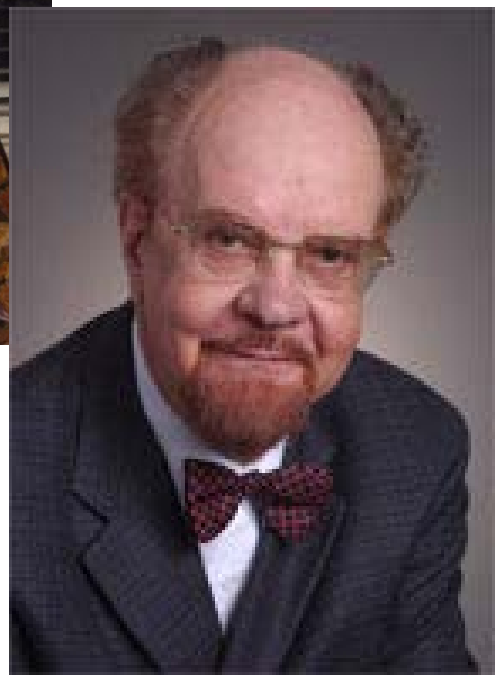
Kognitive Neuropsychologie

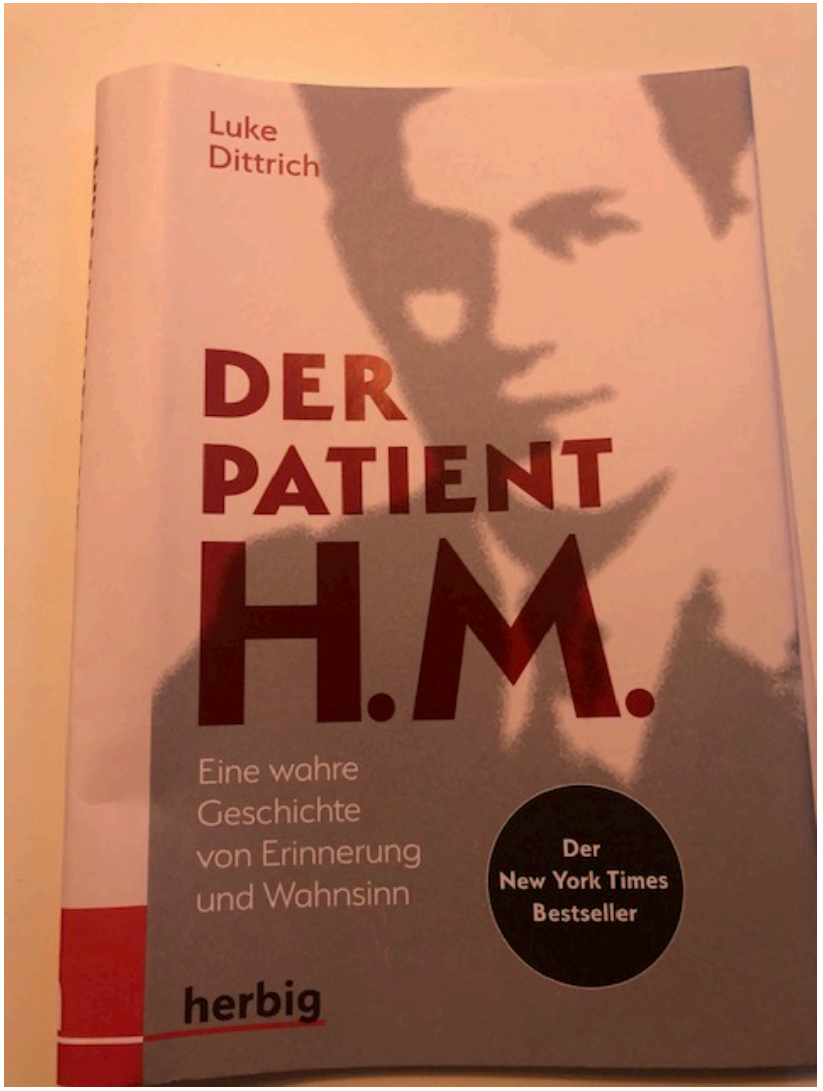
03.11.	Geschichte der kognitiven Neurowissenschaft
10.11.	Funktionelle Neuroanatomie
17.11.	Methoden der kognitiven Neuropsychologie I
24.11.	Methoden der kognitiven Neuropsychologie II
01.12.	Visuelle Wahrnehmung
08.12.	Objekterkennung
15.12.	Auditive Wahrnehmung
05.01.	Sprache
12.01.	Aufmerksamkeit und Selektion
19.01.	Kognitive Kontrolle
26.01.	**Gedächtnis & Lernen**
02.02.	Kognitives Altern


Gedächtnis und Lernen

Gedächtnis und Lernen



Gedächtnis und Lernen



Memory Systems

- Sensory Memory
- Short-term Memory
- Working Memory

- Neuroanatomy of Long-term Memory
    - hippocampal system
    - diencephalic system
    - perirhinal system

- Dissociations in Long-term Memory
    - declarative vs. nondeclarative
    - episodic vs. semantic

Visual Sensory Memory

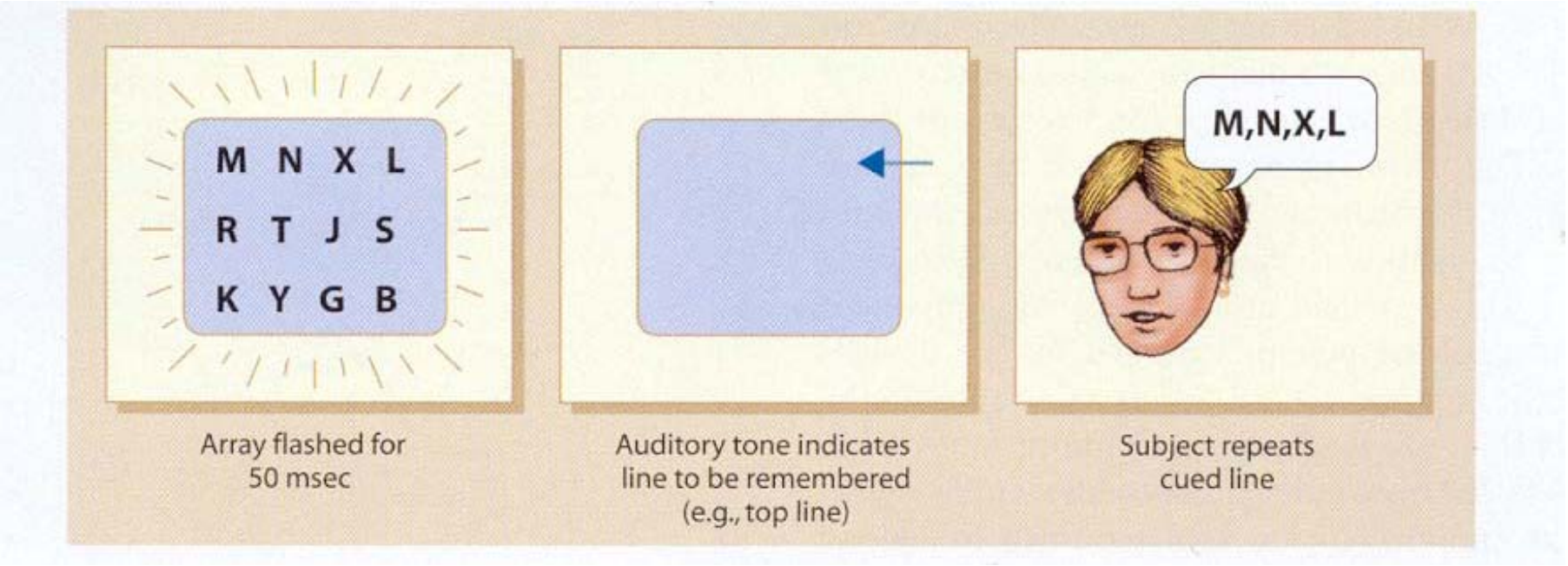


Figure 8.1 Partial report experiment of sensory memory. Subjects are presented with brief (50-msec) glimpses of stimuli like letter arrays that consist of three rows of four letters each. If asked to report as many items as possible, they would show the typical limitation in short-term memory and report about seven (plus or minus two) items. In the partial report method, they see the entire array briefly and then report on only a subset of the array. Which subset to report is indicated by an auditory cue presented with or just after the visual array (e.g., high-frequency tone indicates top row). The cue can tell the subjects to report the first, second, or third row of letters; the key here is that the subjects do not know prior to the stimulus which row of letters they will be asked to report. Nonetheless, the subjects are accurate at reporting the four letters from any row cued. This ability makes sense because the four letters in the row to be reported are well within the limits of the span of immediate memory. Given that the subjects do not know in advance which letters to retain in memory, this pattern of results indicates that for some brief period after the presentation of the visual stimulus, all twelve letters are retained, and so the letters in any row can be reported.

Auditory Sensory Memory

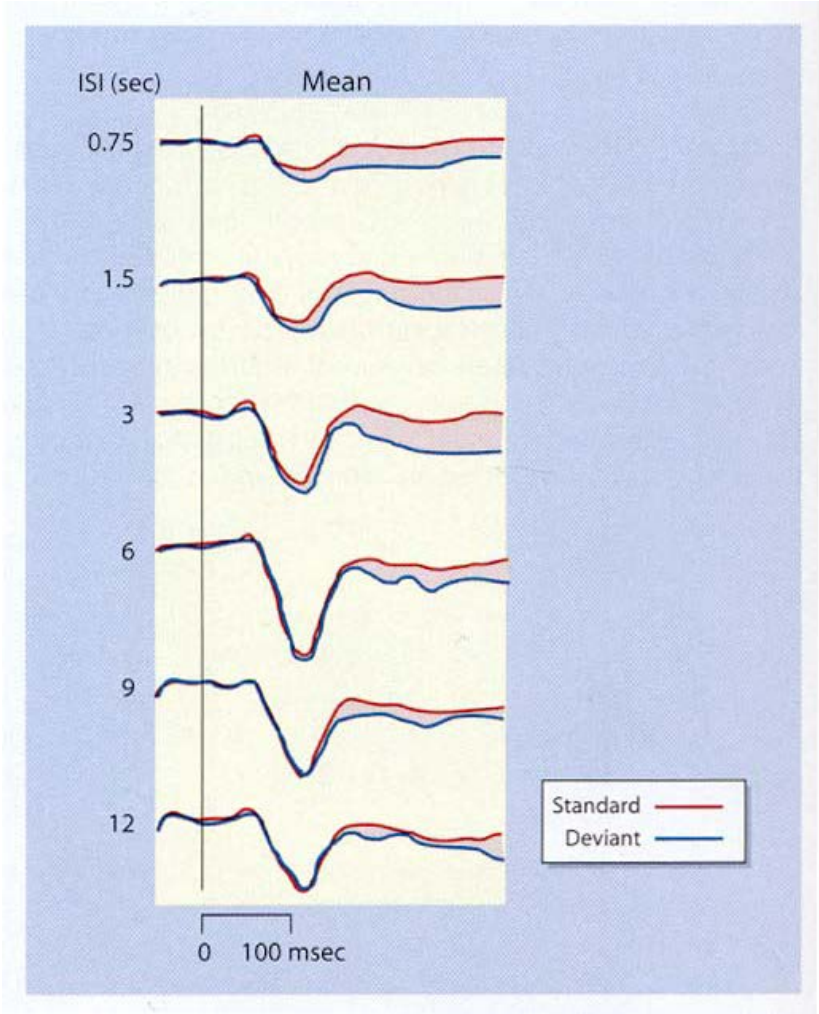


Figure 8.2 The magnetic responses known as the *mismatch field* (MMF) elicited by deviant tones (blue trace) in comparison to the magnetic responses elicited by standard tones (red traces). The amplitude of the MMF (indicated by the shaded difference between the blue and red traces) declines as the time between the preceding standard tone and the deviant tone increases to 12 seconds. This result can be interpreted as evidence for an automatic process in sensory memory that has a time course on the order of approximately 10 seconds. Adapted from Sams et al. (1993).

Kurzzeitgedächtnis und Vergessen: Rehearsal but not interference matters

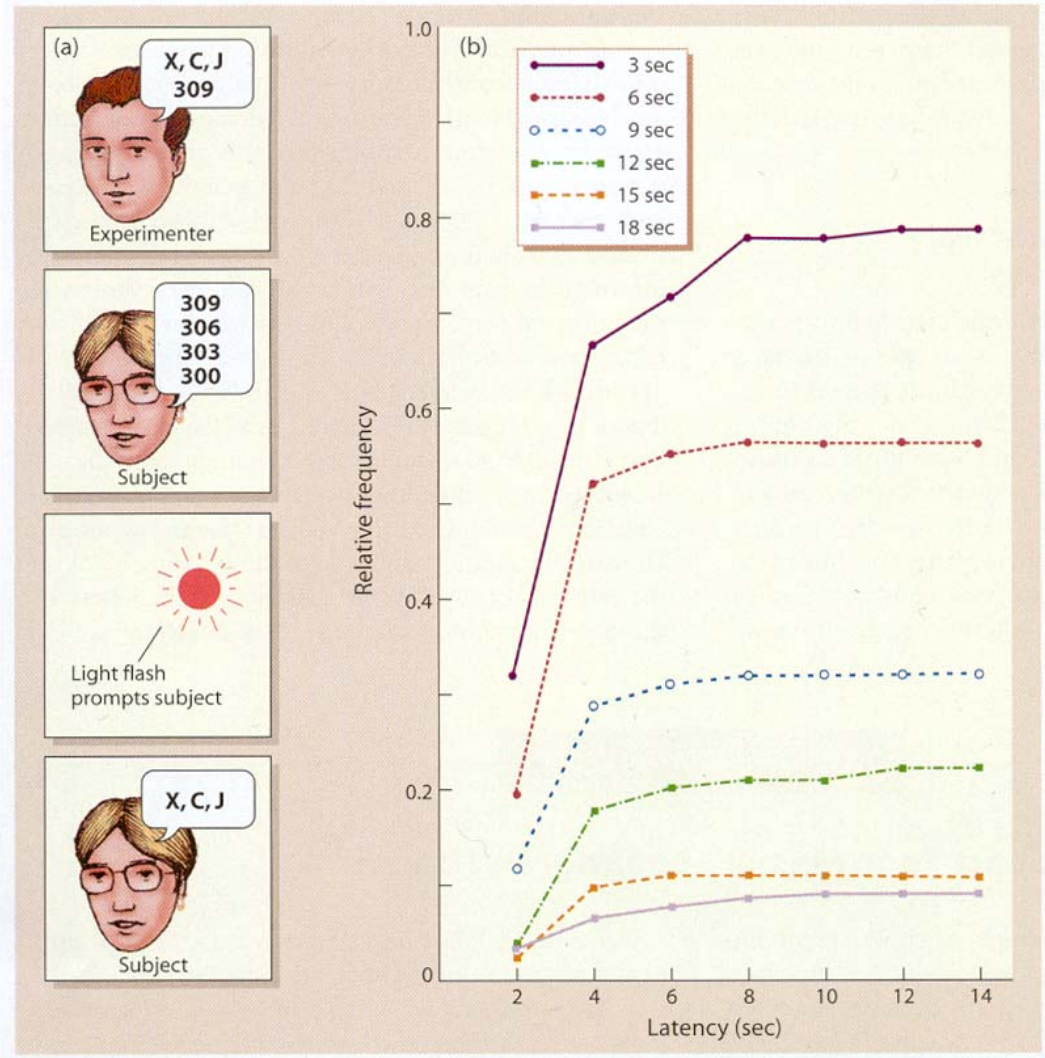


Figure 8.3 **(a)** To test a person's short-term retention of verbal items, an experimenter presents the subject with a string of three consonants such as *XCJ*, and then a number such as *309*. The subject listens to the consonant string and then starts counting backward by threes from the number given by the experimenter. After 3 to 18 seconds, a red light signals the subject to recall and repeat aloud the consonant string. **(b)** Correct recall as a function of response latency and retention delay. In the study by Petersen and Petersen, by 18 seconds the subjects could recall the consonant string less than 10% of the time. Adapted from Petersen and Petersen (1959).

Seriale Positionseffekte: Two separate mechanisms

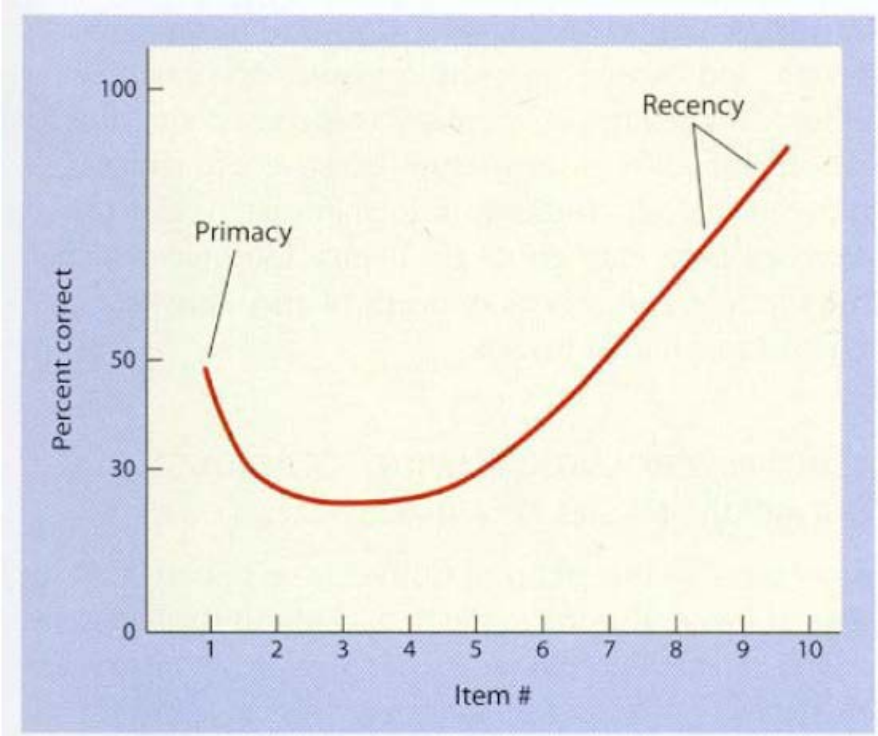


Figure 8.4 Serial position effect. The percentage of items recalled is plotted as a function of the item's position in the list. Primacy and recency effects are represented by the better recall of items presented at the beginning and end of the list, respectively.

