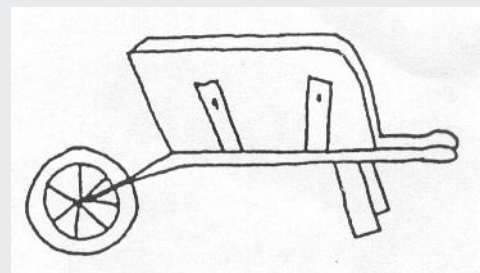
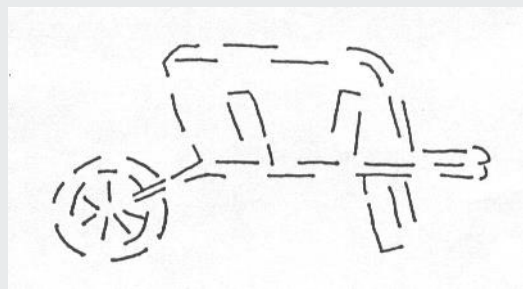
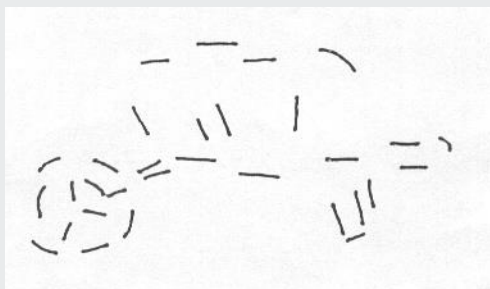
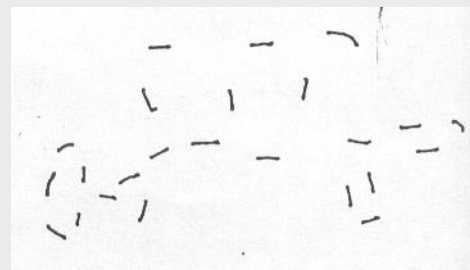
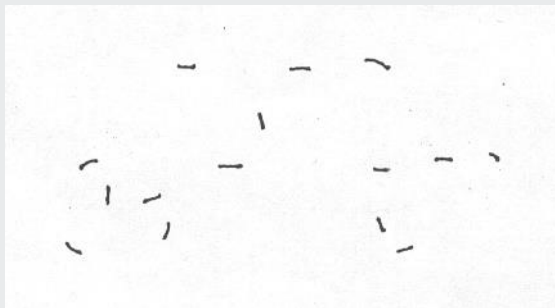


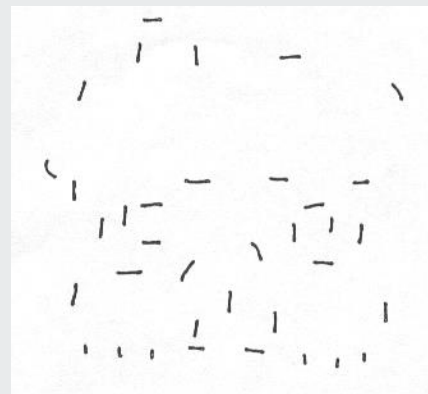
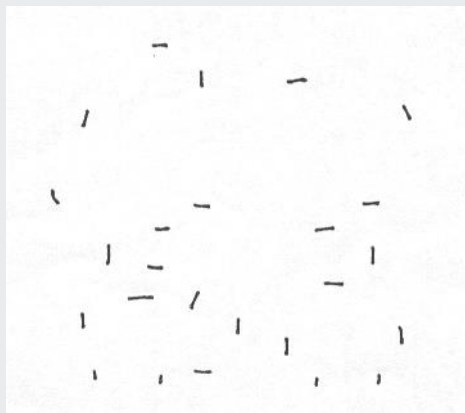
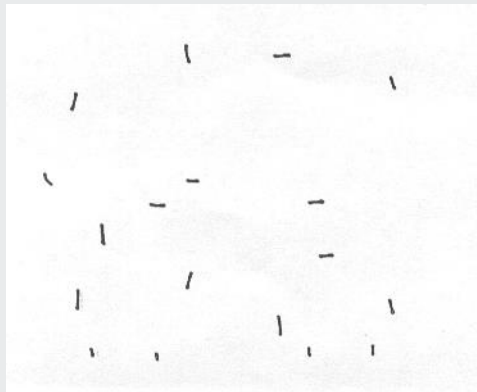






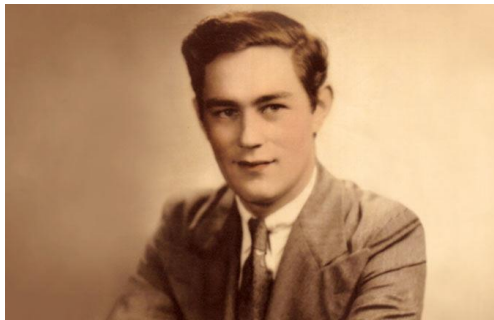




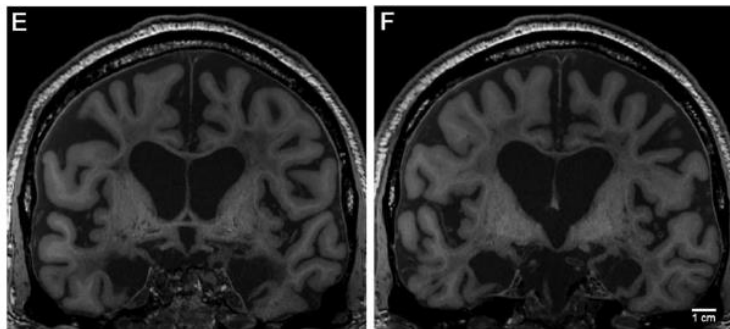


1. Systems of memory

How do we know that there are independent memory systems?



