



Development of Visual Recognition & Recall Memory in Infancy

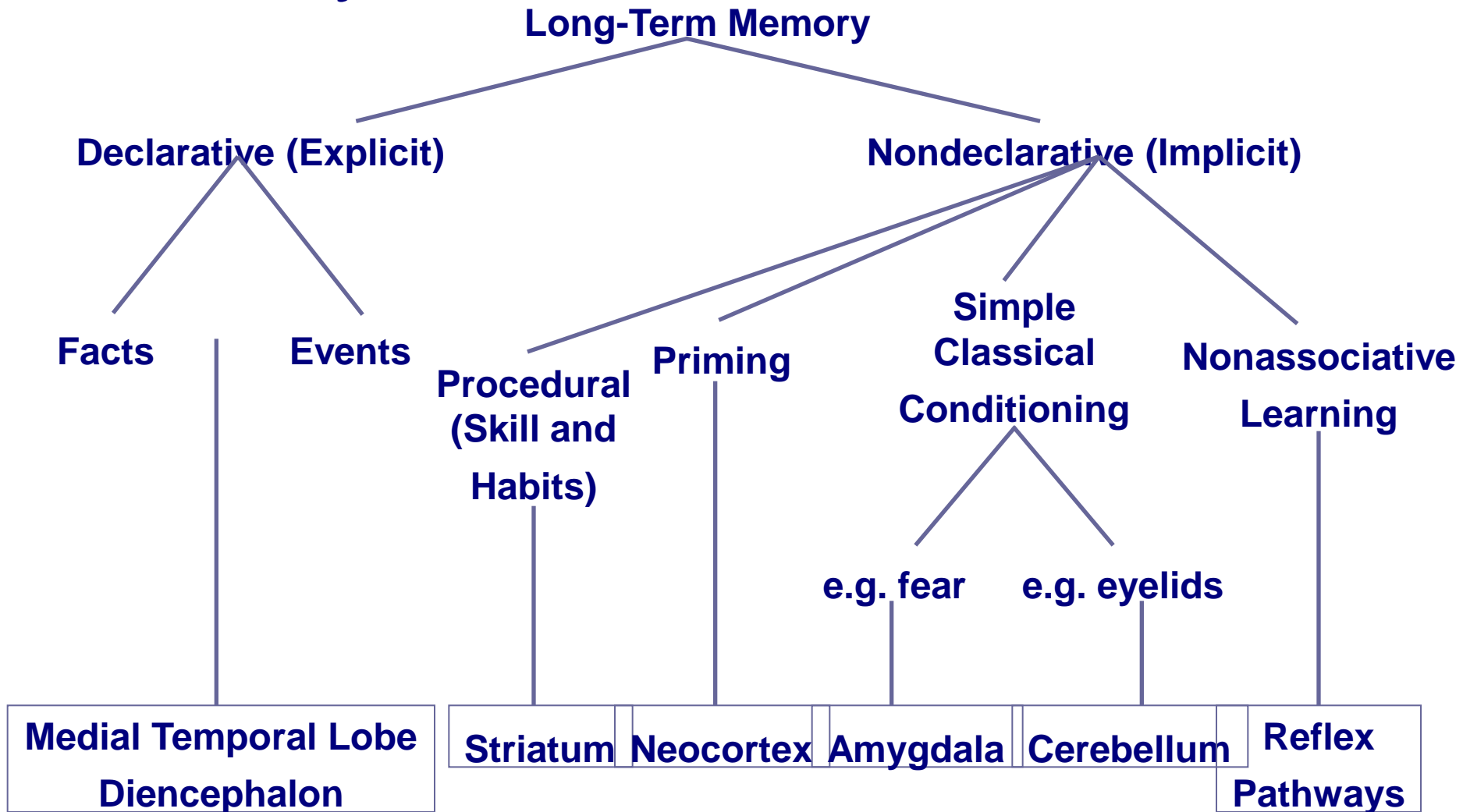
Michelle de Haan



Recognition: Visual Paired Comparisons

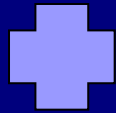
Recall: Deferred Imitation

What is the Brain Bases of Infant Memory?

