

Creating Salient Summaries for People with Episodic Memory Impairment



• Human-
Computer
Interaction
Institute

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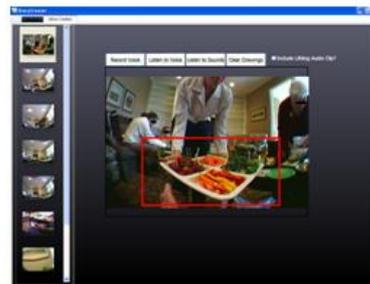
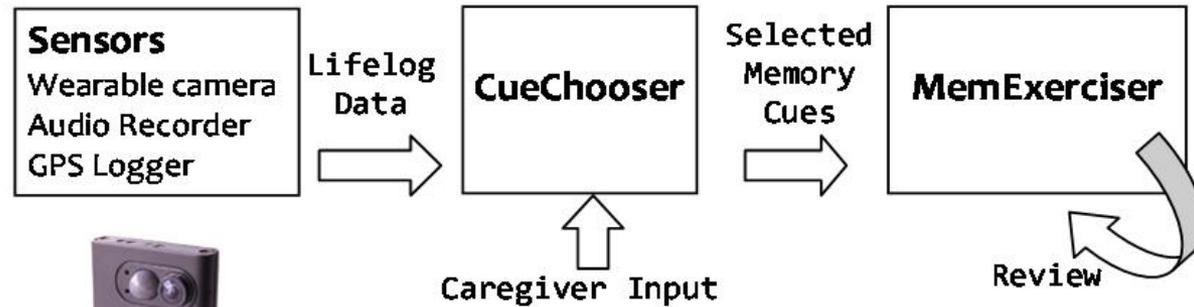
episodic memories



caregiver burden



MemExerciser



Lots of food at Mary's house



too much data!



Only the "good" cues should be reviewed!

FIELD STUDY

IN SEARCH OF GOOD MEMORY CUES

(Lee & Dey, ASSETS 2007)

field study: identifying good memory cues

Research Question

What are the characteristics of a good memory cue?

Organization of Autobiographical Memory

Activity information dominant in narratives
(Reiser 1985; Taylor 1997; Dijkstra 2006)

Who, What, Where can tell you When (Wagenaar 1986)

method

1. **WEAR** the Microsoft SenseCam during a personally-significant experience.



(Hodges *et al.*, 2006)

method

2. **SORT** the photos using a card-sorting approach.



types of cues



People: daughter, waitress



Places: facade of a store, the dining room



Actions: playing piano, driving home



Objects: birthday cake, stained-glass window

dominant cue type

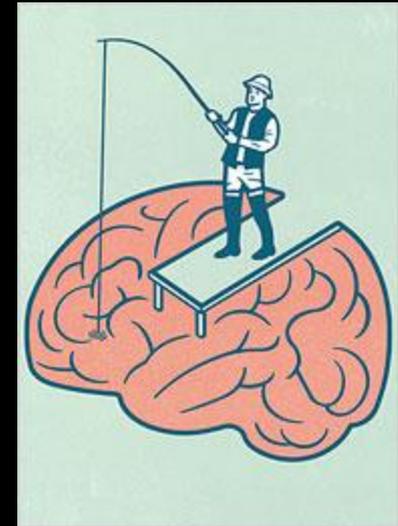
Every experience had a majority of one type of cue and thus can be characterized by its ***dominant cue type***.

Experience	Photo #1	Photo #2	Photo #3	Photo #4	Photo #5	Photo #6
Family Reunion	Person (widow & daughter)	Object (birthday cake)	Person (an old friend)	Person (nephew)	Person (old friends)	Person (relative)
Church performance	Action (hands clapping)	Action (audience getting into the spirit)	Person (pastor)	Action/Person (unexpected speech)	Action (presentation of family)	Object (stained glass windows)
Trip to Philadelphia	Place (tall ceilings in house)	Place/Action (walking through town)	Place/Action (BBQ in backyard)	Place (walking into town)	Place / Object (backyard; treehouse)	Action (ice cream on drive back)
Visit to History Museum	Object (furniture exhibit)	Object (photography exhibit)	Object (kitchen exhibit)	Object (photograph of slave trade)	Object (artifact exhibit)	Object (letters exhibit)

good cues are *memorable*

Cues are anchors into the original experience

Participants often discarded photos that they did not remember or recognize from their experience



"I don't know who this is."



good cues are *distinctive*

Different forms

unusual details of an experience (e.g., spilled water glass)

prototypical details of an unusual experience (e.g., snow at ski lodge)

