

## Week 15

- Ogden Ch 3 : Patient HM - Global Amnesia

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## Ogden Chapter 03 : HM

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### Background: HM (Henry Molaison)

- Born 1926
- Childhood “normal, uneventful” (Ogden)
- Age 9: hit by bicycle, CHI, LOC 5 minutes
- Age 10 : began having absence seizures
- Age 16 : first generalized seizure while riding in car
- Education
  - Teased by classmates, left high school
  - Transferred to another school
  - Graduated at 21 - taking “practical” course
- Employment
  - worked on assembly line as a motor winder
  - stopped working due to increasing Seizures

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### Seizure Types

- Partial Seizures (aka Focal seizures)
  - Simple Partial - consciousness is not impaired
    - with motor, sensory, autonomic, or psychic symptoms
  - Complex Partial - consciousness is impaired
    - aka “temporal lobe” or “psychomotor seizure”
- Generalized Seizures
  - Absence seizures (aka “petit mal”)
    - consciousness altered but motor behavior normal
  - Myoclonic seizures - <0.1 second muscle contraction
  - Clonic Seizures - repeating 2-3 times per second
  - Tonic-Clonic Seizures (aka “Grand Mal”)
    - initial tonic contraction, followed by clonus
  - Atonic seizures - loss of muscle tone

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### Background: HM (Henry Molaison)

- Social life
  - “uninterested in girls” - no known sexual relationships
- Why?
  - anti epileptic therapy (phenytoin, related to but not a barbiturate) - may cause sexual dysfunction
  - normal variation of hyposexuality
  - pathological brain process related to seizures?
    - MTL and adjacent areas related to emotional behavior
  - hiding his sexual orientation?

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### Phenytoin (Dilantin)

- Antiepileptic / anticonvulsant medication
- Effects:
  - reduces seizure intensity, frequency
- Mechanism :
  - unknown
  - appears to work on sodium ion channels
- Side effects:
  - Symptoms of overdose include coma, difficulty in pronouncing words correctly, involuntary eye movement, lack of muscle coordination, low blood pressure, nausea, sluggishness, slurred speech, tremors, and vomiting.

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## Background: HM (Henry Molaison)

- Symptoms (Premorbid Symptoms Age 16-27):
  - Seizures
    - Absence seizures (about 10/day)
    - Generalized seizures (about 1/week)
  - EEG
    - bilateral general EEG abnormalities during seizure
- Treatments:
  - Drugs:
    - large doses of phenytoin : not effective
  - Surgery:
    - (see next slide)

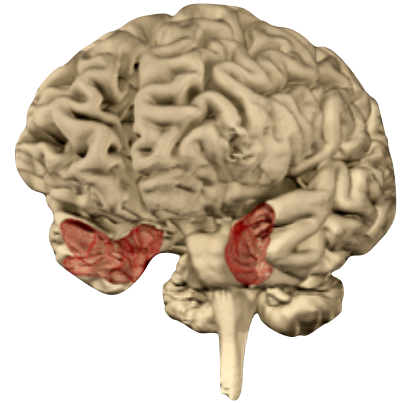
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## HM's Surgery

- At age 27, surgery to control seizures
- removed medial tips of temporal lobes, about 5cm

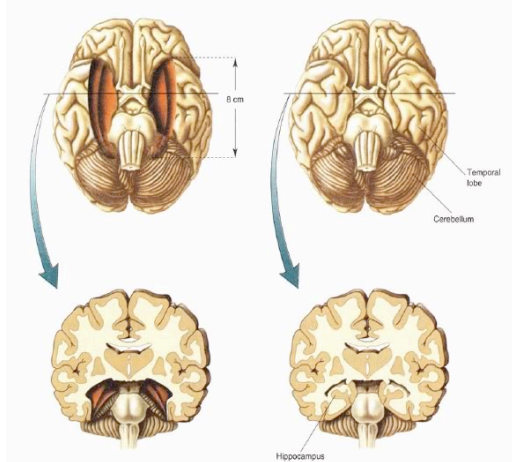


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HM Normal Brain



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## Social status after Surgery

- Timeline
  - 1953 Surgery
  - Lived with parents
  - in 1967 father died
  - till 1977 lived with mother, who died in 1981
  - 1980 till his death, lived in nursing home
- A few times each year, spent 1-2 weeks living at MIT's research center participating in experiments

