Accelerated long-term forgetting and autobiographical amnesia

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Everyone needs his memories: they keep the wolf of insignificance from the door

Saul Bellow
ALF & AbA

- Transient epileptic amnesia
- What is autobiographical memory?
- ‘focal autobiographical amnesia’
- Accelerated long term forgetting
- Time course of memory and loci of impairment
- Conclusions & future directions
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“(4.) A fourth occasion is perhaps worth record. I was attending a young patient whom his mother had brought me with some history of lung symptoms. I wished to examine the chest, and asked him to undress on a couch. I thought he looked ill, but have no recollection of any intention to recommend him to take to his bed at once, or of any diagnosis. Whilst he was undressing I felt the onset of a petit mal. I remember taking out my stethoscope and turning away a little to avoid conversation. The next thing I recollect is that I was sitting at a writing-table in the same room, speaking to another person, and as my consciousness became more complete, recollected my patient, but saw he was not in the room. I was interested to ascertain what had happened, and had an opportunity an hour later of seeing him in bed, with the note of a diagnosis I had made of ‘pneumonia of the left base.’ I gathered indirectly from conversation that I had made a physical examination, written these words, and advised him to take to bed at once. I re-examined him with some curiosity, and found that my conscious diagnosis was the same as my unconscious,—or perhaps I should say, unremembered—a diagnosis had been. I was a good deal surprised, but not so unpleasantly as I should have thought probable.”

(Brain 1888;11:179-207)
Transient Epileptic Amnesia

previous reports

• The case of Dr Z
  – Hughlings Jackson, Brain, 1889/1898

• Isolated reports of ‘amnestic seizures’
  • Epileptic amnesic attacks, Pritchard, 1985
  • Epileptic transient amnesia, Stracciari, 1990
  • Ictal amnesia, Rowan, 1991
  • Epileptic amnesic syndrome, Galassi, 1988/1992
  • Pure amnestic seizures, Palmini, 1992

• Epilepsy mimicking TGA
  – Hodges, Brain, 1990

• Transient epileptic amnesia defined
  – Kapur, JNNP, 1993

• TEA: 10 current cases + 21 reviewed
  – Zeman et al 1998
The Impairment of Memory in Epilepsy
Mr P.M.

- 58 year old man
- 28 episodes of transient amnesia over 18 months
- All on waking
- Circa 20 minutes
- Amnesia for brother’s death
- Lamotrigine abolished
- Returned with olfactory hallucinations when treatment omitted
- Lamotrigine abolished
**Diagnostic criteria**

Recurrent, witnessed episodes of transient amnesia

Other cognitive functions intact

Evidence of epilepsy

i. other clinical features of epilepsy

ii. response to anticonvulsant medication

iii. epileptiform abnormalities on EEG
Methods

UK-wide recruitment
History and examination
Neuropsychology
EEG
Structural MRI
**Demographics**

50 patients

sex ratio

- male = 34 (68%)
- female = 16 (32%)

age seen

- range = 46 to 84 years
- mean = 68.3 years
Clinical Features of TEA

- Onset in later life
- Male predominance
- Attacks 30-60 minutes
- Attacks one/month
- Attacks on waking common
- Amnesia can be sole feature
- +/- olfactory hallucinations, automatisms, brief unresponsiveness
- Partial recall common
- Excellent treatment response
- Diagnosis usually delayed
- Interictal memory complaints usual
  - 2/3 Autobiographical amnesia
  - 1/2 Accelerated forgetting
  - 1/3 Topographical amnesia
Transient Epileptic Amnesia


Peri-ictal MRI

Peri-ictal FDG-PET

One month later
Transient Epileptic Amnesia

- **Clinical**
  - epilepsy causing intermittent transient memory disturbance

- **Cognitive**
  - Transient disruption
    - memory encoding/early consolidation
    - and/or
    - memory retrieval

- **Neurobiological**
  - Medial temporal
    - EEG, imaging
  - Ictal or post-ictal
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Autobiographical Memory

– your memory for your past
  • Self-referential – ‘all about you’
  • Includes facts and episodes
  • Involves
    – Memory search and retrieval
    – Temporality or narrative
  • Incorporates
    – Semantics
    – Imagery
    – Emotion

