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Computer-assisted, video-enhanced SRT for teaching novel procedures to persons with dementia

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It usually takes some effort to get to a cave.

The view from the outside of a cave can be amazing or intimidating.

Inside a cave, the sights almost always blow us away with a view of the unexpected; likely more than we thought before we entered it.

Why the mnemonic *CAVE*?

Background

- The purpose of this study was to document the feasibility and efficacy of CAVE-SRT to teach persons with dementia new procedures (e.g. a novel motor procedure or compensatory strategy).

Goal

- For persons with dementia to learn and independently demonstrate a multi-step, novel, motor procedure.

Motivation: Developing a theory of change

- Our theory of change (Wilcox, 2011) was that:
  - If we tap into implicit and procedural memory systems –more spared in Alzheimer's disease,
  - Invoke evidence-based principles of intervention design for PWD (Mahendra, 2001; Bayles & Tomoeda, 2007; Mahendra & Hopper, 2011)
  - Use a technique with substantial evidence for efficacy for PWD– i.e., spaced retrieval training (SRT)
  - Target functional, personally-relevant behaviors, and
  - Use laptops to enhance stimulus/task control and deliver intervention consistently across clients and clinicians, then

Evidence of new learning and intervention efficacy is more likely to be revealed in PWD.

Research Questions

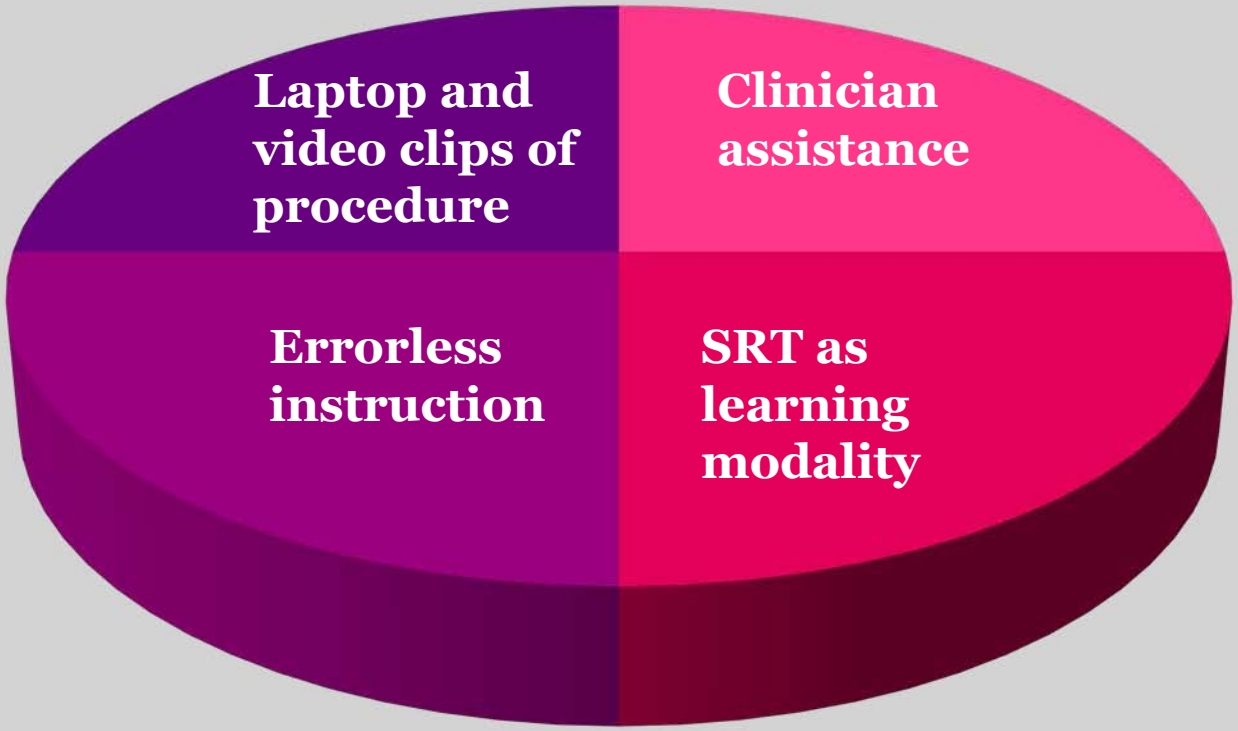
Feasibility

Are computer-assisted interventions feasible for PWD?