unusual



spilled water glass



too much food



unusual windows

prototypical



snow at ski lodge



wife at luncheon



widow at memorial service

good cues are *personally significant*

Personally significant details hold more meaning

Kept photos of people they know, not strangers

Greater personal significance results in a more deeply encoded memory trace



1950's kitchen exhibit



Dad's old pal



friend at garden center

design recommendations

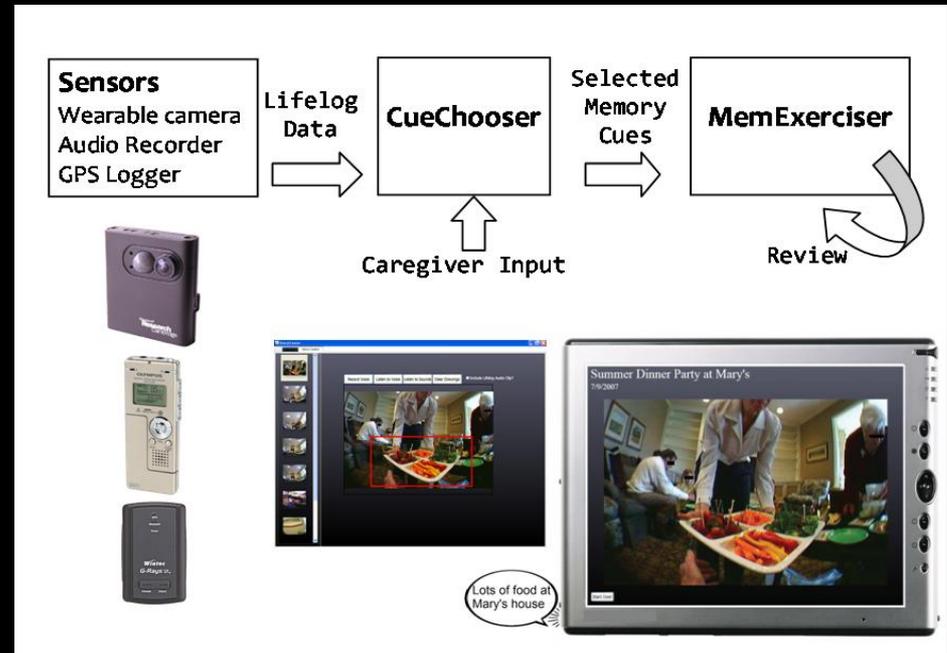
What are the characteristics of good memory cues?

Good cues *match the dominant cue type of the experience*.

=> automate it!

Good cues are *memorable, distinctive, and personally significant*.

=> difficult, so rely on human expert.

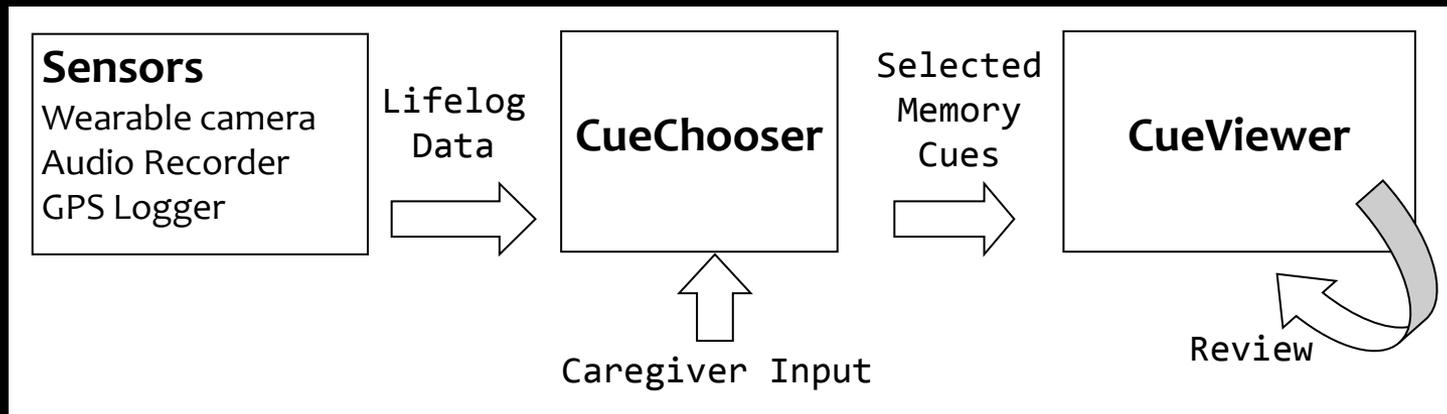


MemExerciser

(Lee & Dey, Ubicomp 2008)

system overview

Automatic **CAPTURE** → Hybrid **SELECTION** → Active **REVIEW**



automatic capture

“set it and forget it”

Content: Visual (photos) + Audio (voices)

Context: location, movement, light



SenseCam

Voice recorder

GPS Logger

hybrid cue selection

Automated Content/Context Analysis

+

Human Caregiver Expertise



good memory cues (1)

Good cues **match the dominant cue type** of the experience. (Lee & Dey, ASSETS 2007)

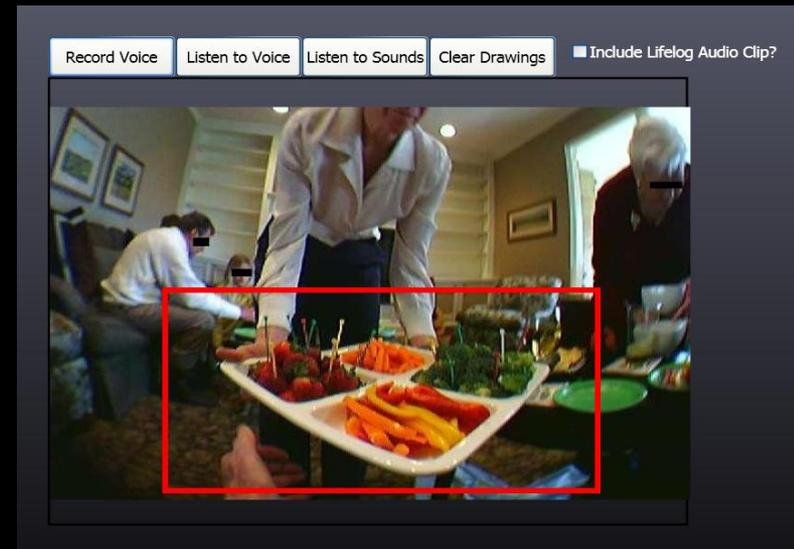
Experience Type	Automated Analysis Technique
People-based	Face and voice detection
Location-based	GPS location stay points
Object-based	Accelerometer movements
Action-based	Scene Segmentation

good memory cues (2)

Good cues are **memorable**, **distinctive**, and **personally significant** (Lee & Dey, ASSETS 2007)

Leverage caregiver's expertise to:

- **select meaningful**, personally-significant cues
- optionally **annotate** the pictures with voice and drawings to create slideshow



active cue review

Self-guided interaction

Tablet-based viewer **appliance**

Reveals cues progressively to encourage user to think deeply about each cue and encounter "Aha!" moments



an afternoon at the zoo

DEMO

Bill, Alice, and Carol at the Zoo
4/11/2008

It was a gorgeous Spring day,
perfect for walking through the
zoo. We saw lions, tigers, bears,
and enjoyed watching them in
their natural habitats.

