Automated Idea Density Measure for Discourse in Aphasia

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Objective

This project presents a newly-implemented version of the automated measure for idea density in discourse using CLAN. CLAN’s density measure is based on the rules used by COPDR 3.2, which replicated Turner and Green’s rules for extracting propositions from text, based on Kintsch’s proposal.

Using this new measure, we replicated and extended the research that used COPDR to measure idea density in aphasia. We propose a new measure for assessing the density of propositional content in oral discourse. We also propose a new measure for assessing the density of propositional content in oral discourse.

Methods, cont.

Propositions are counted based on part-of-speech tagging and rules to handle certain configurations of words.

Results

• Bartlett’s test showed that assumptions of homogeneity of variances were roughly valid, with the exception of the Broca group who had significantly larger variance.

• All statistical tests were run both on raw data and log-transformed raw data. Results did not differ so all data reported will be based on raw data.

• For statistical significance, alpha=0.05.

1. Significant differences between PWA and NC (Hotelling’s T²):

- Proposition density – narrative and procedural – p<0.001
- Total utterances – narrative and procedural – p<0.005
- MLU words – narrative and procedural – p<0.05
- TTR – narrative p<0.05 and procedural p<0.05

2. Correlations between AQ and Density (and other discourse measures) suggested a weak, positive association between AQ and Density for both tasks. However, further inspection of the data using linear regression revealed that the relationship is not significant in the Procedural Task, but significant and negative in the Narrative Task (after removing 2 influential outliers).

3. Significant differences (based on Tukey’s HSD tests) across aphasia types for procedural discourse (below the blue line) and narrative discourse (above the blue line).

Discussion and Future Directions

• PWA and controls differed significantly on both discourse tasks for Density (PD) and all established discourse measures – MLU, TTR, Total Utterances.

• AQ and Density have a weak, positive correlation for both discourse tasks, but linear regression revealed no significant association between Density and AQ for procedural discourse and a significant negative linear association between Density and AQ for narrative discourse, which disappeared when the Wernicke group was removed from the analysis.

• Density is an diachronic measure in relation to aphasia type. High PD can occur with lower AQ (Wernicke) or higher AQ (Frontal). Low PD occurs mostly with Broca’s aphasia where AQs can range from about 8 to 80 and many grammatical elements that contribute to PD may be reduced.

• Density works best in distinguishing participants with Broca aphasia from the other aphasia groups (except TCM).

• Multiple comparison testing showed that all the measures, MLU best distinguishes the aphasia group from the controls.

We recommend further research on the Density measure to better understand its value in aphasia with specific attention to its positive association with MLU and the potential multilinear relationship of AQ and MLU in predicting Density.

References