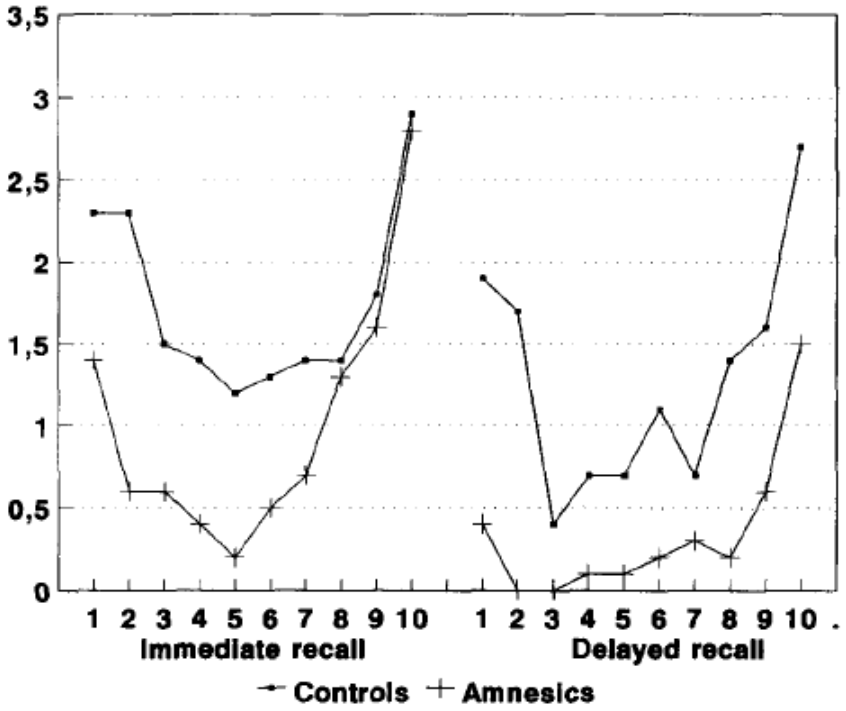
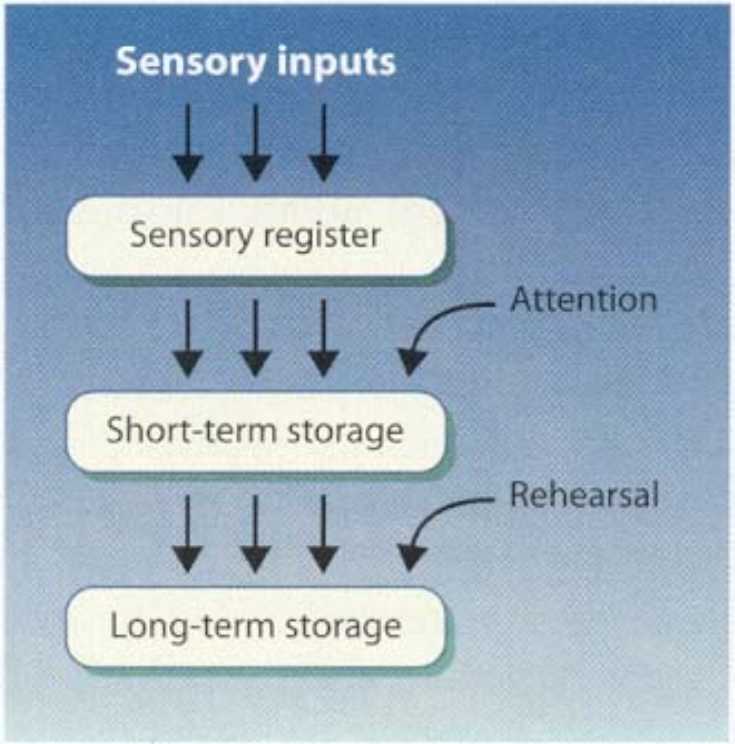


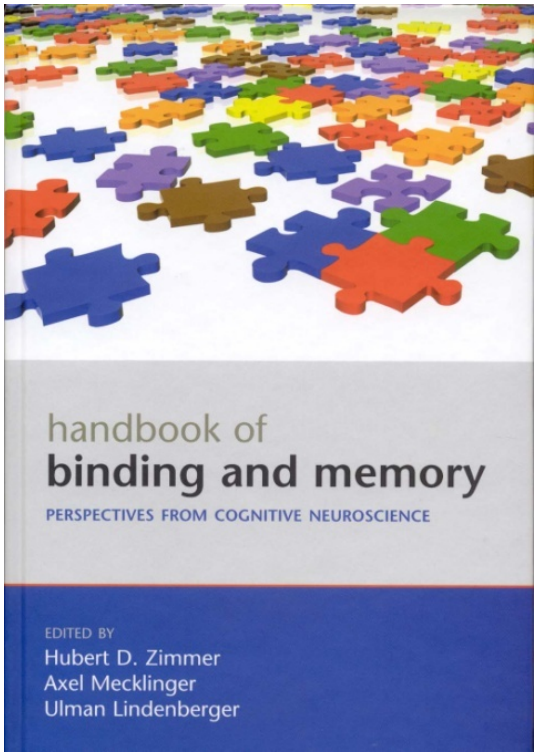
Fig. 1. Serial position curves of amnesic and healthy control subjects for the immediate and delayed recall paradigms.

Kurzzeit-Gedächtnis: Ein modales Modell

Figure 8.5 The Atkinson and Shiffrin modal model of memory. Sensory information enters the information-processing system and is first stored in a sensory register. Items that are selected via attentional processes are then moved into short-term storage. With rehearsal, the item can move from short-term to long-term storage. Adapted from Atkinson and Shiffrin (1968).



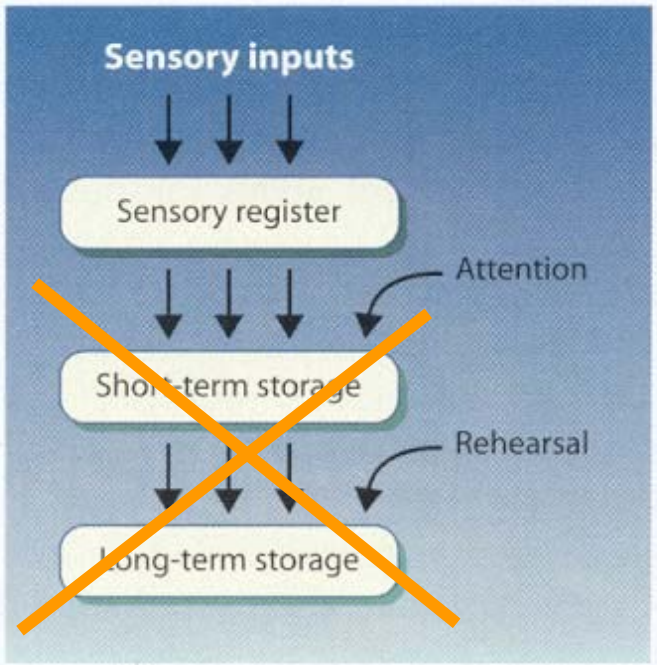
Fergus I.M. Craik: Levels of Processing



Fergus I.M. Craik ist seit September 2013 Ehrendoktor der Universität des Saarlandes

http://universaar.uni-saarland.de/monographien/schriftenreihen_ebene2.php?sr_id=1&la=de

Levels of Processing: Verarbeitungstiefe beeinflußt Langzeitgedächtnisspeicherung



Einwände gegen das modale Gedächtnismodel; Patient E.E.

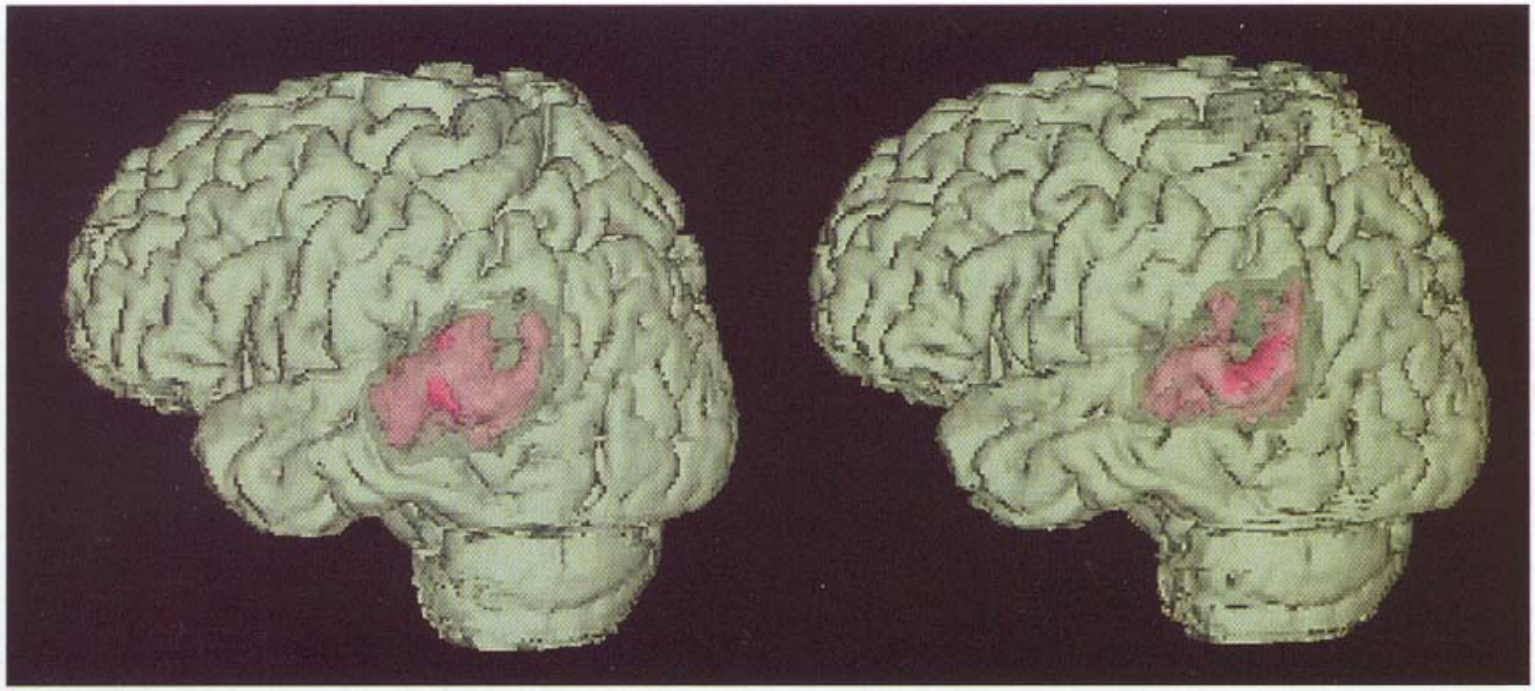
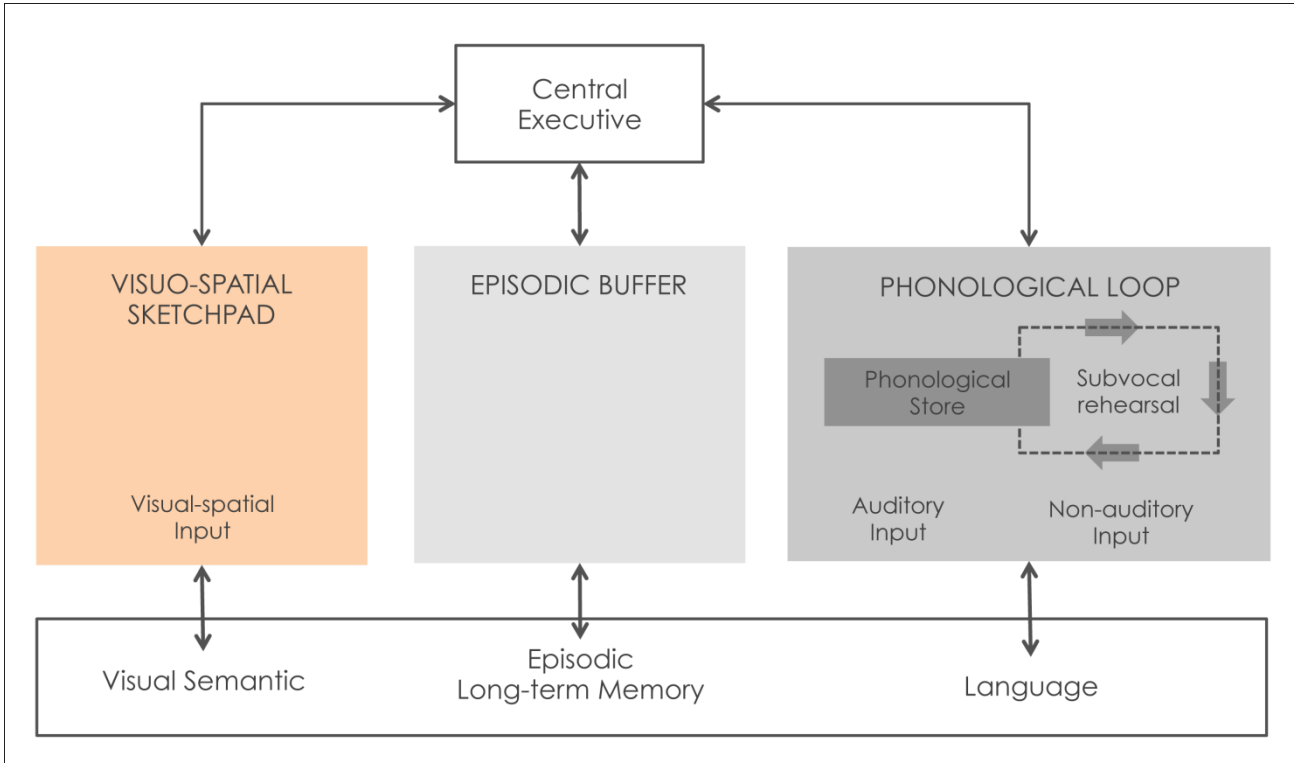


Figure 8.6 Magnetic resonance imaging (MRI) scans reconstructed to provide a three-dimensional rendering of patient E.E.'s left hemisphere. The reconstructed MRI scan taken prior to surgery is on the **left,** and the one taken after surgery is on the **right.** The area of the tumor is indicated by shading. Positron emission tomography (PET) with a radiolabeled methionine tracer was used to identify the tumor based on its increased metabolic profile in comparison to that of surrounding brain tissue. Adapted from Markowitsch et al. (1999).

Das Arbeitsgedächtnis

The Multi-Component Working Memory Model (Baddeley 2000, 2002, Baddeley & Logie, 1999)



Evidenz für auditive Codes im PL: Phonologische Ähnlichkeitseffekte

- T statt G
- Nicht: Q vs O

Verbal vs Spatial Working Memory

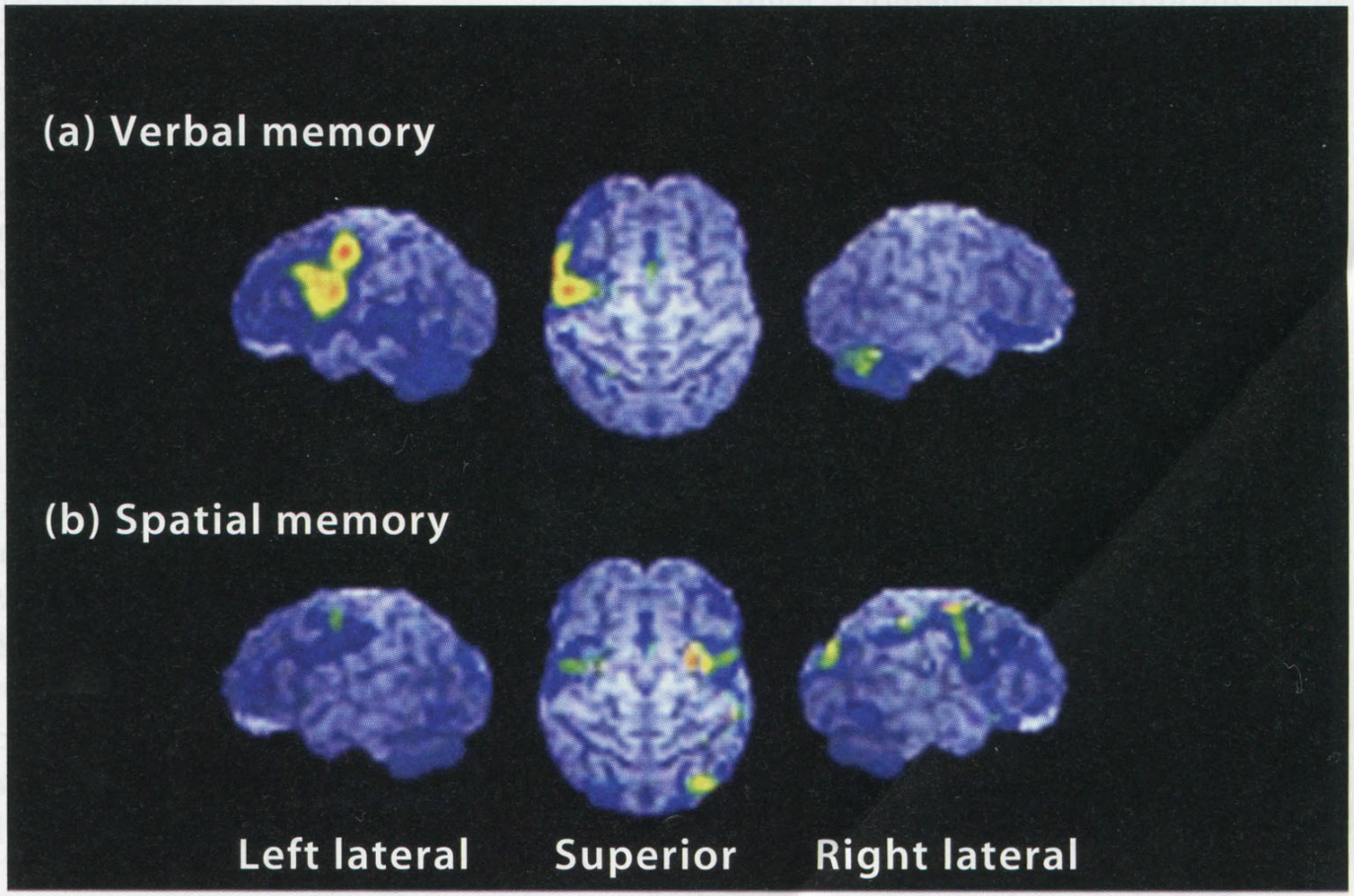


Figure 8.6 Changes in local cerebral blood flow, measured with positron emission tomography for verbal **(a)** and spatial **(b)** working memory tasks in healthy volunteers. In each part the views of the cortical surface show the left hemisphere **(left)**; superior (dorsal) surface of both hemispheres, with the frontal lobe at the top **(middle)**; and right hemisphere **(right)**. See text for details.