Tap the screen with the pen to begin!

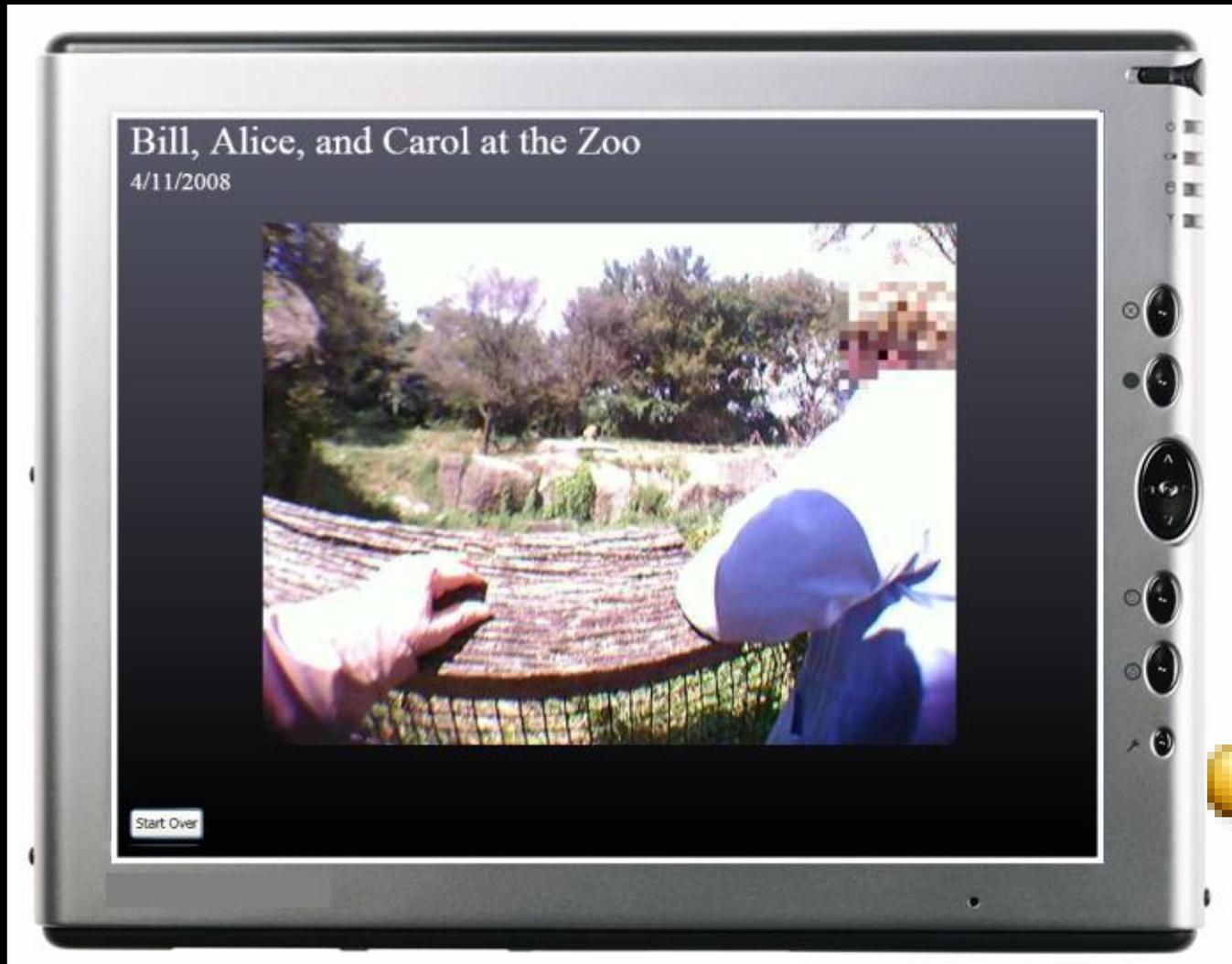
an afternoon at the zoo

DEMO



an afternoon at the zoo

DEMO



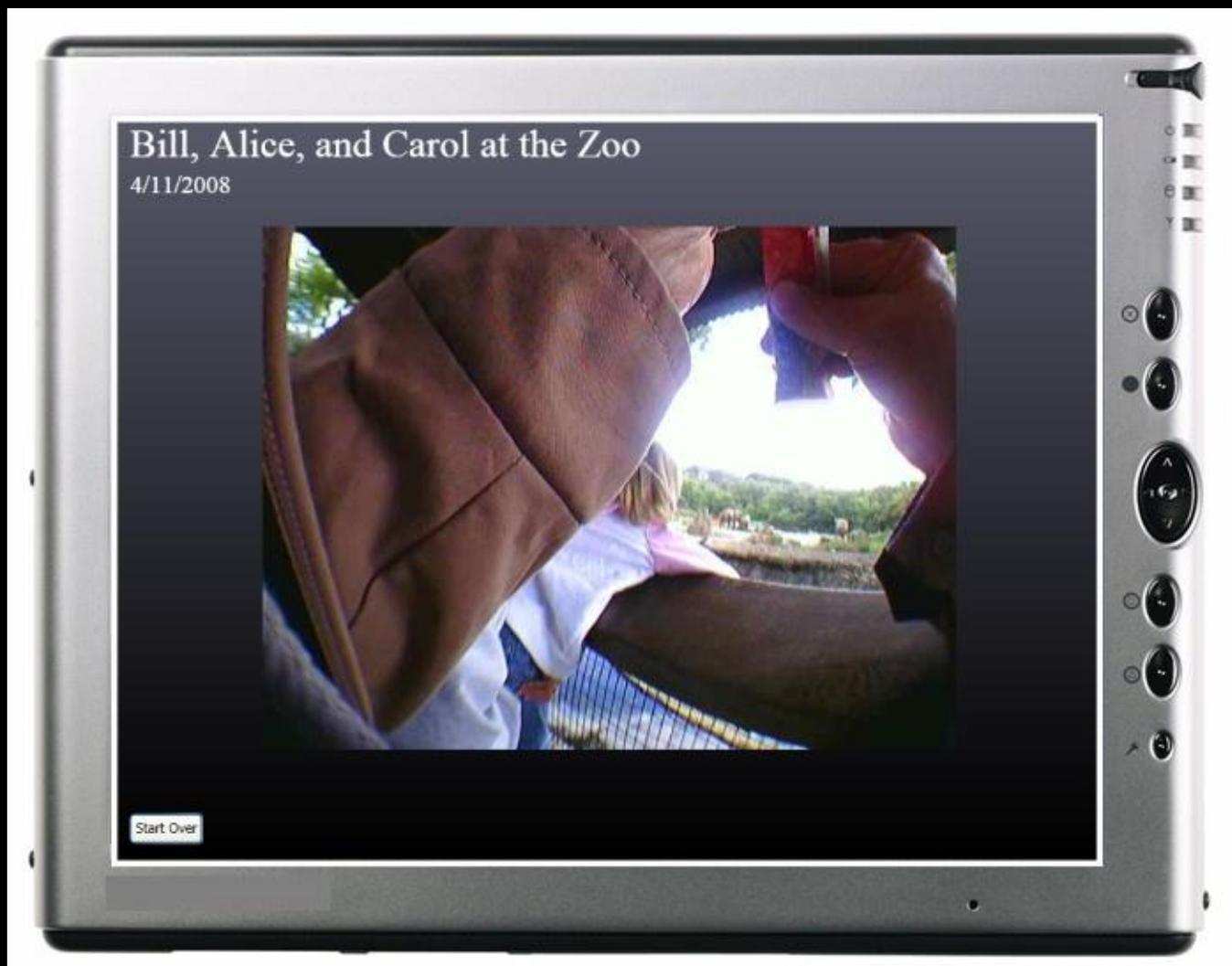
an afternoon at the zoo

