

## **SenseCam**

**A wearable camera can help improve autobiographical memory in patients with Alzheimer's disease**

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# SenseCam

- A new concept for digital cameras
  - wearable, wide-angle lens
  - automatic capture
  - range of sensors
- New media type
  - between digital stills & video
  - ‘digital experience’ capture



# SenseCam



# SenseCam movie (copyright Phil Barnard)

## SenseCam temporal montage



A SenseCam collaboration between MRC-CBU, Psychology Dept, Bangor University and Microsoft Research Cambridge

**A DAY OUT**  
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\*Philip Barnard / MRC Cognition and Brain Sciences Unit

Media Support: Simon Strangeways

# SenseCam & memory

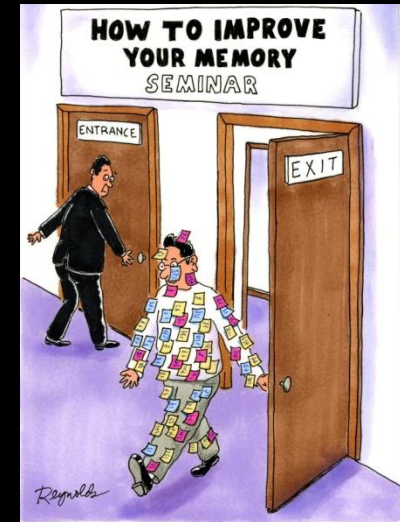
- Different types of memory:
  - Implicit
    - Skills and habits
    - Unconscious learnt responses
  - Explicit
    - Semantic – facts and concepts
    - Episodic – things you have done
      - Recollective experience of significant personal events
      - Linked to self knowledge and long-term goals
      - Important for psychological and social functioning

# SenseCam & memory

- Causes of memory impairment
  - Neurodegenerative disease
    - e.g. Alzheimer's disease, Vascular dementia
  - Brain injury
    - Head trauma, brain infections
    - Epilepsy, stroke, etc
- Treatment
  - Limited/no medication
  - Memory aid rehabilitation (limited access)

# SenseCam & memory

- Cambridge Memory Aids Clinic
  - Memory aids for current and future events
  - Lack of aids for past events
- SenseCam as memory aid for past events
  - Pictorial diary from user's visual perspective
  - Non-intrusive
  - Easy to use
  - Easy to view
- Hypothesis: SenseCam will help cue recall and promote consolidation of episodic memories



# Clinical studies

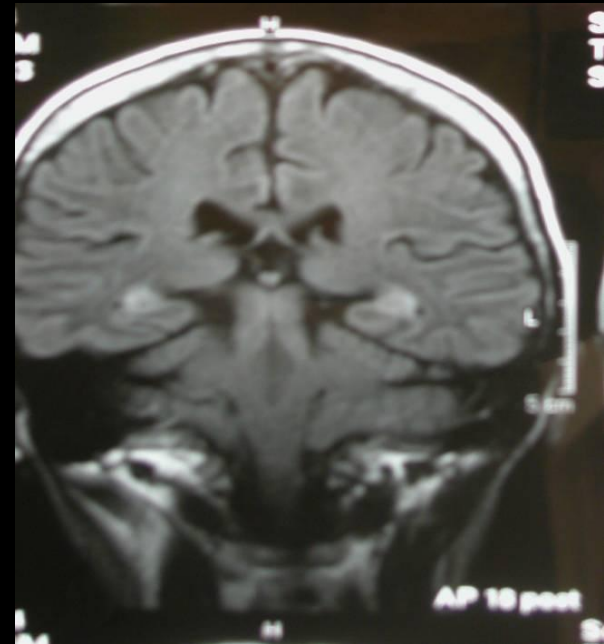
- Study conditions
  - Experimental
    - SenseCam used to record significant events
  - Control
    - Written diary used to record significant events
  - Baseline
    - No memory aid used
- Procedure
  - Significant event
  - Information reviewed every 2 days for 2 weeks
  - Memory of the event tested before each review
  
  - Long-term recall tested



# Clinical studies: case study 1

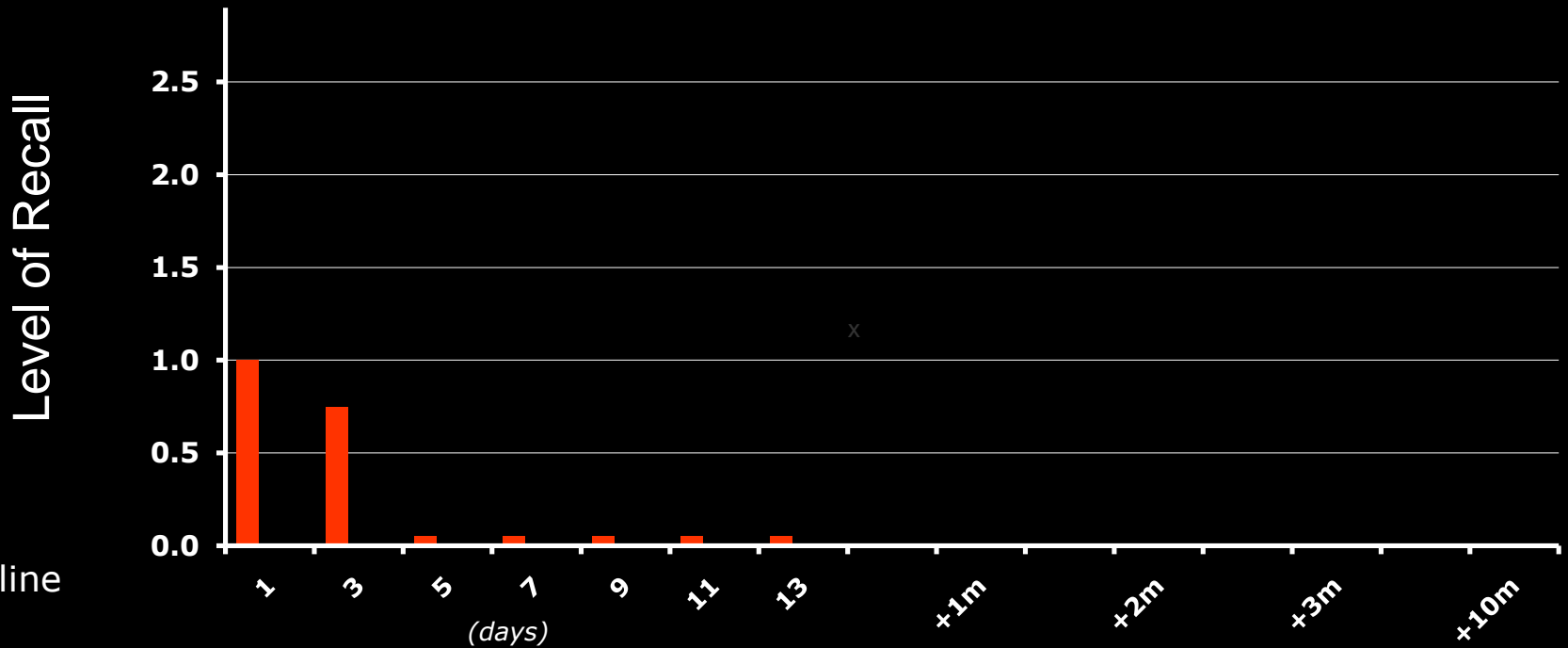
## Mrs B – limbic encephalitis (Berry et al, in press)