Neuropsychologische Belege

Articulatory Mechanism

Phonological Store

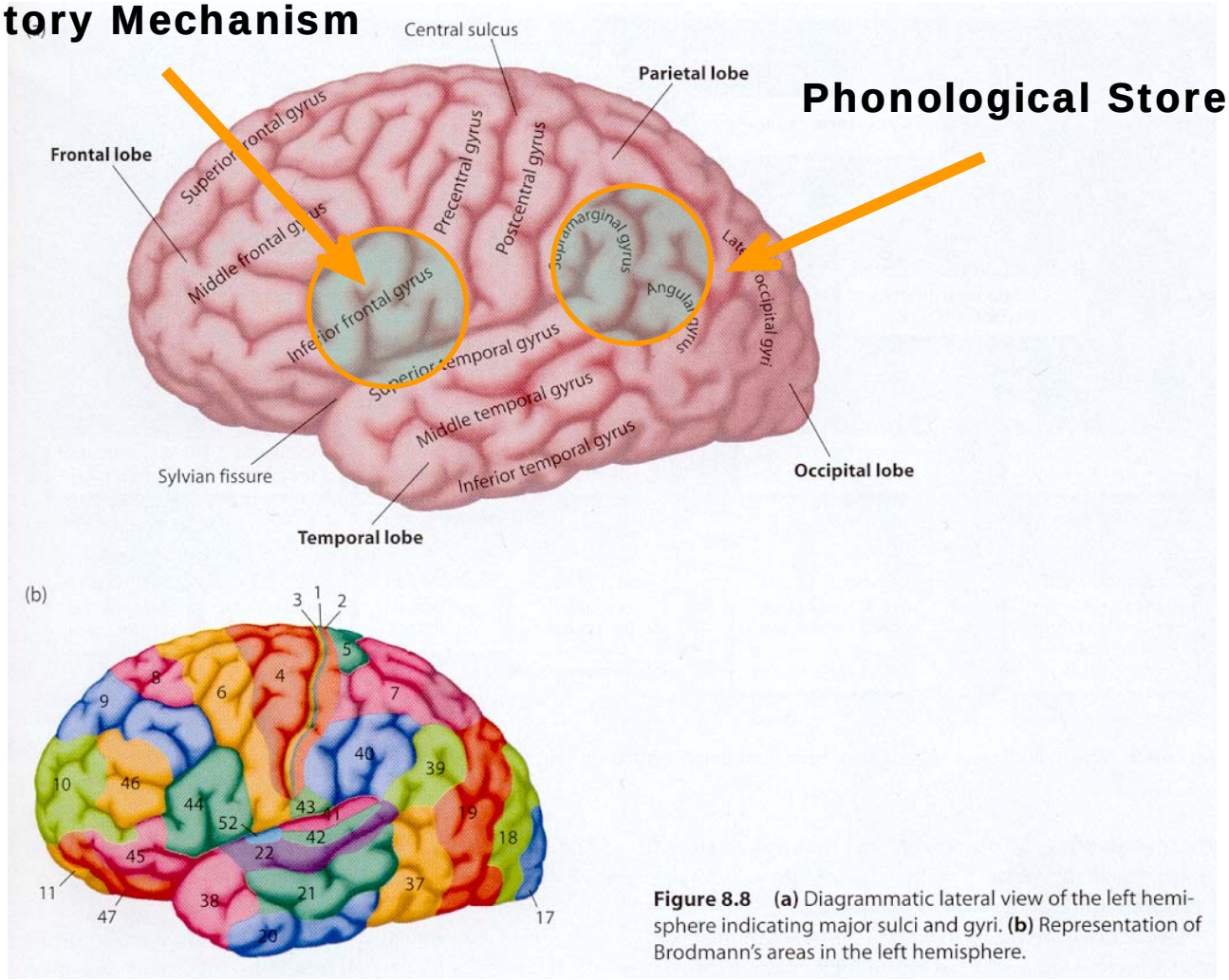
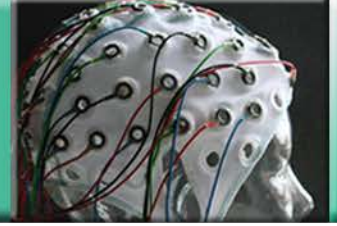
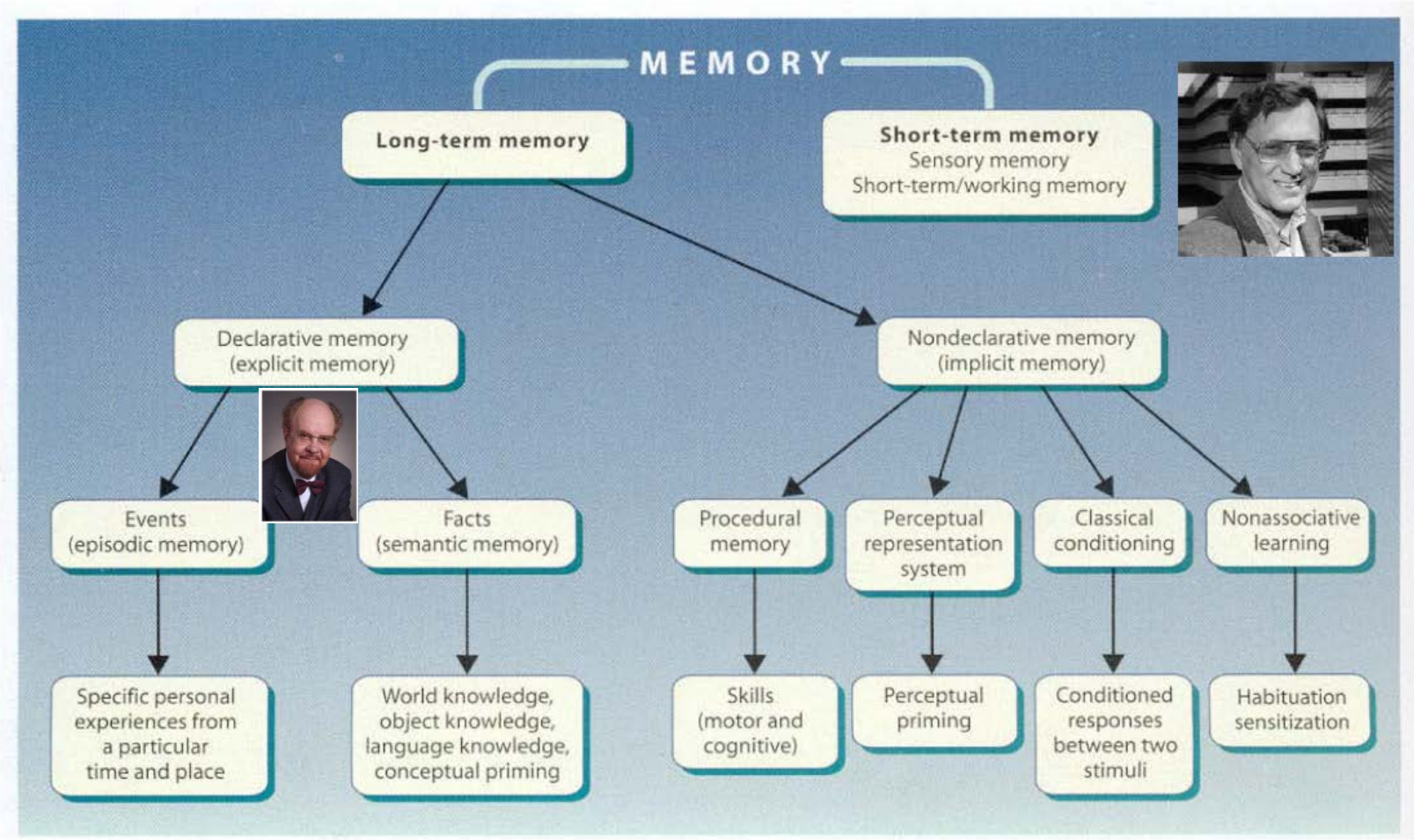


Figure 8.8 **(a)** Diagrammatic lateral view of the left hemisphere indicating major sulci and gyri. **(b)** Representation of Brodmann's areas in the left hemisphere.

Das Langzeitgedächtnis





Structure and function of declarative and nondeclarative memory systems

LARRY R. SQUIRE* AND STUART M. ZOLA

Henry Gustav Molaison (H.M.): 1926-2008

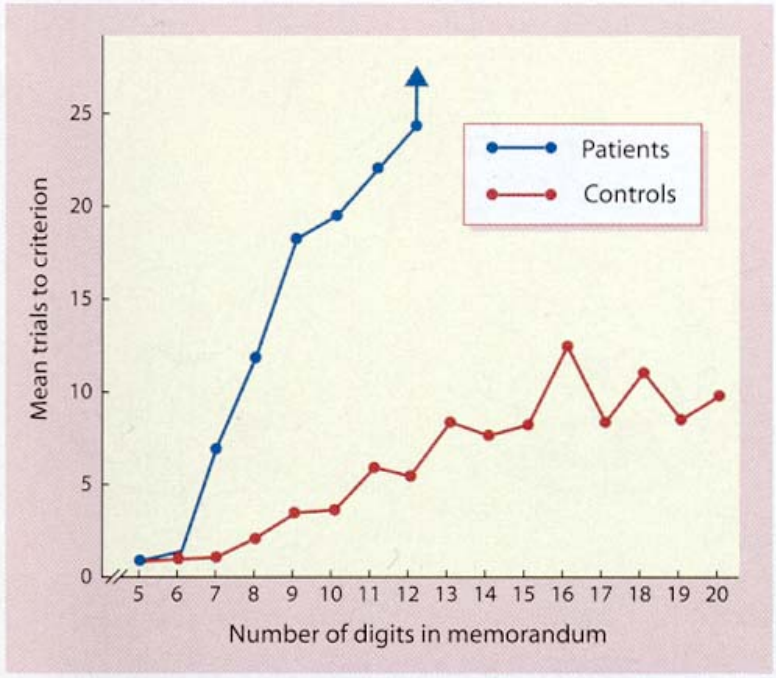


Figure 8.10 Digit span for amnesic patients and control subjects. A sequence of five digits was read to the subjects, who were then asked to repeat the digits back to the experimenter. If the digits were repeated correctly, one more digit was added to the next sequence presented. If the digits in a sequence were reported incorrectly, that sequence was repeated until the subject reported it correctly. Amnesic patients had relatively normal digit span ability, but required more trials to learn strings of digits. Adapted from Drachman and Arbit (1966).

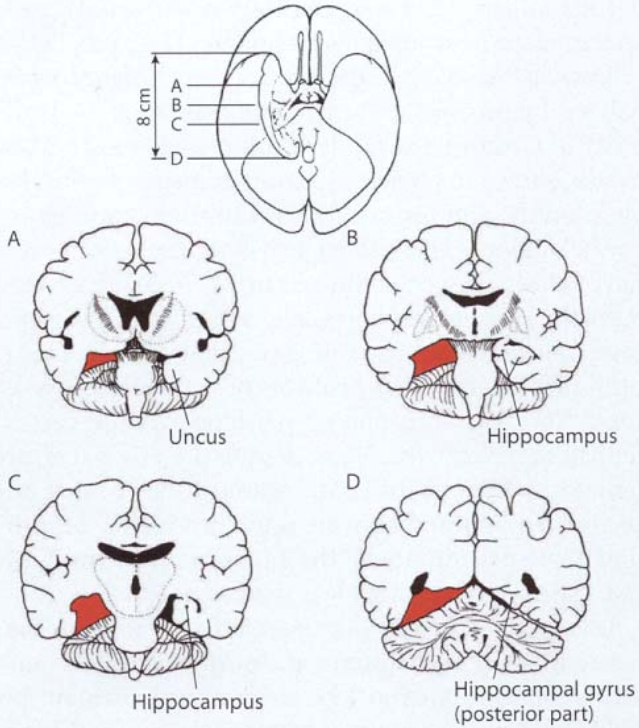
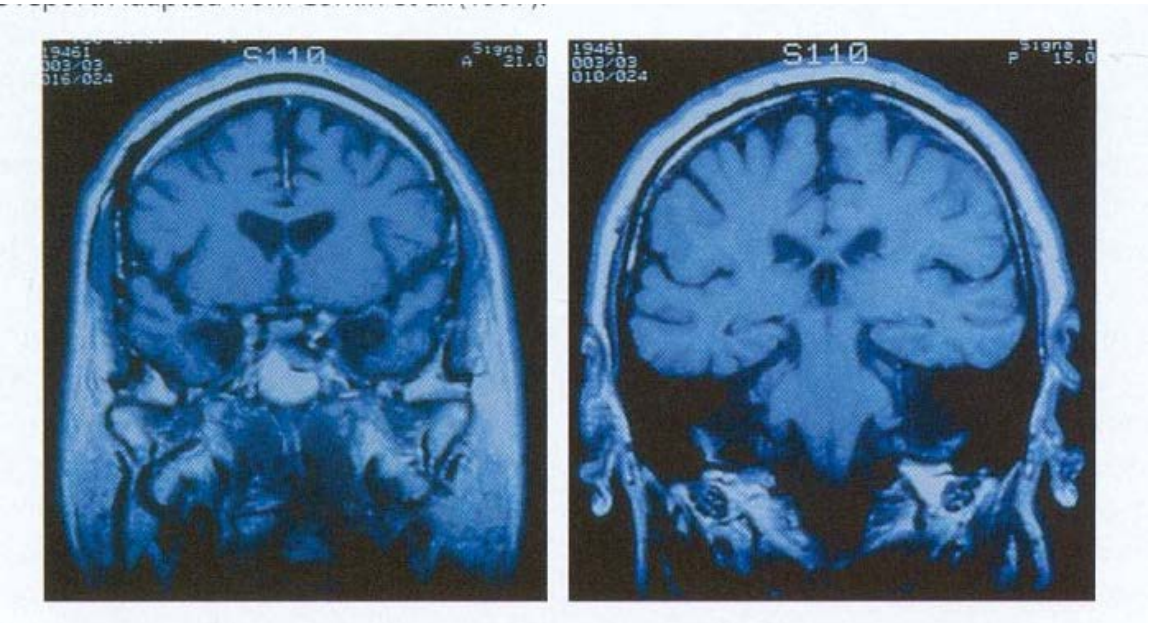


Figure 8.11 Anatomy of the medial temporal lobe and areas believed to have been removed from H.M. (in red) as reported by the surgeon (Note that the resection is shown here on one side only, to permit a comparison of the resected region with an intact brain at the same level. H.M.'s actual lesion was bilateral.) At the top is a ventral view of the brain showing both hemispheres and the details of the right medial temporal area (shown on left of figure). The four anterior to posterior levels (A–D) shown on this ventral view correspond to the coronal sections at the bottom of the figure. Adapted from Corkin et al. (1997).

H.M. im Scanner 1997



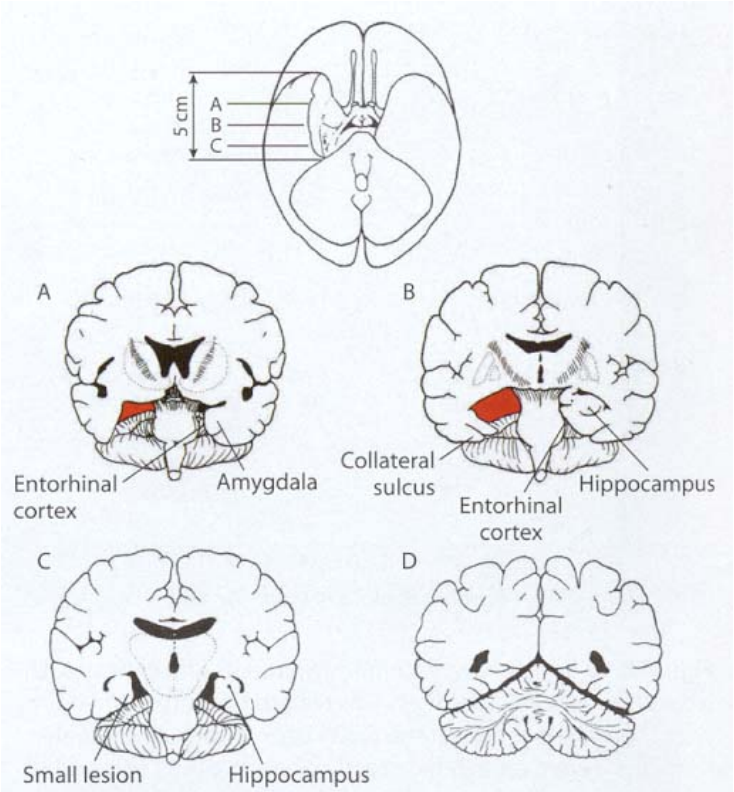
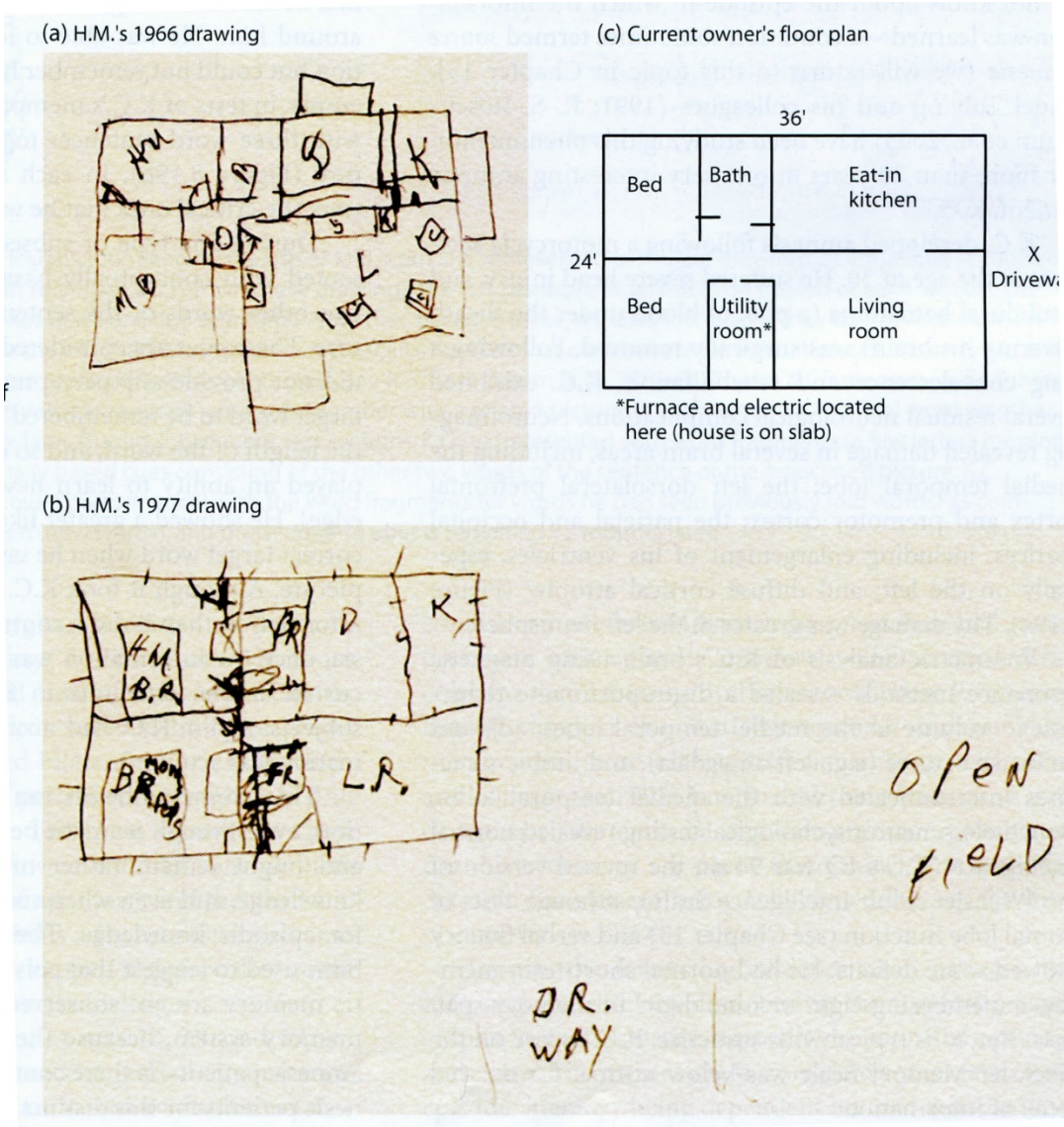


Figure 8.13 Modern reconstruction by Amaral and colleagues showing that portions of H.M.'s posterior hippocampus were not removed during surgery. However, this tissue does show signs of atrophy and may no longer be functioning normally. Adapted from Corkin et al. (1997).

H.M.: Intaktes Alt-Gedächtnis



R.B. : Anterograde Amnesie (wie H.M.) nach selektiver Schädigung des HC

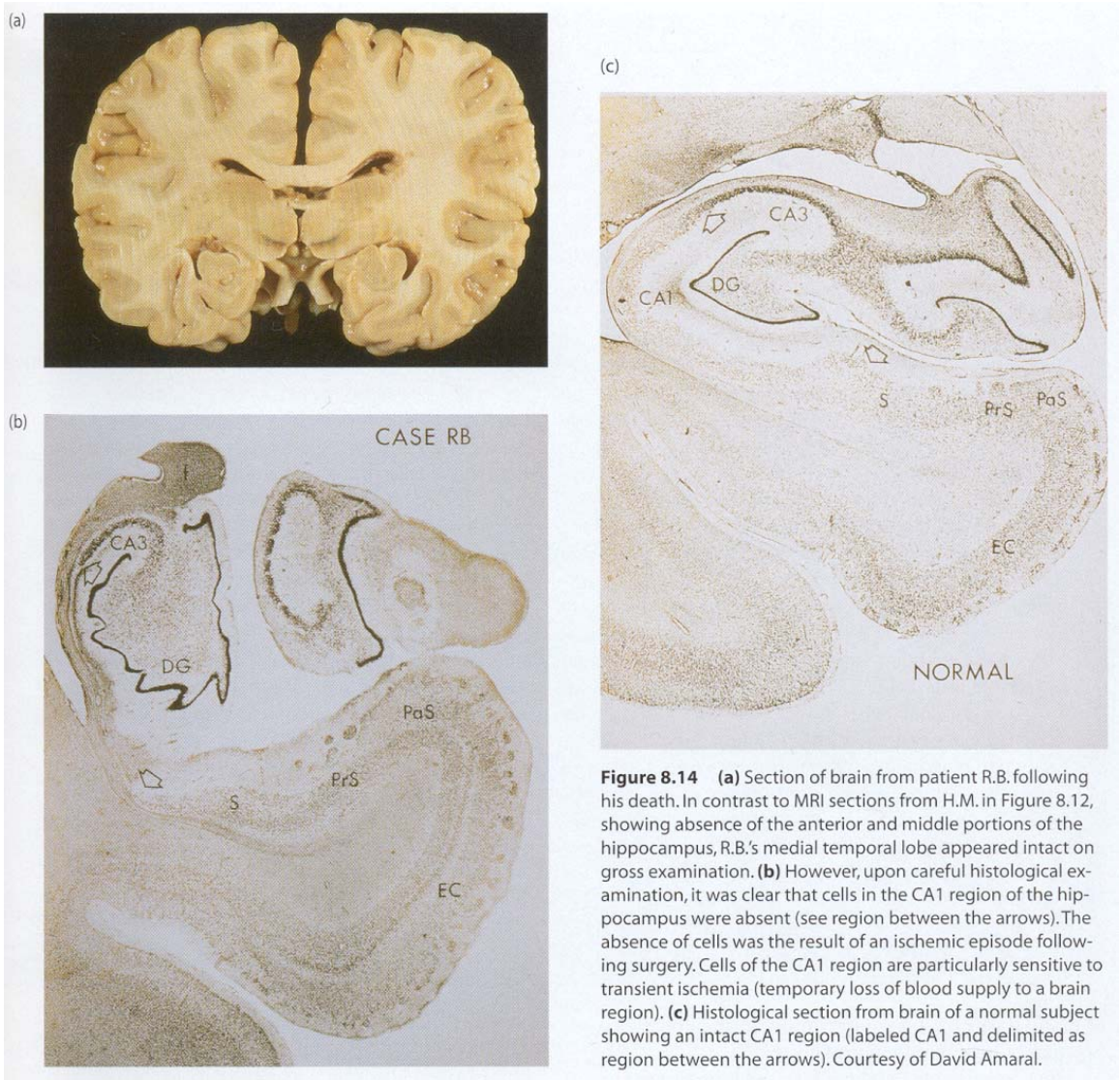


Figure 8.14 **(a)** Section of brain from patient R.B. following his death. In contrast to MRI sections from H.M. in Figure 8.12, showing absence of the anterior and middle portions of the hippocampus, R.B.'s medial temporal lobe appeared intact on gross examination. **(b)** However, upon careful histological examination, it was clear that cells in the CA1 region of the hippocampus were absent (see region between the arrows). The absence of cells was the result of an ischemic episode following surgery. Cells of the CA1 region are particularly sensitive to transient ischemia (temporary loss of blood supply to a brain region). **(c)** Histological section from brain of a normal subject showing an intact CA1 region (labeled CA1 and delimited as region between the arrows). Courtesy of David Amaral.