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## Dr. Jenni Ogden and HM

- Ogden - Neuropsychologist, studied HM at age 60, and again at age 66
  - "He seemed exactly the same as before. His facial expressions, the ways he expressed words, the stories he told, and his mannerisms were uncannily identical to shoe of 6 years previously. My life had moved on, but HM's hadn't"
- "Where do you live?" - "In a house with my mother"
- "Are your parents alive?" - "I'm not sure"

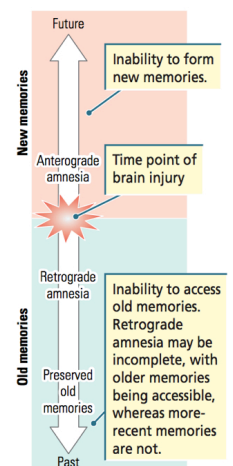
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## HM's Amnesia

- Anterograde Amnesia:
  - complete "Global"
- Retrograde Amnesia:
  - 11 years prior to surgery (age 27) e.g. age 16
- (Note: some confusion in the literature regarding his anterograde amnesia, e.g. in Nova video Kandel says he could remember "everything...prior to the operation" which is not true.)



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## HM's NP Testing : Quantitative

- Pre surgery: given Wechsler-Bellevue IQ test
  - VIQ: 101
  - PIQ: 106
- No memory tests given (why?)
- Post surgery : given WAIS and Wechsler Memory Scales:
  - VIQ: average range (90-110)
  - PIQ: average to superior range (90-129)
  - WMS: 35 or more points below IQ (65 or lower)

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## Describing Performance (WAIS-4)

| Classification | IQ Score     | Z Score      | T-Score      | % of people |
|----------------|--------------|--------------|--------------|-------------|
| Very superior  | above 130    | above 2.0    | 70 and above | 2.2         |
| Superior       | 120-129      | 1.3 to 2.0   | 63-39        | 6.7         |
| High average   | 110-119      | 0.6 to 1.3   | 56-62        | 16.1        |
| Average        | 90-109       | -0.6 to +0.6 | 44-55        | 50.0        |
| Low average    | 80-89        | -0.6 to -1.3 | 43-37        | 16.1        |
| Borderline     | 70-79        | -1.3 to -2.0 | 36-30        | 6.7         |
| Extremely low  | 69 and below | below -2.0   | 29 and below | 2.2         |

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## HM : Dissociations and Memory Systems

- Normal vs. Impaired
  - Immediate vs. Long-term learning
  - Remote vs. Anterograde
  - Implicit vs. Explicit
- Both impaired:
  - Verbal Nonverbal learning
  - Semantic and Episodic learning

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## HM's NP Testing : Qualitative

- Digit span test (5 or 6)
  - One day, HM given 5 digits, then experimenter leaves room for an hour. Upon return, HM recites 5 digits perfectly.
  - Example of LTM? no...
  - Rehearsal - without LTM sense of passage of time is impaired, so he kept rehearsing
- But some transfer from STM to LTM has been shown:
  - knows that Elvis Presley is a musician (Elvis first played on radio 1954)
  - Immediately after Space Shuttle Challenger disaster (1986) could describe some aspects

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## HM's NP Testing : Qualitative

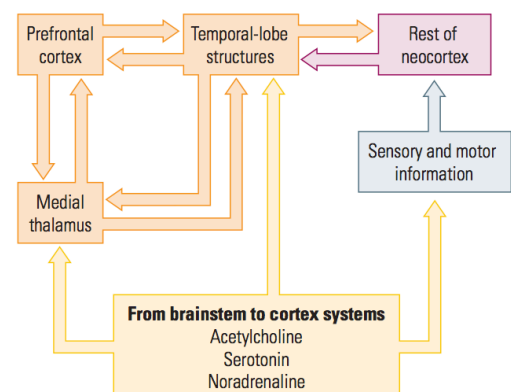
- Tests show inability to learn either episodic or semantic info since surgery
- Semantic tests are more subtle. Example:
  - words that entered language since 1953
  - lexical decision-making (word or non-word)
  - definition
  - pronunciation
  - HM : severely impaired on all of these

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## Neural Substrates of Explicit Memory