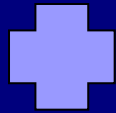


Visual Paired Comparison Task

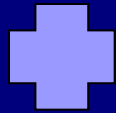




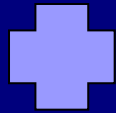








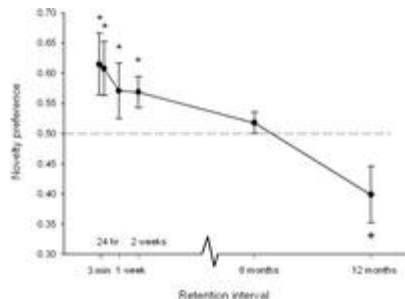




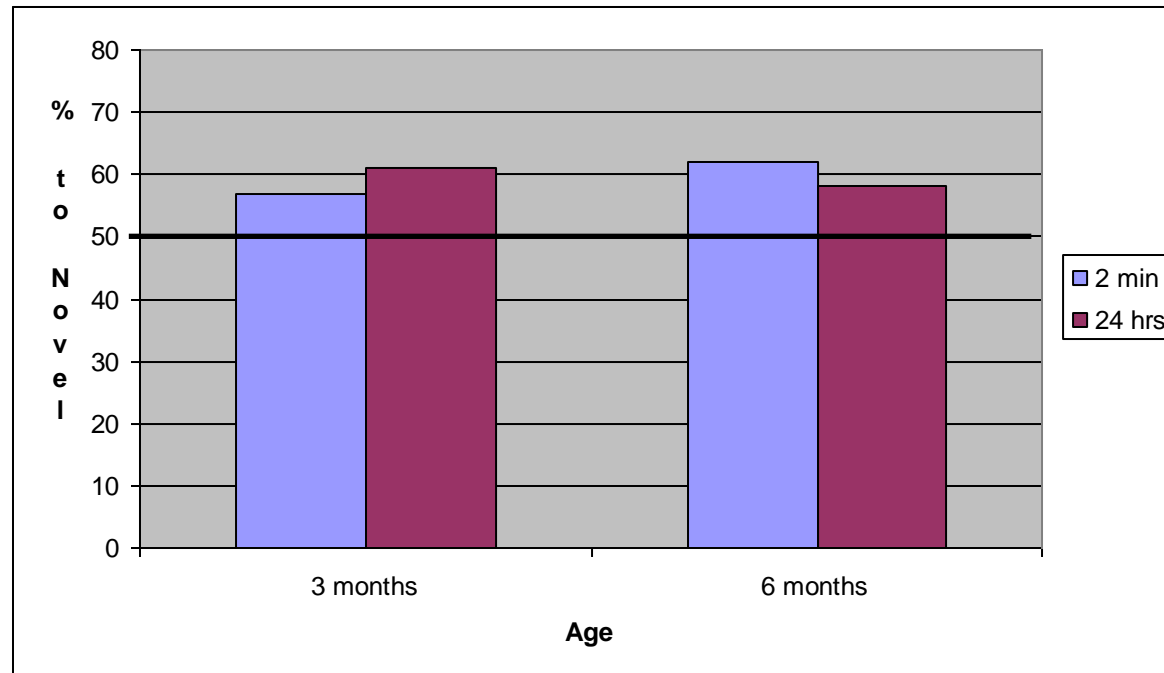


VPC

- Greater looking at novelty compared to chance evidence of memory
- Greater looking at familiarity also interpreted as memory
 - Usually seen as weaker form of memory
- Chance looking less clear cut
 - Forgotten? Not encoded? A memory state in between familiarity and novelty preference?



Recognition after 2-min and 24-hour delay at 3 & 6 months



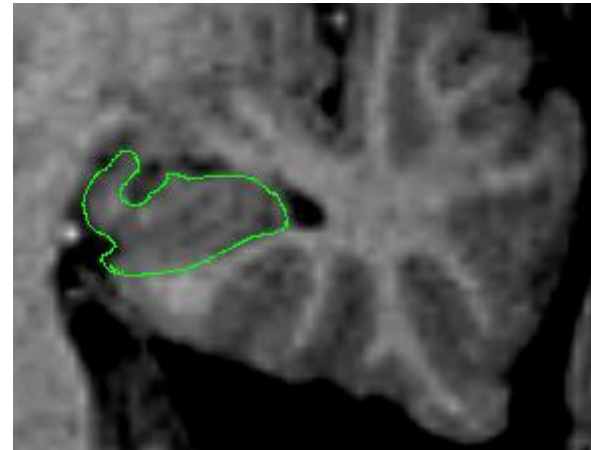
Factors That Affect Preference

- Age: Familiarity to novelty shift (Hunt)
- Encoding: Incomplete encoding leads to familiarity preference (Nelson, Sophian) more likely with younger babies, complex stimuli and brief encoding times
- Encoding style: Short, distributed looks=novelty preference
- Affect: Neutral-novelty, positive-familiarity (Rose)
- Delay: 4-phase model shift from novelty to null to familiarity to null (Bahrick)

What is the Brain Bases of VPC memory?



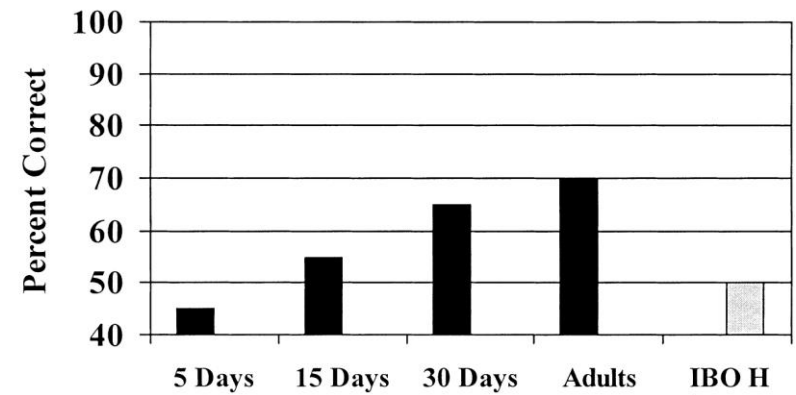
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Hippocampus