Der Hippocampus

Der Hippocampus

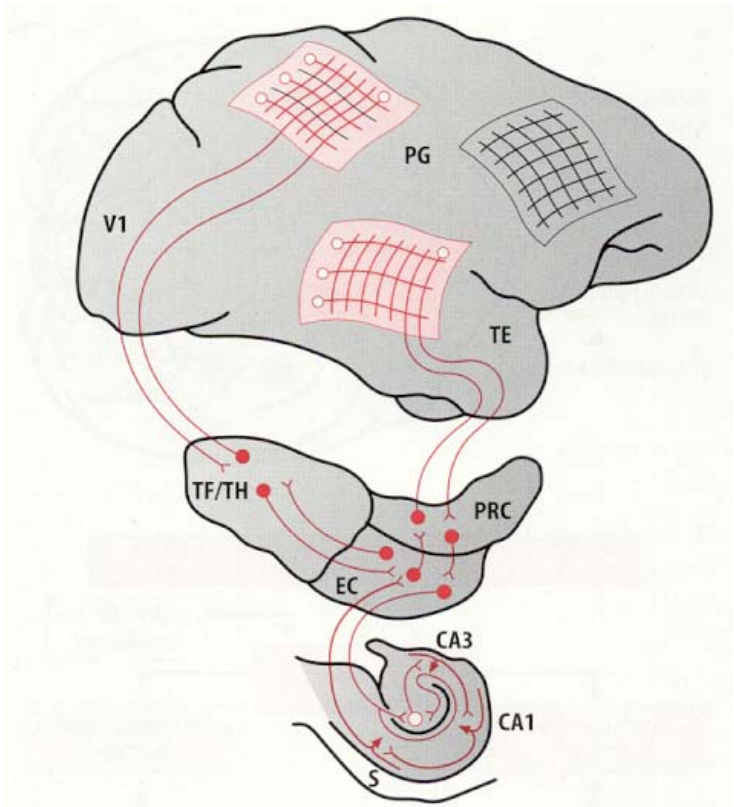
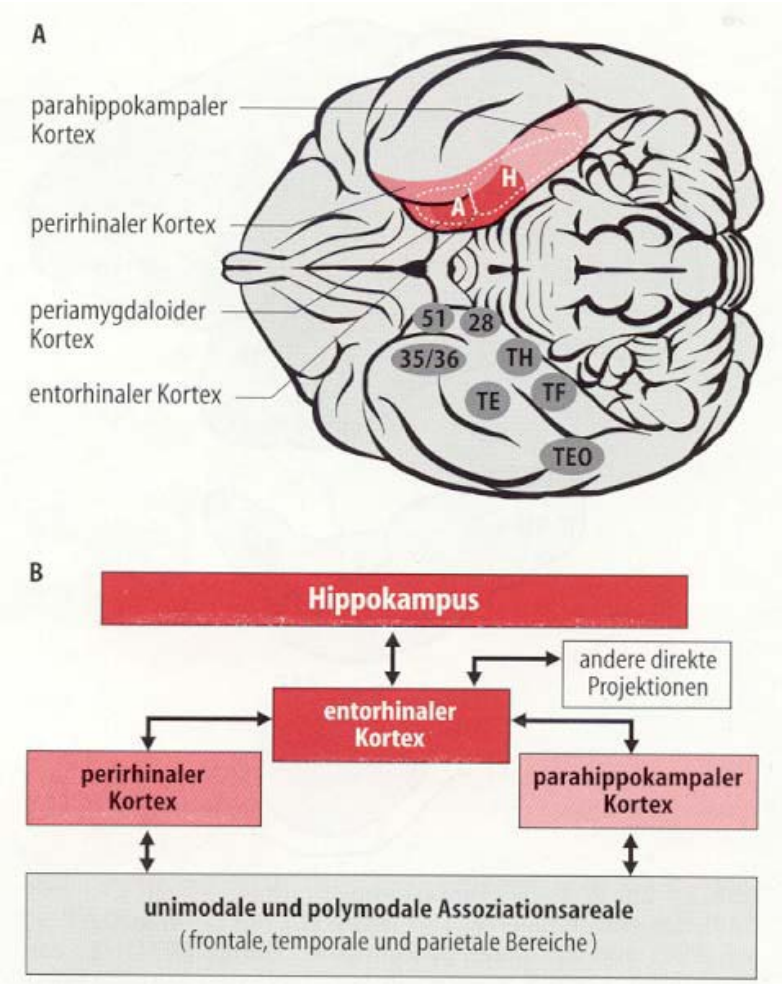


Abb. 24–28. Rolle des Hippokampus (unten: Schicht CA1 und CA3), des entorhinalen Kortex (Mitte:EC), des perirhinalen Kortex (PRC) und des parahippokampalen Kortex (TF/TH) in der Verknüpfung von Kontexten in verschiedenen Kortexarealen (V1, primärer visueller Kortex; PG, Gyrus postcentralis; TE, temporaler Kortex). Siehe auch Abb. 24–29 u. Text. (Modifiziert nach [16] mit freundlicher Genehmigung



Der Hippocampus

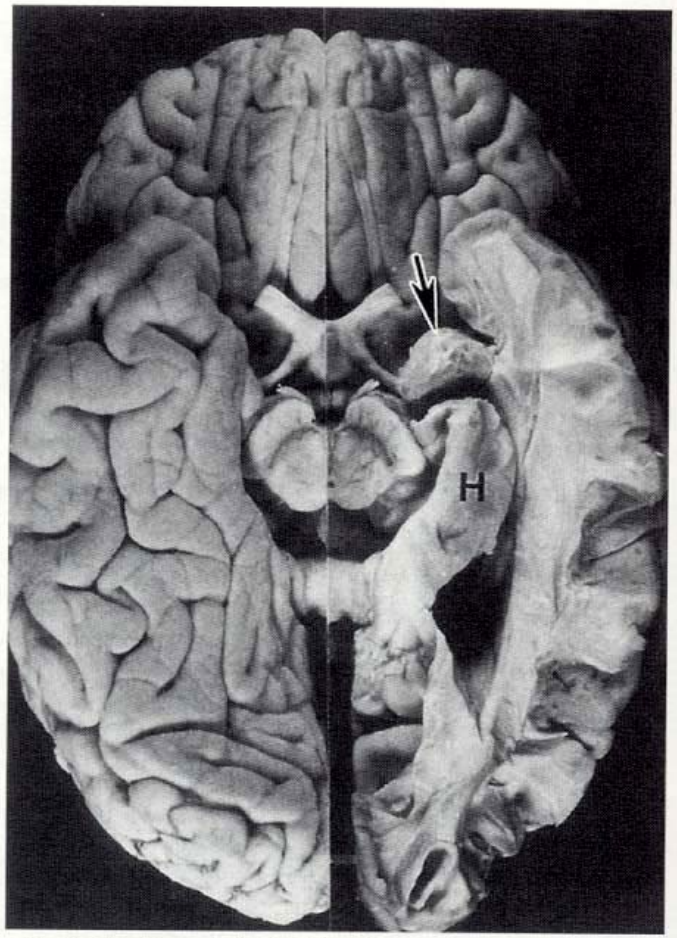
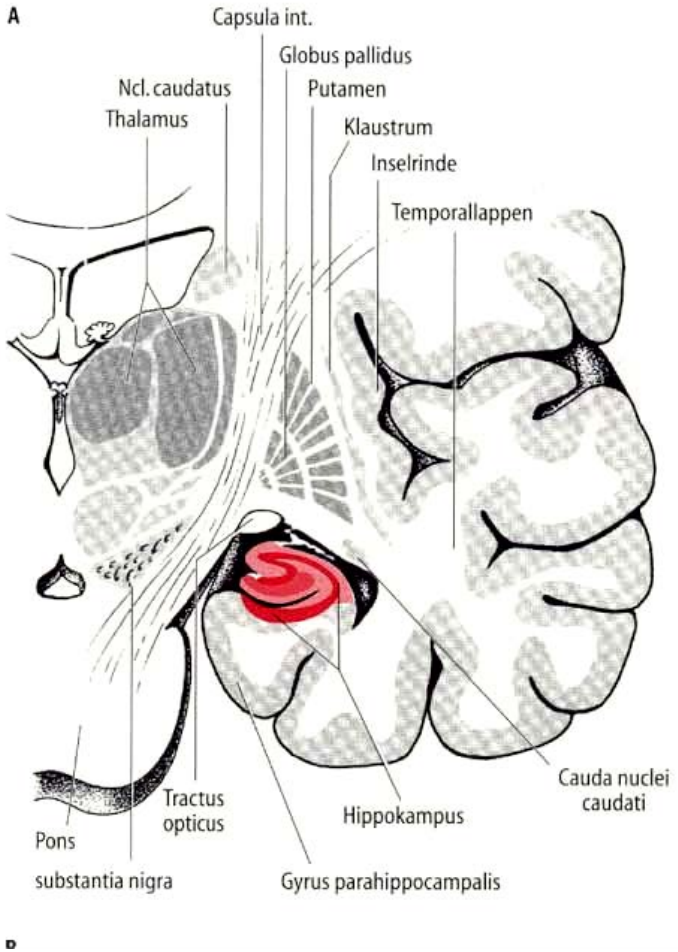
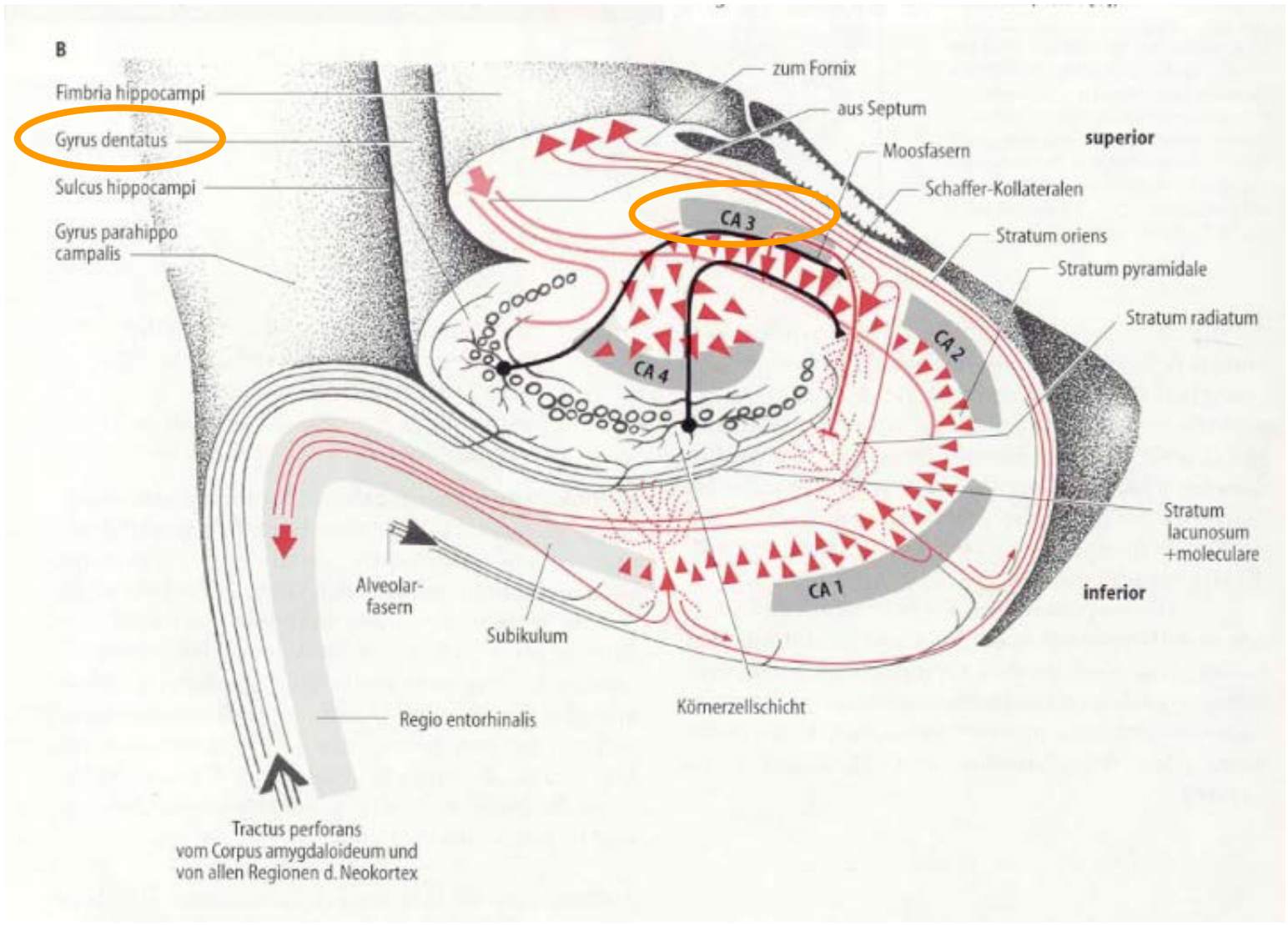


Abb. 20–12. Amygdala *(Pfeil)* und Hippokampus (H) von der ventralen Seite nach Entfernung des vorderen Temporallappens *(links)*. (Aus [6])



Der Hippocampus



Der Hippocampus: Pattern separation & completion

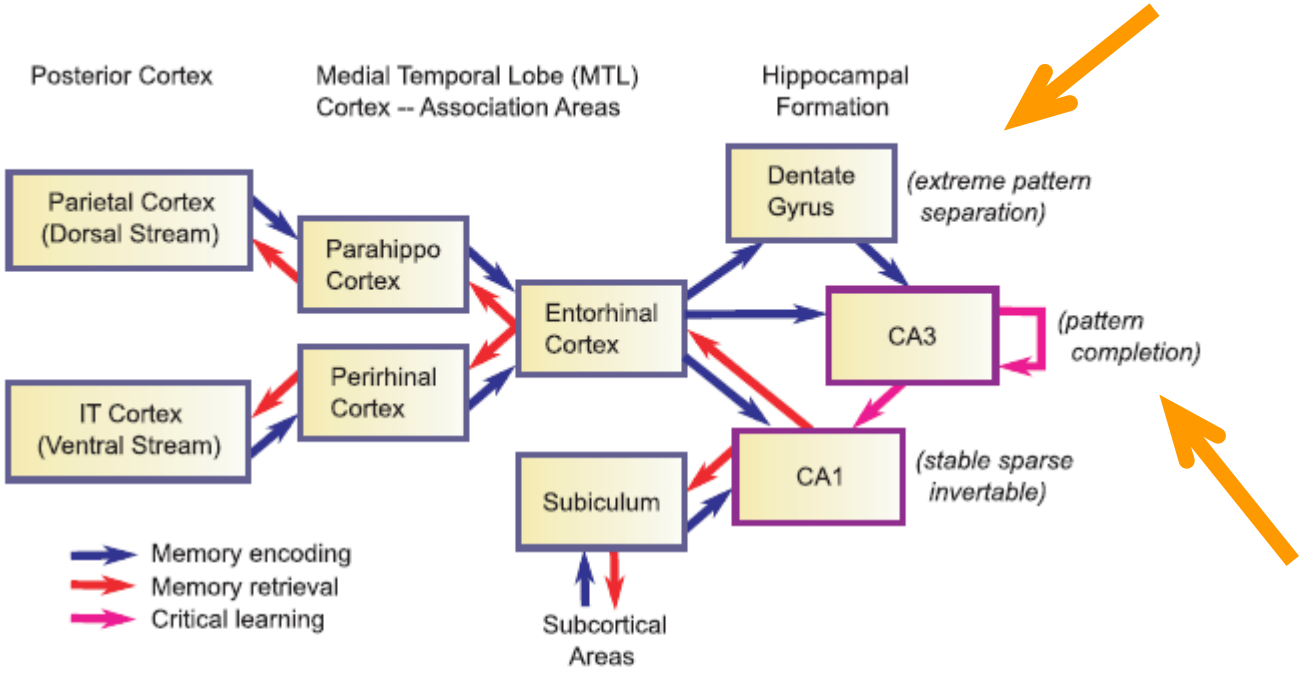


Fig. 1. Hippocampal memory formation, showing how information is encoded and retrieved. The critical learning takes place in the CA3 Schaffer collateral projections that interconnect CA3 neurons with themselves, and in the projections between the CA3 and the CA1. CA3 and CA1 represent the highest levels of encoding in the system (where the blue arrows end), and memory encoding amounts to strengthening the associations between the active neurons within these regions, while memory retrieval involves pattern completion within CA3 driving reactivation of the associated CA1 pattern, which then feeds back down to reactivate the original activity patterns throughout the cortex. IT, inferior temporal.

The Mnemonic Similarity Task

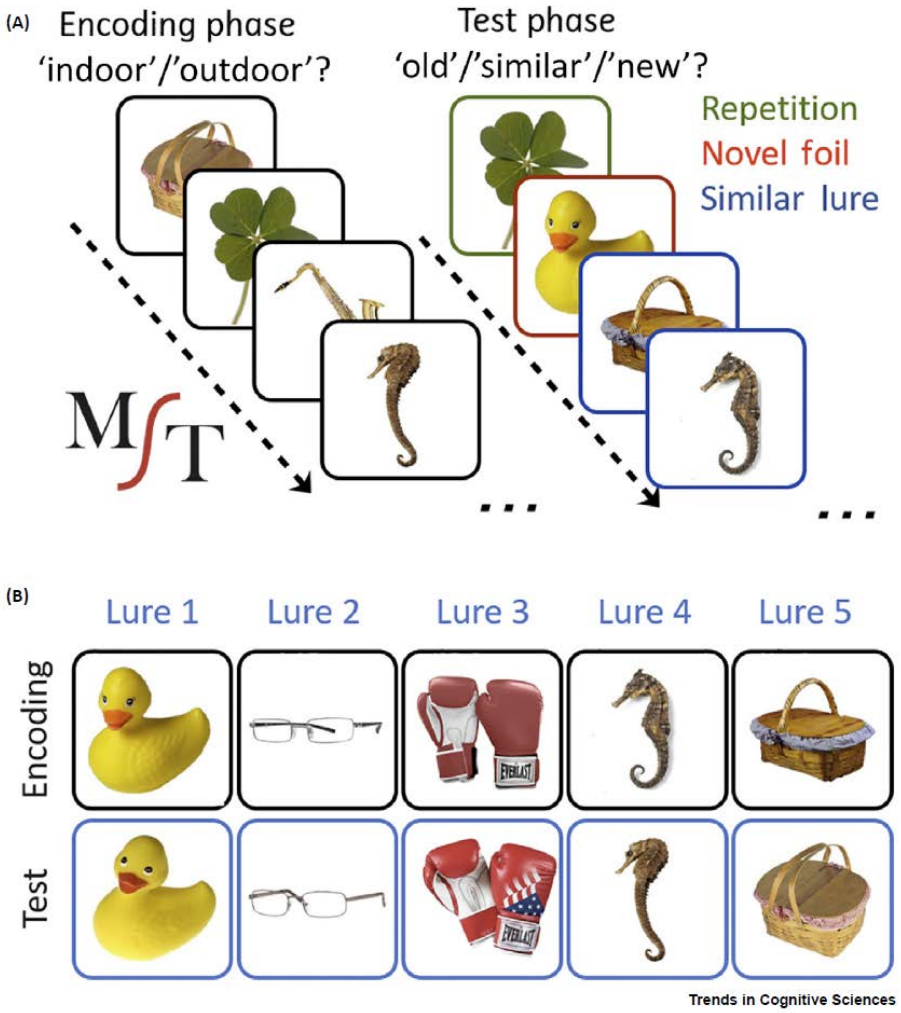


Figure 1. Mnemonic Similarity Task

(A) Examples of stimuli during the incidental encoding and subsequent 'old'/'similar'/'new' recognition task. Colored boxes are to illustrate conditions, but not used during the actual task administration. (B) Examples of images for each of the lure bins, ranging from most similar (lure bin 1) to least similar (lure bin 5).