- Cambridge Memory Clinic
- 63 year old, well educated woman
- Limbic encephalitis 2002
- Severe episodic memory impairment
  - No recall of an event within 3 to 5 days



# Results

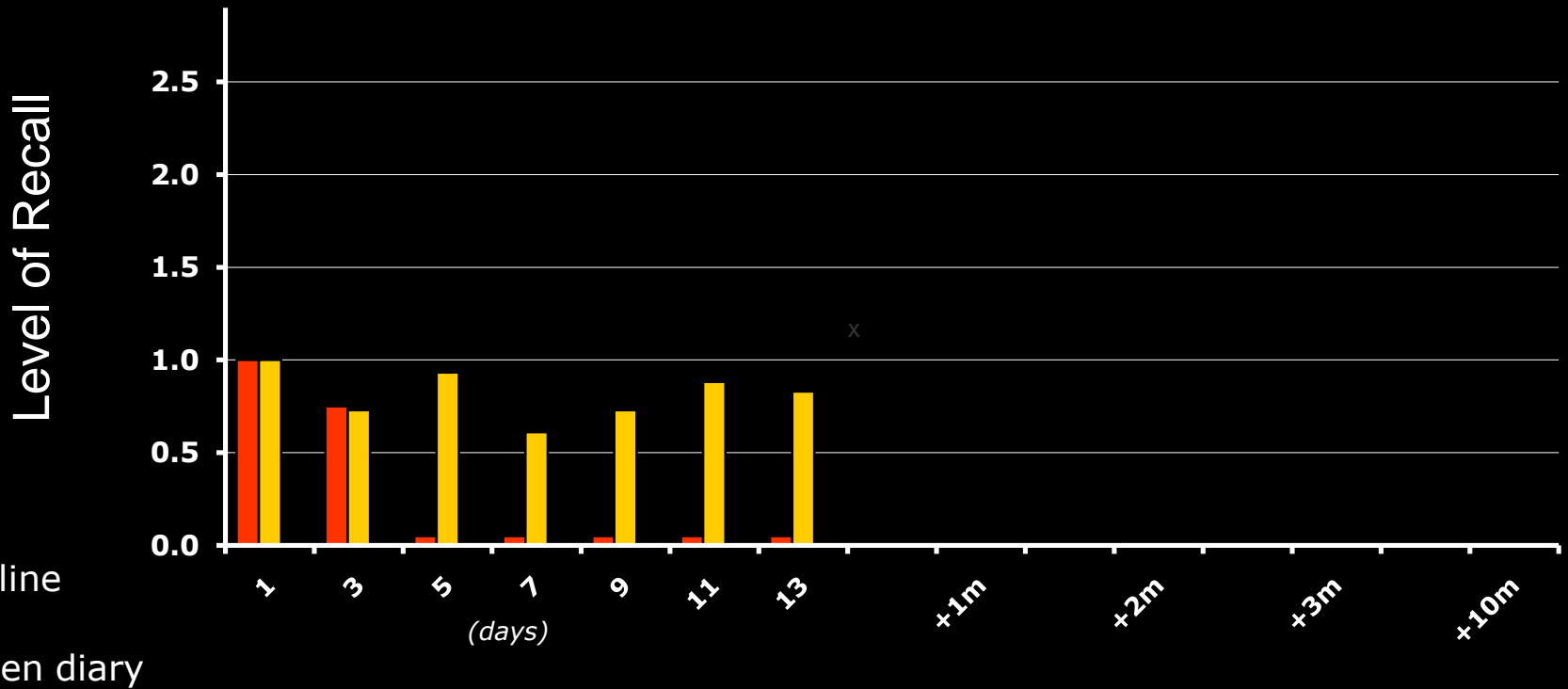
## Memory of an event over time



Time elapsed since event