Evidence from Monkeys

A Preferential Looking





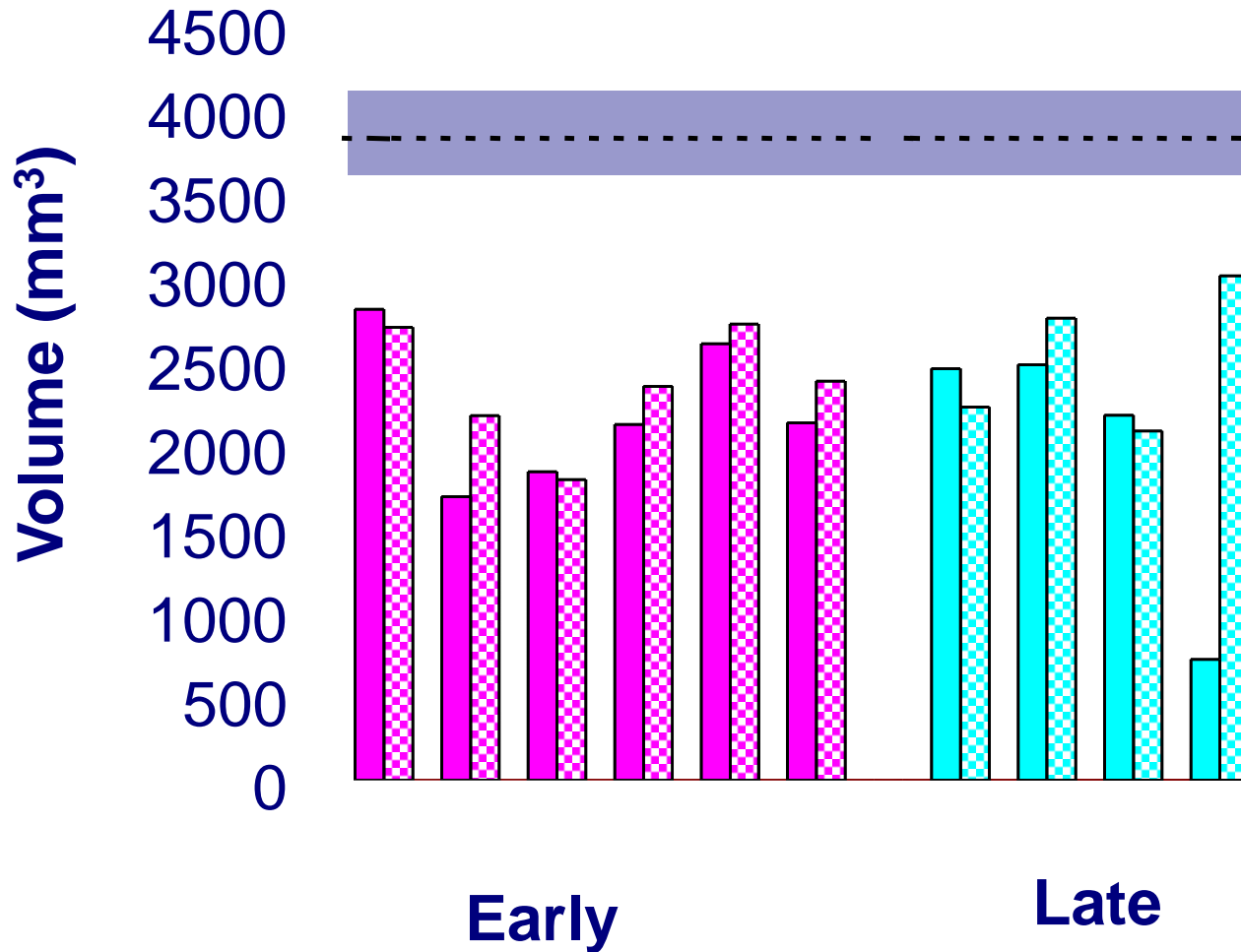
Evidence from Young Adults

Developmental Amnesia

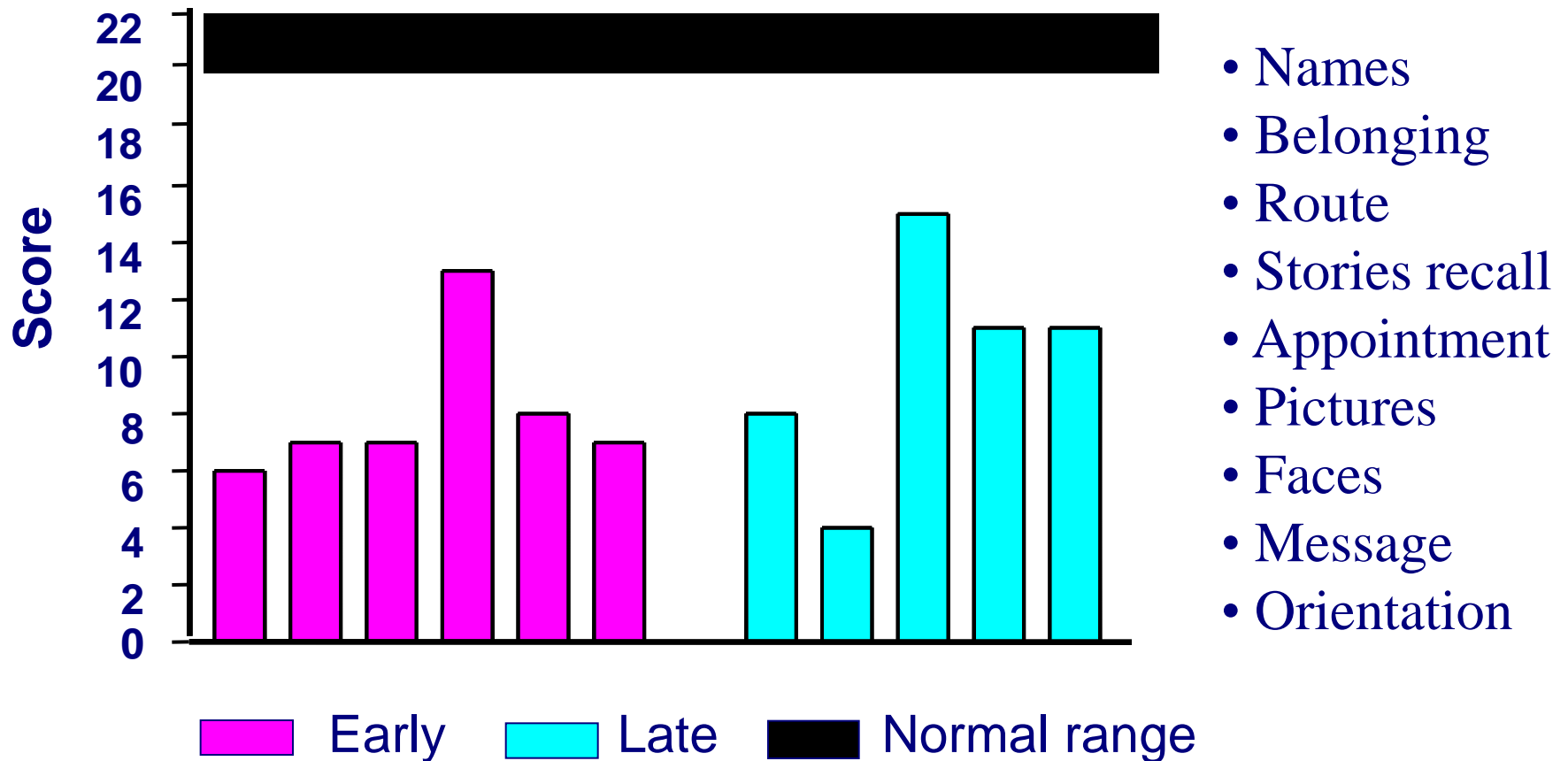
- Bilateral hippocampal pathology of early onset results in severe impairment in episodic memory with relative preservation of semantic memory