Treatment Outcomes

1. Can PWD successfully learn and retain motor procedures using CAVE-SRT?
2. How many 50 minute training sessions are needed to achieve a pre-set criterion for learning a procedure?
3. Are learned procedures retained 8 weeks after criterion is met, without further training?

CAVE-SRT: 4 components



- Laptop+ digitized video clips of to-be-learned procedure
- Clinician assistance
- SRT as learning modality
- Errorless instruction

Method

- **Participants:** 20 persons with dementia (15 with Alzheimer's disease, 5 with Vascular dementia) participated over 6 months.
- **Initial Screening:** Hearing and vision screening, MMSE, Geriatric Depression Scale – Short Form
- **Assessment:** Chart review, caregiver interview, Global Deterioration Scale (GDS), Dementia Rating Scale (DRS-2), Rivermead Behavioral Memory Test (RBMT-2)

Participants

- Gender:6M, 14F Age: 79-91 years Education: 8-19 years
- Ethnicity: 1 biracial, 2 Asian, 17 Caucasian
- Computer exposure: 14 -none, 2-some, 4-high
- 15 met NINCDS-ADRDA criteria for AD; 5 met the NINDS-AIREN criteria for vascular dementia (VaD).
- 16/20 had neuropsychological testing supporting dementia diagnosis.
- 14 were on Aricept or other ACE inhibitor

Cognitive Status

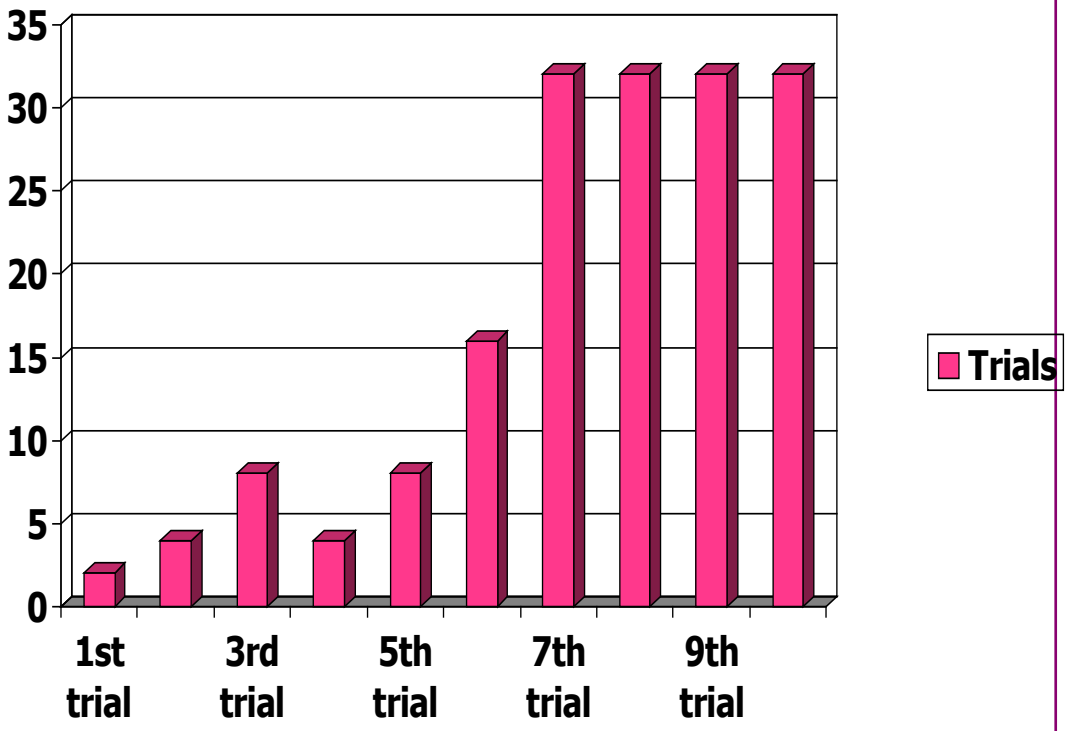
- MMSE Scores: Between 10 and 30
- GDS: Ratings of 3, 4, and 5
- RBMT-2: Mild to moderate memory impairment
- DRS-2 Age- and Education-Corrected Scores: Mild to moderately severe cognitive impairment