# Results

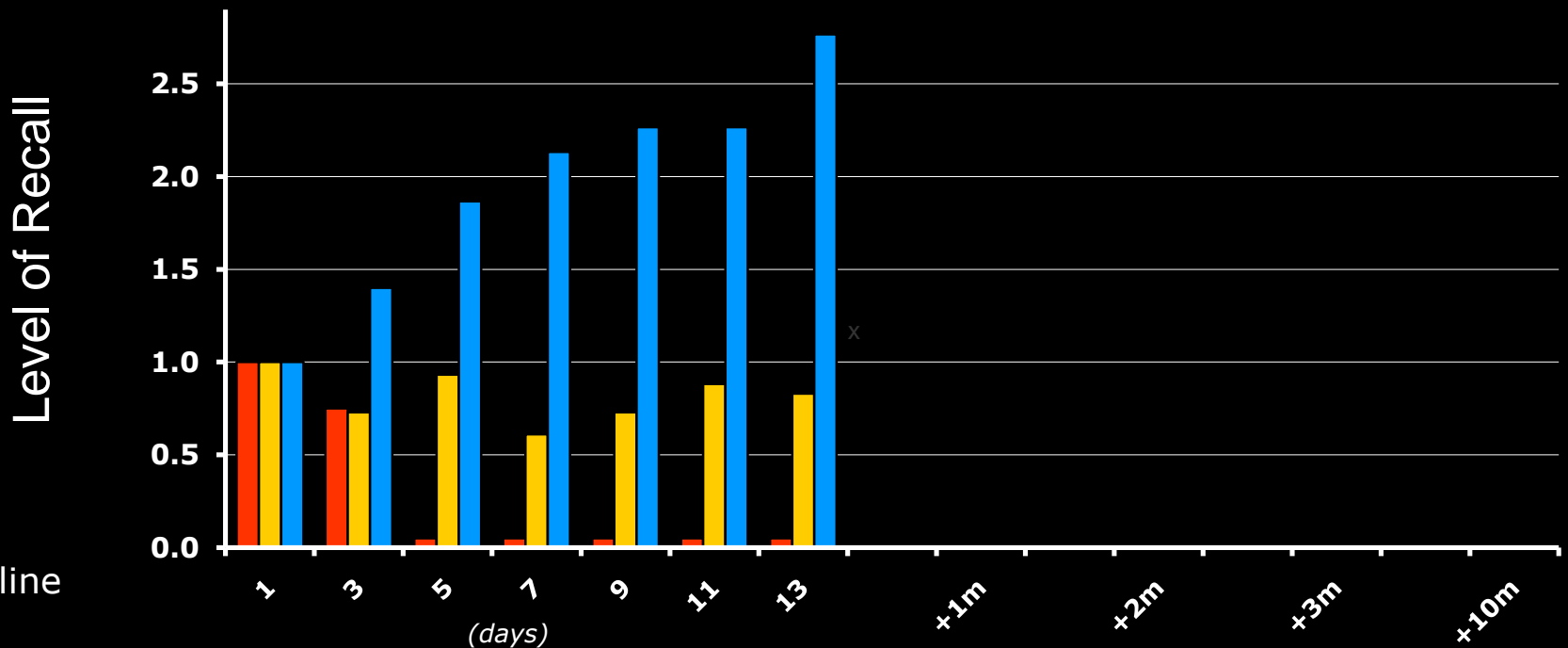
## Memory of an event over time



Time elapsed since event

# Results

## Memory of an event over time



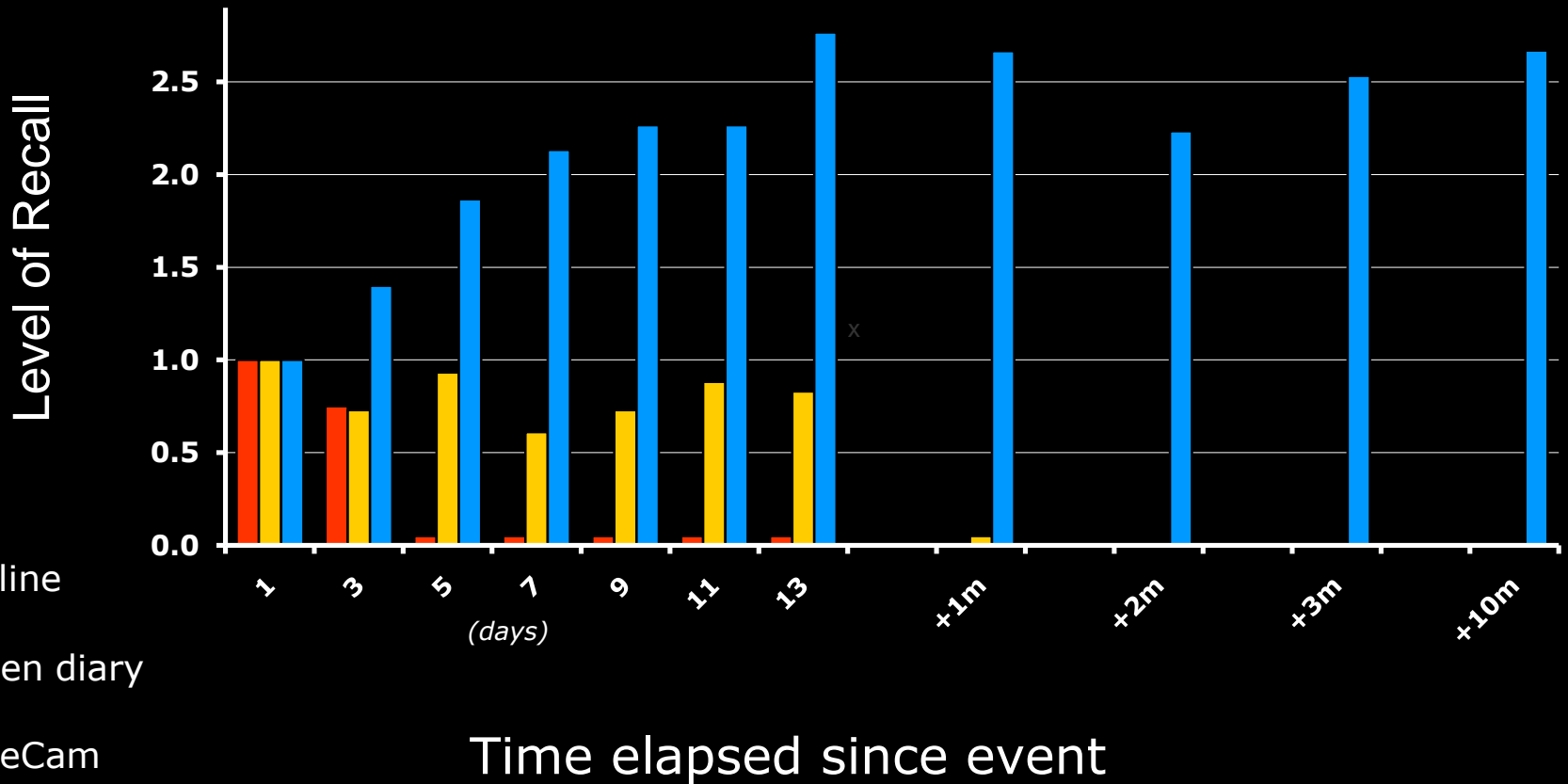
Level of Recall

Time elapsed since event

- Baseline
- Written diary
- SenseCam

