The Team

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- Bret Fuller (Statistician)
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- Barry Oken (neurologist)
Do AAC tools improve the quantity or quality of conversation by individuals with moderate Alzheimer’s disease?
Augmentative and Alternative Communication refers to any strategy, technique or tool that enhances, replaces, augments or supplements an individual’s communication capabilities.
- Speech
- Vocalization
- Gestures
- Eye gaze
- Body language
- Sign language
- Paper and pencil
- Communication books
- Communication boards and cards
- Talking toys
- Speaking computers
- Talking typewriters
- Voice output communication aids
• Pairing the external aid with familiar and spared skills (such as page turning, reading aloud) should maximize a person’s opportunity for success.

• These skills are based on intact procedural memory.

• The stimuli are relevant to a person’s ADLs.
• Speech generating devices
  – Synthesized speech output
  – Digitized speech output

• Computers (Handheld, wearable, or desktop)
  – Dedicated versus integrated devices
  – Software purposes:
    • Schedules
    • Reminders
    • Augmented input or output
A hypermedia reminisce program designed and marketed in Scotland, then the UK.
3 things to consider for each aid:

1. The messages or language in the aid;
2. How those messages are presented;
3. The output, or result, of selecting a message from the aid.
What messages should be chosen?

• Autobiographical memories might be accessible.
• Messages that affect the environment might be more meaningful.
• Message topics have been documented within the language of elders.
Levels of representation

Concept of “apple”

Auditory-verbal
WORD: say “APPLE”

Visual-verbal
Symbol: write APPLE

The tactile symbol
(The tactile Object of APPLE)

The visual symbol:
Black & white picture
Colored drawing photograph
What will be the result of symbol selection?

• Communication partner validates message.

• Electronic voice output that labels the symbol.
REKNEW-AD

• Reclaiming
• Expressive
• Knowledge
• In Elders
• With
• Alzheimer’s disease
Specific Aims

1. To compare the effects of different input modes in an AAC device on conversational skills of persons with moderate AD.
   - Print alone
   - Print + photographs
   - Print + 3-dimensional miniature objects
   - Photographs alone
   - 3-dimensional miniature objects alone
   - Control condition (no board).
• 2. To compare the effects of output mode in an AAC device on the conversational skills of persons with moderate AD.

  – Digitized speech output
  – No speech output
Questions you should be asking by now:

- What do these AAC devices look like?
- What do they sound like?
- What are the different input modes (symbols?)
- How does a participant use the device?
Lena’s cooking board (2-D only)
Lena’s cooking board (3-D only)
“Well, I could use this board to talk from breakfast to hell and back!”
Design for Current Study: # participants per condition (60 total)

<table>
<thead>
<tr>
<th>Output</th>
<th>FLCI (language screening score)</th>
<th>Print only</th>
<th>2-D + Print symbols</th>
<th>3-D + Print symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voice output</td>
<td>Hi</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Lo</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>No Voice Output</td>
<td>Hi</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Lo</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td><strong>20</strong></td>
<td><strong>20</strong></td>
<td><strong>20</strong></td>
</tr>
</tbody>
</table>

- Conditions are varied between subjects.
- Each subject participates in 4 conversations without board and 4 with board with randomly assigned symbol type.
- 1 control and 1 experimental conversation conducted at each visit.
Subject criteria (from OADC)

- Diagnosis of probable or possible AD by a board certified neurologist \((\text{NINCDS-ADRDA criteria})\);
- Clinical Dementia Rating (CDR) = 1 or 2;
- Mini Mental Status Examination (MMSE) = 8-18 within 6 months of enrollment in study (or we administer);
- Visual acuity better than 20/50 O.U. (as performed in the OADC);
- Hearing screening procedure performed to rule out adults with greater than 40dB hearing loss at screening frequencies (as performed in the OADC);
- English as primary language.
Exclusion criteria

History of other neurologic or psychiatric illness (no CVA, reported alcohol abuse, traumatic brain damage, reported recent significant psychological or speech/language disorder).
33 Completed Subjects thus far in Current Study

<table>
<thead>
<tr>
<th>Gender:</th>
<th>25 Females</th>
<th>8 Males</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Mean = 77 yr.</td>
<td>Range = 50-94</td>
</tr>
<tr>
<td>MMSE (0-30)</td>
<td>Mean = 12</td>
<td>Range = 8-18</td>
</tr>
<tr>
<td>CDR (0-2)</td>
<td>Mean = 1.6</td>
<td>Range = 1-2</td>
</tr>
<tr>
<td>FLCI (0-88)</td>
<td>Mean = 62</td>
<td>Range = 27-85</td>
</tr>
</tbody>
</table>
Method

1. Identify participant and randomly assign to condition;
2. Determine participant’s preferred topic and vocabulary;
3. Develop communication device for condition;
4. Conduct 4 videotaped conversations with participant for experimental and control conditions in their homes.
Coding

• A social communication framework relies on the notion of grounding, or the joint establishment of meaning (Clark, 1999).
• A communicative act occurs when partners establish what information is to be entered into common ground.
Non-utterances

- Vacuous Language: nonsensical, rambling utterances
- Unintelligible
- Perseveration: involuntary return to a phrase that occurs at least 3 times in conversation
- No Response: participant does not respond to partner’s bid.
Utterances

• Main Track: Relay propositional content.
  “Let me tell you what I just ate for lunch.”