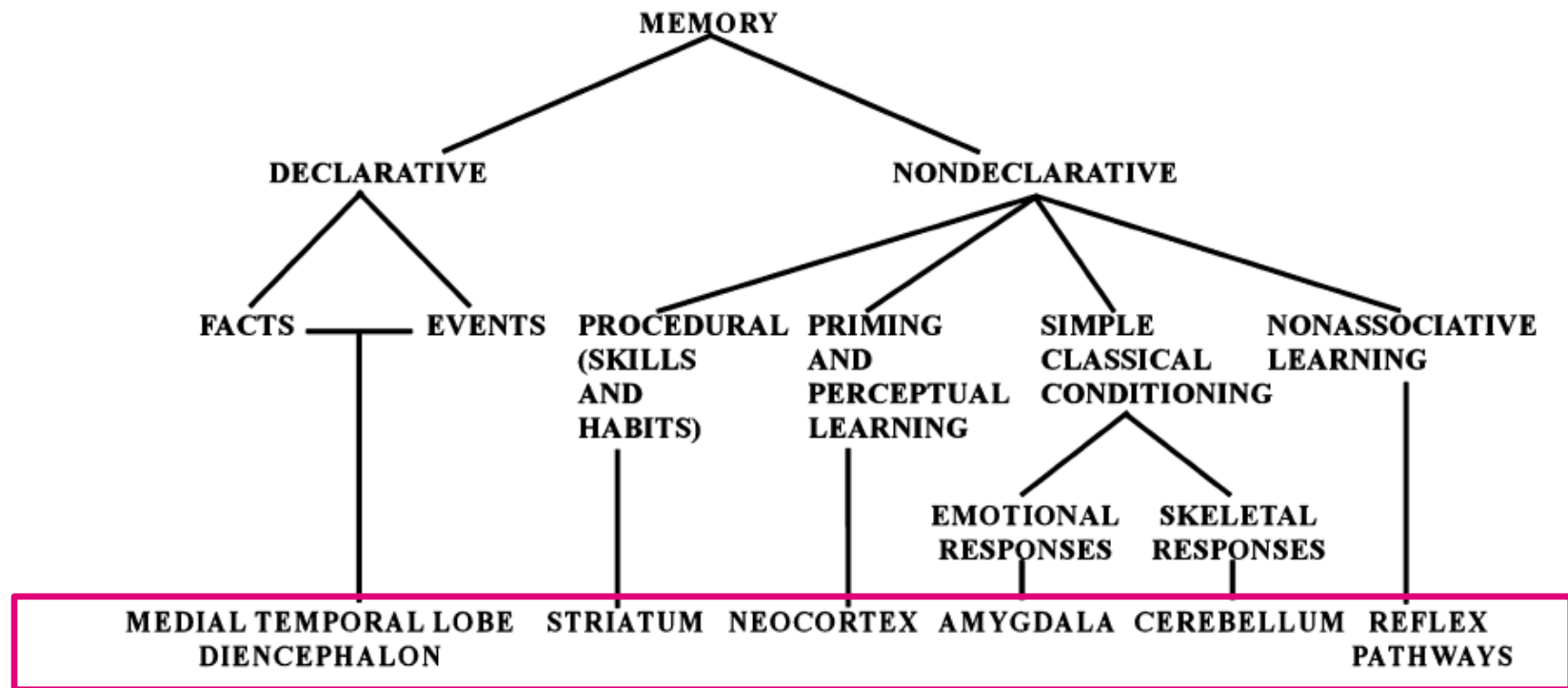
H.M.



Impaired	Intact
Learning of new facts and events	Short-term memory
Retrograde amnesia limited to most recent memories	Procedural memory
	Priming