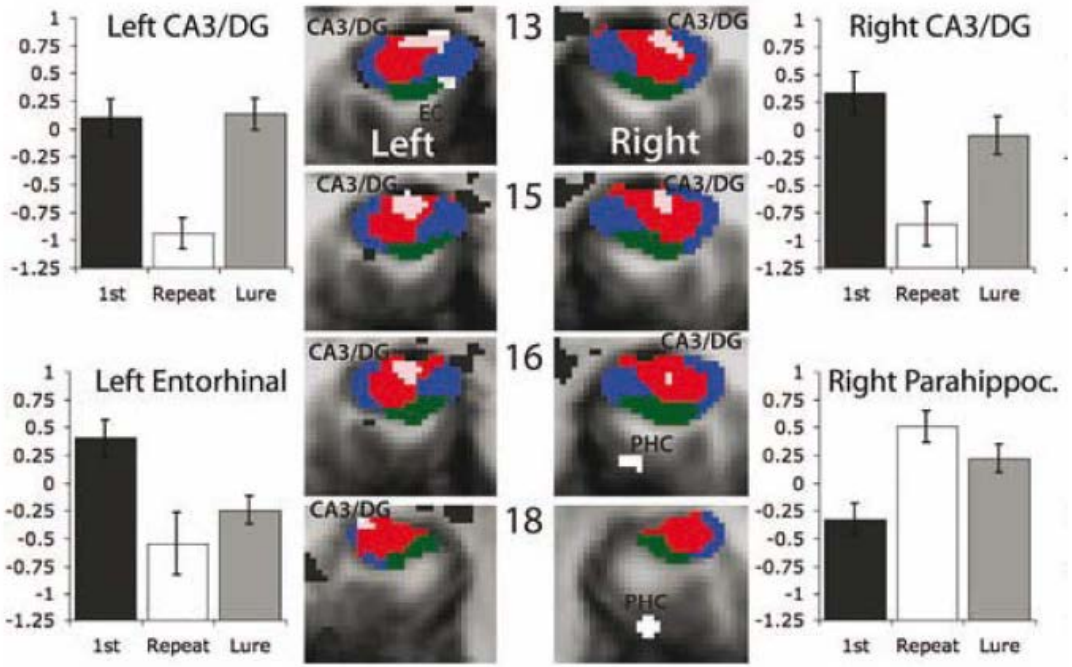
Stark et al. (2019)

Pattern separation & completion im Hippocampus

Pattern Separation: lure = 1st
Pattern Completion: lure = repeat

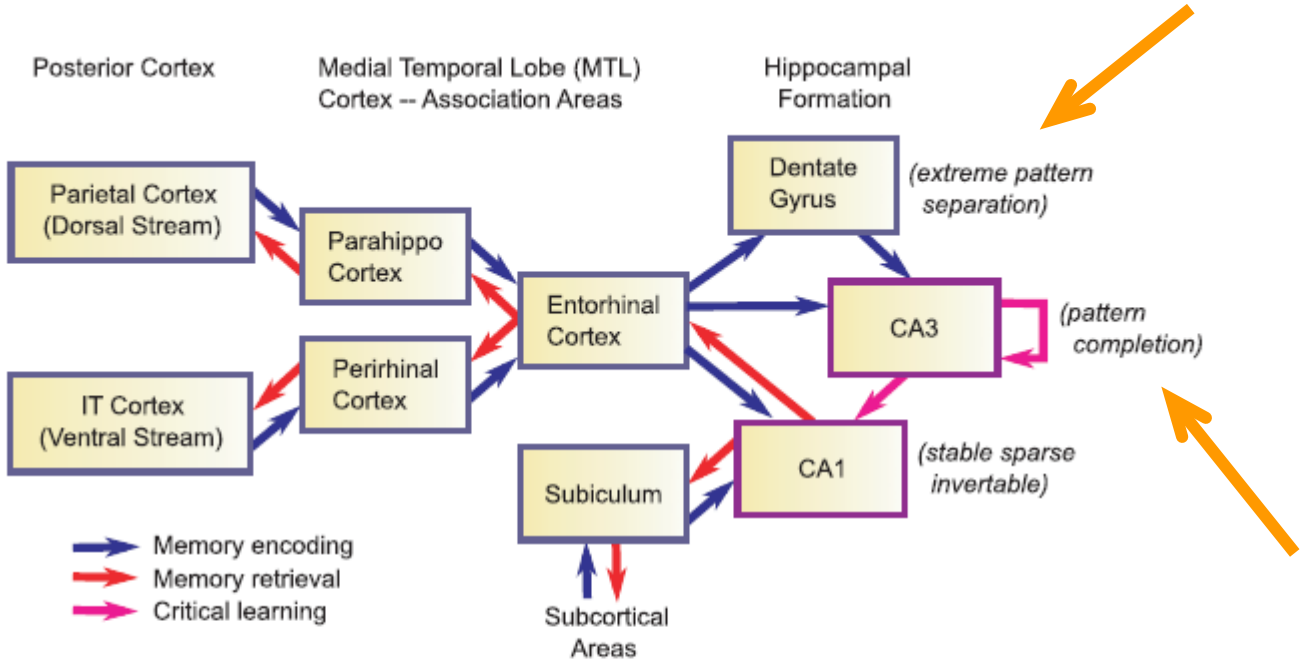
Pattern Separation
Gyrus Dentatus

Pattern Completion
(CA3)



Bakker et al. 2008

Der Hippocampus



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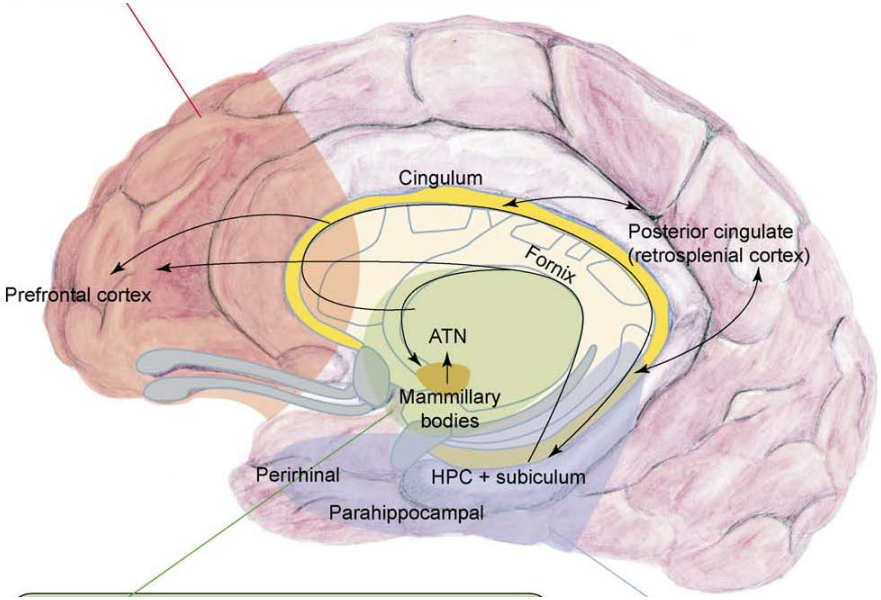
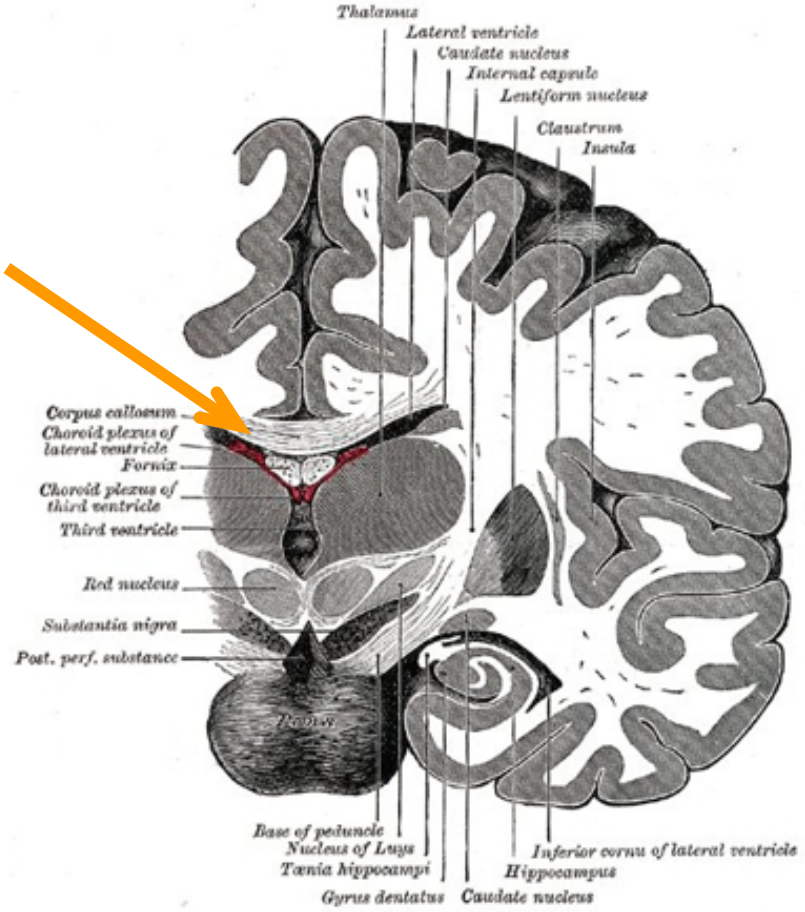
The extended Hippocampal – Diencephalic System





The extended Hippocampal – Diencephalic System

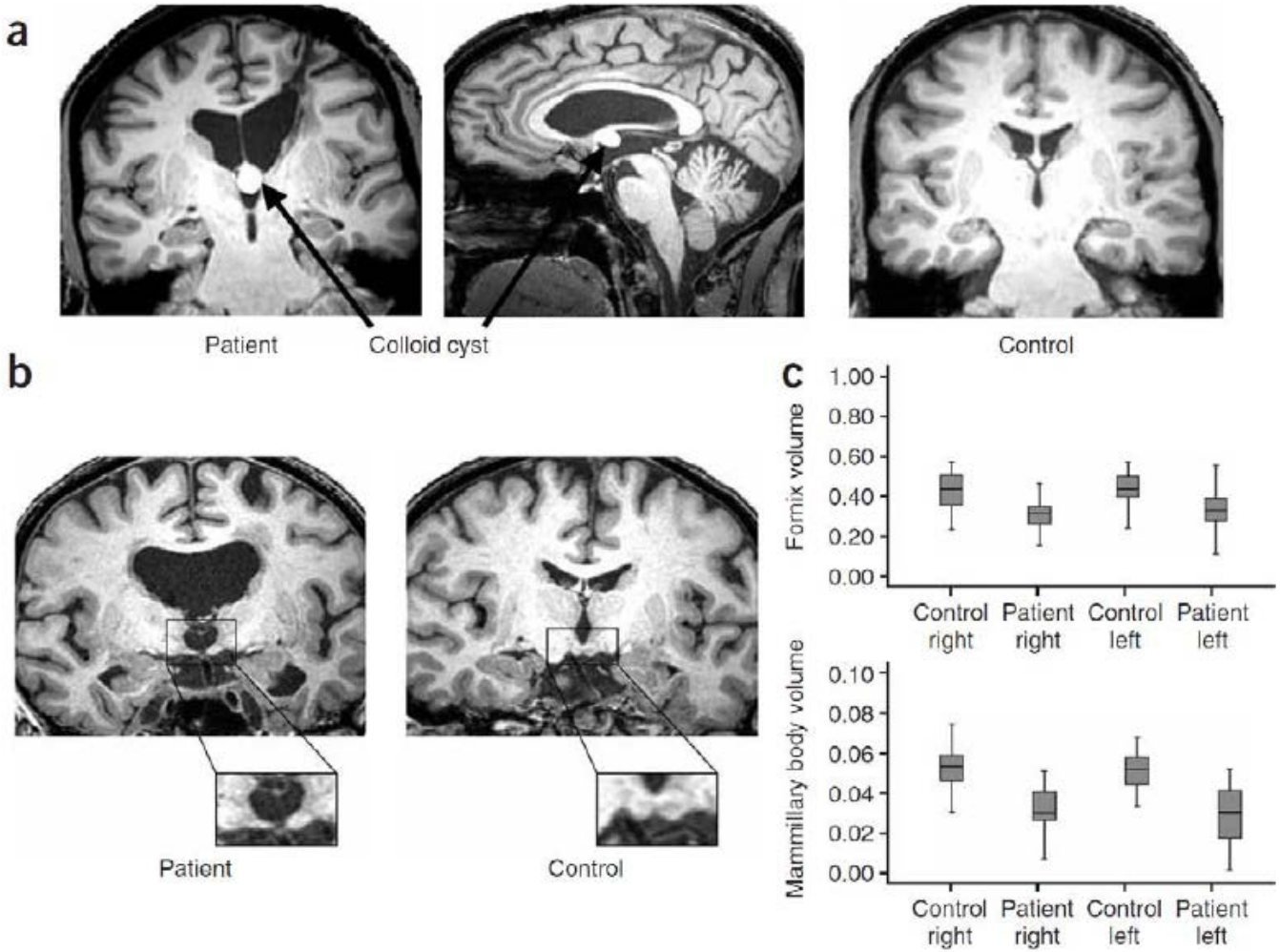
A disproportionate role for the fornix and mammillary bodies in recall versus recognition memory

Dimitris Tsivilis[1,4], Seralynne D Vann[2,4], Christine Denby[1], Neil Roberts[3], Andrew R Mayes[1], Daniela Montaldi[1] & John P Aggleton[2]

nature neuroscience

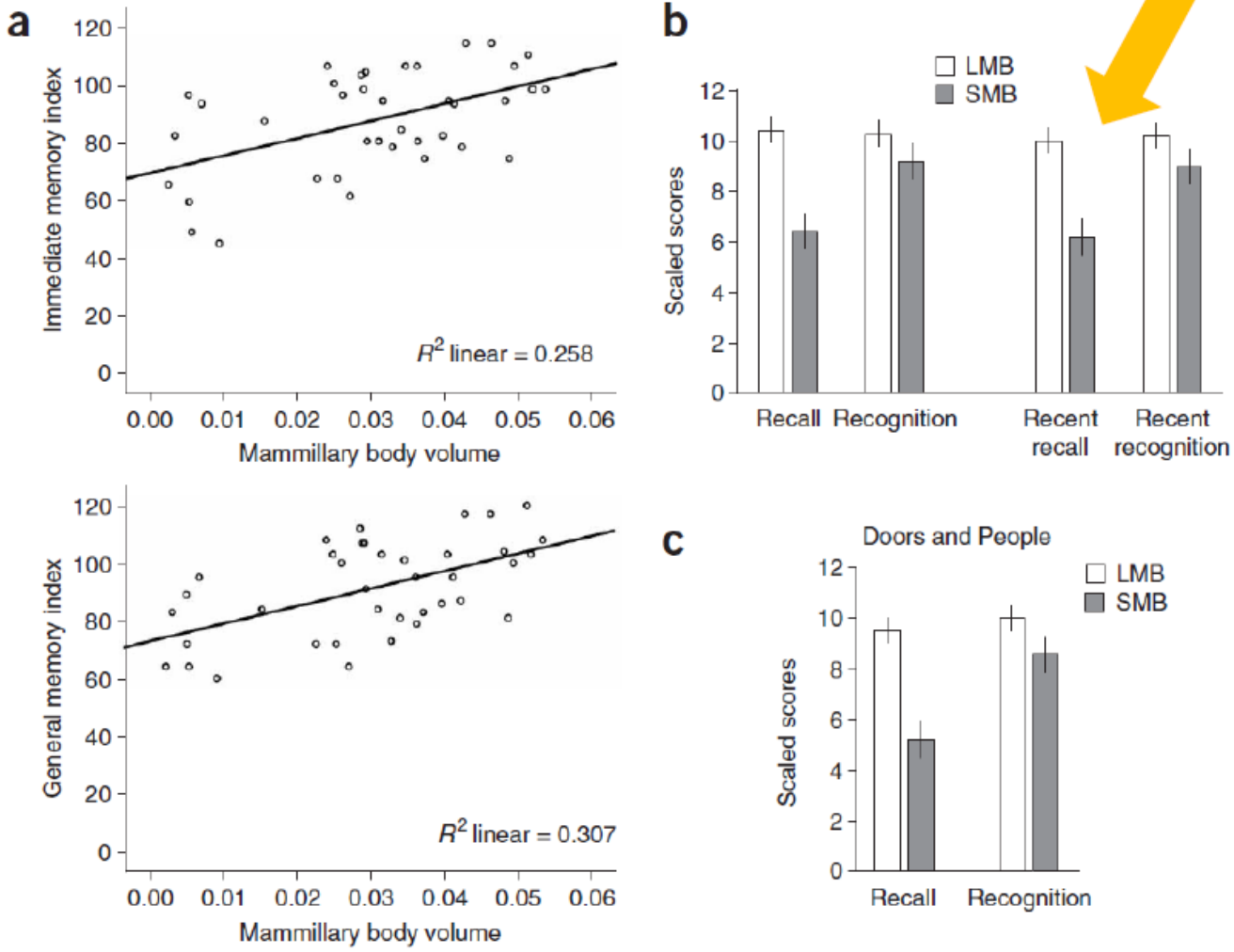
Tsvilis et al (2008)

Kolloidzysten (n=38 Patienten)



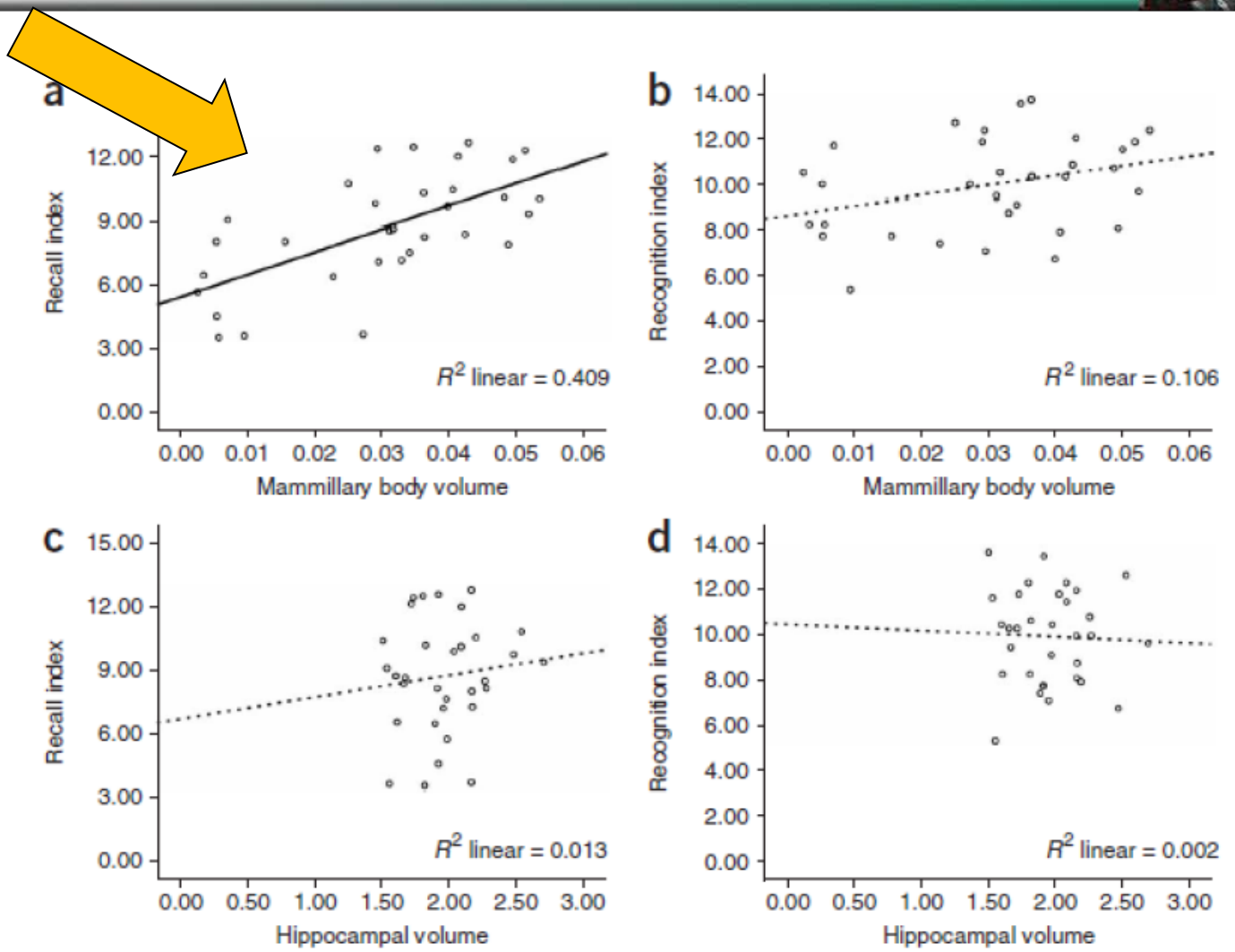
Tsvilis et al (2008)

