Understanding Fluency in Aphasia
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Background
- One of the most common ways of describing aphasia is by fluency.
- Both the BDAE and the WAB attempt to capture the multidimensional nature of fluency using ratings on dimensions such as prosody, paraphasia, grammaticality, word-finding difficulty, and articulatory effort.
- However, they have demonstrated poor agreement on aphasia classifications, including fluent vs non-fluent distinctions.¹
- Perceptual ratings by practicing speech-language pathologists have identified several features that predict fluency judgements, including:
  - Grammaticality, articulatory effort, and word-finding difficulties²
  - Speech productivity, speech rate, and audible struggle³
- We propose a shift away from the fluent/non-fluent dichotomous categorization toward a focus on identifying the underlying contributors to disrupted speech fluency.

Methods
- Participants included 254 people with aphasia (PwA) from the AphasiaBank database, representing a range of WAB aphasia types:
  - Each PwA was classified by WAB and clinical impression as having fluent (F) or nonfluent (NF) aphasia.
  - Each produced a Cinderella story narrative.
- Objective measures of connected speech predicted to underlie fluency were extracted from the Cinderella stories using CLAN.
- All inter-correlations were <.50 or -.50 to reduce collinearity.

<table>
<thead>
<tr>
<th>Underlying Component</th>
<th>Dimension</th>
<th>Predictor Variable</th>
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<tbody>
<tr>
<td>Grammatical competence</td>
<td>Grammatical accuracy</td>
<td>% Grammatical utterances</td>
</tr>
<tr>
<td>Lexical retrieval ability</td>
<td>Lexical accuracy</td>
<td>% Semantic errors; % Neologistic errors</td>
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<tr>
<td>Facility of speech production</td>
<td>Phonological encoding</td>
<td>% Phonological errors; % Neologistic errors</td>
</tr>
<tr>
<td>Grammatical and lexical dimensions</td>
<td>Content/function word ratio</td>
<td>Retracting</td>
</tr>
<tr>
<td>Grammatical, lexical, speech &amp; content dimensions</td>
<td>Total utterances; % Pauses; % Relevant utterances; Propositional density</td>
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Conclusions & Future Directions
- Fluency categories based on the WAB largely reflect aphasia severity.
- Clinicians are sensitive to differences in a variety of spontaneous speech dimensions that the WAB does not capture.
- In making fluency judgements, clinicians are influenced by variables contributing to underlying components of fluency: grammatical competence, lexical retrieval, and speech production.
- By providing objective and standardized methods of capturing these underlying variables, we aim to improve diagnostic reliability of fluency.

References

Results (continued)
- Linear Regressions: Fluency is often measured with the Spontaneous Speech rating scale of the WAB. This largely reflects severity. Lexical specificity and accuracy and grammatical complexity also contribute.
  - Different variables affect ratings for fluent and nonfluent PwA.
  - All PwA:
    - AQ (Severity) (p<.001, η²=.564)
    - Empty Speech (p<.001, η²=.398)
    - Semantic Errors (p<.001, η²=.311)
    - Phonological Errors (p<.001, η²=.144)
    - Complex Grammar (p<.001, η²=.120)
  - Fluent PwA:
    - AQ (Severity) (p<.001, η²=.801)
    - Empty Speech (p<.001, η²=.768)
    - Semantic Errors (p<.001, η²=.482)
    - Dysarthria (Yes) (p<.001, η²=.499)
  - Non-Fluent PwA:
    - AQ (Severity) (p<.001, η²=.554)
    - Empty Speech (p<.001, η²=.393)
    - Semantic Errors (p<.001, η²=.665)

- Linear Regressions: Fluency is also measured by mean utterance length or speech rate. Both indices are themselves influenced by multiple (lexical, grammatical, and speech) dimensions.
  - MLU is most strongly affected by severity and grammatical complexity.
  - WPM is further influenced by lexical variables (VocD, empty speech).

- Logistic Regression: WAB Fluency was predicted primarily by aphasia severity, empty speech, and the use of verb inflections.

- Clinicians were influenced by apraxia, complex grammar, lexical diversity, and sex of the PWA.
- WSF Fluency Classification
  - AQ (Severity) (p<.001, η²=.655)
  - Empty Speech (p<.001, η²=.393)
  - Phonological Errors (p<.001, η²=.144)
  - Complex Grammar (p<.001, η²=.120)
  - VocD (p<.001, η²=.801)

References