SenseCam

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

Georgina Browne, Emma Berry, Steve Hodges, Lyndsay Williams, Gavin Smyth, Narinder Kapur, Alex Butler and Ken Wood
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 & 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
Memory of an event over time

Level of Recall

Time elapsed since event

Baseline
Results

Memory of an event over time

Level of Recall

- Baseline
- Written diary

Time elapsed since event
Results

Memory of an event over time

Level of Recall

Time elapsed since event

Baseline
Written diary
SenseCam

IPEM Annual Meeting 2007
Results

Memory of an event over time

Level of Recall

Time elapsed since event

Baseline
Written diary
SenseCam

IPEM Annual Meeting 2007
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

Memory of an event over time

Time elapsed since event

Baseline
Results: Mrs. F, Alzheimer’s disease

Memory of an event over time

Time elapsed since event

Level of Recall

Baseline

Written diary

IPEM Annual Meeting 2007
Results

Memory of an event over time

- Baseline
- Written diary
- SenseCam

Time elapsed since event

IPEM Annual Meeting 2007
Results: Mrs F, Alzheimer’s disease

Memory of an event over time

Level of Recall

Time elapsed since event (days)

Baseline
Written diary
SenseCam
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

Memory of an event over time

Time elapsed since event

Level of Recall

Baseline

IPEM Annual Meeting 2007
Results: Mrs F, Alzheimer’s disease

Memory of an event over time

Time elapsed since event

Level of Recall

Baseline
Written diary

IPEM Annual Meeting 2007
Results: Mrs F, Alzheimer’s disease

Memory of an event over time

Time elapsed since event

Baseline
Written diary
SenseCam
Results

Memory of an event over time

Level of Recall

Baseline
Written diary
SenseCam

Time elapsed since event

IPEM Annual Meeting 2007
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.