*Klein, 2004; Kihlstrom, 2009; Svoboda, 2006; Piolino, 2009; Rubin, 2012*
Svoboda et al
Neuropsychologia
2006;44: 2189–08.
Buckner et al ANYAS
2008 1124:1-38
Autobiographical Memory

– Crucial for *human* cognition
  • Mirror self recognition
  • Theory of mind
  • Mental time travel ~ autonoesis

– Facilitates
  • Self-knowledge and social emotions
  • Interpersonal relationships
  • Imagination, future thinking, problem solving

*Kihlstrom 2009; Tulving 1985, 2002; Conway 2000*
Autobiographical Memory

– Assessment
  • Lack of experimental control
  • Approaches:
    – Free recall
    – Crovitz & Schiffmann (1974) cue word technique
    – Kopelman (1989/90) Autobiographical Memory Interview
    – Dritschel (1992) Autobiographical fluency
    – Piolino (2006) TEMPau task
    – Autobiographical memory recognition tests
    – Prospective assessment eg diary, SenseCam
Autobiographical Memory

• A vulnerable system
  – …travel through subjective time, allowing individuals to re-experience specific past events…the last feature of … memory to become fully operational in development and the first … to go in ageing and most amnesias (Piolino et al, 2009)
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MAMI: average lifetime scores

![Bar chart showing group mean scores for Semantic and Episodic memory for controls and patients. The chart indicates a significant difference with ***p<0.001.](chart.png)
MAMI: episodic score by decade

Decades ago

Score

Controls

Patients

* p<0.05
** p<0.01
*** p<0.001
Internal details

Milton et al, Brain 2010:133:1368-1379
AM – Category (MTL ROI)

Controls

Patients

Milton et al Neuropsychologia 2012
50:3528–3541

(p<.005, cluster size > 10)
Temporal lobe epilepsy
– autobiographical memory loss

– Chronic refractory
  • eg Viskontas, 2000; Lah, 2006; Addis, 2007

– Temporal lobectomy
  • eg Barr, 1990; Lah, 2004; Noulhiane, 2007

– Adult-onset drug sensitive
  • Tramoni, 2011

– As presentation of TLE
  • Subtle seizures
    – Jansari, 2010
  • Prodromal
    – Hornberger, 2010; Tramoni, 2011
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Focal Aba in other contexts

- Diffuse pathology

- Right temporofrontal pathology

- Visual deficit amnesia
  - Rubin & Greenberg 1998

- Functional amnesia
  - Kopelman 2002; Kritchevsky et al 2004

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Designs

(Butler et al Ann Neurol 2007)
Muhlert et al, Neuropsychologia 2010 48:3235-3244
Tramoni E et al Brain 2011 134:816-831
Recall performance over the first 24 hours after acquisition

Hoefejzers et al Neuropsychology 2014
http://dx.doi.org/10.1037/neu0000114

Atherton et al Cortex 2014;54:92-105
Picture Presentation

... (300 pictures)

Recognition Test
(5min, 2.5h, 7.5h, 24h and 1 week after Picture Presentation)

Similar foil (x 20)
Different foil (x 20)
Presentation picture (x 40)

... (80 pictures)
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  – What causes it?
  – What is its prognosis?

• Autobiographical amnesia
  – Functional or structural?
  – Acquisition, consolidation, storage or retrieval?
  – Distinctive patterns in different disorders?

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  – An early feature in other disorders?
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‘Having last week makes me functional, to a very large degree. What it means not to have last year is very hard to describe...my primary symptom is the void that is my past’
People

Exeter
Fraser Milton
Sharon Savage
Adam Zeman

Oxford
Chris Butler
Kathryn Atherton

Cardiff
Kim Graham
Nils Muhlert

London
Narinder Kapur

Edinburgh
Michaela Dewar
Serge Hoefeijzers
Sergio Della Sala
Joanna Wardlaw

Sydney
John Hodges

Buenos Aires
Facundo Manes

Funding

Academy of Medical Sciences
Dunhill Medical Trust
Epilepsy Research UK
ESRC
Great Western Research
Health Foundation
Microsoft Research
Mrs Dale Medical Neurology Fund
Patrick Berthoud Charitable Trust
Wellcome Trust

Recruitment

BNSU
• http://projects.exeter.ac.uk/time/