Impaired recall & spared recognition



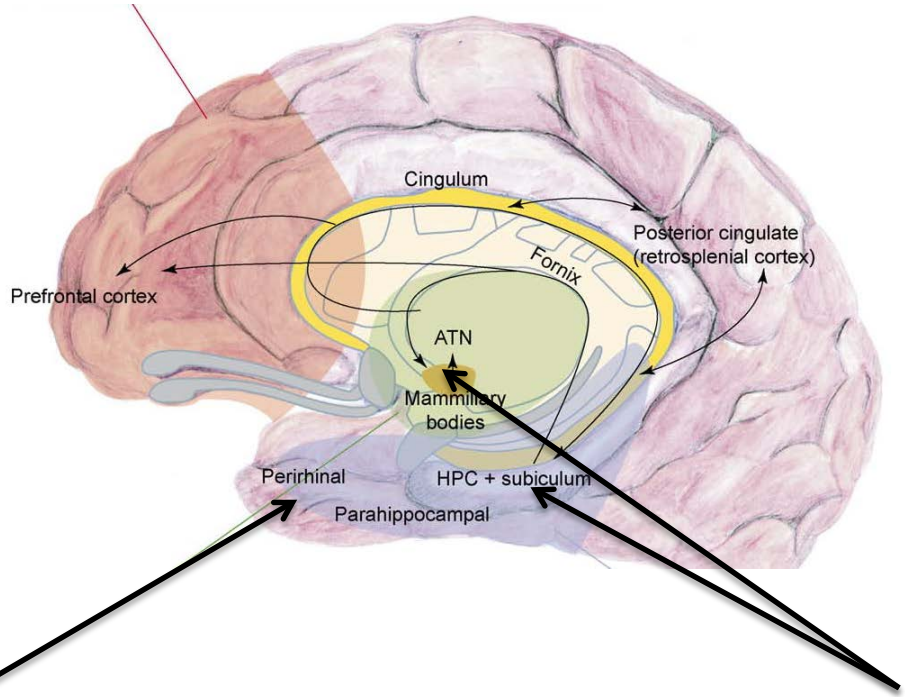
Tsvilis et al (2008)

Impaired recall & spared recognition



Tsvilis et al (2008)

The extended Hippocampal – Diencephalic System



Perirhinal temporal lobe System
Familiarity components of recognition

Recall/Recollection
components of recognition

Aggleton & Brown (1999)

Anterograde vs retrograde Amnesien

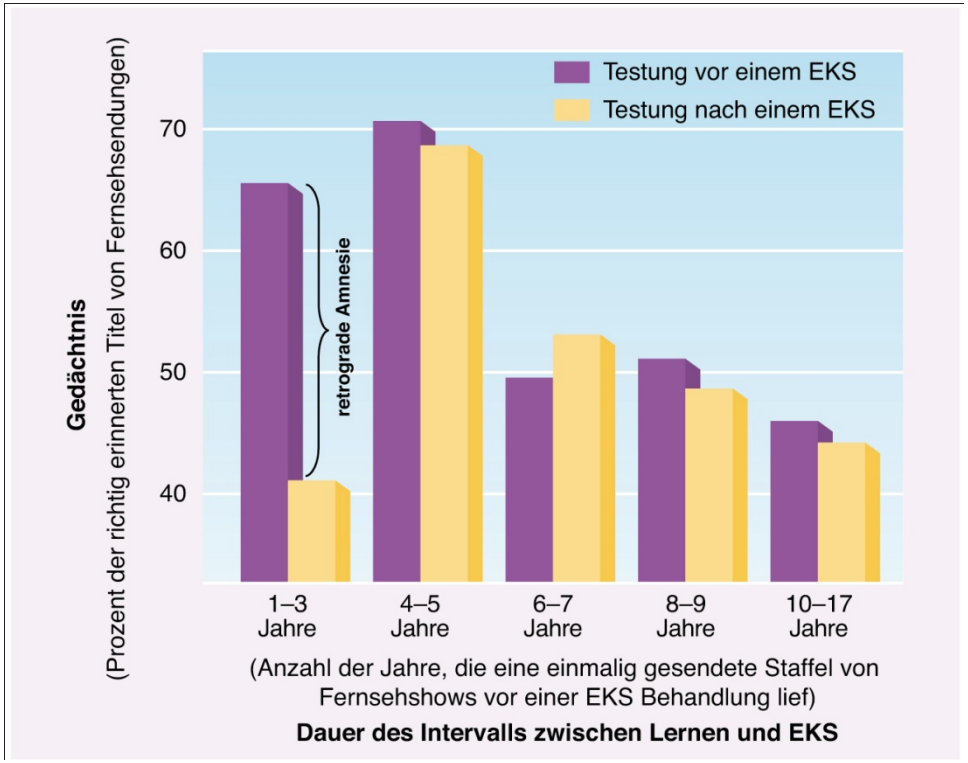
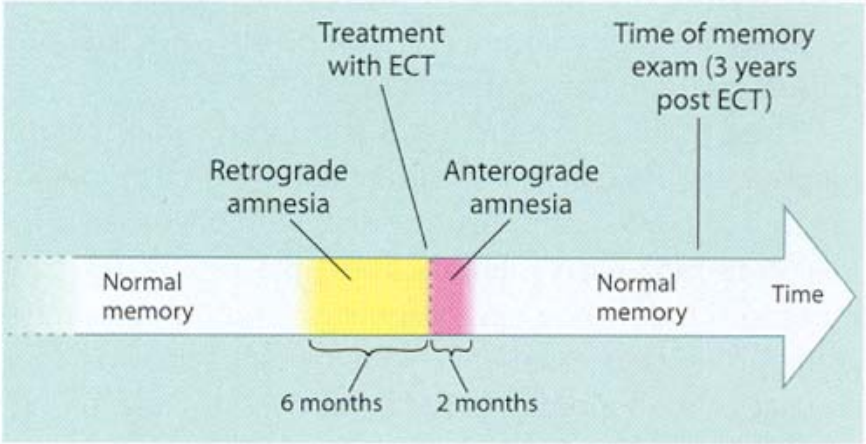
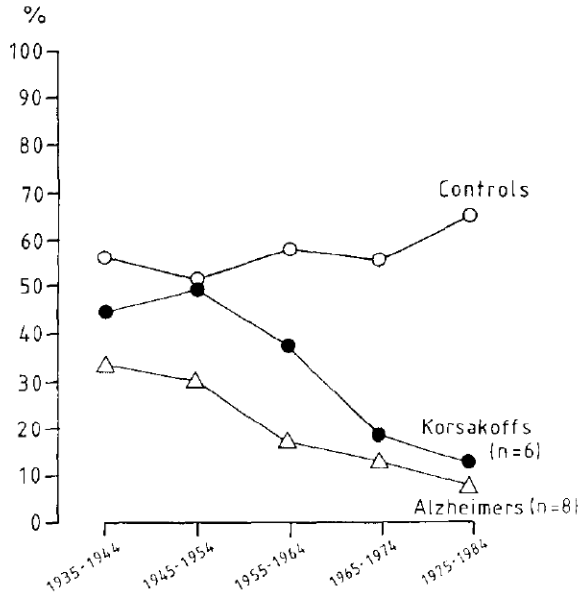


Figure 8.15 Effects of electroconvulsive therapy (ECT) on memory performance. Memory apparently changes for a long time after initial learning, with some material being forgotten and the material that remains becoming more resistant to disruption. Adapted from Squire and Slater (1983).



Retrograde Amnesie: Der Ribot Gradient

Théodule-Armand Ribot



Kopelman (1989)

"the progressive destruction of memory follows a logical order – a law… It begins with the most recent recollections which, being… rarely repeated and… of no permanent associations, represent organization in its feeblest form."

Elektrokonvulsionsschock (ECS):
Evidenz für kurzen Gradienten

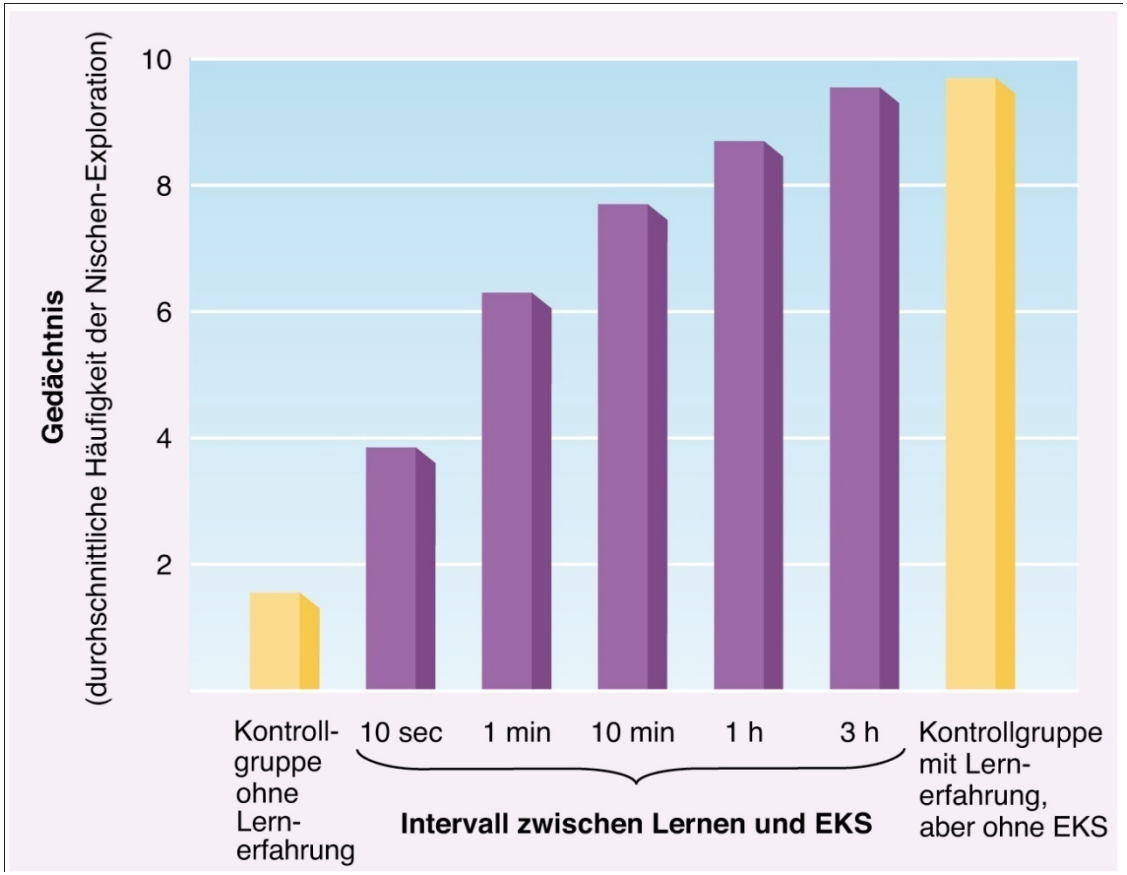


Abbildung 11.7: Eine EKS-erzeugte retrograde Amnesie mit einem kurz andauernden Gradienten. Abgebildet ist die Behaltensleistung nach einem einzigen Durchgang von Appetenzlernen für eine Kontrollgruppe von Ratten und für Gruppen von Ratten, die in verschiedenen Zeitabständen nach dem Lerndurchgang einen EKS erhielten. Nur die Ratten, die einen EKS innerhalb von zehn Minuten nach dem Lerndurchgang erhielten, zeigten eine bedeutsame retrograde Amnesie (adaptiert nach Pinel, 1969).

Langer Gradient (ca. 3 Jahre) der retrograden Amnesie ?

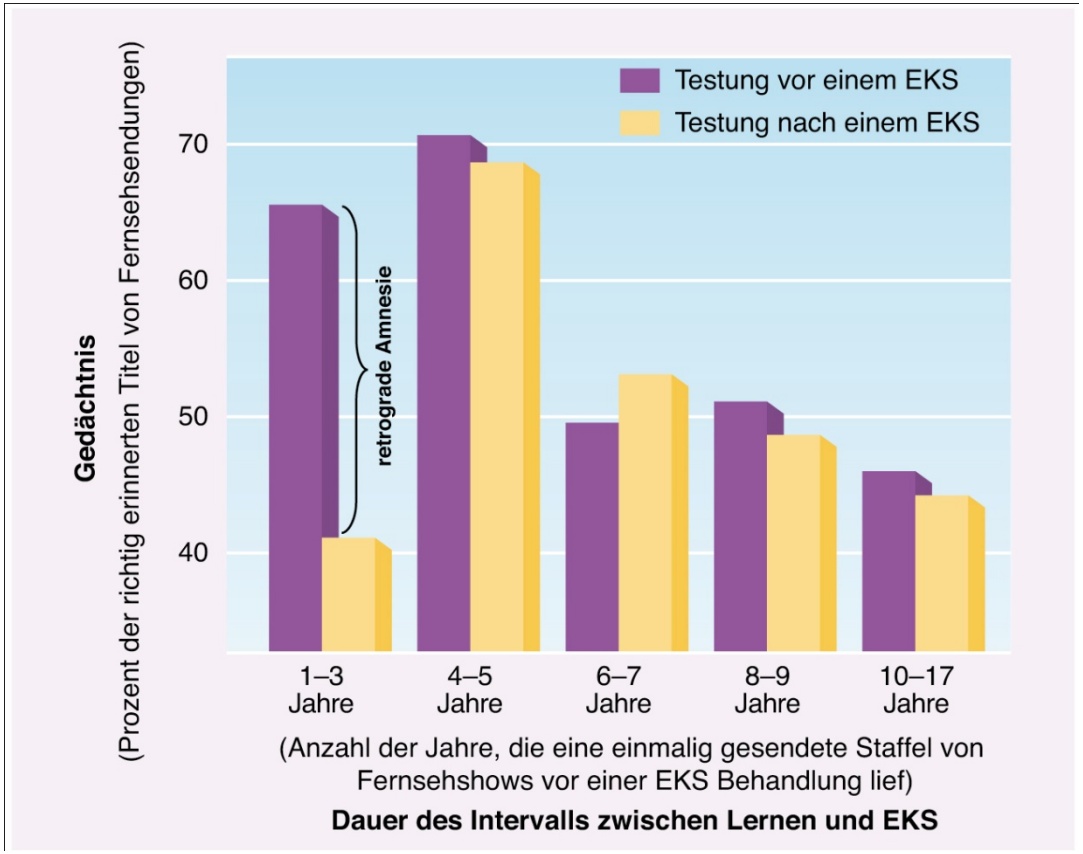
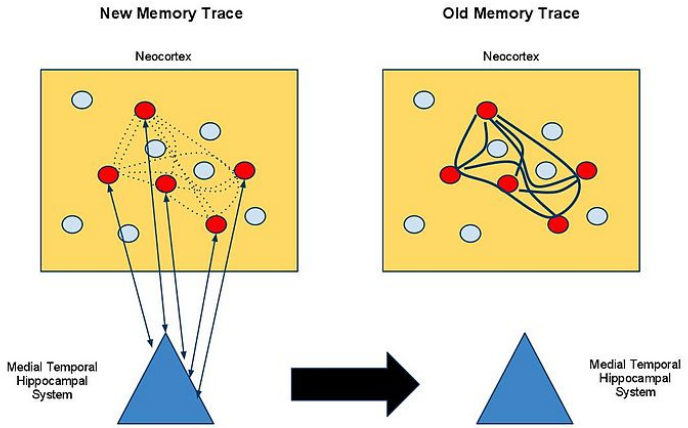


Abbildung 11.8: Eine EKS-erzeugte retrograde Amnesie mit einem lang andauenden Gradienten. Eine Serie von fünf elektrokonvulsiven Schocks erzeugte eine retrograde Amnesie für Fernsehsendungen, die nur eine Saison lang innerhalb der drei Jahre vor den Schocks gesendet wurden; die EKSs erzeugten allerdings keine Amnesie für vergleichbare Fernsehsendungen, die vor drei Jahren oder mehr gesendet wurden (adaptiert nach Squire, Slater & Chace, 1975).

Zwei Theorien zur Gedächtniskonsolidierung

- Traditionelle Konsolidierungstheorien: Erinnerungen werden vorübergehend im Hippocampus gespeichert und werden dann in stabilere kortikale Speichersysteme überführt.



- Multiple-Trace-Theorie: Hippocampus speichert Erinnerungen so lange, wie sie bestehen. Erinnerungen werden durch Rekonsolidierung zunehmend widerstandsfähiger gegen Hippocampusschädigungen.

Can memory improve after MTL lesions?

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Article

Attenuated Boundary Extension Produces a Paradoxical Memory Advantage in Amnesic Patients

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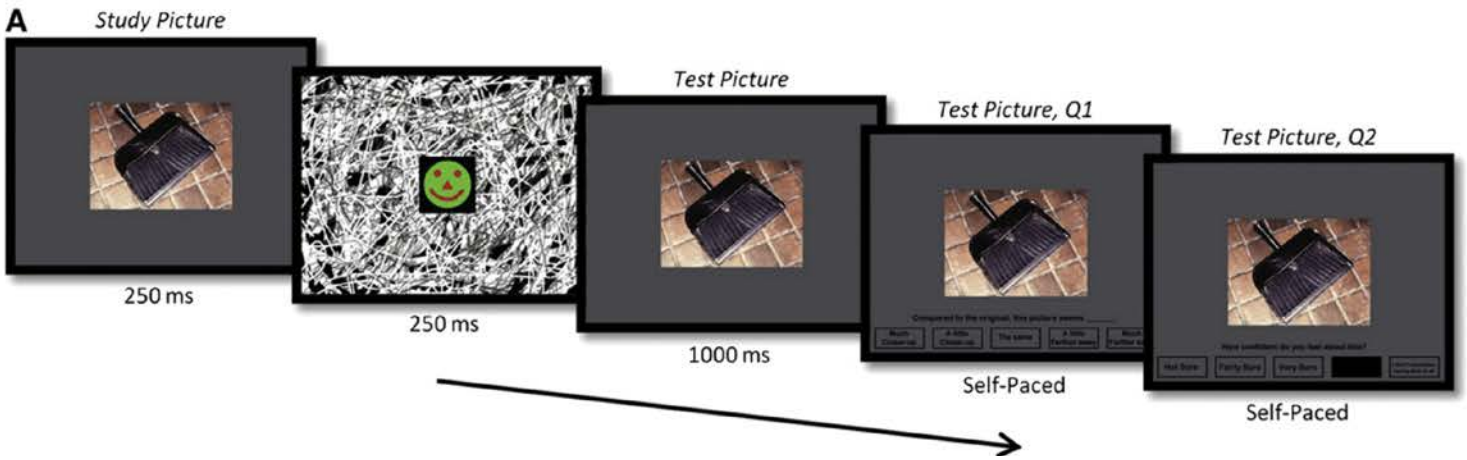
[7–9]. Hassabis et al. [10] found that patients with bilateral hippocampal damage and amnesia could not imagine either fictitious or future scenes (see also [11–14]); their constructions were fragmented and lacked spatial coherence. This led to the proposal that the hippocampus may facilitate the construction of complex spatial contexts or scenes into which event details are bound, and this scene construction process may underpin functions such as navigation, recalling the past, and imagining the future [6].