DEMO



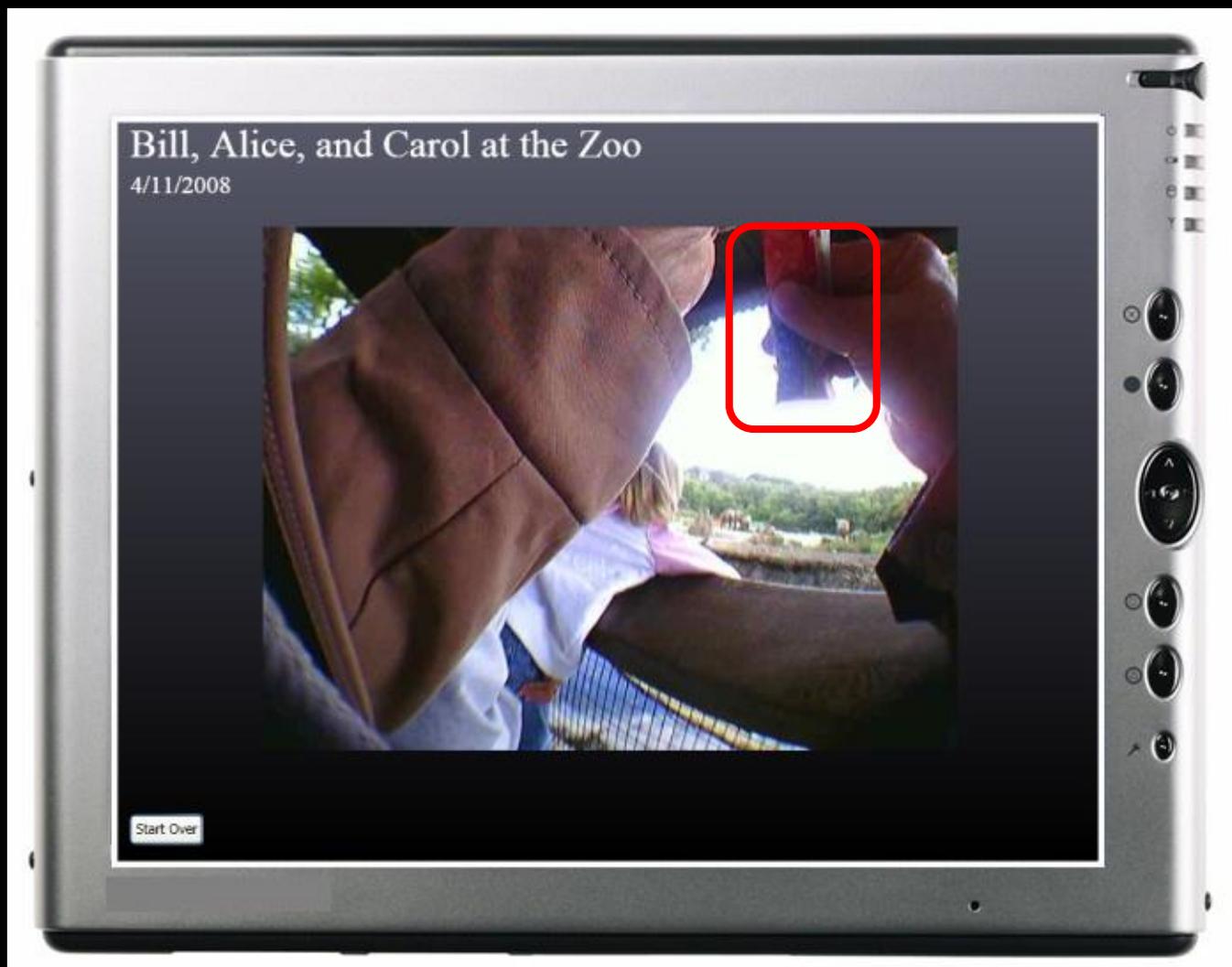
an afternoon at the zoo

DEMO



an afternoon at the zoo

DEMO



EVALUATION

participants

3 couples: husband w/ episodic memory impairment, wife as caregiver (CG)