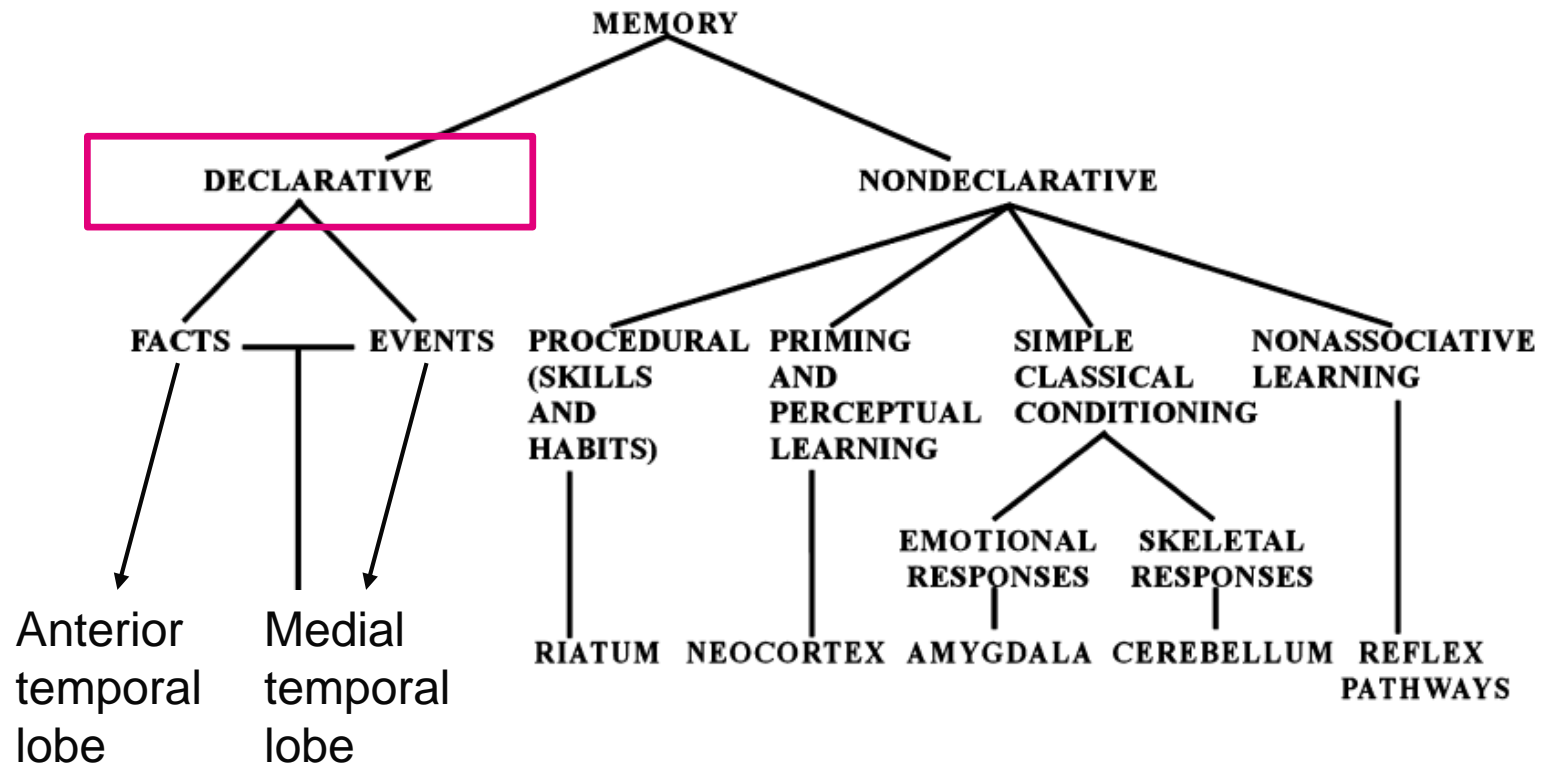
Scoville WB, Milner B. 1957. Loss of recent memory after bilateral hippocampal lesions. *J Neurol Neurosurg Psychiatry* 20:11–21.

1. Systems of memory



Squire et al. (2004)

1. Systems of memory





1. Systems of memory

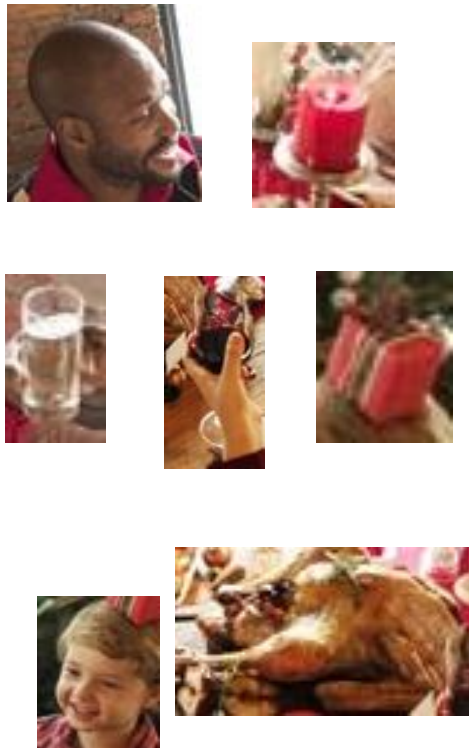
Forms of consciousness associated with declarative memory:

- Semantic memory → noetic consciousness
- Episodic memory → autonoetic consciousness

1. Systems of memory

Episodic memory

Items



Context



+



=

Episode





1. Systems of memory

Episodic memory



« When did I meet Peter? »

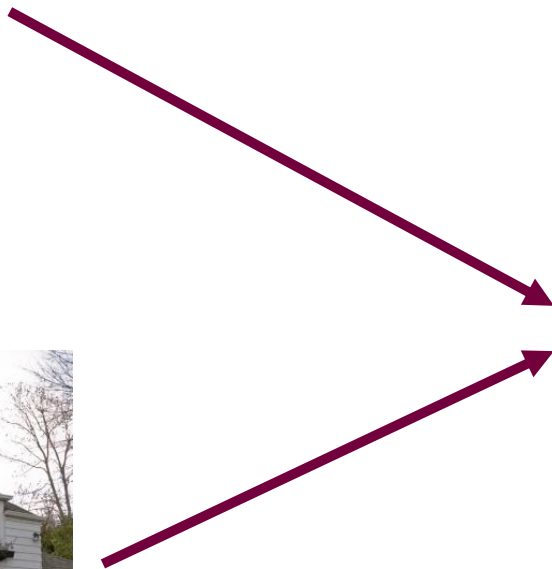
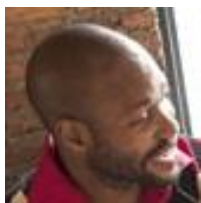


« What was the last time I went to this place? »



1. Systems of memory

Episodic memory



2. Mental time travel and construction of identity

Autonoetic awareness: sense of re-experiencing

= mental time travel

“We have an autonoetic awareness of one’s experiences in the continuity of subjectively apprehended time that extends both backward into the past in the form of **remembering** and forward into the future in the form of **thinking about or imagining the future**” (Tulving, 2001)

