Evaluating Computer-based Treatment of Anomia: Results of Phase I Trials

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ASHA, November, 2010, Philadelphia, PA Contact: rink@einstein.edu

Phases of Research

- Pre-efficacy studies (Phase 1 and 2)
- Efficacy studies (Phase 3)
- Effectiveness (Phase 4 and 5)

Pre-efficacy Studies

Phase 1
examines new treatments
tests for therapeutic effect
small, single subject designs

Phase 2
optimizes procedures
determines appropriate candidates
dosage (intensity)
further explores potential efficacy

Efficacy studies

- Phase 3: Clinical trial
  - Controlled large group design
  - Tests the efficacy of the treatment under ideal conditions
Effectiveness studies

- Phase 4
  - Potency under typical clinical conditions
- Phase 5
  - Practical considerations (e.g., Cost-benefit analysis)

Computer-Assisted Treatments: a popular movement

Computer-assisted treatments have potential to:
- Increase the intensity of therapy
- Improve outcome and efficiency of therapy
- Extend the period of rehabilitation

State of the evidence

A growing body of experimental literature attests to the benefits of this approach, for example:
- Lingraphica: Aftonomos, Steele, & Wertz, 1997
- Sentactics: Choy, Holland, Cole, & Thompson, 2009
- MossTalk Words: Fink, Brecher, Schwartz, & Robey, 2002

Large-scale (Phase 3) clinical trials, a level of evidence critical for establishing treatment efficacy are lacking
- Preliminary research (Phase I and II trials) needed to shape factors (patient selection criteria, intensity of administration, etc.) that are prerequisite to a Phase 3 clinical trial.
- Important to inform clinicians about the evidence available for treatment technology they may recommend.
Outcomes: MossTalk Words® (MTW)

**Today’s talk**
1. Present a model for facilitating programmatic research to advance the state of evidence on a computer-assisted treatment.
2. Summarize the data that emerged from this project.
3. Discuss clinical implications and future directions.

What is MossTalk Words® (MTW)

- A computerized therapy system for aphasic adults with word retrieval deficits
- Provides extensive practice in word comprehension and production using multimodality cues and feedback
- Treatment modules
  - Theoretically motivated
  - based on effective treatments
  - routinely employed by clinicians

Outcomes: MossTalk Words®

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Two Modules

Cued Naming (CN):
Provides visual and auditory cues that can be systematically applied in a hierarchy to promote retrieval (Linebaugh & Lehner, 1977)

Multimodality Matching (MMM):
Encourages semantic processing to strengthening the association between words and pictures (Howard, Patterson, Franklin, Orchard-Laid, & Morton, 1984a,b)
Additional features

- Customize vocabulary
- Create homework assignments
- Track results

Phase 1 Study

- Investigated effects of CN Module: a hierarchical phonological cueing procedure
- Two conditions of instruction:
  - clinician guided (CG) condition
  - Partially self-guided (PSG)
- 6 subjects with primarily phonologically based deficits, 3 in each instruction condition

Conditions of instruction

- Clinician guided (CG)
  - worked on computer exercises with clinician 3 times/week
- Partially self-guided (PSG)
  - Worked on computer exercises 3 times/week
    - 1 day with clinician
    - 2 days independently

Prior Studies

Our study draws on prior studies without replicating any of them.

> From Linebaugh and Lehner we took the idea of individuating the cueing hierarchy-moving up and down hierarchy on each trial.
> From Howard et al., Raymer et al. and Thompson et al., we limited cues to phonological type.
> To provide maximum support for all severity levels, we included both written and spoken cues.
Study Aims

To assess acquisition, generalization and maintenance effects associated with computer-assisted hierarchical cueing.

Design

- Single Subject (replicated)
- Multiple Baseline Across Behaviors
- Two conditions:
  - Partially self-guided (PSG)
  - Clinician-guided (CG).

Participants

- 6 chronic aphasic subjects
  - 5 M; 1 F
  - 54-64 yrs (mn= 60 yrs)
  - 2.3-7.5 yrs post onset (mn=4 yrs)
- Moderate-severe naming deficits
  - Naming severity: 17.8 - 77.4 % (PNT)
  - Aphasia Severity: 2 - 4 (BNT)
- Primarily phonological in nature
  - Phonological retrieval and/or
  - Phonological encoding
- Patients with central semantic deficits excluded
  - Mild semantic (2)

Table 1. Demographic information and language classification.

