

## **SenseCam & memory rehabilitation**

---

Emma Berry, Georgina Browne, Steve Hodges, Gavin Smyth, Narinder Kapur, Lyndsay Williams, Alex Butler, and Ken Wood

# What is SenseCam?

- A new concept for digital cameras
  - Wearable, wide-angle lens
  - Automatic capture
  - Range of sensors
- New media type
  - Between digital stills & video recordings
- Applications
  - Cueing recall for the wearer
  - Sharing experiences with others



# A SenseCam movie



# Easy to use software...

Frame 424/803, Timestamp 01/11/2006 15:57:19

**Bookmarks** HideBookmarks ▶

Sort by time ▼

**Lunch**  
Frames: 199-260  
01/11/2006 15:51:35

**X-country**  
Frames: 343-413  
01/11/2006 15:55:16

**Rest time!**  
Frames: 520-740  
01/11/2006 15:59:42

**Add** **Remove**

Fast Back Back Pause Forward Fast Forward

Simple Mode Undistort Start bookmark End bookmark Delete

# How can SenseCam help memory?

- External memory aids are an effective aid to memory rehabilitation (Kapur et al. 2000)



Two issues with this:

- 1) Almost all treat prospective memory
- 2) Memory aids are best used by people with intact memory (Wilson, 2002)

# How can SenseCam help memory?

SenseCam overcomes these problems:

1. It records events as they happen
2. Use requires little cognitive effort
  - Passively records experiences
  - No conscious thought
  - Allows full participation in the event
  - Simple to upload and view images (VCR interface)
- Subsequent viewing of image sequences
  - Cue recall & so consolidate storage of memories

## Why Rehabilitate Autobiographical Memory?

- Remembering is an act of communication
  - Retelling past experiences is integral to social interaction
  - Reminiscing creates interpersonal bonds
- Autobiographical knowledge ‘constrains what the self is, has been and can be...’ (Conway, 2005).

# SenseCam Clinical Trials: Study Design

- Experimental condition  
SenseCam used to record memorable days
- Control condition  
Written diary used to record memorable days
- Baseline  
No memory aid to help recall memorable days
- Information reviewed approx. every 2 days for 2 weeks
- Memory evaluated before each review

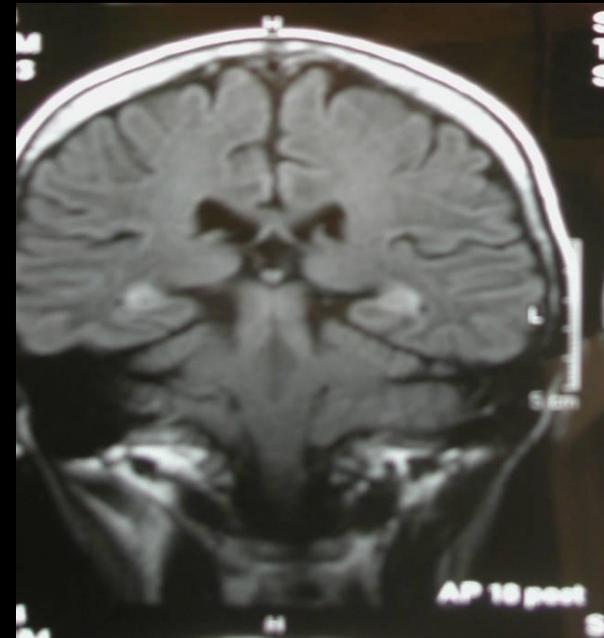
*In this way we assess whether a patient's memory of an event improves with successive viewings of the event*