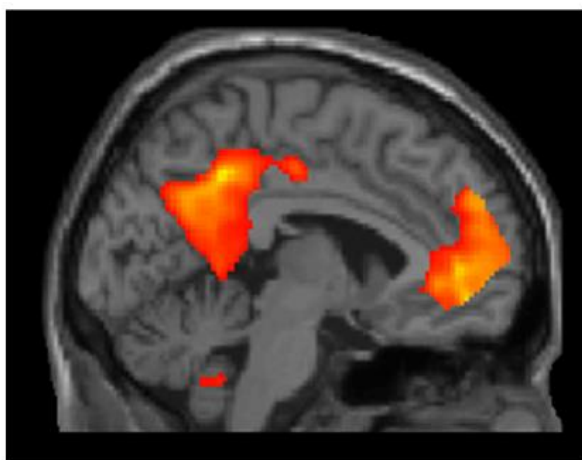


2. Mental time travel and construction of identity

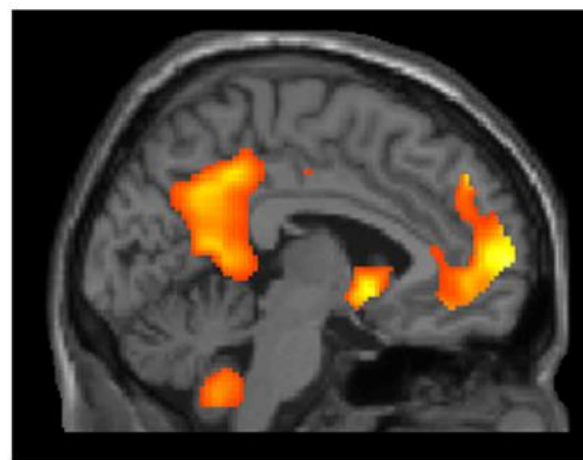
Remembering and future thinking

- Both impaired in amnesia
- Overlapping neural bases

PAST AND FUTURE EVENT ELABORATION



PAST EVENT > CONTROL



FUTURE EVENT > CONTROL



Tulving: “What will you be doing tomorrow?”
(There is a 15-second pause)

K.C.: smiles faintly, then says, “I don’t know”

Tulving: “Do you remember the question?”

K.C.: “About what I’ll be doing tomorrow?”

Tulving: “Yes. How would you describe your state of mind when you try to think about it?”

(A 5-second pause)

K.C.: “Blank, I guess”



2. Mental time travel and construction of identity

Remembering and future thinking

Constructive episodic simulation hypothesis (Schacter & Addis, 2007)

Episodic simulation (or future thinking) is based on an episodic memory system that provides

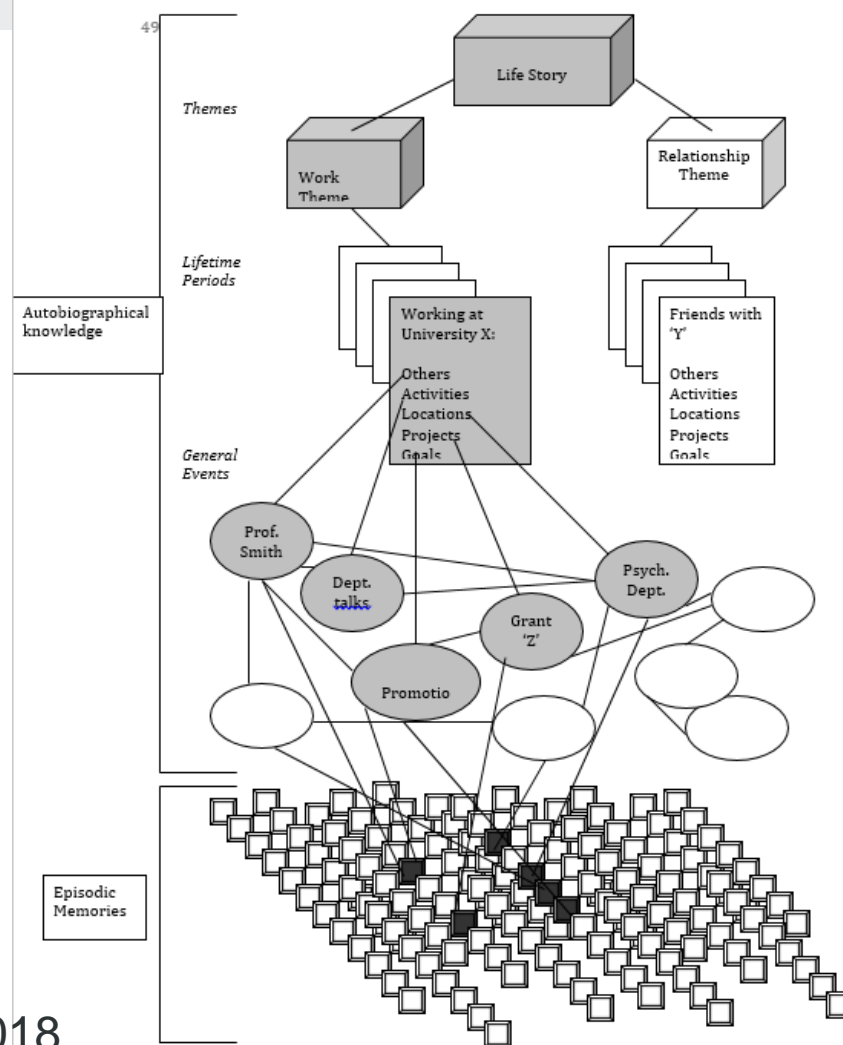
- access to stored episodic details
- the constructive processes to flexibly retrieve and recombine these details for the mental simulation of hypothetical episodes

2. Mental time travel and construction of identity

Memory and the construction of identity

- Episodic memories = details derived from single experiences ('*experience-near*')
- EM grouped temporally. AK grouped thematically
- Daily experiences (EM) are destined to be forgotten, unless they support long-term goals
- AK organization driven by goals and coherence of the Self (conceptual self) → stable self image
- Retrieval of a specific event starts from general knowledge (cue specification).