Vargha-Khadem et al., Science, 1997

Hippocampal Volumes

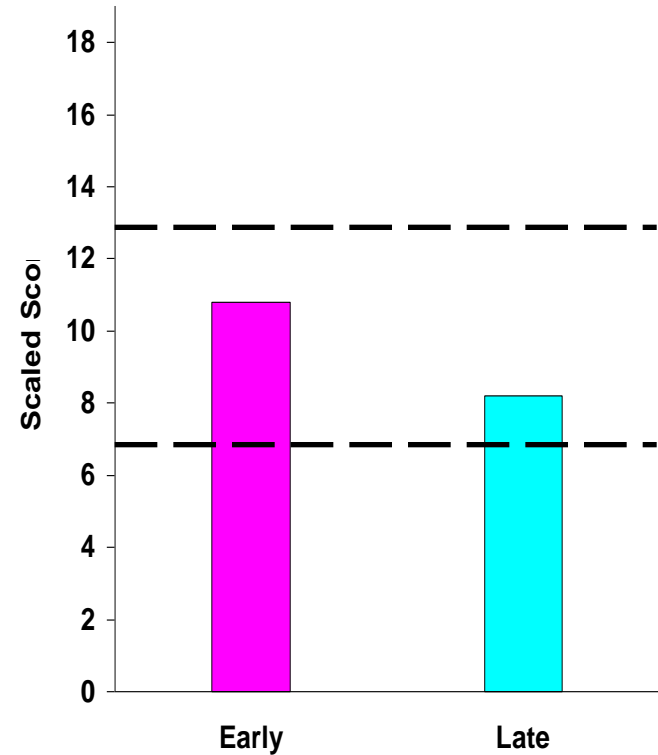
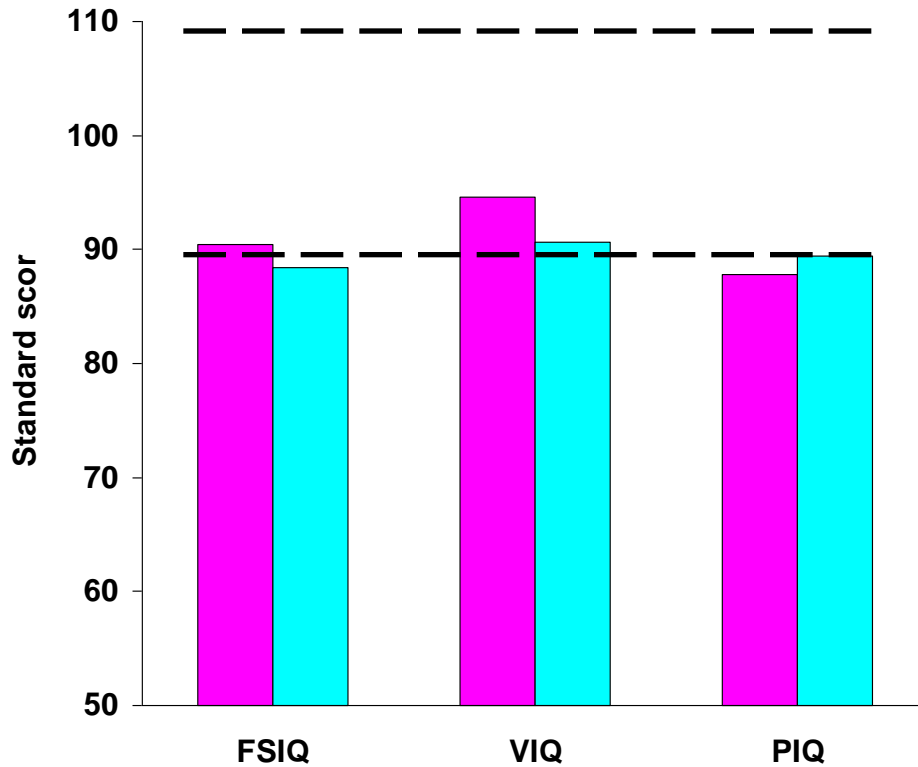


