SenseCam & memory rehabilitation

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

BPS PSIGE 2007
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

• Cambridge Memory Aids Clinic
  – Memory aids for current and future events
  – Lack of aids for past events
    • Episodic memory important for psychological well-being

• 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

Level of Recall

Time elapsed since event

Baseline

BPS PSIGE 2007
Results

Memory of an event over time

Level of Recall

0.0 0.5 1.0 1.5 2.0 2.5

Baseline

Written diary

Time elapsed since event

BPS PSIGE 2007
Memory of an event over time

Level of Recall

Time elapsed since event

Baseline
Written diary
SenseCam

Results

BPS PSIGE 2007
Results

Memory of an event over time

Level of Recall

Time elapsed since event

- Baseline
- Written diary
- SenseCam

BPS PSIGE 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

Results: Mrs. F, Alzheimer’s disease

Memory of an event over time

Level of Recall

Baseline

Time elapsed since event

(days)
Results: Mrs. F, Alzheimer’s disease

Memory of an event over time

Level of Recall

Baseline
Written diary

Time elapsed since event
Results: Mrs F, Alzheimer’s disease

Memory of an event over time

Time elapsed since event

<table>
<thead>
<tr>
<th>Level of Recall</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
</tr>
<tr>
<td>Written diary</td>
</tr>
<tr>
<td>SenseCam</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Days</th>
<th>Level of Recall</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

BPS PSIGE 2007
Results: Mrs. F., Alzheimer’s disease

Memory of an event over time

Level of Recall

Time elapsed since event

Baseline
Written diary
SenseCam

BPS PSIGE 2007
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

Level of Recall

Baseline

Time elapsed since event

<table>
<thead>
<tr>
<th>Level of Recall</th>
<th>0</th>
<th>0.5</th>
<th>1</th>
<th>1.5</th>
<th>2</th>
<th>2.5</th>
<th>3</th>
<th>3.5</th>
<th>4</th>
<th>4.5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Days</td>
<td>0</td>
<td>0.5</td>
<td>1</td>
<td>1.5</td>
<td>2</td>
<td>2.5</td>
<td>3</td>
<td>3.5</td>
<td>4</td>
<td>4.5</td>
</tr>
<tr>
<td>Baseline</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Results: Mrs F, Alzheimer’s disease

Memory of an event over time

- **Baseline**
- **Written diary**

<table>
<thead>
<tr>
<th>Time elapsed (days)</th>
<th>Level of Recall</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>0.5</td>
<td>1</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1.5</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>2.5</td>
<td>4.5</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>3.5</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>4.5</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Time elapsed since event
Results: Mrs F, Alzheimer’s disease

Memory of an event over time

- Baseline
- Written diary
- SenseCam

Time elapsed since event

BPS PSIGE 2007
Results: Mrs F, Alzheimer’s disease

Memory of an event over time

Level of Recall

Time elapsed since event

Baseline
Written diary
SenseCam

BPS PSIGE 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
Ongoing research

- **MSRC**
  - Alzheimer’s disease
  - Other clinical groups
  - Neuroimaging studies

- **Collaborations**
  - fMRI in normal population (Conway & Cabeza)
  - Rehabilitation of dysexecutive functioning (Gracey)
  - Facilitated recollection in dementia (Barnard & Clare)
  - Multimedia biography reminiscence therapy (Baecker, Stern, & Black)
  - Assessment and rehabilitation of TEA (Zeman)
  - Objective memorability of SC images (Finlay, Brewer, & Benjamin)
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