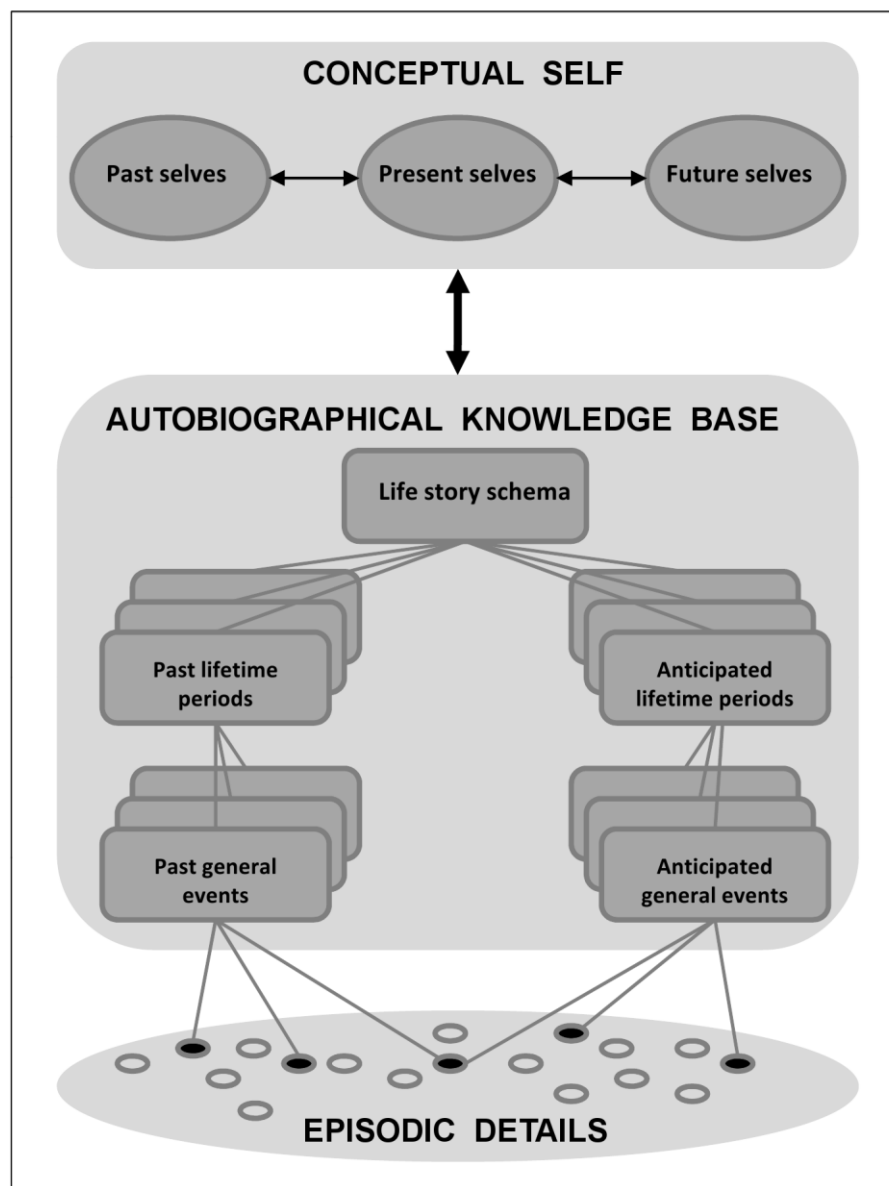
Conway et al., 2018



2. Mental time travel and construction of identity

Memory and the construction of identity

- For imagined events to be perceived as possible future happenings, they have to be placed in an autobiographical context.
- Future self: knowledge about personal goals and anticipated self-attributes, in continuity with past and present self.
- Lifestory schema = an overall representation of a person's entire life that covers both the past and the future.
- Anticipated lifetime periods and general events derive from cultural life scripts (i.e., shared knowledge about a series of events that represents a prototypical life course in a given culture) or may be based on personal experiences, interests, and goals.