# Results

## Memory of an event over time



# Clinical studies: case study 2

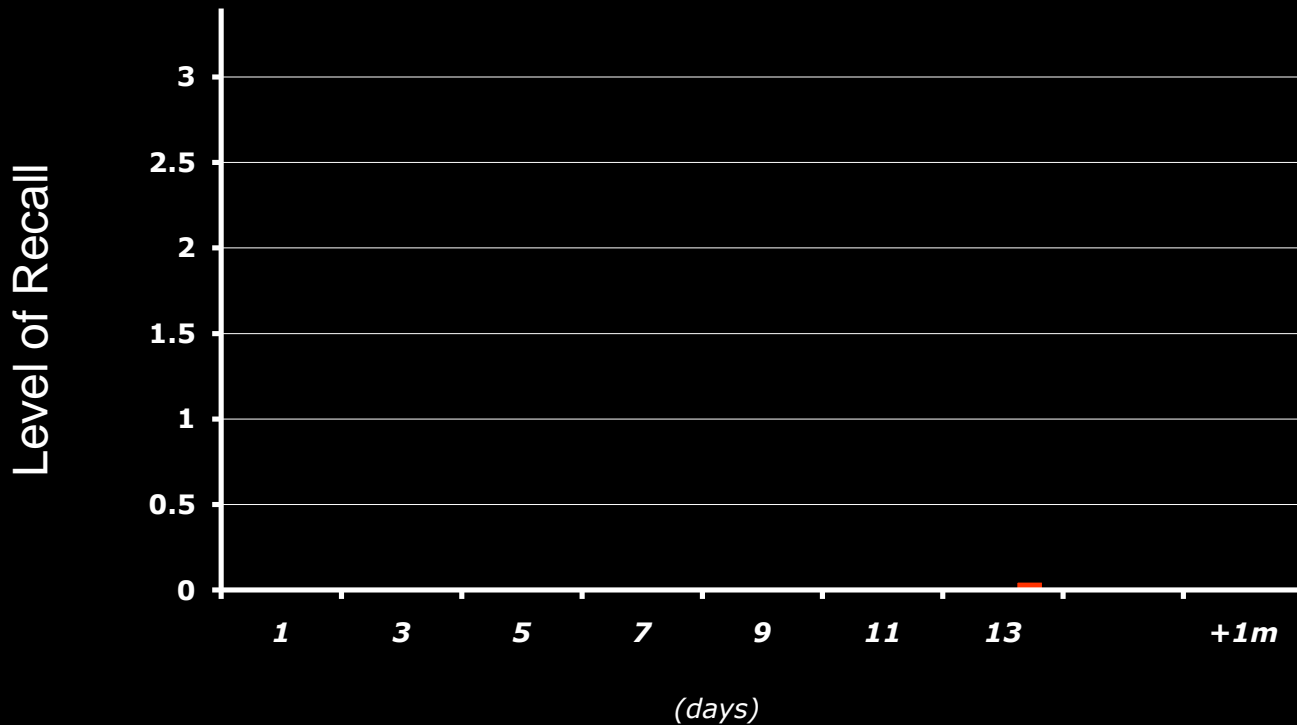
## Mrs F – Alzheimer's disease

- Cambridge Memory Clinic
- 67 year old woman, living alone
- Alzheimer's disease diagnosed in 2000
- Now in 'moderate' stages of disease
- Marked memory impairment