	Age	Condition
P1/CG1	81/72	Mild Alzheimer's disease
P2/CG2	79/76	Mild Cognitive Impairment
P3/CG3	82/75	Mild Cognitive Impairment

study design

3 experimental conditions:

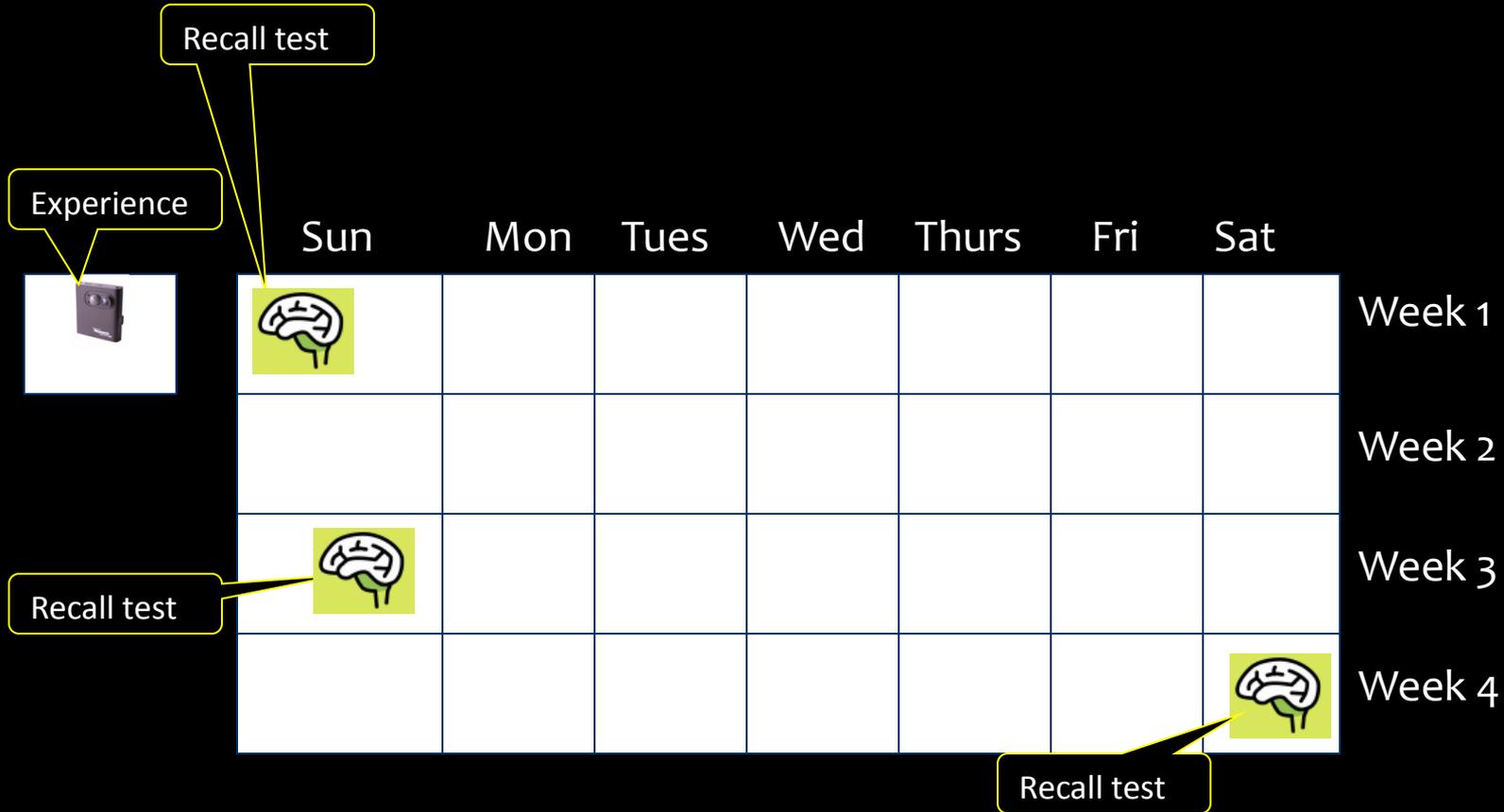
Control (no intervention)

Self-Guided (MemExerciser)