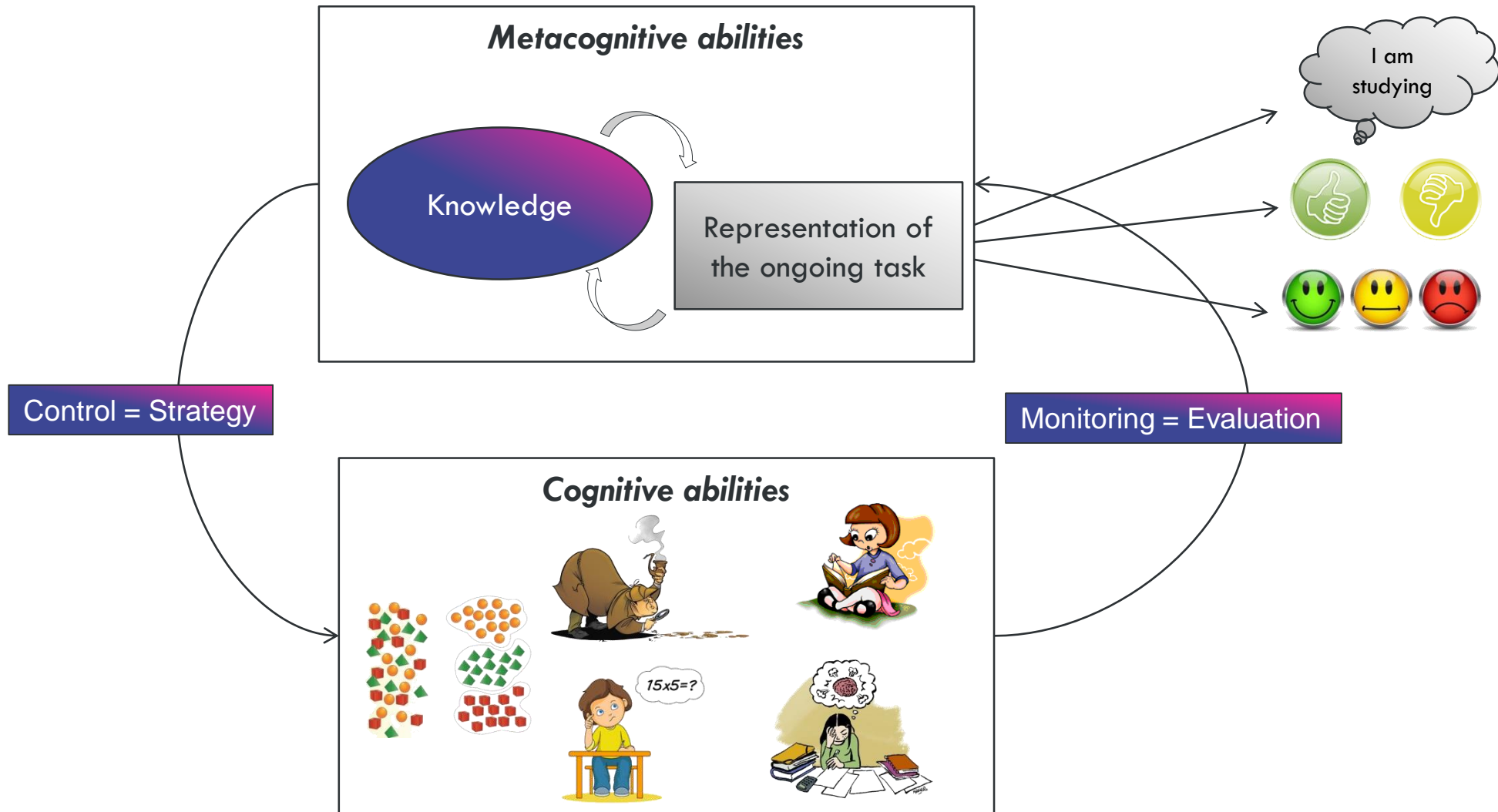


3. Metacognition



Metacognition = awareness of one's own functioning and cognitive abilities

3. Metacognition

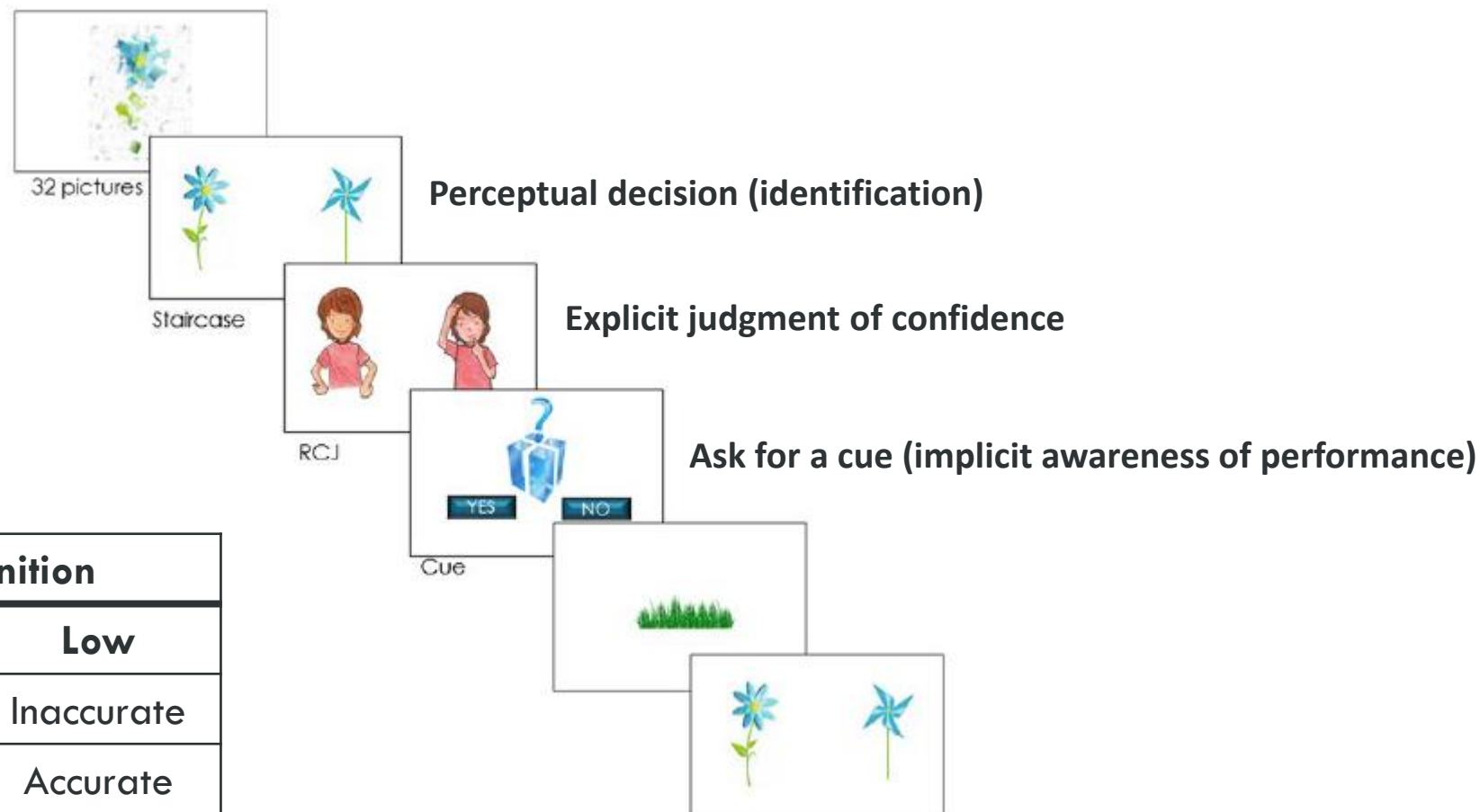




3. Metacognition



Implicit and explicit metacognition



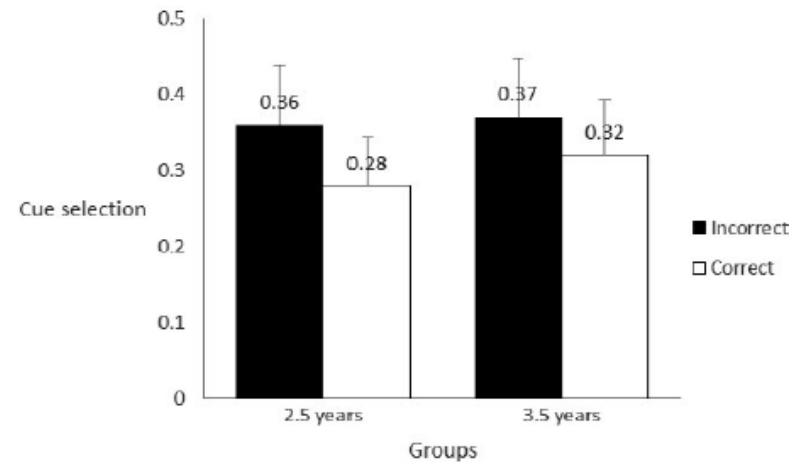
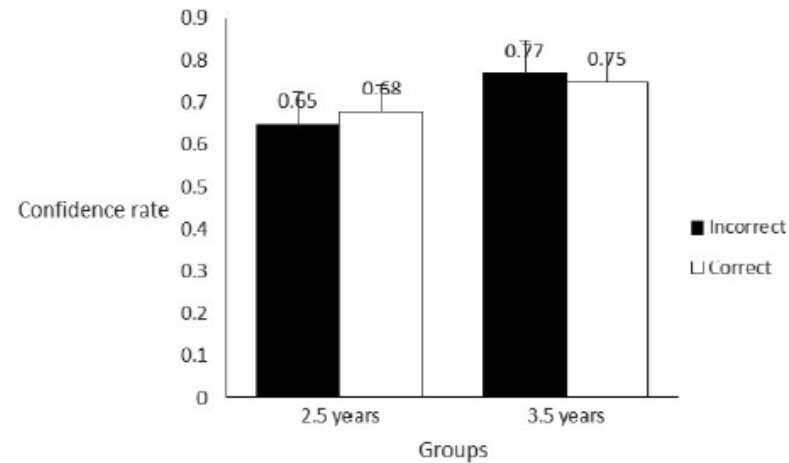
		Metacognition	
		High	Low
Identifica- tion	Correct	accurate	Inaccurate
	Incorrect	inaccurate	Accurate



3. Metacognition

Implicit and **explicit** metacognition: In young children (2.5 years versus 3.5 years)

Inefficient explicit metacognition at young age;
but efficient implicit metacognition as early as 2.5 years old