<table>
<thead>
<tr>
<th></th>
<th>Clinician Guided</th>
<th>Partially Self Guided</th>
</tr>
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<tbody>
<tr>
<td>Age (years)</td>
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<td>56 62 63 63 63</td>
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<tr>
<td>Gender</td>
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<tr>
<td>MDAS Anxiety</td>
<td>4 2 2 3 2 2</td>
<td>4 2 2 3 2 2</td>
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</tbody>
</table>
**Training Procedure**

• The Cued Naming module of MTW software delivered the picture stimuli, cues and feedback.

• 6 of the 8 cues were used and presented in a hierarchy, individually determined for each subject.

**Multimodality Cues**

**Auditory cues**
- Initial phoneme
- Sent. completion
- Word repetition

**Written cues**
- First letter
- Sent. completion
- Oral reading

**Training conditions**

• Clinician guided condition (CG)
  3 participants

• Partially self-guided condition (PSG)
  3 participants

**Duration of Treatment**

• Subjects were treated 3 times a week

• Treatment continued until criterion was reached or for a maximum of 4 weeks
Outcome measures: naming

- Big Naming test-pre and post
- Daily naming probes of trained and untrained items during baseline, training, maintenance and follow-up phases
- Follow-up naming probes were administered after an average of 4 weeks

Outcome measures

- Philadelphia Repetition Test (PRT)
- Philadelphia Oral Reading Test (PORT)

Results
Study Results

• Training - specific acquisition was demonstrated in both conditions for all subjects
  – 2 of 3 subjects in each group showed moderate-strong gains
  – 1 subject in each group showed weaker gains
  – Set 1 performance higher for 4 of 6 participants (2 from each group)

• Gains were maintained when treatment was withdrawn

• Small advantage for Clinician-guided group

Results: Generalization

• Limited and variable generalization patterns were noted in:
  – Oral Reading and Repetition
  – 339 item pre-post Naming test
    • All showed improved scores on trained items
    • GM and AS also showed significant improvement on untrained items
  – Naming of untrained items during training (EL and AS)
Conclusions

• Chronic aphasic subjects with moderate to severe phonologically-based naming impairments can benefit from a computerized cued naming protocol.

• Independent work on the computer can be an effective adjunct to therapy.

A model for facilitating research

Identify intervention (e.g., MossTalk Words)
Organize collaborative network

Site A  Site B  Site C
Evaluate results
Plan Phase 3 Clinical Trials

Organizing Collaborative network

Letters of invitation were sent to researchers and clinicians who work with individuals with aphasia.

* Collaborators agreed to:
  * Participate in a brief training program
  * Complete a set of evaluation forms
  * Execute a controlled experiment of their design (research sites)
  * Use MTW in clinical setting (clinical sites)

Results of Dissemination

End of Year 1
  * 3 Research groups had preliminary data on clinically relevant factors
  * Effectiveness for various etiologies and language impairments
  * Effectiveness when self administered
  * Impact of therapy intensity on outcomes

Subsequently
  * Researchers presented and published several articles on clinically relevant aspects of MTW
Conclusions

Findings confirm and extend Fink et al data:

- CN and MM modules were effective in improving naming of trained words (acquisition and short-term maintenance) for individuals with moderate/severe naming impairments.

- Software effective with varied population (NPA, Semantic Dementia, and moderate-severe chronic aphasia)

- Some advantage for greater intensity, but significant improvement noted with either intensive and non-intensive schedules.

- Independent work on computer can be an effective adjunct to clinician guided treatment

- BUT

  - Limited and variable generalization to untrained words or tasks.

Acknowledgements

MTW research was supported in part, by a grant from the NIH (NIDCD) (R01DC00191) and by a grant awarded by the Peer Review Committee of the Moss Rehabilitation Research Institute. Funded.

The dissemination project was funded, in part, by a grant from the NEC Foundation.

Assistance and resources were made available through the Neuro-Cognitive Rehabilitation Research Network (NCCRN) at www.nccrn.org supported by grant #1 R24 HD050836 from the NICHD/NIMH.

MossTalk Words was developed with partial funding from McLean Contributionship and MossRehab.

* We are grateful to all the researchers and clinicians who have participated.
References