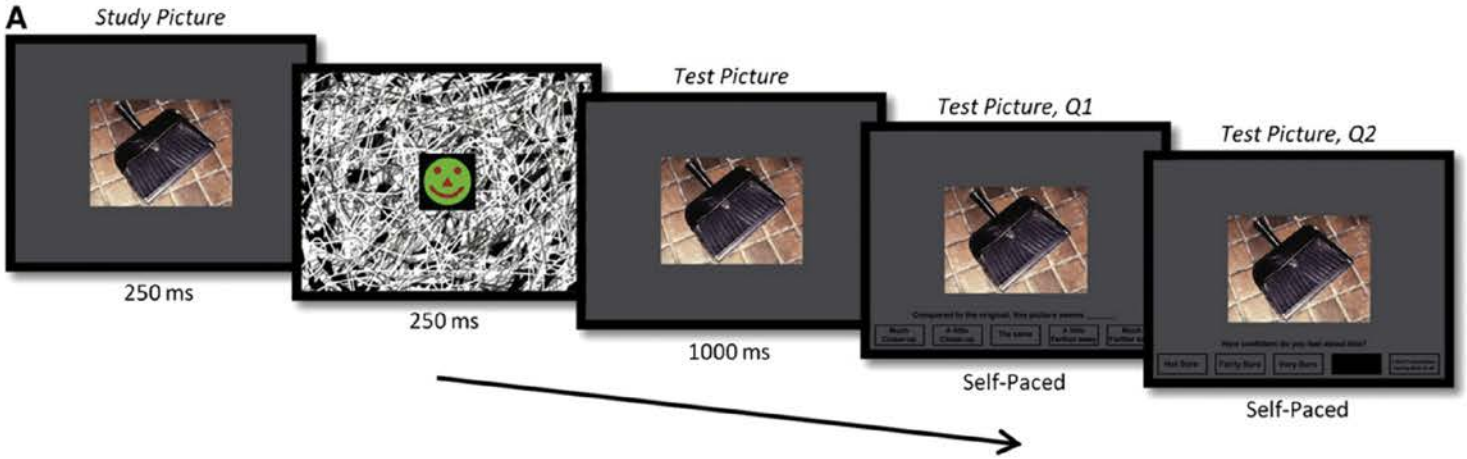
Figure 1. A Demonstration of Boundary Extension

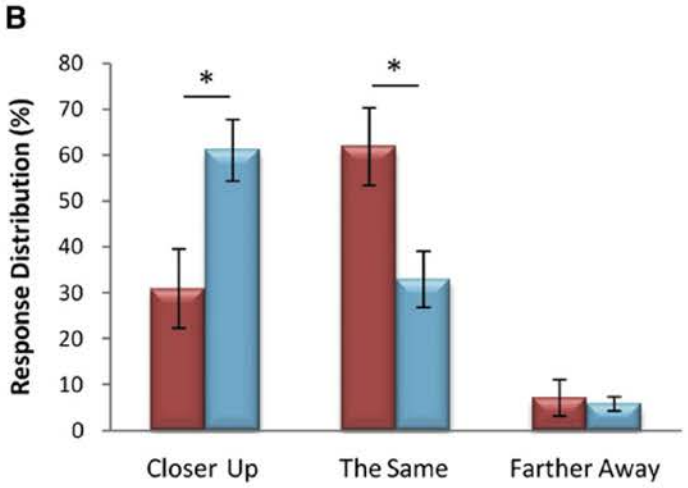
The left panel shows the studied photograph (i.e., a close-up view of a scene) and the right panel shows the scene as subsequently drawn from memory moments later by a control participant. The drawing clearly depicts a more extended expanse of background than was evident in the original stimulus (taken from [24]).

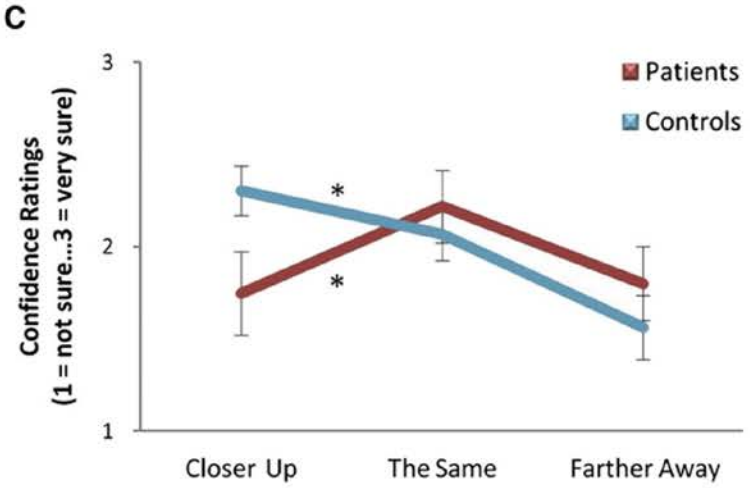
Rapid serial visual presentation task



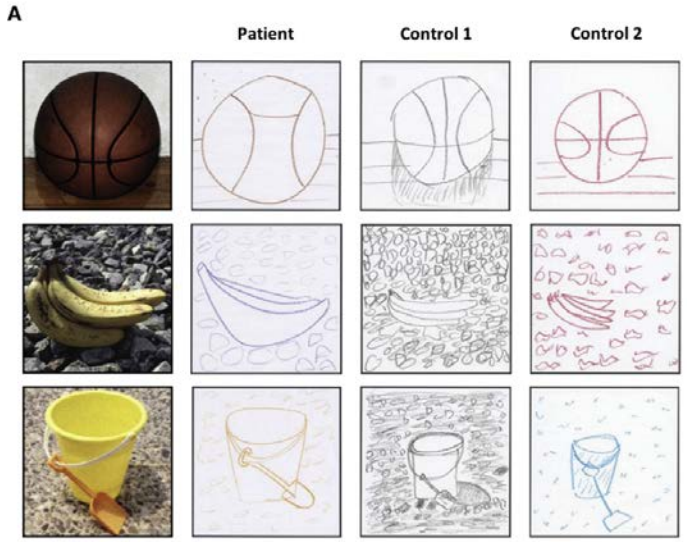
Rapid serial visual presentation task

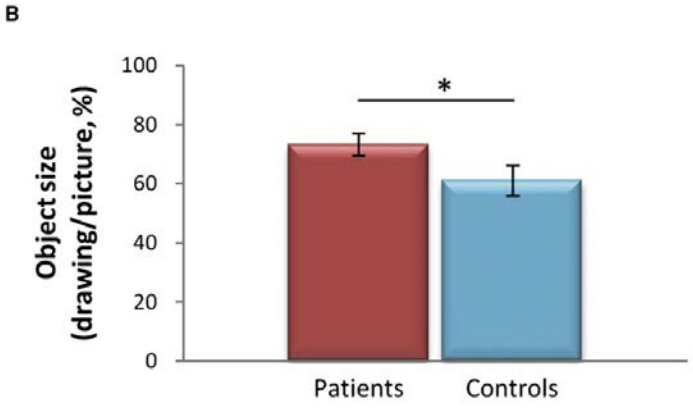




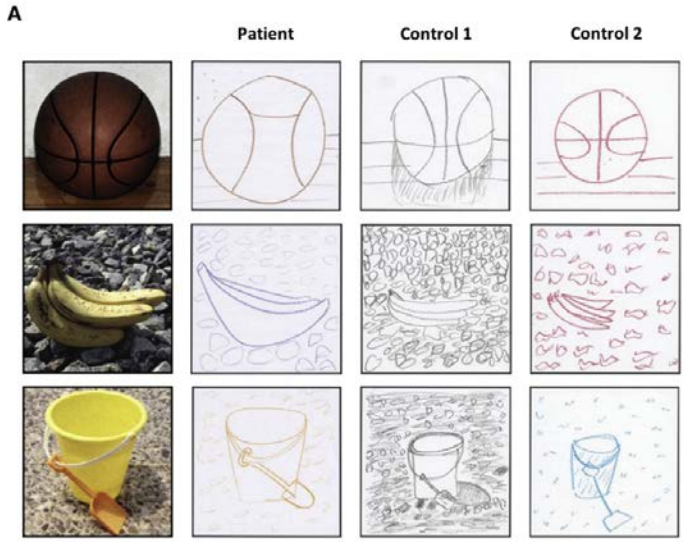


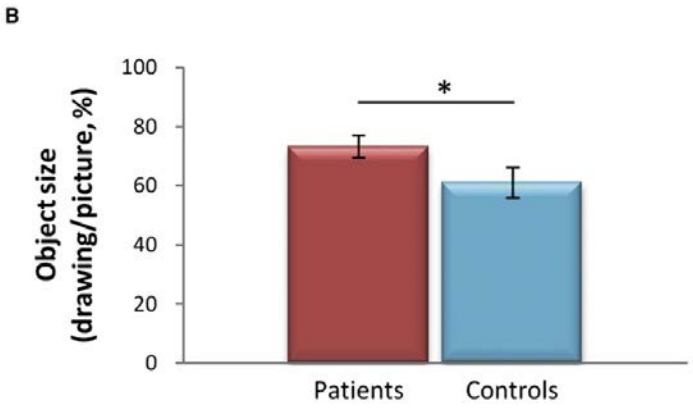
Drawing task & haptic BE task

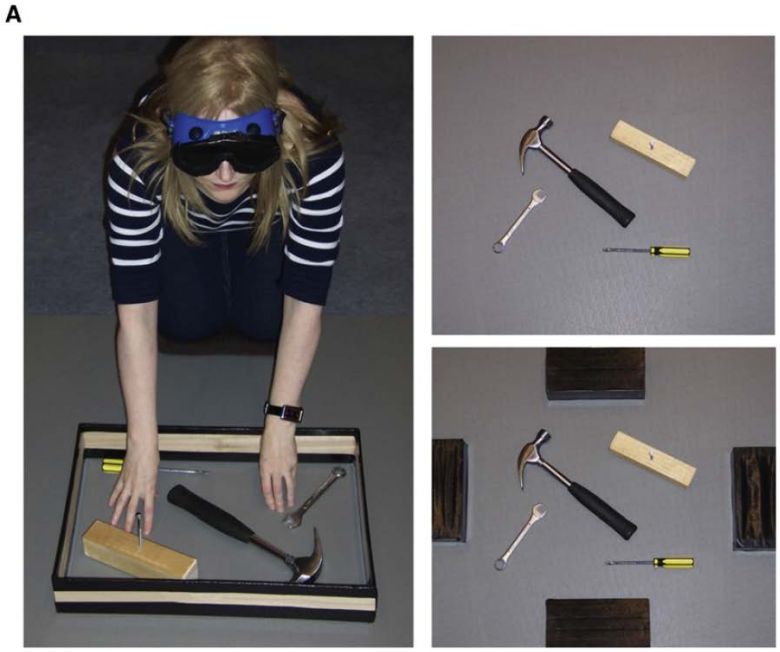


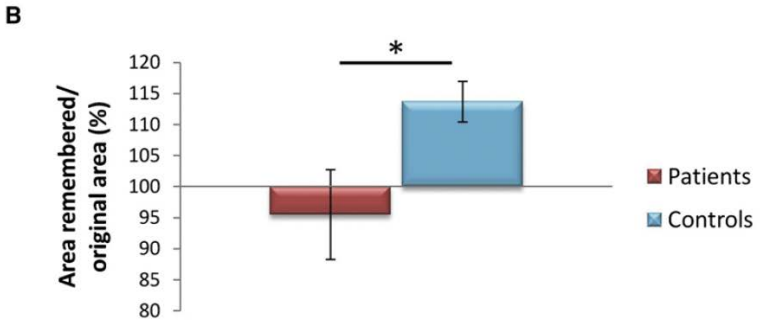


Drawing task & haptic BE task

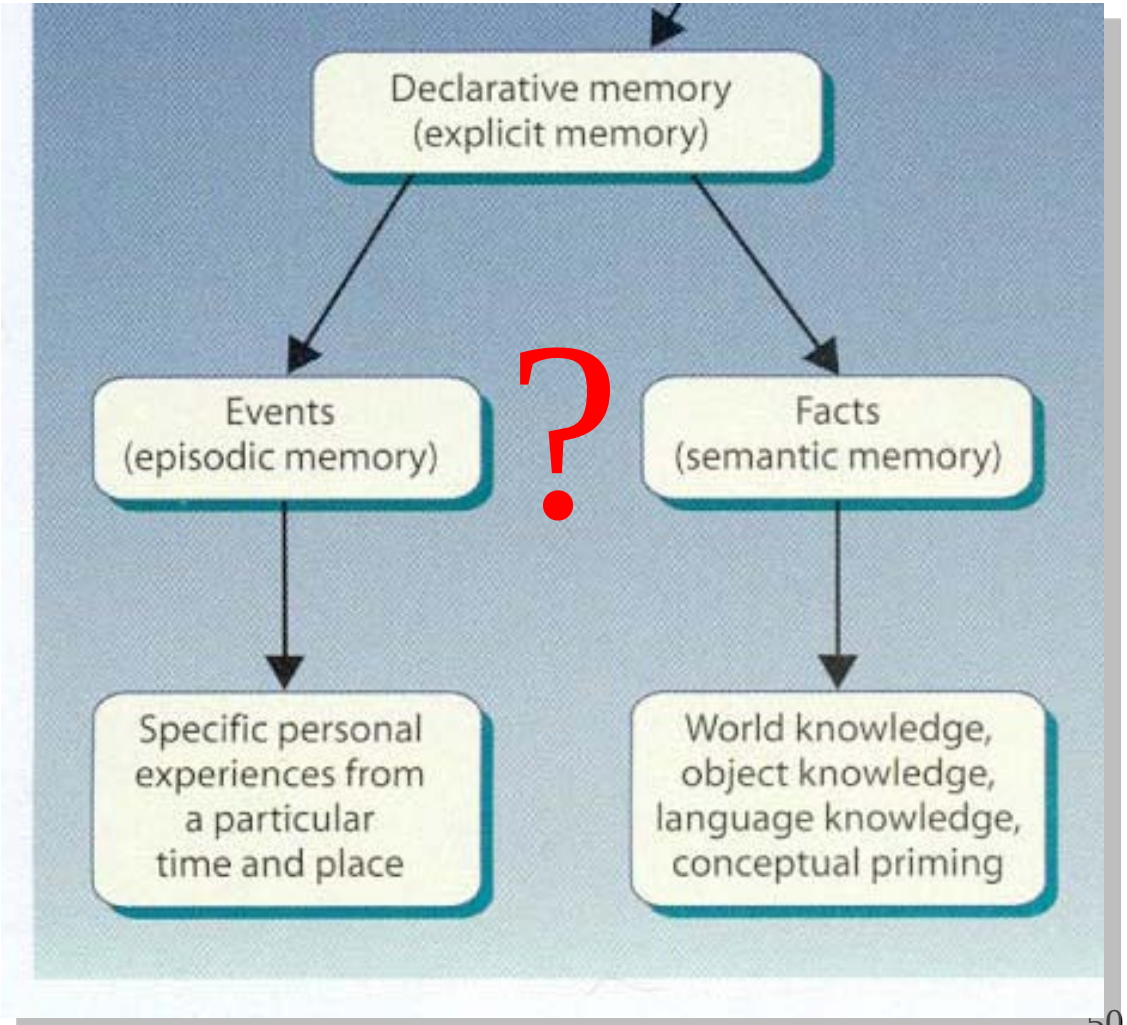




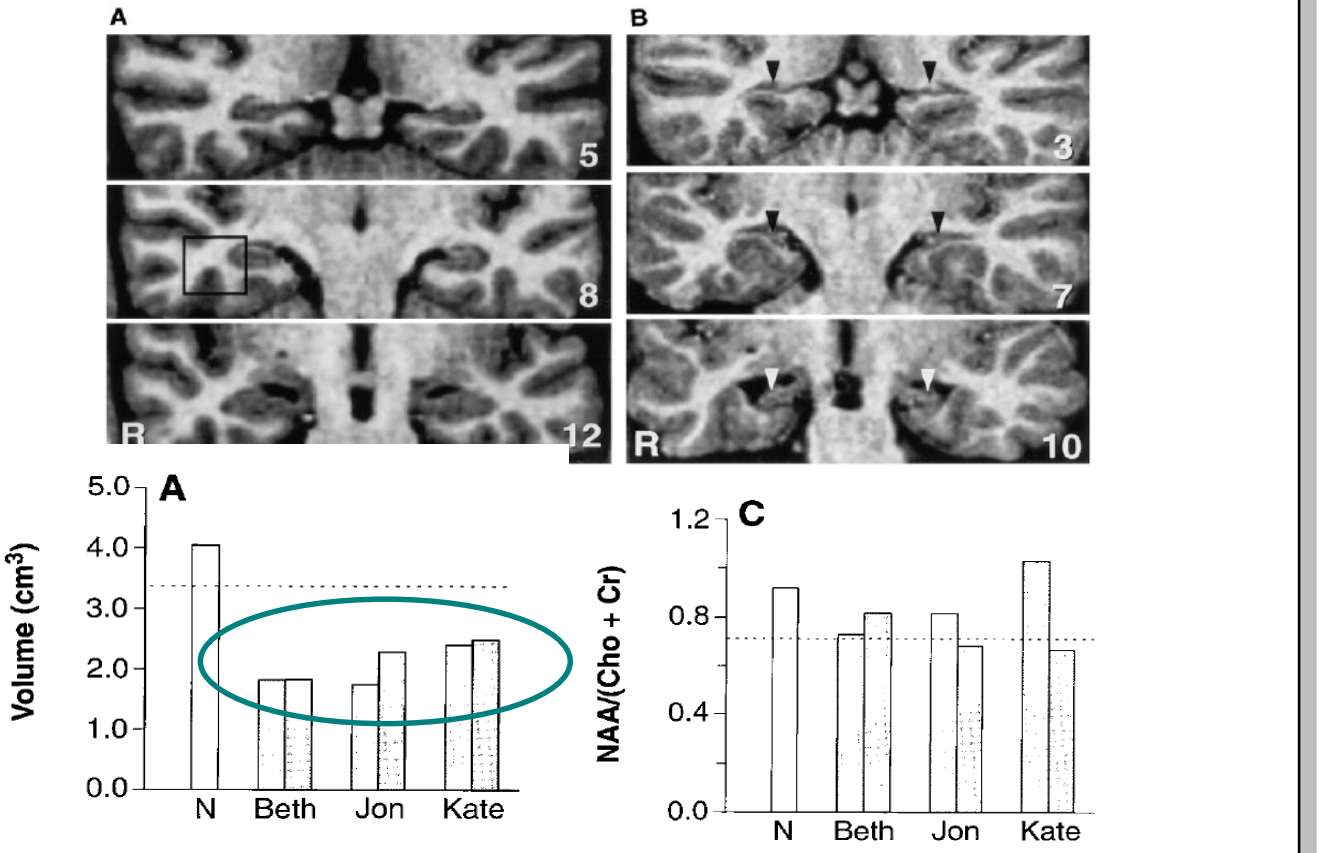




Episodisches vs semantisches Gedächtnis?

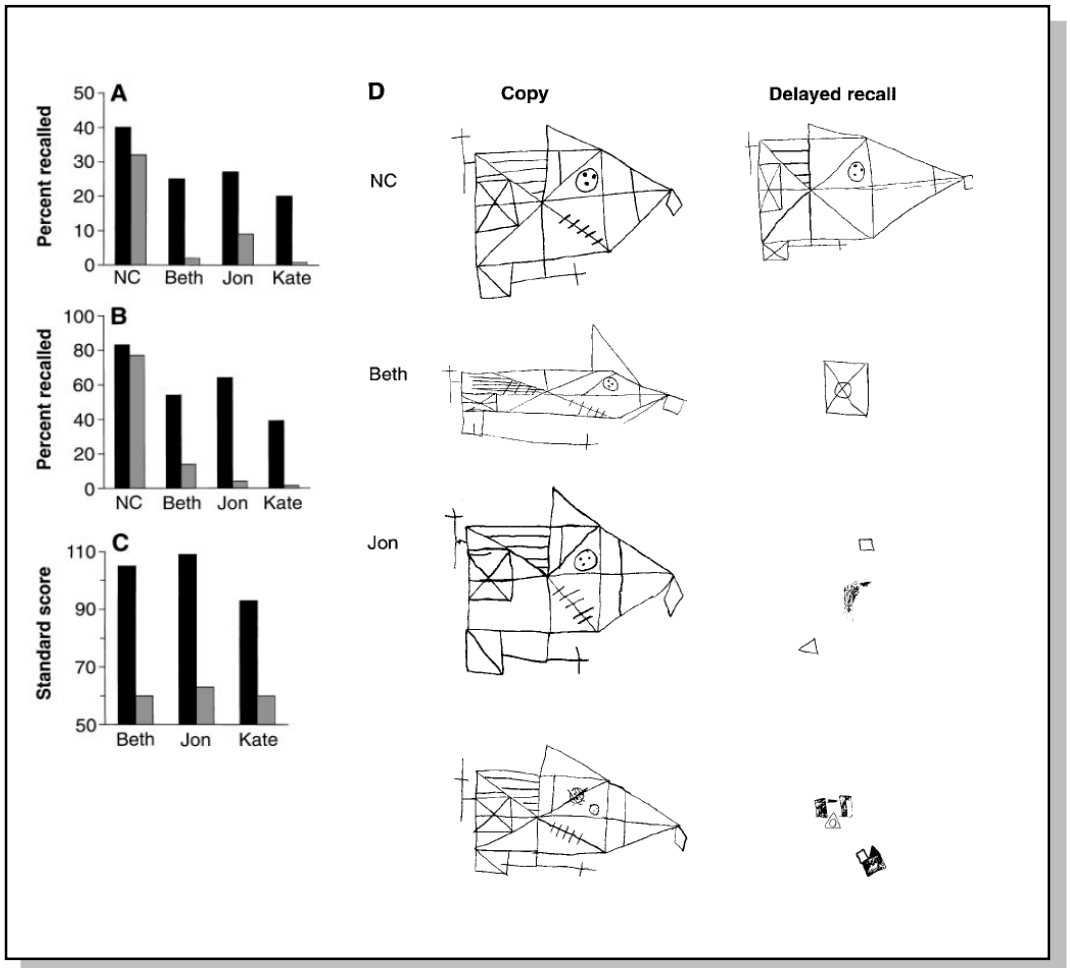


Early hippocampal pathology



Vargha-Khadem et al (1997)

Early hippocampal pathology



Vargha-Khadem et al (1997)

Early hippocampal pathology

Neuropsychological testing:

Table 1. Results of neuropsychological tests in the three patients and in normal control individuals (NC). The measures are of VIQ, PIQ, MQ, digit span, and block span.