Everyday Memory



Intelligence and Digit Span

■ Early ■ Late

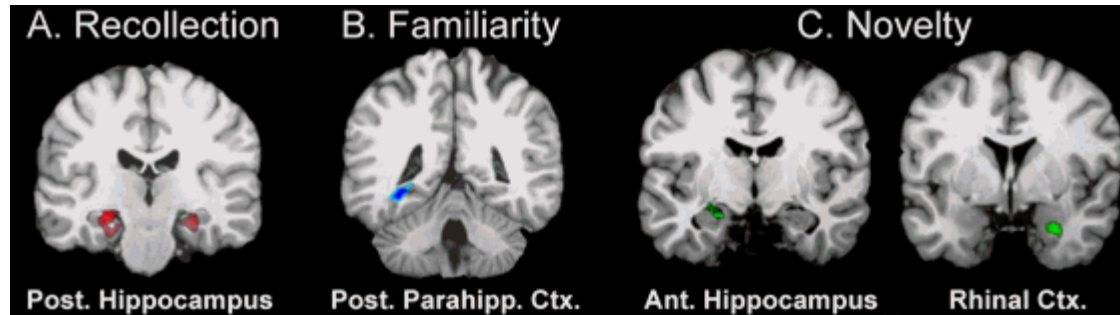




VPC

- Novelty preference for scenes or fractal patterns normal at immediate test
- Novelty preference shows a delay-dependent reduction

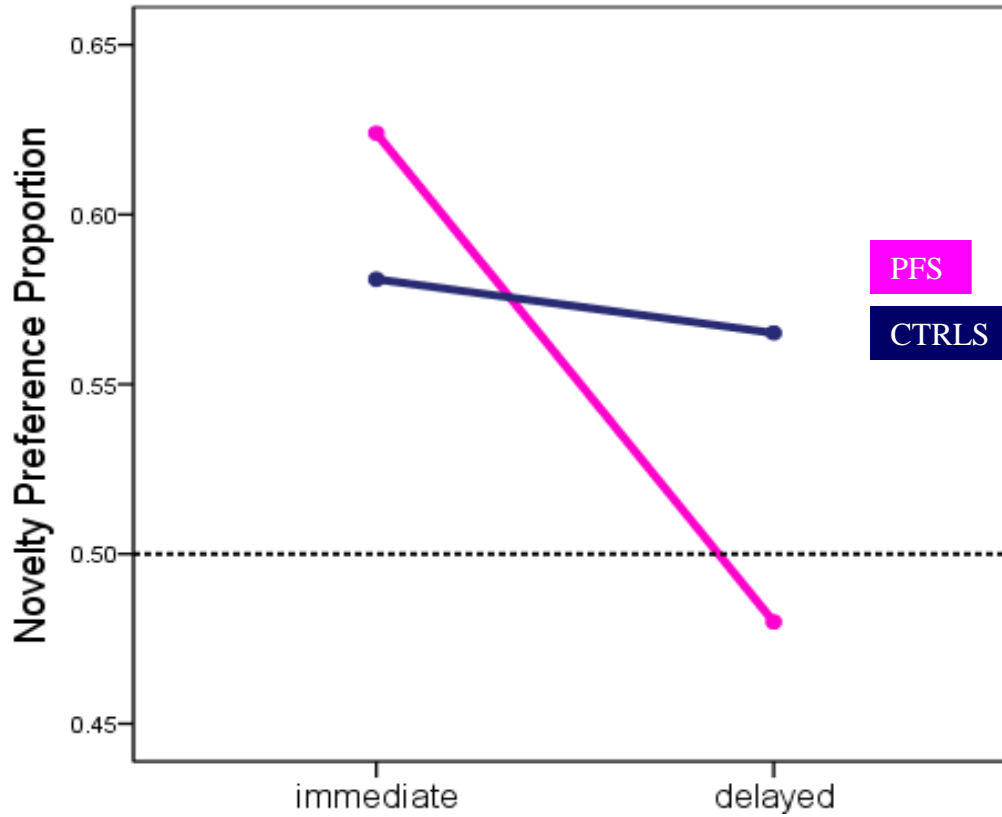
Is hippocampus involved in novelty preference or memory?