# Clinical studies: case study 1

## Mrs B

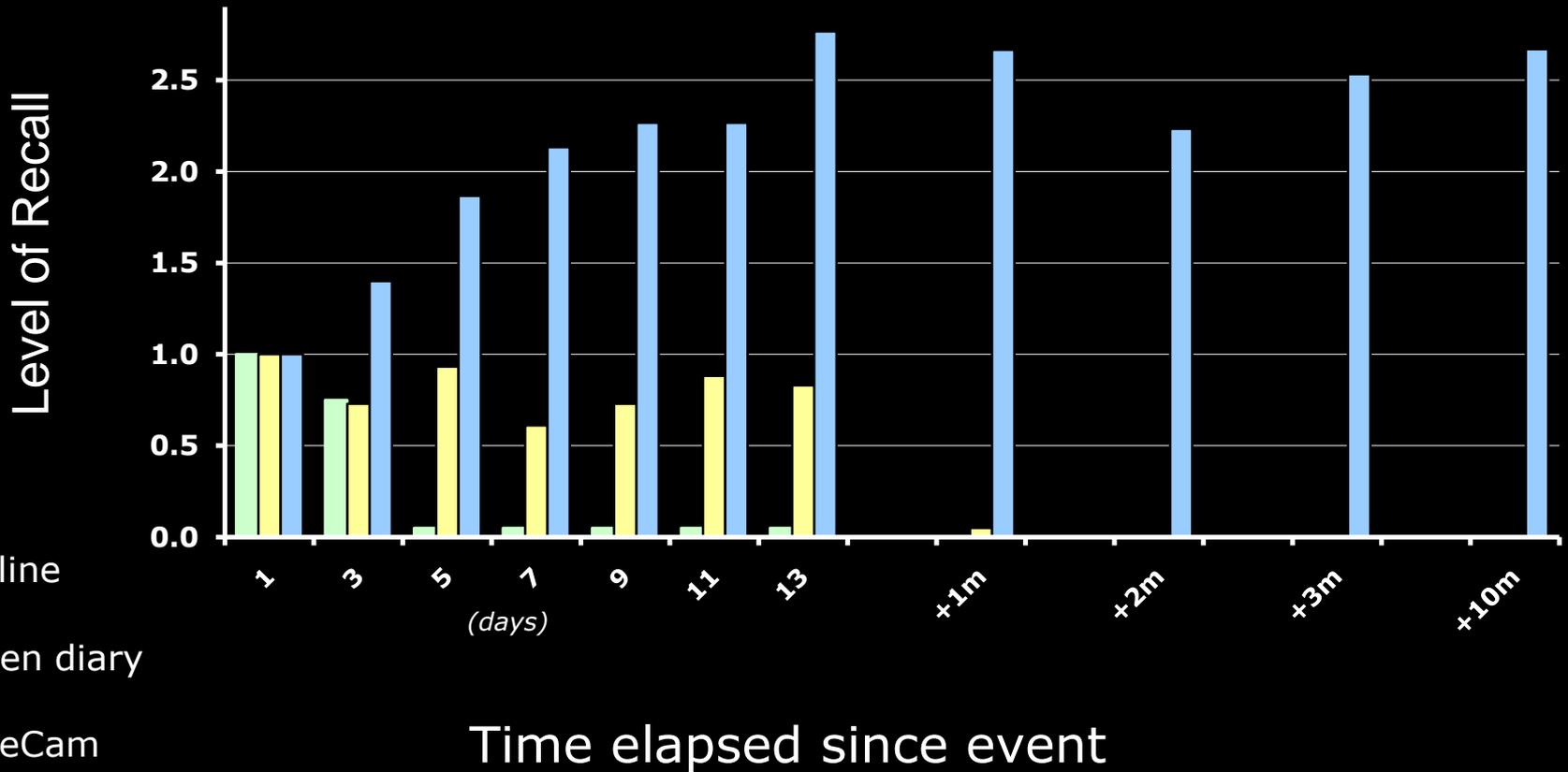
(Berry et al, in press)

- 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



## Results: feedback from patient and spouse

- Seeing images brings memories '*flooding back*'
- More relaxed socially and less anxious
- Sharing experiences again was a '*sheer pleasure*'
- '*It has enormous potential as a memory aid and has been a great success for us personally*'