	Beth	Jon	Kate	NC (n = 47) [mean (SD)]
Age at testing	12 years, 10 months	16 years, 4 months	19 years, 2 months	12 to 42 years
VIQ	82	109	86	101.5 (15.1)
PIQ	61	109	79	102.6 (13.8)
MQ	83	93	66	108.6 (15.1)
Digit span				
Forward	6	8	7	6.6 (1.3)
Backward	5	6	4	4.6 (1.7)
Block span				
Forward	4	7	5	5.6 (0.9)*
Backward	6	8	5	5.5 (1.0)*

*See (*10*).

Early hippocampal pathology: Patient Jon

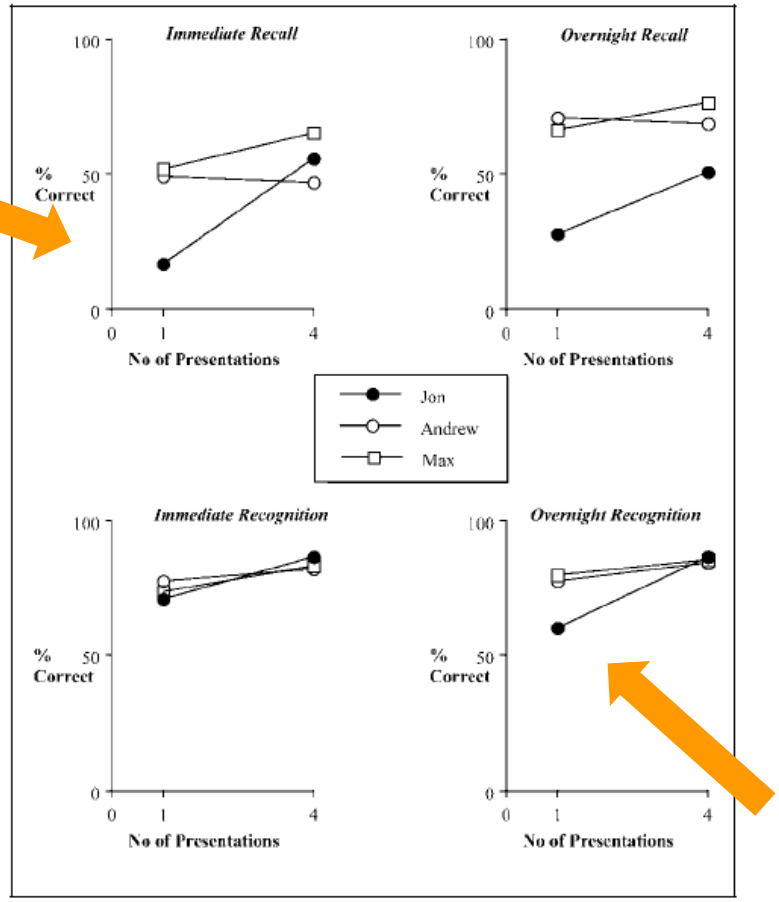


Figure 3. Recall and recognition of events from unfamiliar news videos viewed on one or four occasions and tested immediately or after an overnight delay.

Episodisches vs. semantisches Gedächtnis: SPI Model

Serial encoding
Parallel storage
Independent output

- **Episodic** remembering (autonoetic awareness)
- Remembering implies knowing
- Knowing does not imply remembering

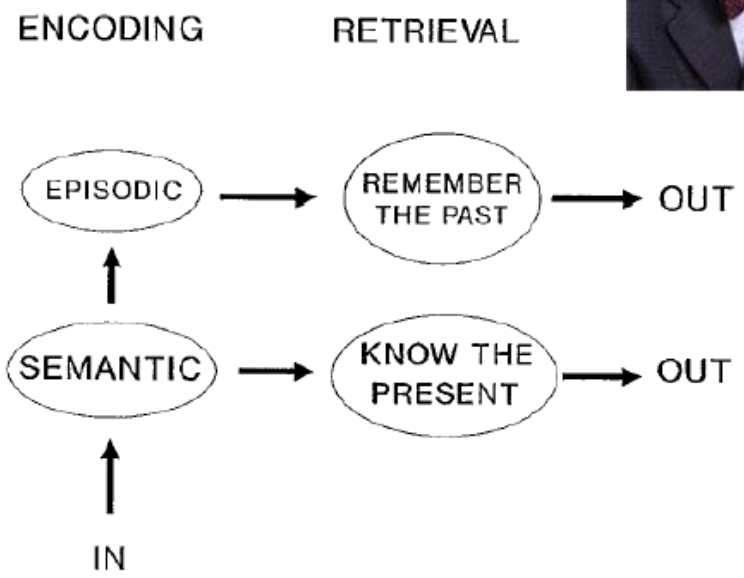
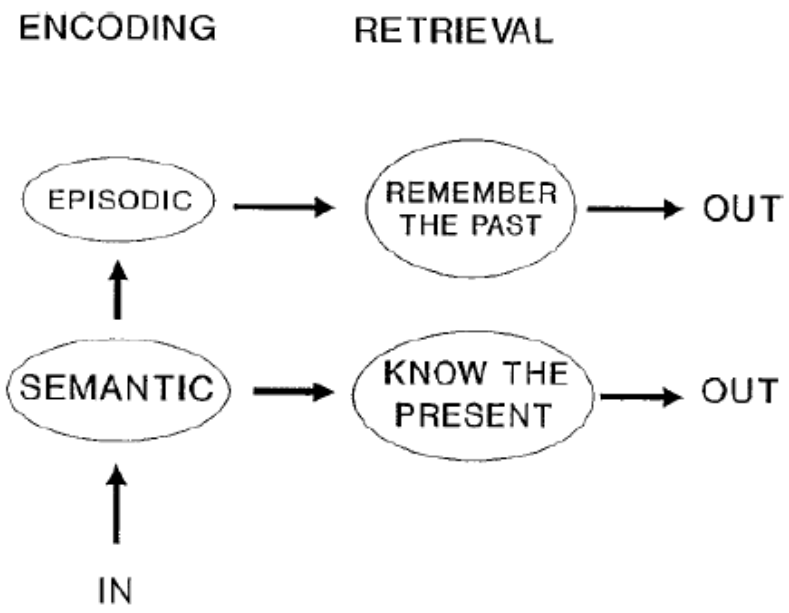


FIGURE 1. Sketch of the relations between semantic and episodic memory as envisaged by the SPI model. Information can be encoded into semantic memory independently of episodic memory, but must be encoded into episodic memory 'through' semantic memory. Encoded and stored information is potentially available for retrieval from one of the two systems, or from both of them.

Semantic memory is gateway to episodic memory

Episodisches vs. semantisches Gedächtnis: SPI Model

Serial encoding
Parallel storage
Independent output

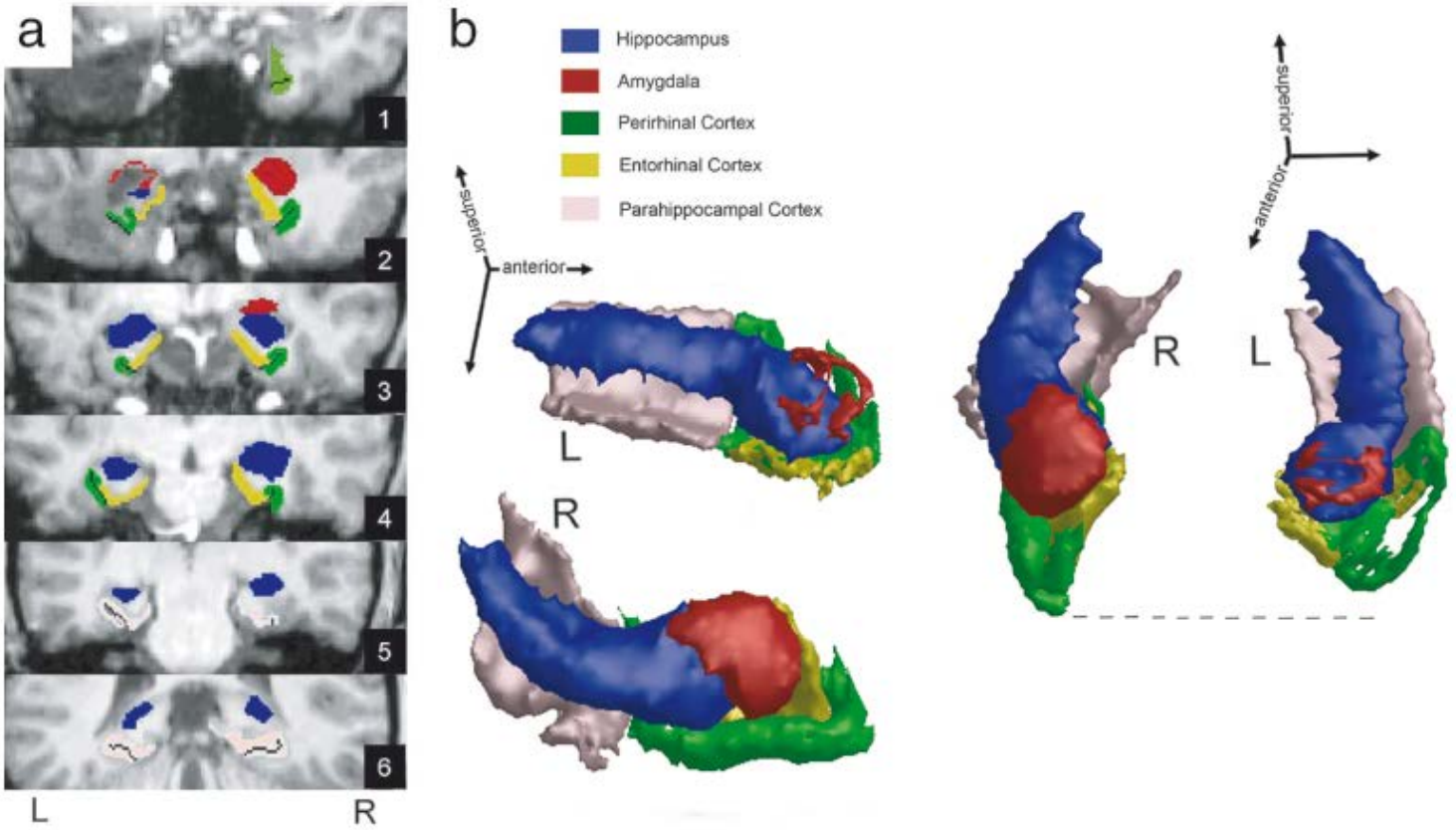


Can account for:

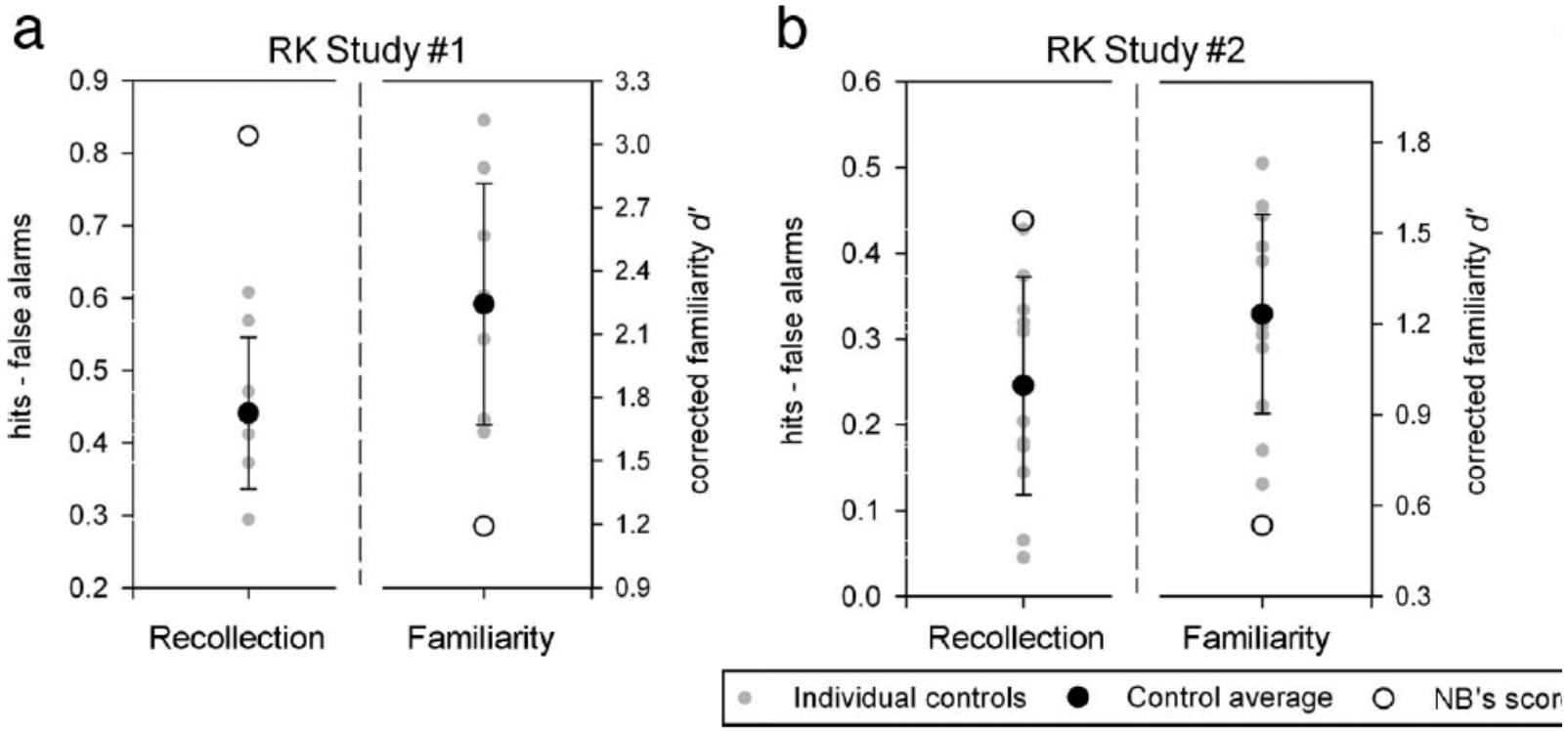
- Amnesia after early hippocampal pathology
- Preserved semantic learning after amnesia

But not for impaired knowing (familiarity) and preserved remembering

Patientin N.B.

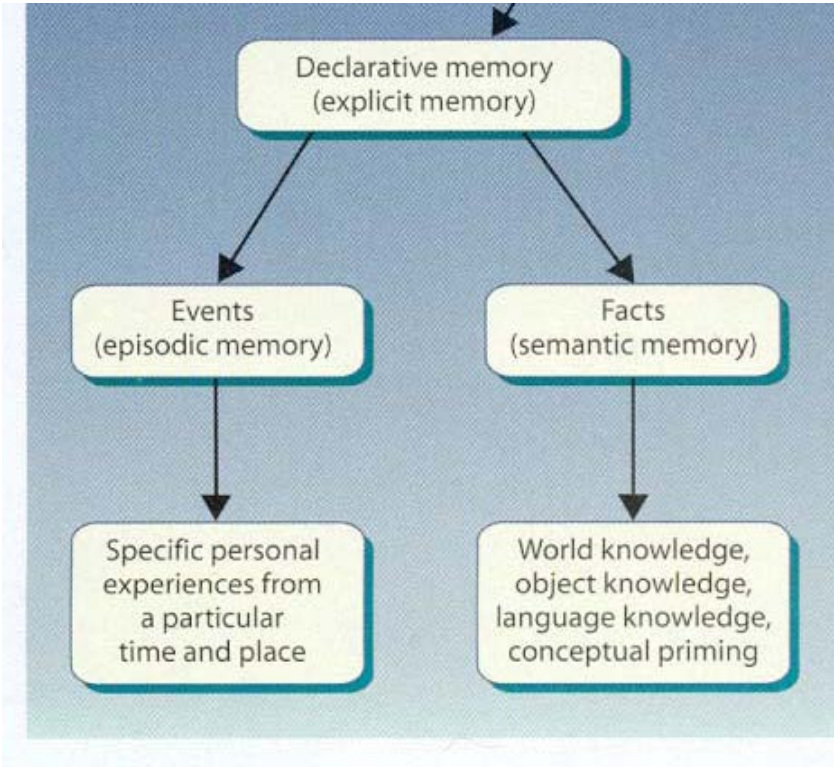


Patientin N.B.

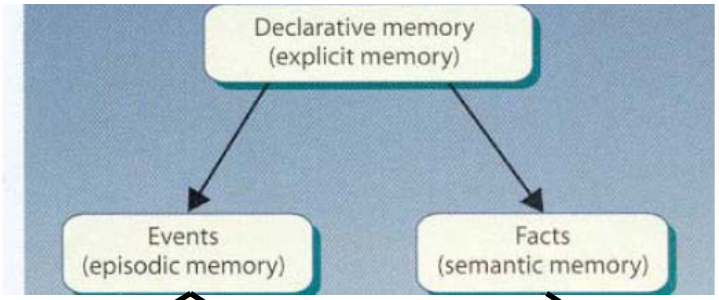


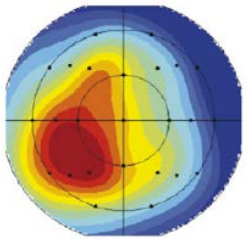
Episodisches vs semantisches Gedächtnis

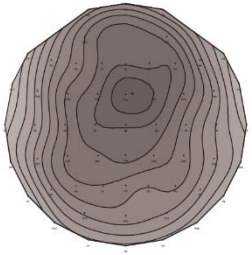
Independence instead of embeddedness:
Remembering London Trip without Knowing that English whether is wet.

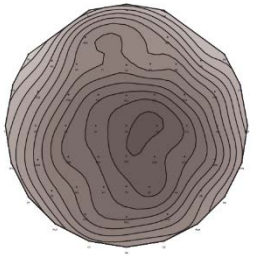


The next steps:









Episodic Recollection	Episodic (relative) Familiarity	Semantic (absolute) Familiarity
„Remember“	***„know“***	***„Know“***
Hippocampal-diencephalic System	***Perirhinal-medial dorsal thalamus***	***Perirhinal/Temporal Lobe?***

The next steps:

Neuropsychologia 146 (2020) 107527

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Review article

From fluency to recognition decisions: A broader view of familiarity-based remembering

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ARTICLE INFO

Keywords:
FN400
Familiarity
Fluency attribution
Recognition memory
Episodic memory
Event-related potentials

ABSTRACT

The goal of this article is to critically examine current claims and assumptions about the FN400, an event-related potential (ERP) component which has been related to familiarity memory though some uncertainty exists regarding the cognitive processes captured by the FN400. It is proposed that familiarity can be multiply determined and that an important distinction has to be made between a recent-exposure, relative familiarity mechanism indexed by the FN400 and an absolute/baseline familiarity mechanism being reflected by a coincidental but topographically distinct ERP effect. We suggest a broader conceptualization of the memory processes reflected by the FN400 and propose an unexpected fluency-attribution account of familiarity according to which familiarity results from a fast assessment of ongoing processing fluency relative to previous events or current expectations. The computations underlying fluency attribution may be closely related to those characterizing the relative familiarity mechanism underlying the FN400. We also argue that concerted activation of the perirhinal cortex (PrC) and the lateral prefrontal cortex (PFC) plays a pivotal role for fluency attributions and the generation of the FN400.


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Aufmerksamkeit!