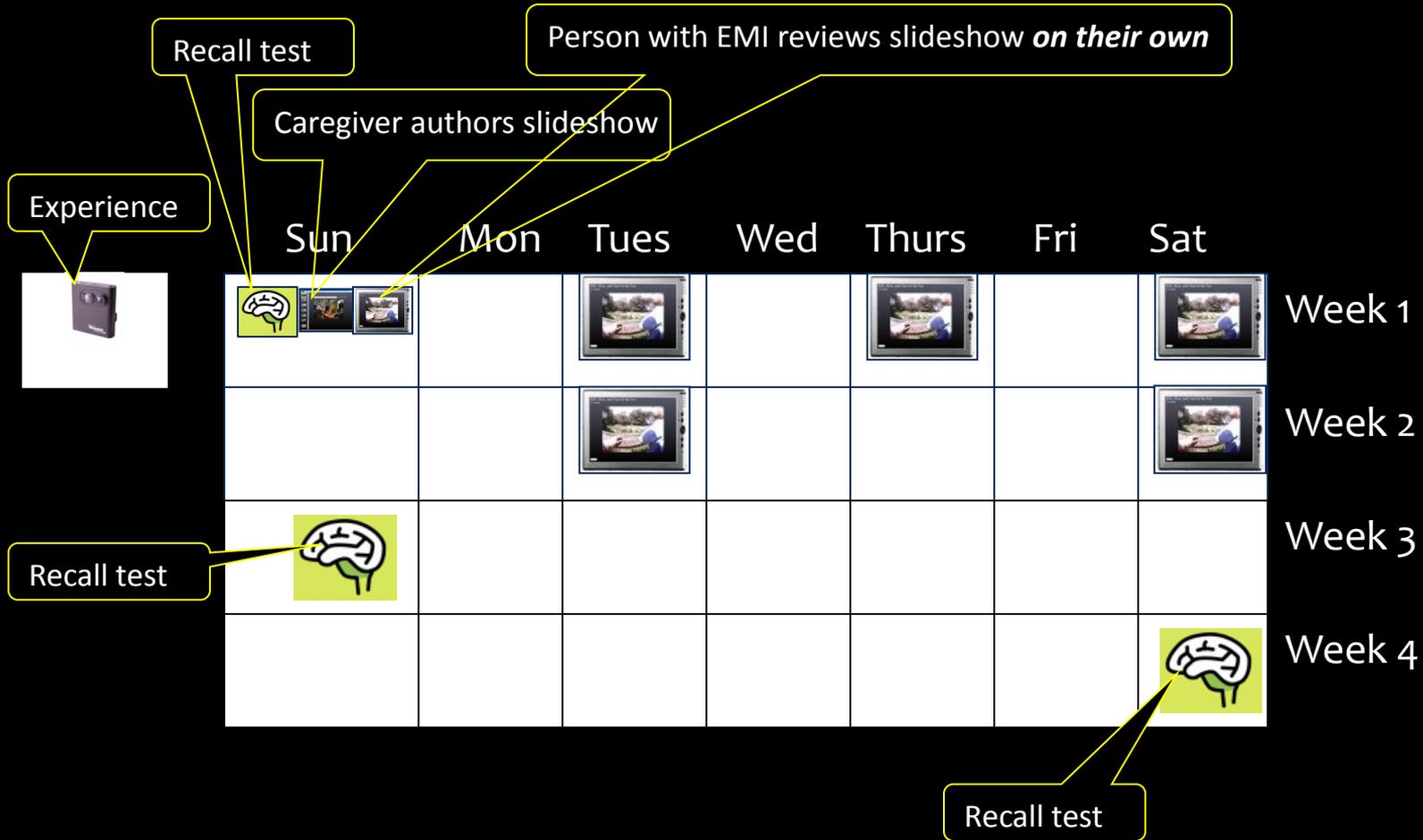
Caregiver-Guided (Traditional SenseCam)

Within-subjects design

study design control condition



study design self-guided condition



study design caregiver-guided condition

Caregiver guides person with EMI through the pictures

Caregiver selects photos

Experience



	Sun	Mon	Tues	Wed	Thurs	Fri	Sat	
Week 1	   		 			 		 
Week 2			 				 	
Week 3								
Week 4								

Recall test

Recall test

measures

“A Return to Normalcy”

Hypotheses

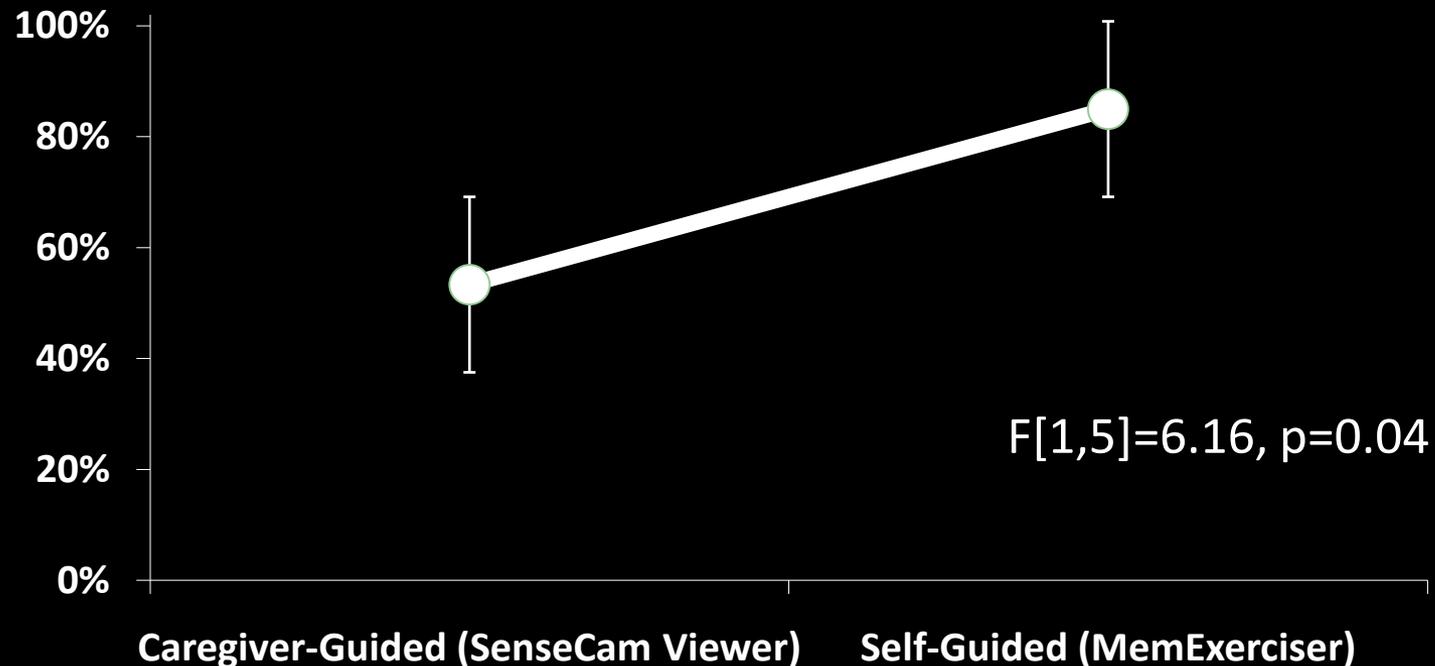
1. Improved recall ability
 - # of details recalled after 4 weeks
 - Vividness of recalled details
 - Memory Confidence Ratings
2. Less additional caregiver burden
 - Amount of time spent
 - Interviews with caregivers