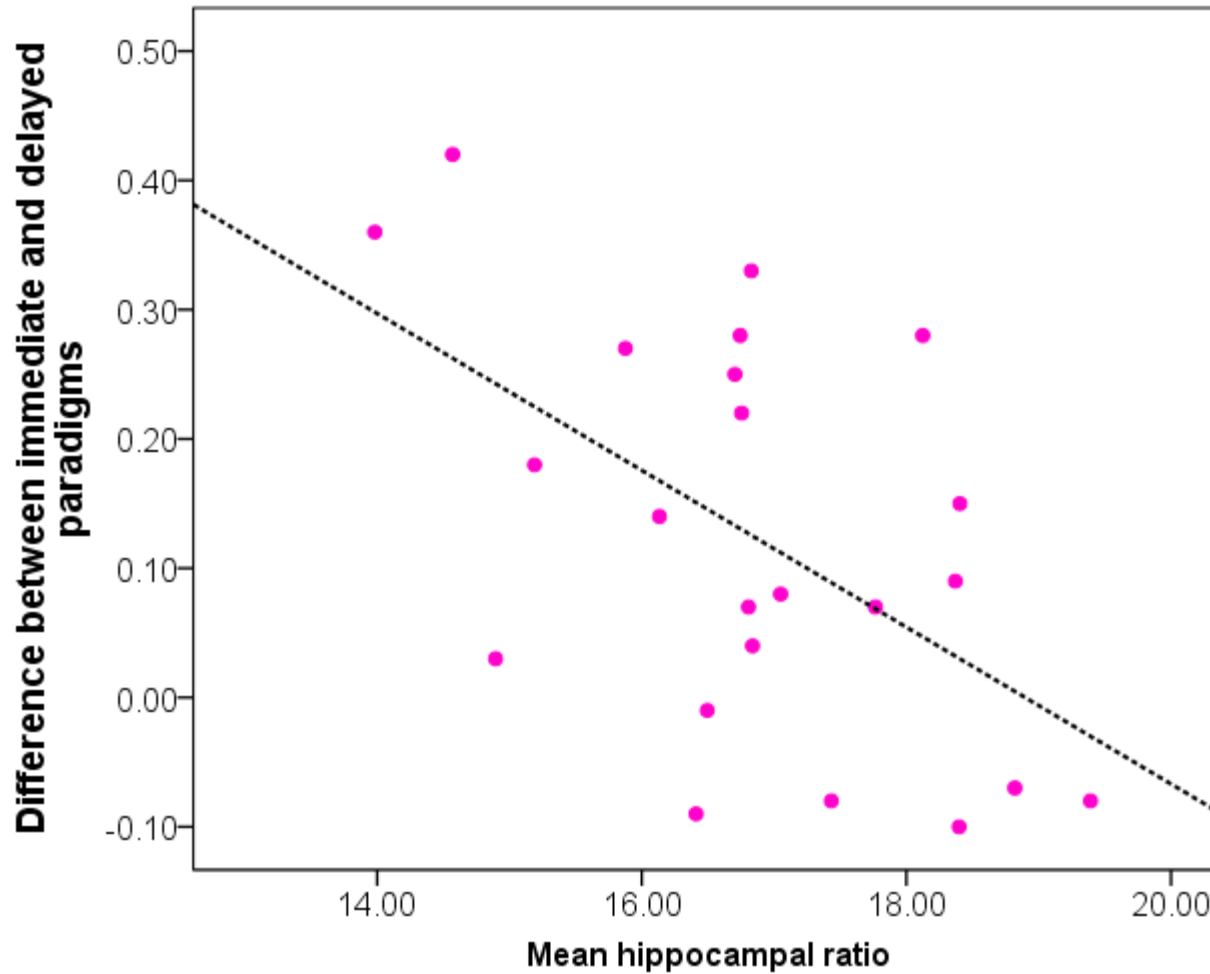
Role of Hippocampus in Human Infants: Prolonged Febrile Seizures

- Convulsive status epilepticus (CSE) is continuous unremitting seizure > 30 min
- CSE associated with a prolonged febrile seizure (PFS) in normally developing children is largely thought to be innocuous
- However, association between prolonged febrile seizures (PFS) and temporal lobe epilepsy (TLE) with mesial temporal sclerosis (MTS).

	PFS	Controls
N	24	24
Male	7 (29.2%)	15(62.5%)
Age at test (months)	23.8 (2.53)	29.13(2.59)
Prematurity (<36 weeks)	3	0
Days from PFS (Range)	49.7 (10:254)	Not applicable
Duration of PFS (Range)	76.9 (30:190)	Not applicable
Immediate novelty preference	0.61 (0.02)	0.59 (0.02)
Mean familiarization looking time	27.65 (1.78)	31.34 (1.80)
Mean looking time during test (sec)	11.39 (1.11)	12.45 (0.82)
Delayed novelty preference	0.49 (0.02)	0.55 (0.02)
Cognition	96.9 (2.93)	107.04 (3.31)



Martinos, Yoong, Patil, Chin, Neville, Scott & de Haan, under review



Martinos, Yoong, Patil, Chin, Neville, Scott & de Haan, under review



Summary: VPC

- Evidence of recognition memory from days after term birth
- Factors related to encoding affect recognition
- Evidence that performance relies on hippocampus
- Hard to measure forgetting because of ambiguity of null preference

Recall: Deferred Imitation



Baseline



Step 1. Put on the ring



Step 2. Put on the top



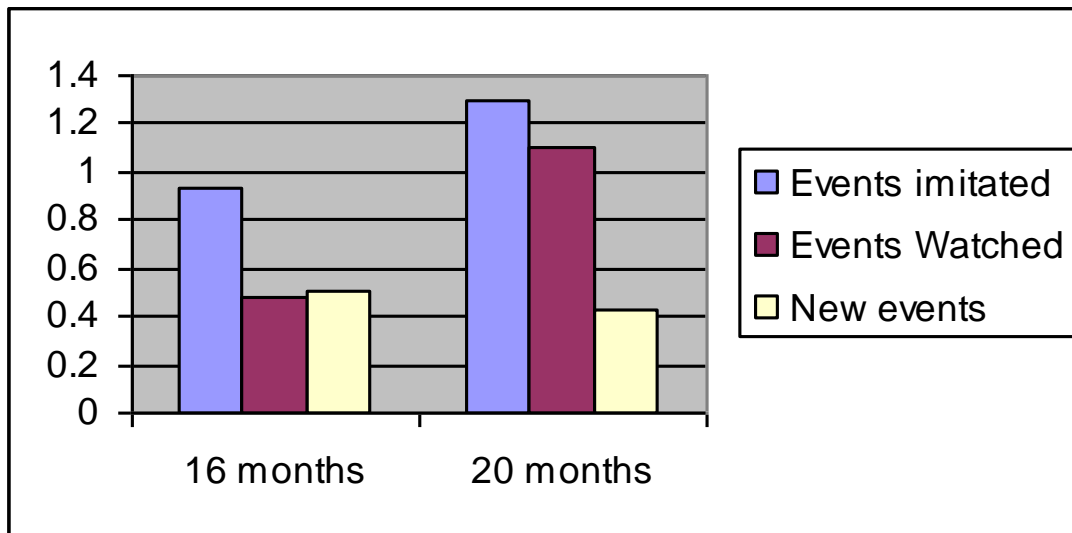
Step 3. Hang up the sticker



Changes in Performance With Age

- 1. Reliability with which recall is observed:
 - 25% 6 month olds recall after 24 hours
 - 50% 9 month olds recall after 1 month
 - 100 % 20 month olds recall after 1 month
- 2. Temporal extent of memory
 - 6 month 1 day
 - 9 month 1 month
 - 20 month 1 year

Later Verbal Accessibility



- Children were 16 and 20 months at the time of exposure to specific target events and subsequently were tested for their verbal and nonverbal memories of the events after a delay of either 6 or 12 months (at 22-32 months) and then again at 3 years.