• Collateral Track: Comment on the propositional grounding that may or may not be occurring in the conversation. “I know that I ate lunch but I’m having trouble thinking of the words. This is hard for me.”
Explanatory collaterals advance the conversation by managing it for both the speaker and the listener.

“Just a minute while I picture the menu.”
Flag Collaterals

• Flag collaterals serve as flags or signals that the speaker is having difficulty with the conversation, but don’t reveal any insight into what’s wrong.
• “Gee, um, uh, I hope this is okay.”
Mode

- Speech
- Minimal Speech (1-word utterance)
- Gesture
- Reference to Board
Completeness

- Completed
- Abandoned
- Interrupted
Topic Management Strategy (for Completed utterances)

The Topic Management Strategy is dependent upon:

- Initiate
- Maintain
- Elaborate
- Revive
Content (for Completed utterances)

- Board Topic
- Other Topic
Reliability

Mean Index of Concordance across participants:
• Signal Track---.82
• Mode---.82
• Completeness---.87
• Topic Management Strategy---.82
• Content---.86
• Overall---.84
Signal Track

Main Track

Flag Collateral

Explanatory Collateral
**Anticipated Effects of AAC on Signal Track**

- We expect the rate of Flag Collateral to decrease in experimental conditions.
- We expect the rate of Explanatory Collateral to increase in experimental conditions.
Anticipated Effects of AAC on Mode

- We expect the rate of Minimal Speech to decrease in experimental conditions.
- We expect the rate of longer utterances (Speech) to increase in experimental conditions.
- We expect to see References to Board in experimental conditions.
Completeness

- Completed
- Abandoned
- Interrupted
Anticipated Effects of AAC on Completeness

- We expect the rate of abandoned utterances to decrease in experimental conditions.
Topic Management Strategy

- Revive
- Initiate
- Elaborate
- Maintain
Anticipated Effects of AAC on Topic Management Strategies

• We expect the rate of Elaborations and Initiations to increase in experimental conditions.
• We expect the rate of Maintenance to decrease in experimental conditions.
Anticipated Effects of AAC on Content

• No changes are expected for Content.
Anticipated direction of changes for key dependent variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Examples</th>
<th>Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td># Utterances</td>
<td>(frequency)</td>
<td></td>
</tr>
<tr>
<td>% Flag Collateral</td>
<td>“um, um”</td>
<td></td>
</tr>
<tr>
<td>% Explanatory Collateral</td>
<td>“I know what it is but can’t think of the word.”</td>
<td></td>
</tr>
<tr>
<td>% Reference to Board</td>
<td>Point to symbols</td>
<td></td>
</tr>
<tr>
<td>% Minimal Speech</td>
<td>“Yeah”</td>
<td></td>
</tr>
</tbody>
</table>
Wide variations between subject means for dependent variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td># Utterances</td>
<td>31</td>
<td>79</td>
</tr>
<tr>
<td>% Flag Collateral</td>
<td>2%</td>
<td>34%</td>
</tr>
<tr>
<td>% Explanatory Collateral</td>
<td>1%</td>
<td>20%</td>
</tr>
<tr>
<td>% Reference to Board (Exp.)</td>
<td>0%</td>
<td>27%</td>
</tr>
<tr>
<td>% Minimal Speech Only</td>
<td>3%</td>
<td>61%</td>
</tr>
</tbody>
</table>
Voice Output

- Fewer utterances with Voice Output (p<.007)
- More Minimal Speech with Voice Output (p<.018)
- Anecdotal evidence suggests participants are distracted by Voice Output
Explanatory Collateral by Condition

![Chart showing mean Z-score of Explanatory Collateral by condition.](chart.png)

- **Control**: Mean Z-score of -0.20000
- **Print**: Mean Z-score of -0.10000
- **Photos**: Mean Z-score of 0.20000
- **Objects**: Mean Z-score of 0.00000

Legend:
- 0 = Control
- 1 = Print only
- 2 = 2-D
- 3 = 3-D
Reference to Board

![Bar graph showing the mean Z-score of Reference to Board across different conditions: 0=Control, 1=Print only, 2=2-D, 3=3-D. Categories include Photos and Objects.](image-url)
Flag Collateral by Condition

The graph shows the mean Z-score of flag collateral across different conditions.

- Control
- Print
- Photos
- Objects

The x-axis represents the condition levels: 0=Control, 1=Print only, 2=2-D, 3=3-D.