Warren G. Harding
Former U.S. President (1921-1923)

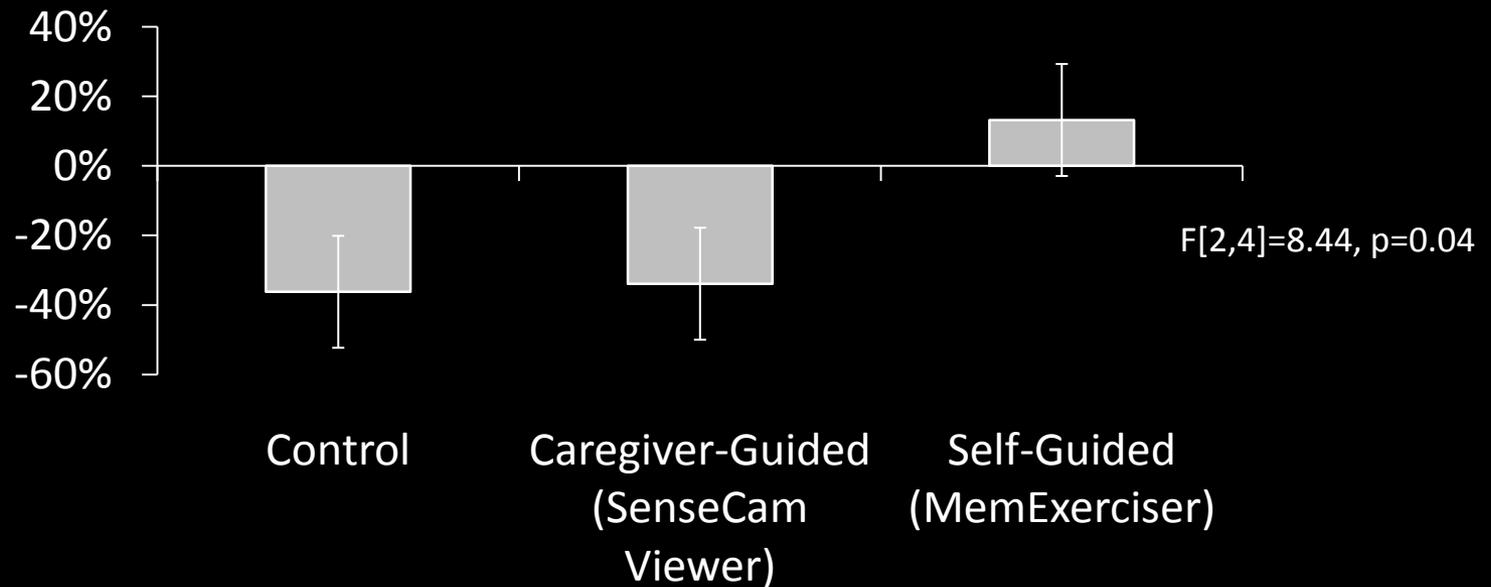
memory recall

Percentage of details recalled four weeks after the original experience.



maintaining vividness

Percentage change in number of details judged as vividly **remembered** after four weeks. (Remember-Know-Guess scale[†])



[†](Gardiner et al, 1993)

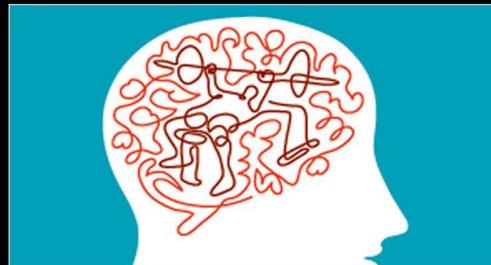
supporting memory recall

Deeper processing of memories make them easier to remember.[†]

CG2 said: *"It helps [P2] focus his thoughts, plus [the ambient] voices for the slides makes it easier for him to recall each picture."*

Person with EMI controls the **pace of review**.

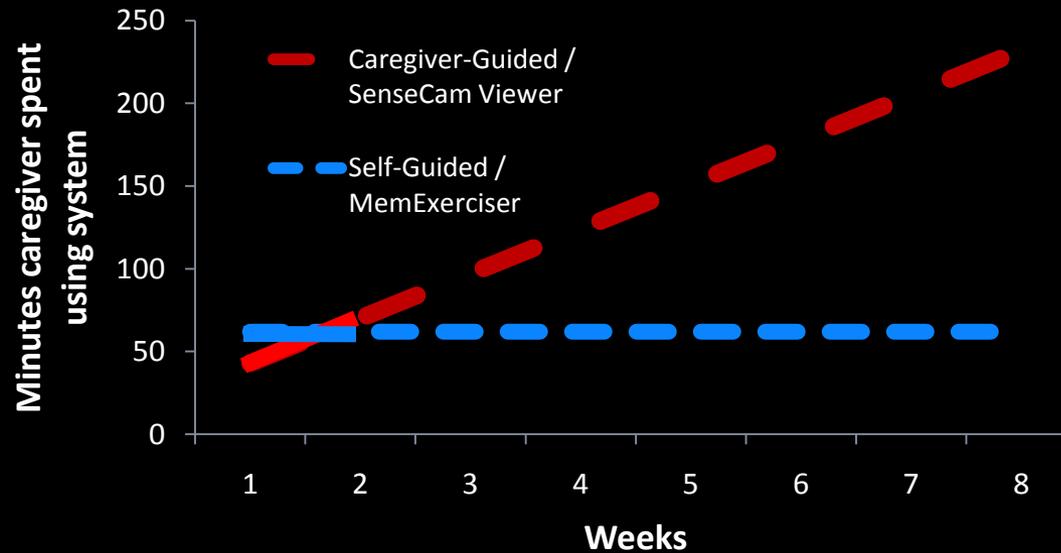
P2 said: *"[I] would be more inclined to take more time and look for more details...and get more out of it...because you're looking for things you don't normally see."*