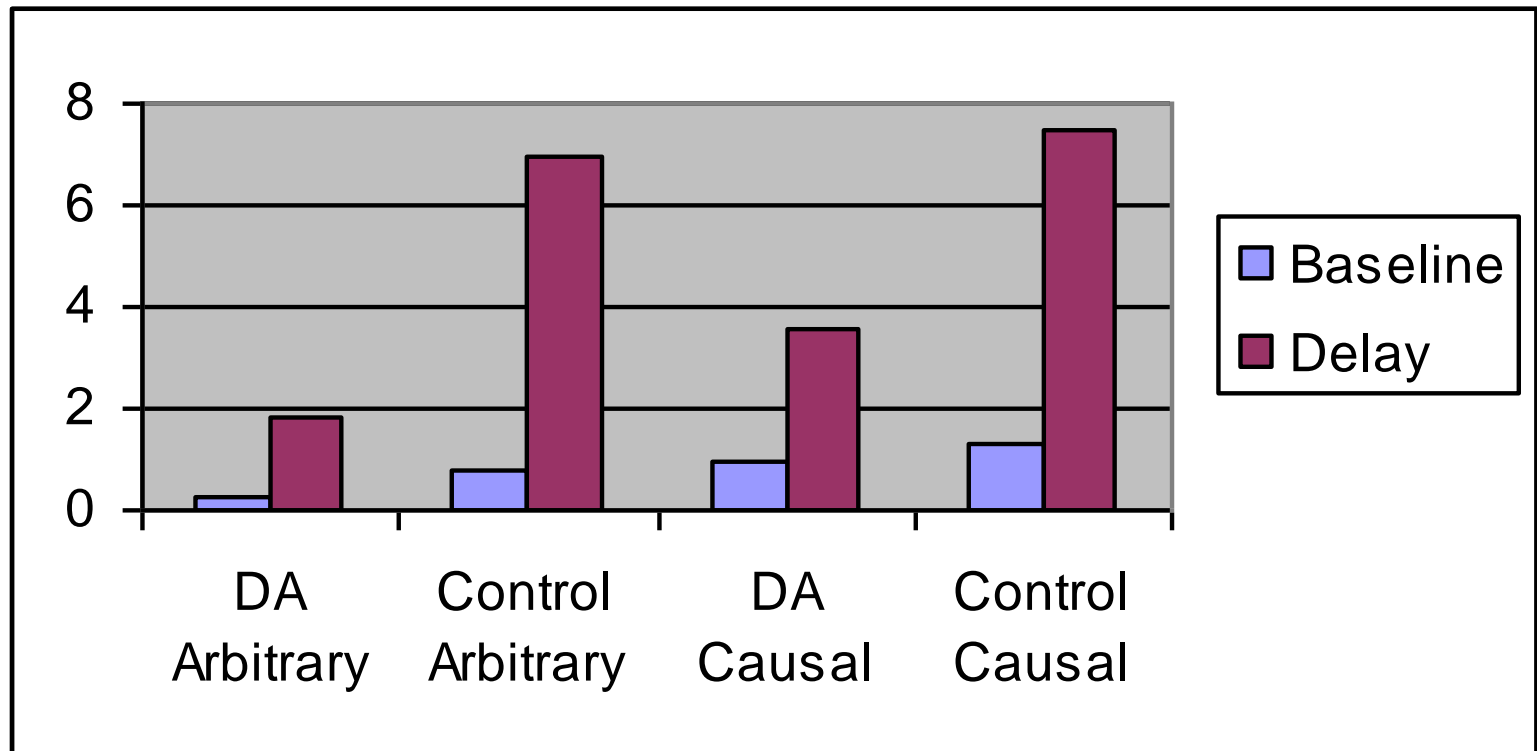


What part of memory changes?

