Further Evidence of Auditory Extinction in Aphasia

Rebecca Shisler Marshall, Ph.D.
Communication Sciences & Disorders
University of Georgia
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Introduction

- In the aphasia literature, more research has focused on various cognitive aspects that may decrease communication abilities in individuals
- Recent research has shown that cognitive processes, such as attention, are disrupted in individuals with aphasia
  - Murray, 2000; McNeil, Odell, & Tseng, 1991

Extinction

- One way to explore attention deficits in the auditory modality of individuals with aphasia is by studying a clinical phenomenon termed extinction.
  - Extinction = omissions not due to sensory loss
  - Decreased performance for contralesional side when two sounds are presented simultaneously
    - Few or no errors for single sounds
  - Found after both LH and RH lesions
    - Due to binding?
What is ‘Binding’?

- Extinction is arguably a difficulty in binding information
- Binding is the integration of sensory information (identity and location) into a whole
- Results in the perception of an object or event

Binding & Attention

- Individuals with RH brain damage have difficulty binding together identity and location information
  - visually (Baylis, Gore, Rodriguez & Shisler, 2001)
  - auditorily (Shisler et al., 2004).
- Such binding problems have been attributed to deficits in attention (Treisman, 1996).

Binding & Aphasia

- Attention deficits in Aphasia (Murray, 2000)
- Extinction in RH patients due to deficits in binding (attention)
- Perhaps extinction in aphasia is due to a deficit in binding?
- Individuals with aphasia demonstrated extinction and deficits in binding (Shisler, 2005)
  - Similar to RH individuals
  - $N=6$
Alternatively...

- Cusack, Carlyon, and Robertson (2001) suggested that auditory extinction in aphasia may be due to a deficit in allocation of attention between auditory objects.
- Supported by other researchers (e.g., McNeil et al., 1991).

Purpose

- Expand on findings from Shisler (2005) regarding deficits in extinction for individuals with aphasia
- Determine if binding plays a role in auditory extinction in individuals with aphasia
  OR
- If resource allocation leads to extinction

Participants

<table>
<thead>
<tr>
<th>GROUP</th>
<th>N</th>
<th>M age</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTROL</td>
<td>17</td>
<td>55.17</td>
</tr>
<tr>
<td>APHASIA</td>
<td>14</td>
<td>51.91</td>
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</tbody>
</table>
Design & Procedures

- Single of Double Simultaneous Stimulation trials
- Each experiment had different instructions, same stimuli
- Five experiments:
  - Identify & Localize
  - Identify & Count
  - Identify Only
  - Localize Only
  - Count Only

Identify & Localize

'O'  Male Voice
'T'  Female Voice

"O left, T right"

* Binding
* Resource Demanding

Identify & Count

'O'  Male Voice
'T'  Female Voice

"one O, one T"

* Non-Binding
* Resource Demanding
Extinction

- Significant extinction observed
- Extinction = \( \uparrow \) omission errors on DSS vs. single trials
- *Significant (p<.001).
Group Differences

- Aphasia vs. Control
  - Significantly different (p<.0001).
  - Omissions differed by Experiment, and differed significantly by Group (p=.046)

- Binding vs. Nonbinding
  - ID Local (binding) was significantly different from 3 out of 4 other experiments (p <.022 for all)
    - Except ID only (p= .12)

Others...

- Increased omission errors were also found to be correlated with lower scores on:
  - CLQT Attention, Memory, Executive Fx subtests
    - Except Local Only
Conclusions

- Extinction was observed for the Identify & Localize Task (binding)
- Replication and expansion ($N=14$) of Shisler, 2005

Although...

- Extinction also observed on other non-binding (ID & Count) and single item tasks (e.g., ID only)
- Not consistent with the binding theory

However...

- It does not appear that binding OR resource allocation can explain these findings
- If decreased resource allocation is the cause, performance on ID only, Local only, and Count only should have increased since only one task was required.
  - Not what we observed
Furthermore...

- Correlations of declining cognitive scores with increased omission errors suggest other contributing factors
  - Visual Attention
  - Memory
  - Executive functioning

Future Research

- Further research is necessary to determine the nature of the deficit observed in aphasia
- Determine the interplay of decreased CLQT scores on attentional tasks
- New methods of increasing attention in aphasia patients
  - Maybe ASHA '07? Stay tuned....

Questions?

- Many Thanks....
  - Graduate Assistants
    - Jennifer Geissman
    - Cassie Brinkman
  - And the many participants who generously donated their time (and attention)
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Many Thanks...
References