[†](Craik & Tulving, 1975)

caregiver burden

	Self-Guided	Caregiver-Guided filter + review = total
CG1	67 mins	n/a
CG2	64 mins	19 + 52 = 71 mins
CG3	55 mins	12 + 54 = 66 mins

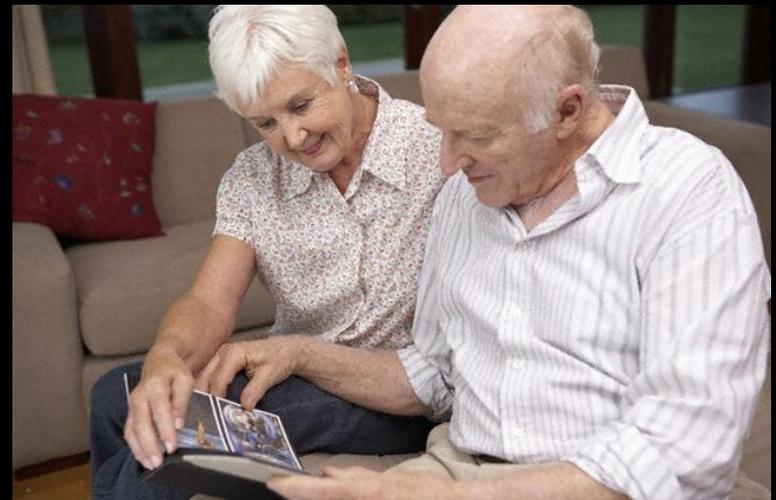


normalcy for caregivers

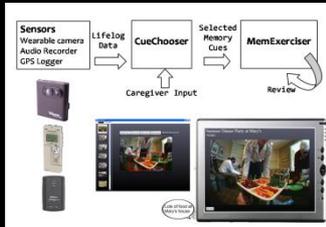
All caregivers said the main bulk of the “work” was going through the cues together with the person with EMI.

CG2 said “I had to go through it with [P2] every time instead of him just doing it himself.”

CG1, caregiver-guided review method gives an opportunity to **engage her husband in a conversation** about a shared experience



summary



Designed lifelogging system

Automated Capture, Hybrid Cue Selection, Active Cue Review

Evaluation: looking for normalcy

Self-Guided

Better recollection: Ambient Audio + Progressive Revealing of Cues

Lower Caregiver Burden: Computer-assisted filtering + one-time authoring

Caregiver-Guided

Shared review => opportunities for conversations

=> active role in preventing further decline

future work

Clinical evaluation with psychometric testing

Fun interactions: scrapbooking, storytelling, photosharing

Salient summaries with machine learning



embedded assessment



acknowledgements

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Contact:

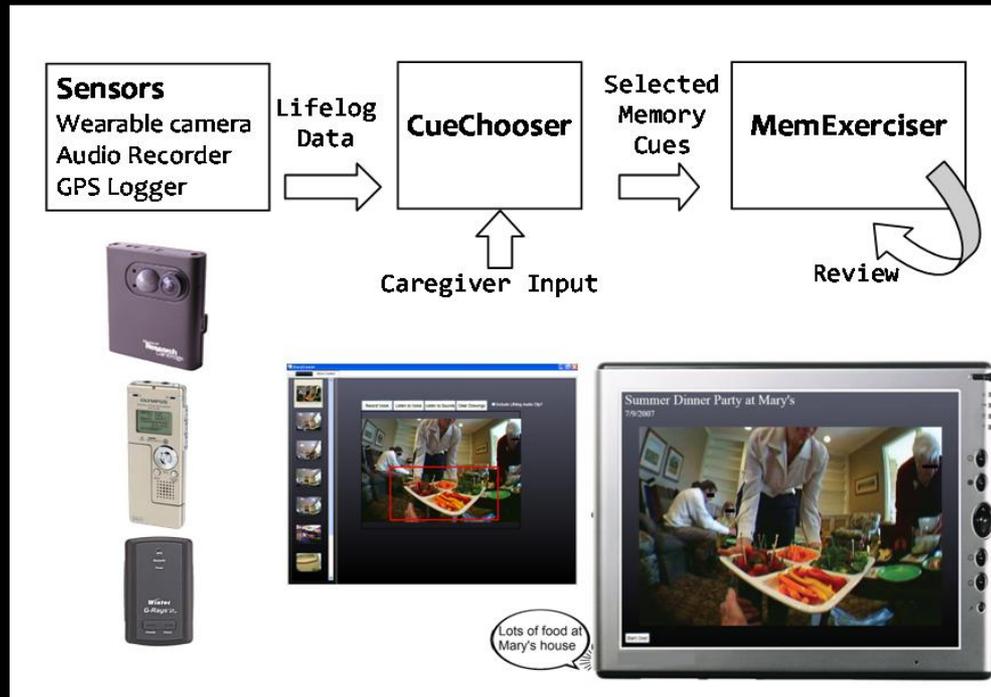
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The End

Automatic Hybrid Active
CAPTURE **→** **SELECTION** **→** **REVIEW**



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