3. Metacognition

Implicit and **explicit** metacognition: In Alzheimer's disease

Impaired explicit metacognition,
but preserved implicit
metacognition

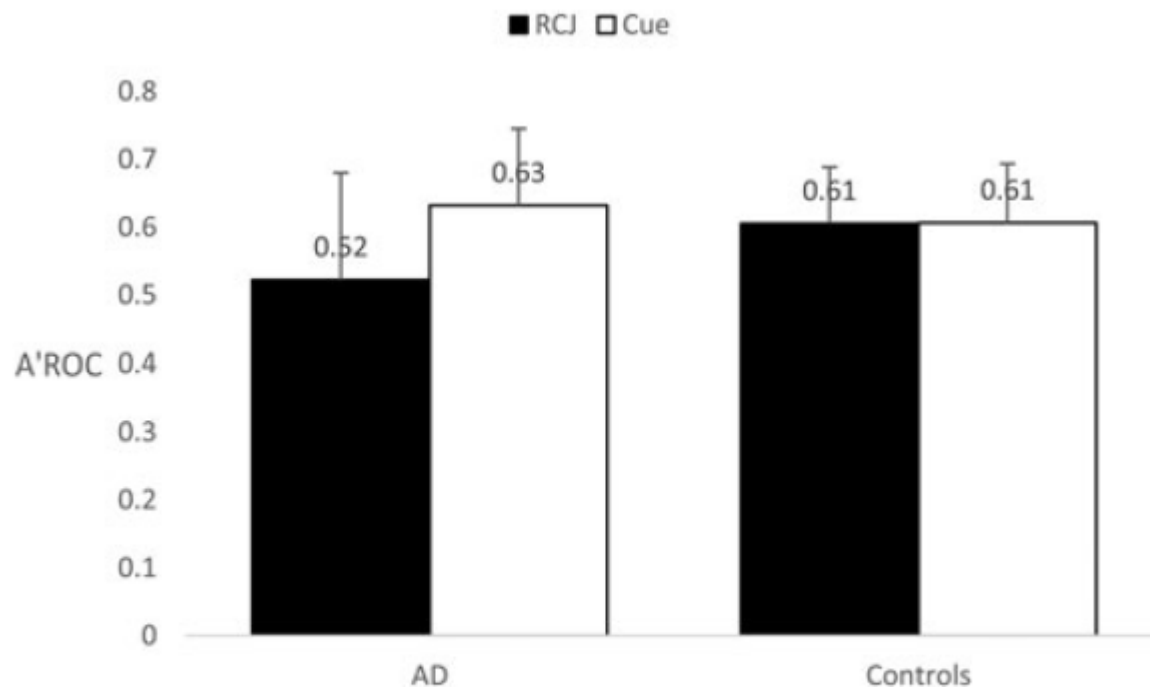


Figure 2. Metacognitive accuracy for the implicit (cue) and explicit (RCJ) measure of metacognitive monitoring in both AD patients and their matched controls; RCJ = retrospective confidence judgment.



3. Metacognition

Anosognosia in Alzheimer's disease

= lack of awareness about the disease, the cognitive deficits, and their functional consequences

Anosognosia cause many problems in everyday life:

- ❑ Reduced compliance to treatment and therapeutic interventions
- ❑ Less efficient cognitive rehabilitation
- ❑ Poor interpersonal relationships
- ❑ Increased burden for the caregivers



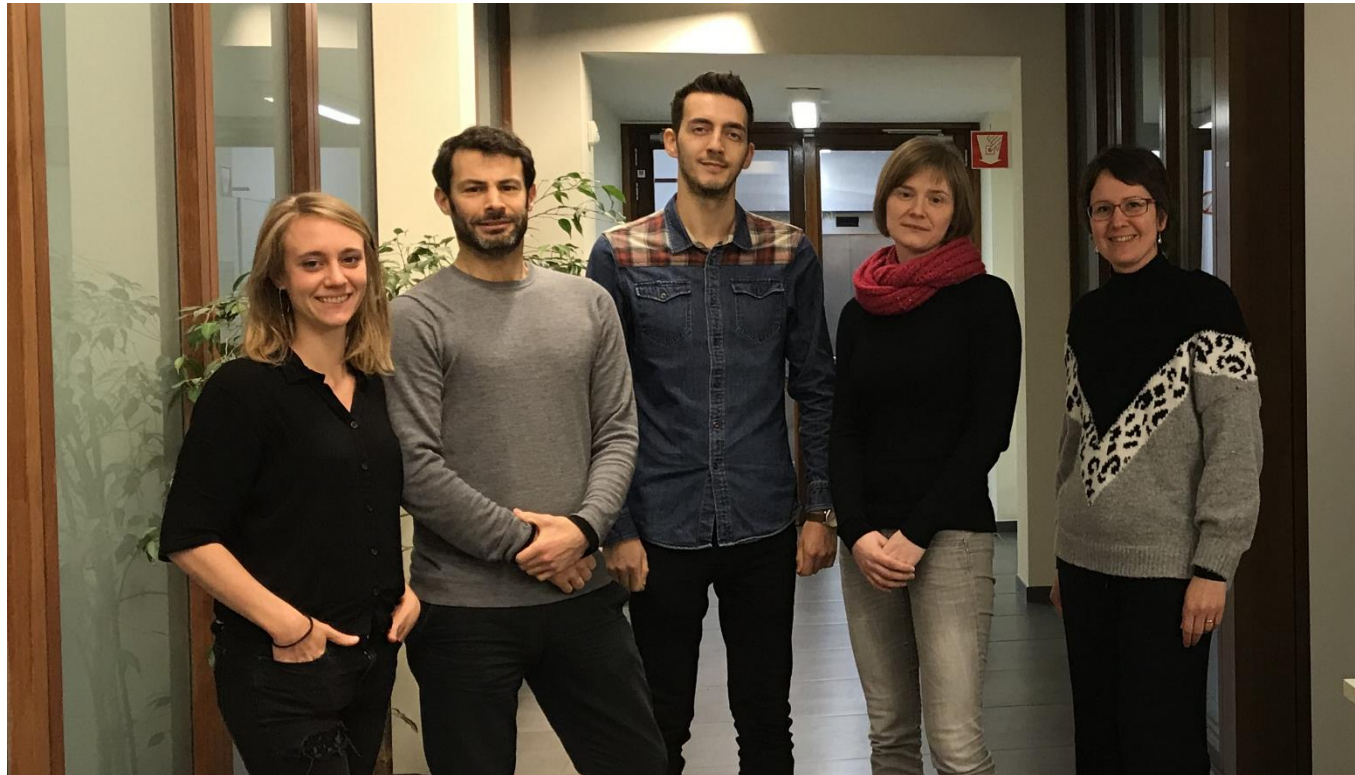
Conclusion

Memory supports consciousness

- Of our past
- Of our future
- Of our identity
- Of our own abilities (strengths and weaknesses)



Our research in the Aging and Memory group



Memory group in 2020



Our research in the Aging and Memory group

- The origins of subjective experiences of memory (feelings of familiarity and sense of vividness)
- The search for the early cognitive changes in the course of Alzheimer's disease: the role of the transentorhinal cortex
- Collective memory: how are constructed memories shared by communities?



Christine.Bastin@uliege.be

7/12/2021