Meta-Analysis of Anomia Therapies in Relation to Underlying Deficits

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Abstract

This meta-analysis focuses on comparing the efficacy of semantic, phonological, and mixed therapies for individuals with anomia due to damage of the semantic or phonological system. The effect sizes for 24 different anoma therapy studies were calculated for gains made for confrontation naming tasks for trained and untrained words. Results showed that individuals with damage to the semantic system made extremely large gains for trained words, and also showed large gains for untrained words, with either semantic or phonological therapies. Individuals with damage only to the phonological system showed extremely large effect sizes with phonological and mixed therapies, but only small gains for trained words with semantic therapy. Individuals with phonologically-based naming deficits also showed an extremely small effect size for untrained words with all therapies.

Introduction

This meta-analysis focuses on comparing the efficacy of different types of therapy for anomia due to aphasia in relation to different underlying deficits. Previous meta-analyses of anoma treatment (Wisenburn, 2008; Wisenburn & Mahoney, 2009) analyzed efficacy studies of therapy for anomia due to aphasia to calculate the effect size of therapy considering various moderator variables, but did not relate therapy effectiveness to the characteristics of the word-finding deficit.

The cognitive-neuropsychological (CN) model of therapy (Raymer & Rothi, 2001) states that therapy should relate to the underlying area of deficit, whether it be the semantic system or the phonological output lexicon. According to the CN model, individuals with deficits to the semantic system should be provided semantic therapy, involving tasks such as sorting words into categories, defining words, describing words, selecting words with semantic foils, answering semantic questions about words, using words in sentences, and using gestures. Individuals with damage to the phonological output lexicon are provided with phonological therapies, such as repeating words, reading and writing words in isolation, listening to phonemic or syllabic cues, guessing sounds or number of syllables, and seeing orthographic cues. Mixed therapy combines aspects of both approaches or may involve the use of functional or conversational approaches.

Some individual studies have supported the CN model, such as Nettleton and Lessos (1991), who found that patients made gains with their model-appropriate therapy, while those with damage to the phonological output lexicon did not make gains with semantic therapy. Other studies, such as Wambaugh, Cameron, Kalinyak-Finsler, Nesser and Wright (2004), and Raymer, Thompson, Jacobs and Grand (1993) found that individuals with damage to the semantic system made gains with phonologically-based therapies. As Nickels (2002) emphasized, we still do not know what therapy is best for what patient characteristics.

Methods

This study further analyzed the word finding efficacy studies evaluated in the meta-analysis by Wisenburn and Mahoney (2009). Effect sizes for confrontation naming tasks were calculated as follows:

\[ d = \frac{(M_{\text{post}} - M_{\text{pre}})}{SD_{\text{post}}} \]

An unbiased effect size was then calculated to account for studies with small sample sizes:

\[ Unbiased \, d = 1 - \left(\frac{3}{4} \times (\frac{1}{N} - 0.5)\right) \times a \]

The results were categorized according to the following moderator variables:

• Characteristics of the participants: Participants for each study were categorized as having damage to a particular system, or on their auditory comprehension skills. Participants with damage to a particular system either had damage to the semantic system or the phonologic output lexicon. The results of this meta-analysis focuses on comparing the efficacy of semantic, phonological, and mixed therapies, but only small gains for trained words with semantic therapy. Individuals with phonologically-based naming deficits also showed an extremely small effect size for untrained words with all therapies.

• Type of treatment: Treatment methods were categorized as semantic (e.g., sorting words into categories, defining words, describing words, selecting words with semantic foils, answering semantic questions about words, using words in sentences, and the use of gestures), phonological (e.g., repeating words, reading and writing words in isolation, phonemic cues, syllable cues, guessing sounds or number of syllables, and seeing orthographic cues) or mixed (e.g., functional or conversational therapies), or a combination of semantic and phonological therapies.

• Word set: The pre- and post-therapy confrontation naming word sets used for measurement included words trained in therapy or words that were untrained and only administered before and after therapy.

Results

The average unbiased effect size (d) for various types of therapy for participants with damage to the semantic system and to the phonological system were calculated, along with the standard deviation (SD), number of effect sizes (l) and number of studies (N). The results are as follows:

<table>
<thead>
<tr>
<th>Word set</th>
<th>Sem. Tx Unbiased d (SD)</th>
<th>Phon. Tx Unbiased d (SD)</th>
<th>Mixed Tx Unbiased d (SD)</th>
<th>Sem. Tx Unbiased d (SD)</th>
<th>Phon. Tx Unbiased d (SD)</th>
<th>Mixed Tx Unbiased d (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trained</td>
<td>1.64 (1.87)</td>
<td>3.87 (2.37)</td>
<td>0.41 (1.18)</td>
<td>5 (5)</td>
<td>2 (2)</td>
<td>3 (3)</td>
</tr>
<tr>
<td>Untrained</td>
<td>1.13 (1.17)</td>
<td>1.50 (0.69)</td>
<td>0.30 (1.29)</td>
<td>4 (4)</td>
<td>1 (1)</td>
<td>2 (2)</td>
</tr>
</tbody>
</table>

Semantic System damage

<table>
<thead>
<tr>
<th>Word set</th>
<th>Sem. Tx Unbiased d (SD)</th>
<th>Phon. Tx Unbiased d (SD)</th>
<th>Mixed Tx Unbiased d (SD)</th>
<th>Sem. Tx Unbiased d (SD)</th>
<th>Phon. Tx Unbiased d (SD)</th>
<th>Mixed Tx Unbiased d (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trained</td>
<td>0.7 (0.28)</td>
<td>3.17 (5.03)</td>
<td>2.22 (0.92)</td>
<td>2 (2)</td>
<td>6 (5)</td>
<td>4 (4)</td>
</tr>
<tr>
<td>Untrained</td>
<td>0.25 (0.47)</td>
<td>0.12 (0.21)</td>
<td>0.37 (0.25)</td>
<td>5 (5)</td>
<td>7 (6)</td>
<td>4 (4)</td>
</tr>
</tbody>
</table>

Phonological Output lexicon damage

Discussion/Conclusion

According to the CN model, therapy methods should match the area of deficit (semantic system or phonologic output lexicon). The results of this meta-analysis suggest that individuals with damage to the phonological output lexicon only make substantial gains for trained words with phonological or mixed therapy, while those with semantic deficits make gains for trained words with any type of therapy (semantic, phonologic, or mixed). Generalization to untrained words was only seen for individuals with semantically based deficits (with either semantic or phonological therapy), and not to those with phonological deficits (regardless of the therapy). This meta-analysis is limited by the low number of studies comparing the type of therapy in relation to the area of deficit. More research is needed, especially for investigating the efficacy of therapy methods that run counter to the CN model. This is especially true of phonological therapies for those with semantic deficits, as the limited data showed an extremely large effect size for this pairing.

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References

References marked with an asterisk indicate studies included in the meta-analysis.