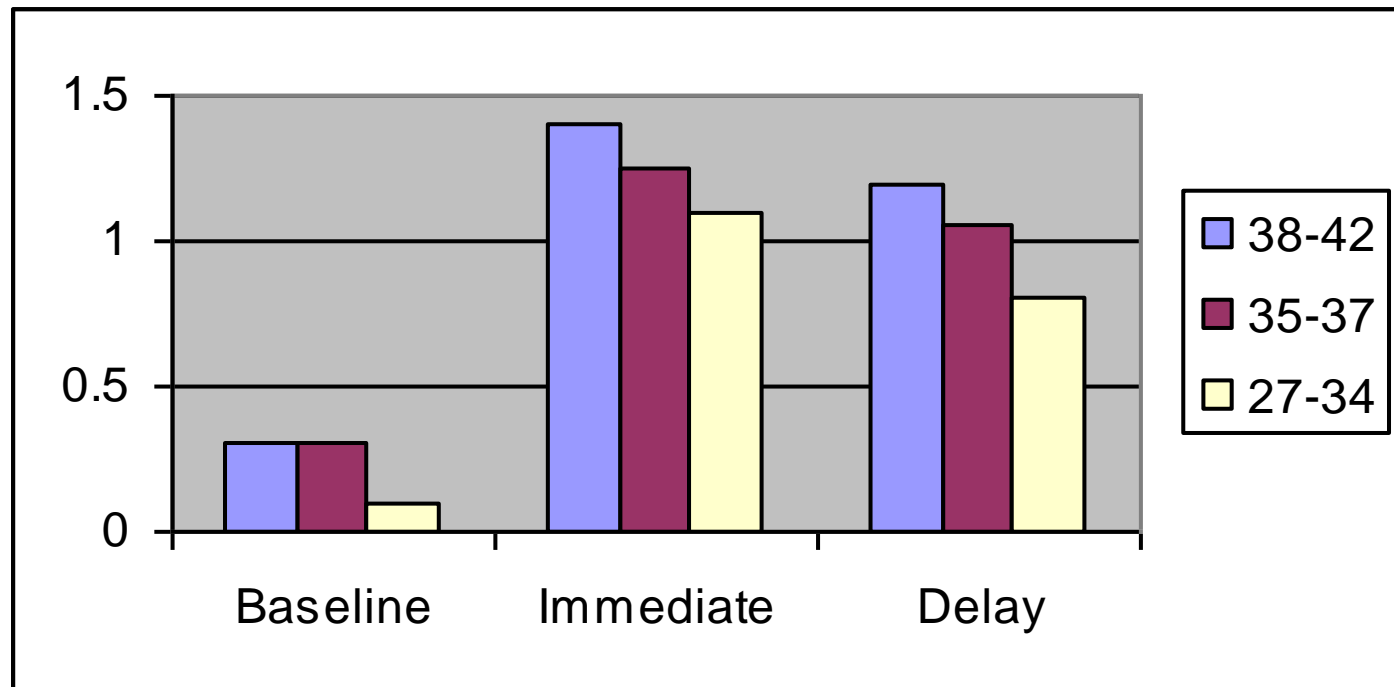
- In the first year, most variation (70%) in memory performance is related to encoding/storage/consolidation
- Later, factors related to retrieval emerge as more important

Brain Bases of Deferred Imitation

Developmental Amnesia



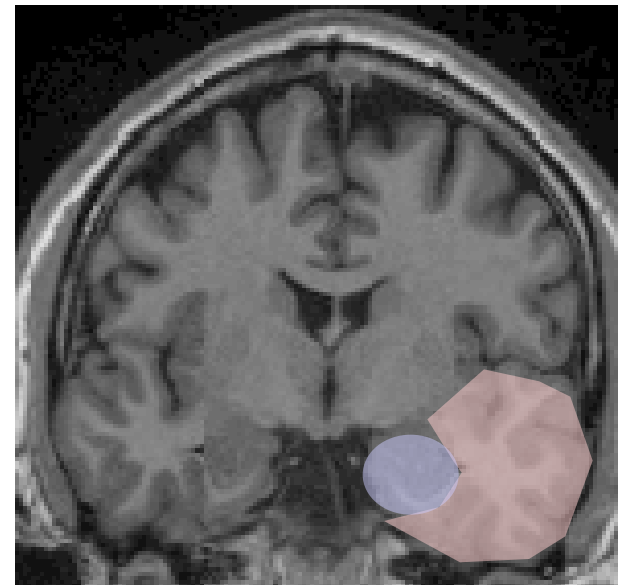
Preterms



de Haan et al., 1998

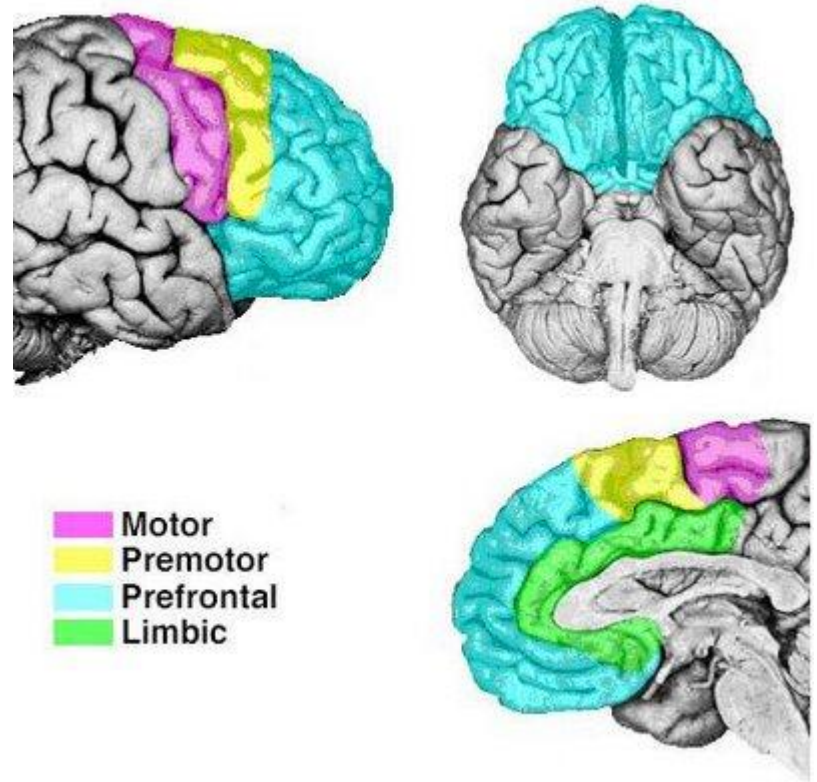
Memory Model (Nelson, Bauer)

- Recognition memory present from term birth
 - hippocampus
- 6-8 months improvements in recognition and emergence of recall
- Now main constraint on memory is in encoding/consolidation
 - Hippocampus(dentate gyrus) /MTL



Memory Model (Nelson, Bauer)

- By ~2 years, factors related to retrieval and strategy gain importance
 - Prefrontal



Questions?