Procedures

- Procedures taught varied from having between 3 to 7 steps.
- When selecting a procedure, 3 factors were important.
  1. First, the procedure could not have fewer than 3 steps or exceed 7 steps.
  2. The procedure had to be novel i.e., participants did not know how to do it prior to training.
  3. Third, procedures had to have some functional relevance and/or personal significance for a participant. Several procedures trained pertained to using a computer for sending email, playing games, searching for information on the internet. Other procedures involved using an appliance or device, or learning safe swallowing strategies.

SRT for training procedures

<u>Learning Criterion</u>:
Successful recall over a 32-minute within session time interval, maintained over 2 weeks (4 sessions)



Learning criterion

When would we be able to say that a procedure had been *learned*?

We said the procedure had been learned when a participant could:

- Independently perform all steps of the procedure in the right sequence,
- Demonstrate the procedure over increasingly longer time intervals within-session, and
- Retain it over 48 hours between sessions

Example 1: Teaching a compensatory swallowing strategy

Learning and Retention of Novel Procedures

Ss	Met Criterion*	# of Sessions
n = 20	18/20	Range: 6-12 Mean: 8.3

n = 20	Wk 1	Wk 2	Wk 3	Wk 4	Wk 6	Wk 8
# met criterion = 18/20						
# who demonstrated target procedure	18	18	18	18	18	15

Results

- CAVE-SRT was feasible and efficacious for teaching novel motor procedures and strategies to **18/20 PWD.**
- Participants responded favorably while receiving **two 50-minute intervention sessions weekly**.
- **18/20 PWD** were able to perform newly trained procedures independently **within 6-12 sessions** (mean = 8.3 sessions) or approximately 4-6 weeks of training.
- Procedures trained using CAVE-SRT were retained by 15 of the 18 PWD (who learned procedures to criterion), 8 weeks after training cessation.

Two participants did not learn procedures to criterion

- Qualitative analysis was conducted to better understand reasons for this performance.
- 3 factors were important:
  - **Dementia severity:** Both had moderate dementia.
  - **Type of dementia:** Both had vascular dementia and presented with more overall variability in performance over the training.
  - **Dose-response relationship:** Likely, two weekly sessions are insufficient for persons with moderate dementia to initially learn a new procedure. This weekly treatment frequency worked for persons with mild dementia, but was inadequate for these 2 participants.

Conclusions

- Our findings showcase the clinical applicability of using CAVE-SRT for teaching procedures to PWD. Our findings expand the current evidence base and confirm the importance of:
- Using a combination of computer technology, personalized stimuli, and verbal instructions in teaching new procedures to PWD
- Observing actions performed and re-enacting those actions by imitation - this helps to create a cognitive representation of actions, likely evoking the participation of mirror neurons.
- Stimulating the relatively spared *learning-by-doing* system or nondeclarative memory by procedure training, as opposed to factual/episodic learning.

Challenges

Recruitment

- High attrition due to illness/injury/change in cognitive status
- Therapeutic nihilism widely prevalent regarding interventions designed for PWD to use technology

Methodology Issues

- Learning criterion likely too stringent for persons with moderate dementia
- Greater weekly session frequency for moderate dementia patients likely would lead to to learning outcomes.
- Learning and retention was documented tightly in this study; generalization assessed more loosely.

Future Directions

1. Document the effect of treatment dosage (weekly tx session frequency) on learning outcomes of PWD.
2. Investigate efficacy of computer-assisted interventions for staff and caregiver training.
3. Examine responses of clients with VaD and other dementias to CAVE-SRT.

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Clinical Sites

- Masonic Home for Adults, Union City
- Aegis Living and Carlton Plaza, Fremont