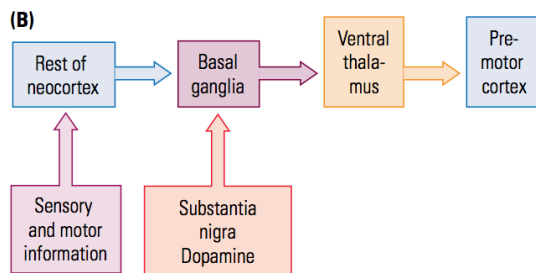


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## Neural Substrates of Implicit Memory



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## HM's emotional processing

- “Happy placid, uncomplaining” (Ogden)
- “Rarely complains about anything.” (his mother)
  - caregivers have to carefully assess - he may be ill or injured but not say anything
- Very little spontaneous speech, but can respond normally once conversation is flowing
- Insight : some - “I can’t remember”
- Attitude & Emotions : lacks anger or frustration
  - (Other amnesiac, e.g. CW, show frustration)
- Theories:
  - removal of Amygdala -> reduction in emotional behavior?
  - years of anticonvulsant medications?
  - genetic (his Father was “good humored and placid”)

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## HM's emotional processing : Testing

- Verbal : Spoken words “I am going to the movies”
  - presented with happy, sad, surprised, angry, tearful, and disinterested prosody
  - HM : accurate on all except angry
- When asked to repeat words:
  - he repeated all accurately, including angry tone
- Facial expressions:
  - make facial expressions, name them, ask him to copy them
  - “he found this task difficult, as he could not stop smiling”
- “Greet everyone with warmth”

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## Day to day life / self Care / ADLs

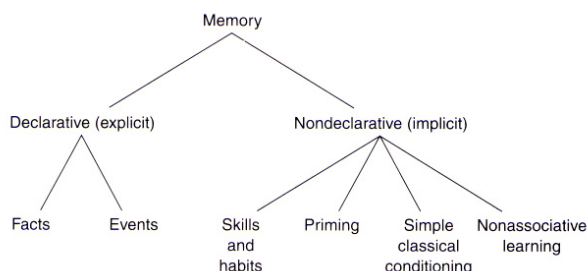
- HM is negligent about self care, feeding, clothing, grooming
- Spends the day doing crossword puzzles, watching TV, reading the newspaper.
- Compliant to caregiver requests
  - “He will go anywhere with anyone”
  - “if asked to sit in a particular chair, will sit there all day without moving or complaining”

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## HM's Pattern of Memory Deficits



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## HM - discussion and questions

- Testing shows better semantic memory from age 16-27 than episodic memory (questionable?)
  - semantic memory is frequently “refreshed”
  - episodic memories less so
- What is reason for age 16-27 retrograde amnesia?
  - Theories:
    - first seizure at 16
      - pre-existing MTL dysfunction
    - high doses of anti-epileptic drugs
      - impaired memory formations
    - hippocampus damage
      - memory consolidation theory

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## Other patients with amnesia

- CW
- SB

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## HSV - Herpes Simplex Virus

- Virus known for over 2000 years
  - “Emperor Tiberius banned kissing in Rome”
- Pathophysiology
  - Virus lives in nerve ganglions between outbreaks
- Epidemiology
  - HSV1 - (mostly) cold sores on mouth/face
    - 57% of adults are infected (USA)
  - HSV2 - (mostly) genital sores
    - 16% of adults are infected (USA)
- Correlations:
  - HSV and Alzheimer’s Disease
  - HSV and Bell’s Palsy

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## CW - Clive Wearing

- born 1938, aged 75
- Musician, singer, chorus master
- At age 47 contracted Herpes Encephalitis
  - HSV-1 (57% of american adults are infected)
- Widespread damage:
  - Temporal Lobes (bilateral)
  - Frontal Lobes
- Results:
  - LTM : Profound retrograde & anterograde amnesia
    - remembers his wife, but little else
  - STM also affected - about 7 to 30 seconds of memory
  - emotionally labile
  - keeps feels as if he’s “waking up” for the first time

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## Scott Bolzan

- born 1962, aged 51
- former NFL player (for 2 years)
- then worked in Insurance
- At age 46 slipped & fell in bathroom
  - severe concussion
- SPECT scan shows no blood flow to
  - Right temporal Lobe
  - Frontal Lobes
- Results:
  - Profound Retrograde Amnesia
  - No Anterograde Amnesia

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## Scott Bolzan

- Symptoms
  - no memory of prior life
  - did not recognize wife & children
  - Lost semantic knowledge
    - what is a cellphone
    - what is a TV
    - what is a birthday

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