# Results: Mrs F Alzheimer's disease

## Results

### Memory of an event over time



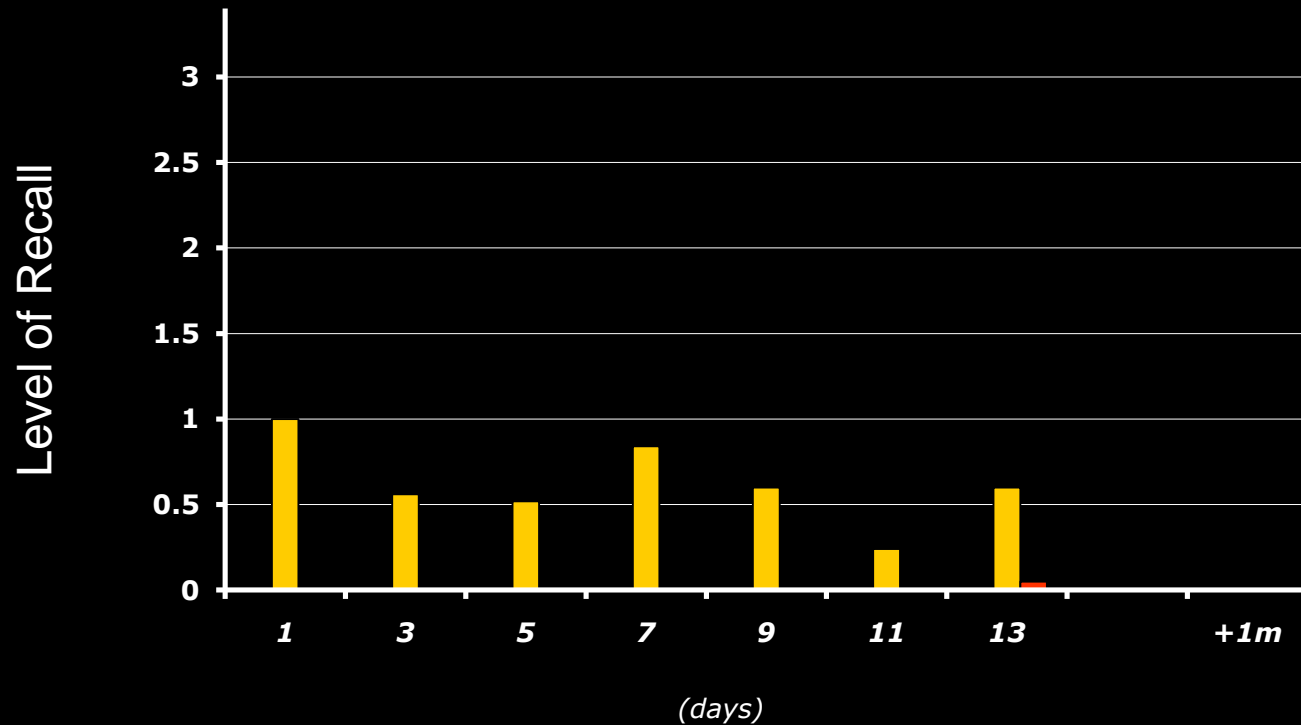
■ Baseline

Time elapsed since event

# Results: Mrs F Alzheimer's disease

## Results

### Memory of an event over time



Baseline

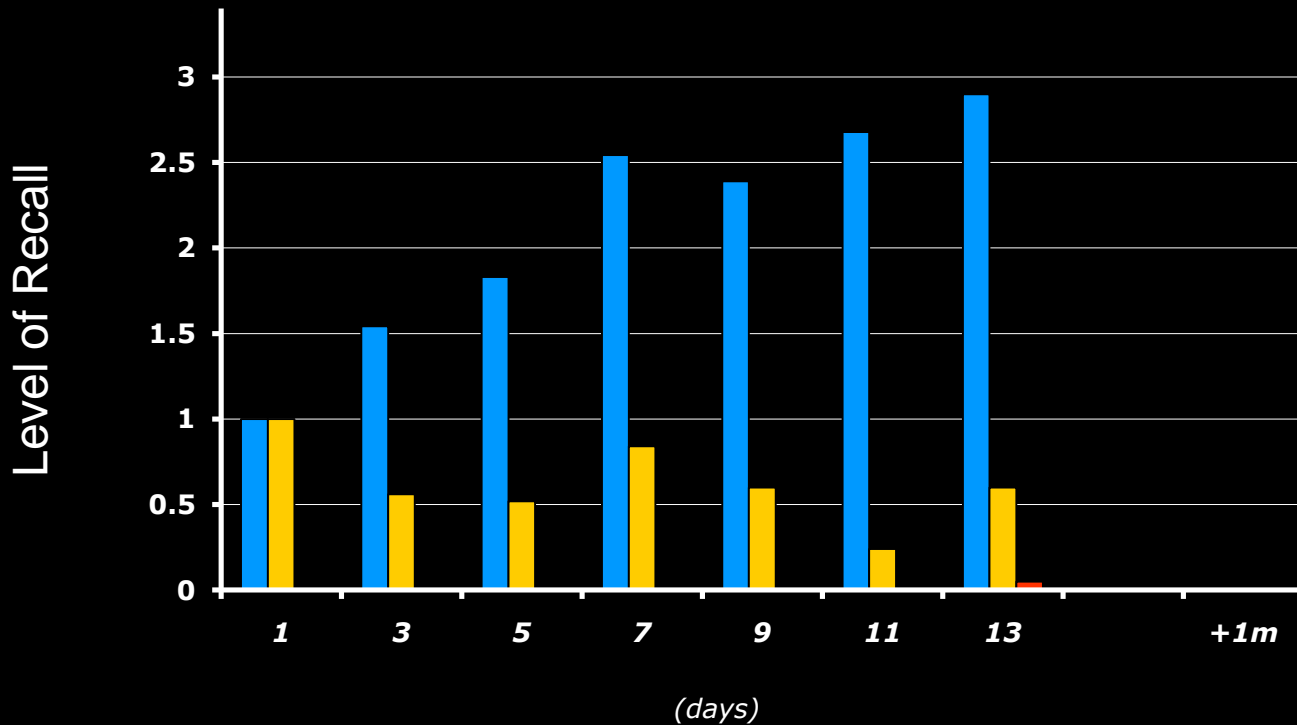
Written diary

Time elapsed since event



# Results

## Memory of an event over time

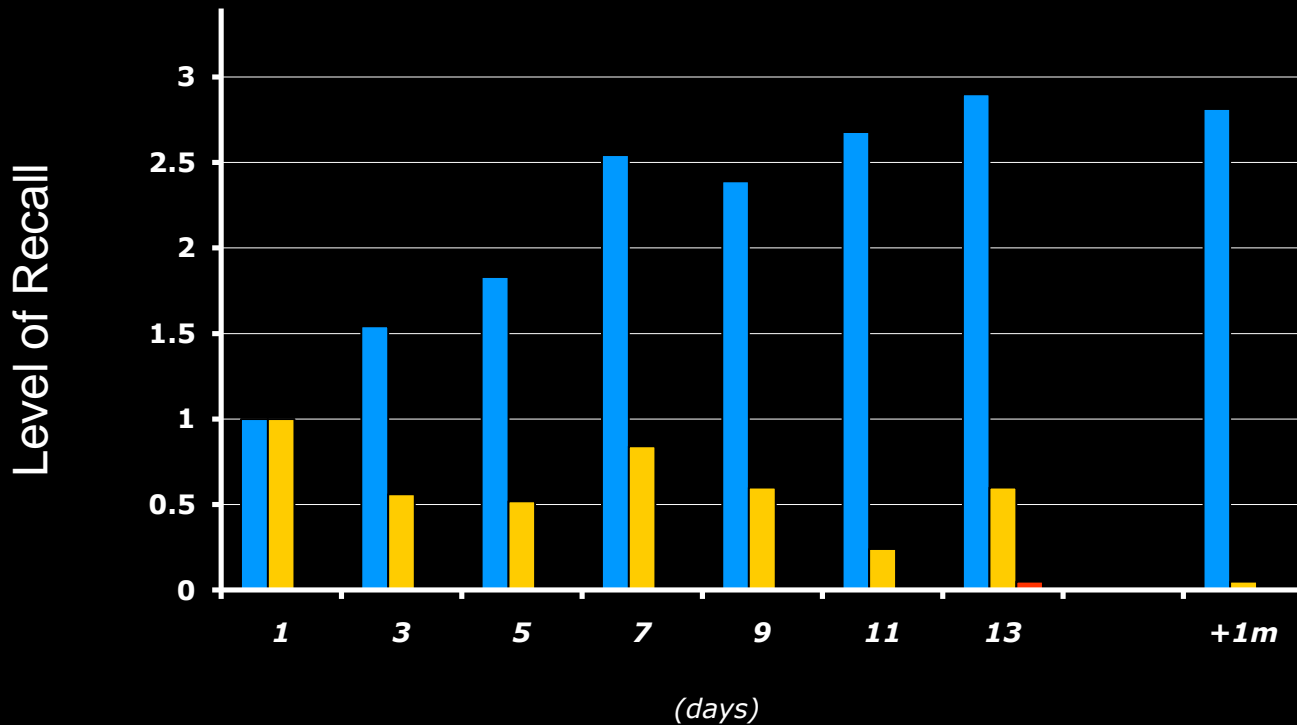


- Baseline