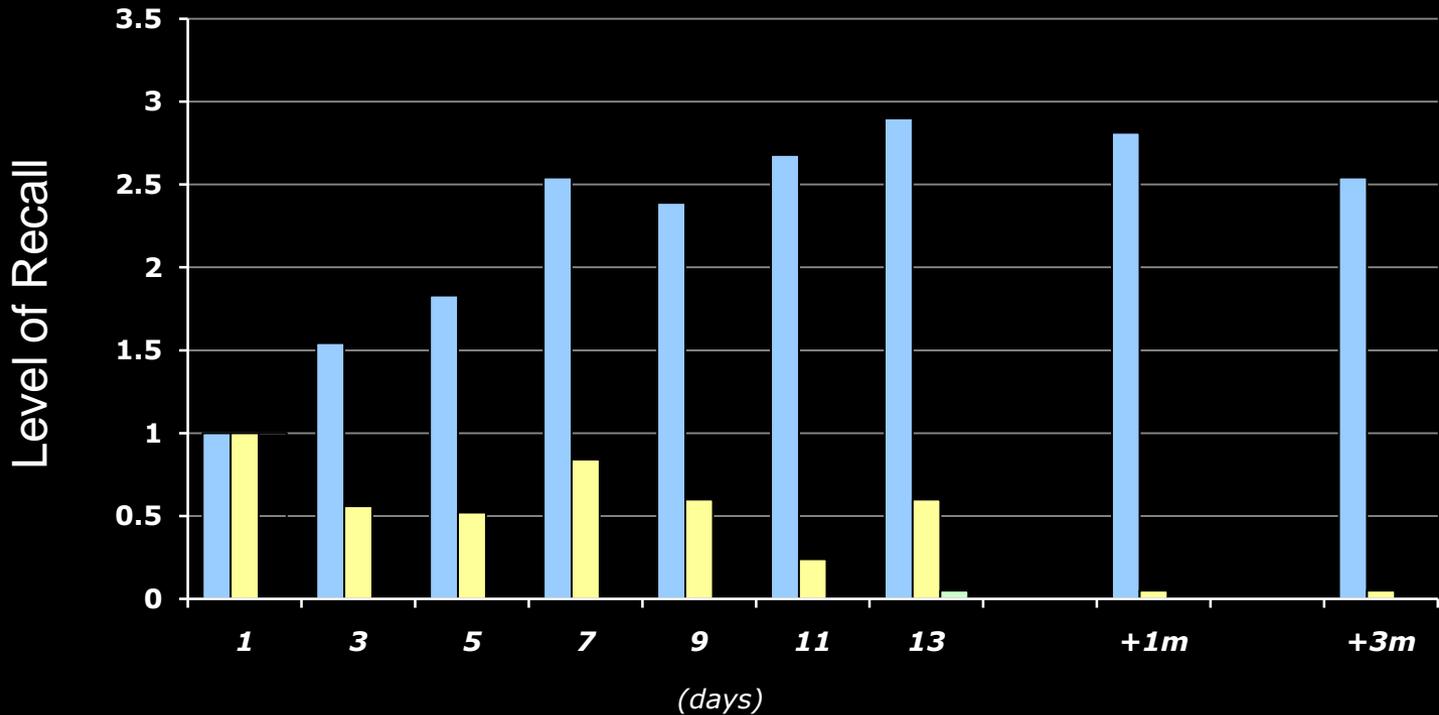
# Clinical studies: case study 2

## Mrs F – Alzheimer's disease

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

# Results

## Memory of an event over time



- Baseline
- Written diary
- SenseCam

Time elapsed since event

# Clinical studies: case study 3

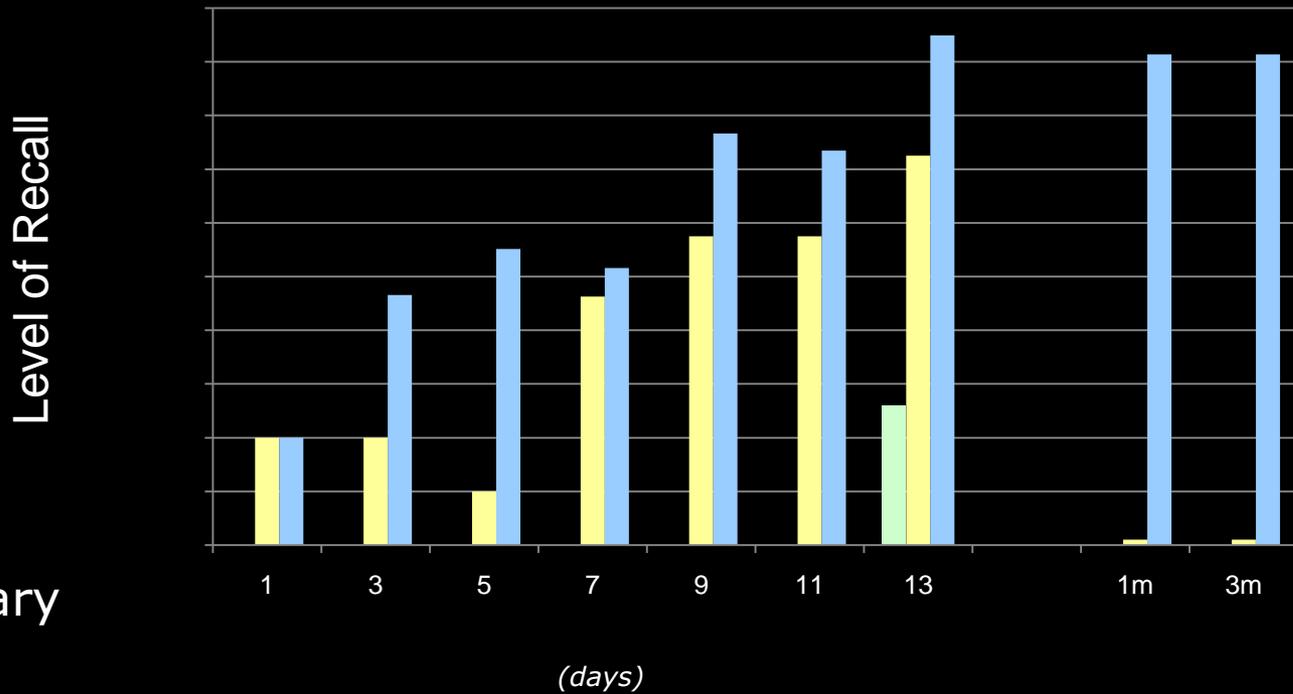
## Mr RD – Alzheimer's disease

- Cambridge Memory Clinic
- 75 year old man, living with his wife
- Diagnosed with MCI in 2005 & AD 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: feedback from patients & spouse

- *'(It) is definitely helpful... normally I would just forget these things'*
- *'I have more confidence'*
- *'SenseCam is a Godsend... everyone should have one!'*
- *'When we didn't have the camera she wouldn't be able to recall much... We get enjoyment out of it'*
- *'I'm grateful because I remember what I have done'*
- *'Even if we didn't have you to worry about, we'd still use it'*

# Why is SC better than written diary?

- Evidence that autobiographical memory is rich with visual imagery (Brewer, 1988; Greenberg & Rubin, 2003)
- SenseCam images may be similar to images in autobiographical memory (Martin Conway, 2006)
- Certain SC images may powerfully cue recall:
  - SC movies capture *personally meaningful events* which appear to cue recall for thoughts & feelings at the time the image was taken
  - Croucher, Calder & Barnard (2006) call these 'impact' images
  - These are not necessarily accessible to another person

# Personally meaningful images



# Personally meaningful images



# Personally meaningful images



# Personally meaningful images



# Ongoing funded SenseCam research

- Dr Fergus Gracey and Prof. Andrew Bateman
  - SC & physiological monitoring as a tool to aid executive functioning after brain injury
- Dr Phil Barnard & Dr Linda Clare
  - SC facilitated recollection in patients with dementia
- Prof. Adam Zeman
  - SC as a memory support in Transient Epileptic Amnesia
- Prof. Martin Conway & Prof. Roberto Cabeza
  - Behavioural and neuroimaging studies of effects of SC on human memory

# Conclusions

- SenseCam powerfully stimulates the recall and consolidation of memories that would have otherwise have been forgotten
- Patients have a subjective feeling of remembering. They recall events, thoughts and feelings not in the images
- In some patients, this improves confidence & reduces anxiety
- The clinical and experimental applications of SenseCam are continuing to be explored by us and our collaborators