- Written diary
- SenseCam

Time elapsed since event

# Results

## Memory of an event over time



- Baseline
- Written diary
- SenseCam

Time elapsed since event

# Clinical studies: case study 3

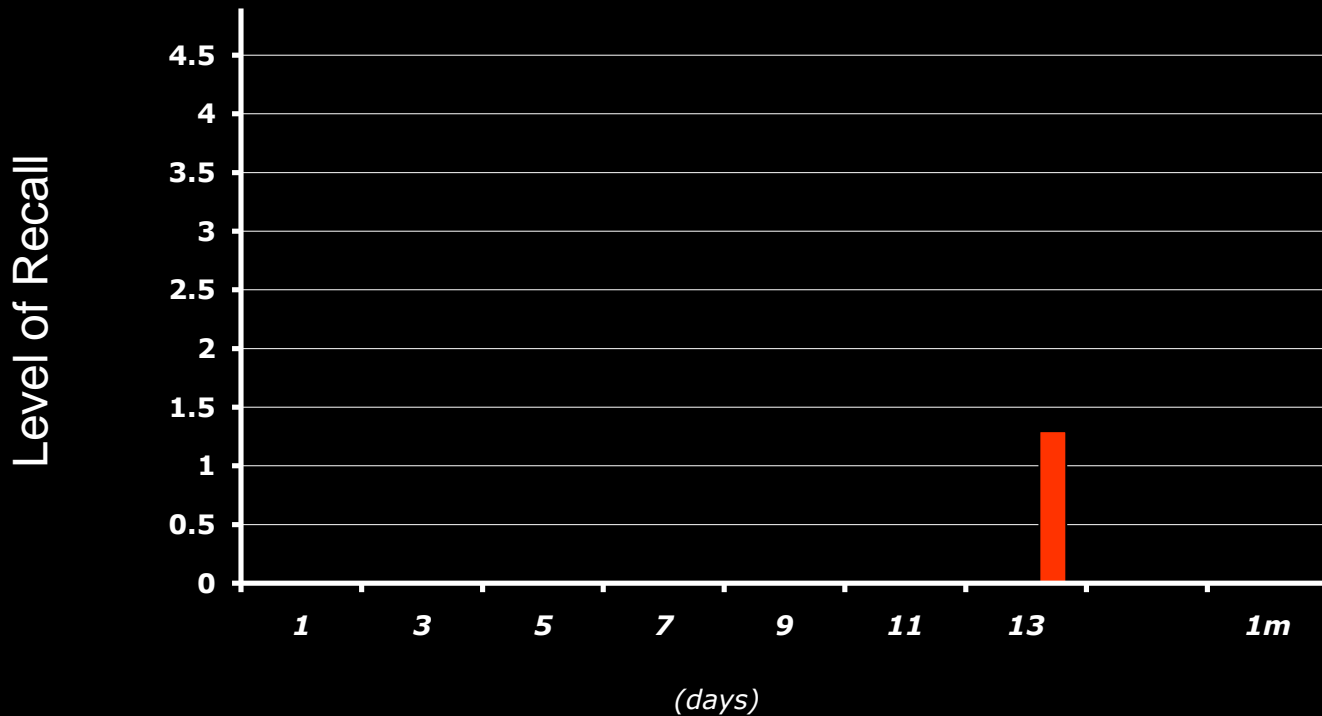
## Mr D – Alzheimer's disease

- Cambridge Memory Clinic
- 75 year old, married man
- Alzheimer's disease diagnosed in 2006
- Now has marked memory impairment
- Relatively intact other cognitive functioning

# Results: Mrs F Alzheimer's disease

## Results

### Memory of an event over time

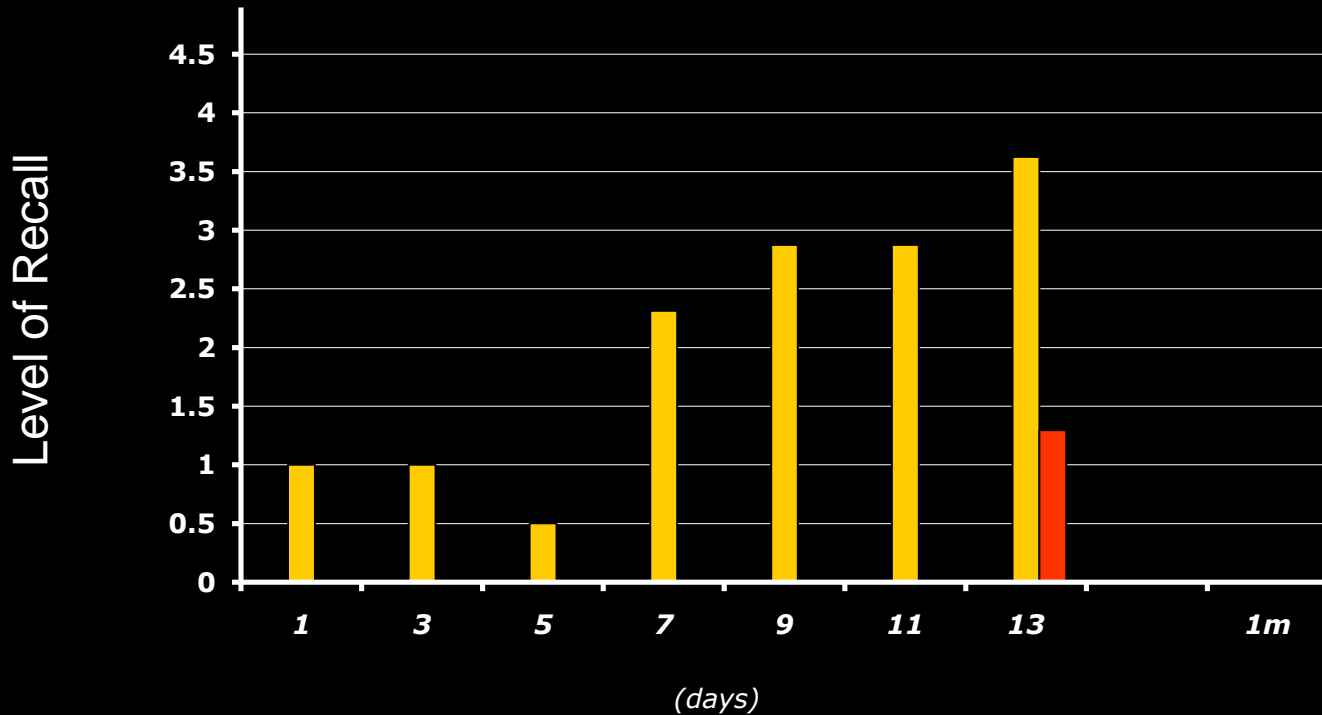


Time elapsed since event

# Results: Mrs F Alzheimer's disease

## Results

### Memory of an event over time



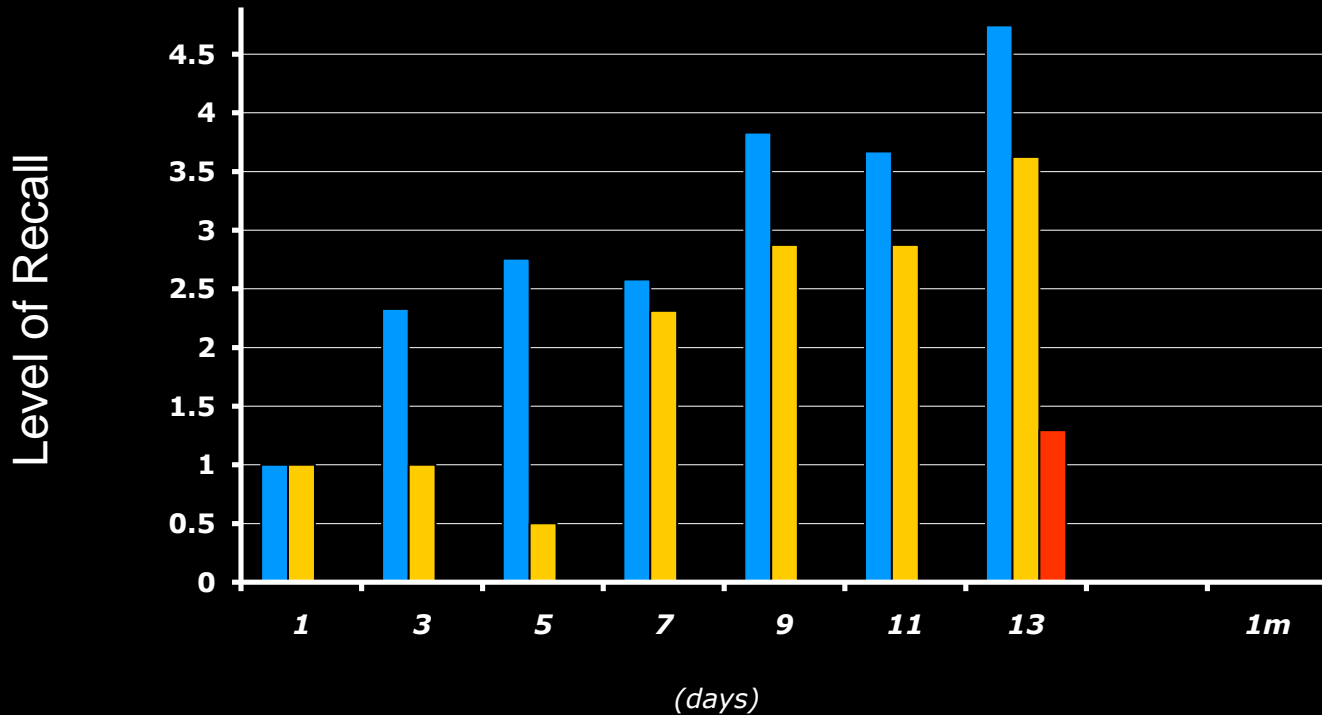
Baseline

Written diary

Time elapsed since event

## Results

### Memory of an event over time

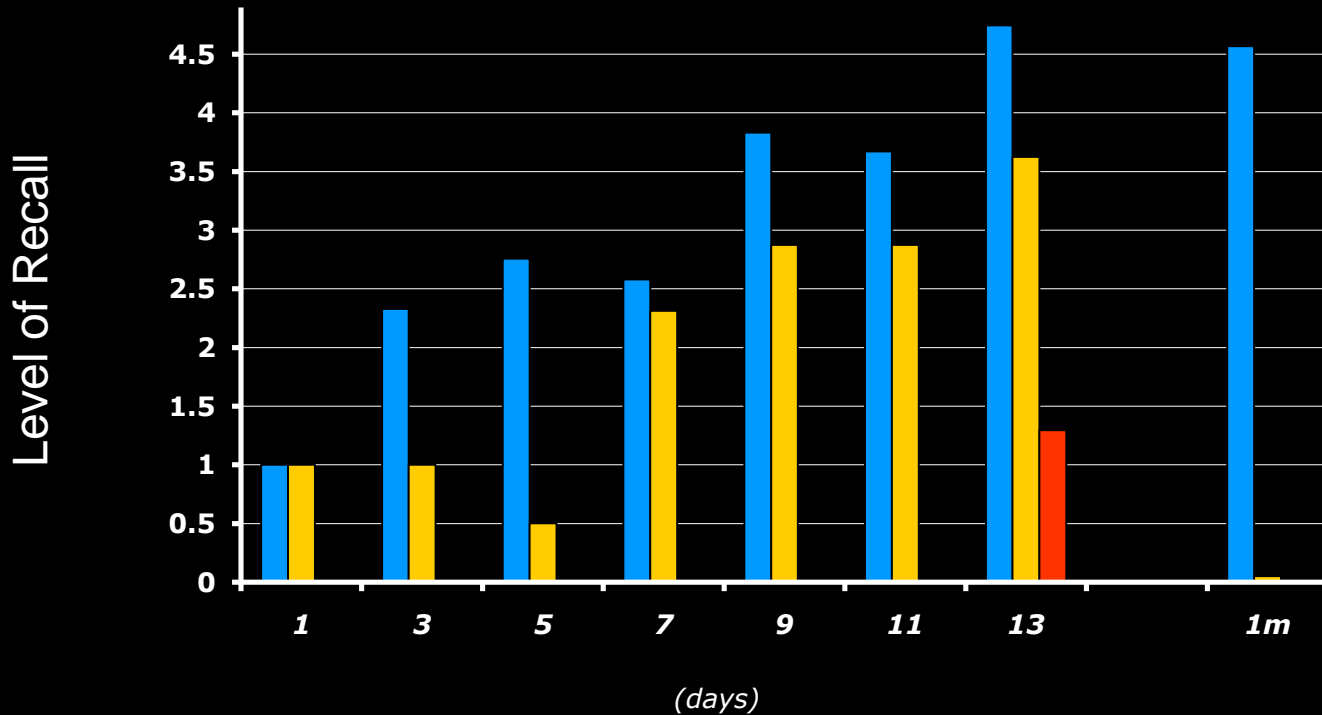


- Baseline
- Written diary
- SenseCam

Time elapsed since event

# Results

## Memory of an event over time



- Baseline
- Written diary
- SenseCam

Time elapsed since event

# Results

- *'Looking at the images is definitely helpful... normally I would just forget these things'*
- Using the written diary *'I just have to take J's word for it'*
- Different to ordinary camera as *'you see exactly what you saw'*
- Sharing experiences again is a *'sheer pleasure'*
- *'SenseCam is a Godsend... everyone should have one!'*



# Discussion

## Why is SenseCam an effective memory aid?

1. SenseCam movies mimic episodic memory (Conway, 2006)
  - Visual
  - From egocentric viewpoint
  - Recollectively experienced
  - Summary records
  - Correspond to reality
2. Certain SenseCam images are particularly strong cues
  - Personally meaningful events
  - Unpredictable 'high impact' images (cf. Croucher, Calder, & Barnard, 2006)
3. SenseCam movies stimulate brain regions important for memory consolidation
  - Hippocampus and related memory structures
  - Neural networks not easily activated otherwise

# Summing up

- SenseCam powerfully stimulated the recall and consolidation of autobiographical memories in patients with memory loss
- SenseCam images may be especially potent cues for triggering autobiographical memory recall
- SenseCam has many important clinical and theoretical applications