Syntactic complexity: a potential linguistic marker to track changes of language ability in RCTs

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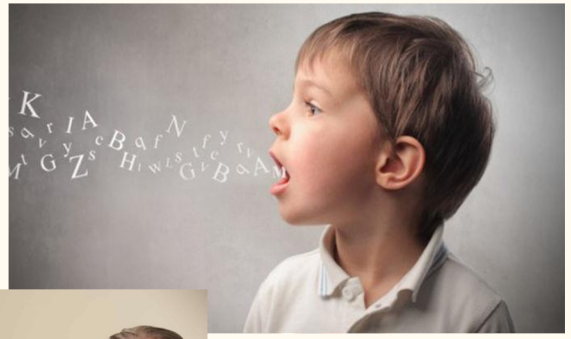
Motivation

Atypical linguistic characteristics are one of the earliest signs observed in a range of of diseases including:



https://otsimo.com

- Parkinson’s disease (PD)
- Alzheimer’s disease
- Depression
- Autism Spectrum Disorder

https://www.cambridgevillageofapex.com/

- Previous researches suggest that progressive decline in linguistic and syntactic abilities due to the cognitive decline

Syntactic Complexity

- Extracting measures of syntactic complexity from spoken words of participants (pre and post trial), their efficacy in tracking changes in linguistic abilities are explored

- Syntactic Complexity: “the range and the sophistication of grammatical resources exhibited in language production” [Ortega 2015]

- From a range of measures, the number of *coordinated phrases* (CPs) was used as an indicator of syntactic complexity

- In linguistics, **coordination** is a complex syntactic structure that links together two or more elements by **coordinators** e.g., *and, or, but* [Wikipedia]

- Example: **[After the announcement]** but **[before the game]**, there was a celebration.

Research Hypothesis

- We hypothesized that the number of *coordinated phrases* could improve by the intervention aimed to enhance cognitive reserve by providing social interactions through frequent video-chats.

Data

- Speech samples: weekly 10-minute phone check-in (responses to the standardized questionnaire) collected from I-CONECT provided to both experimental and control groups unlike video chats delivered only to the experimental group

- Subjects' demographics:

Variable	Intact (n=54)	MCI (n=59)	p-value
Age	79.35 (2.88)	80.86 (3.88)	0.022
Years of Edu.	15.39 (2.29)	15.15 (2.03)	0.562
Gender (% Female)	81%	63%	

Method

- Candidate samples:
  - Baseline: the 2nd, 3rd and 4th weeks of the intervention.
  - Post-trial assessments at M6: the last 3 weeks (i.e., 22, 23, 24th) before the month 6 post-intervention assessments.
- Sample selection
  - For extract linguistic measurements, we only keep conversations that more than 50 words belongs to participants.
  - Among those candidate conversations, we select least talktive one from each participant.
  - At last, we have one conversation from the baseline and one from the post-trial assessments.

Statistical Analysis

- Regression tool
  - Ordinary least squares (OLS) regression
- Analysis
  - For each cognitive group, we regressed CP scores at M6 on age, gender, years of education, baseline CP scores and the experimental (vs. control) groups.

Results

MCI participants Limiting to participants with in-person assessments who finished trial before the pandemic	Cognitive Group	Experimental Group (Reference: Control G) * Controlling for baseline score, age, gender and year of education		
Outcome		Estimate	SE	p-value
CP score at 6th month (6M)	Mild cognitive impairment	0.61	0.30	0.046
	Intact cognition	-0.37	0.45	0.414

Experimental group: joins regular video conversation and weekly 10-minute phone check-in.
Control group: no video conversation. Weekly 10-minute phone check-in.

Conclusions

- In this analysis, we used responses to the standardized questionnaire. Through analyze the CP score, we find that MCI participants in the experimental group uses more coordinate pharse than those in control group after 6 months.

- The downside of the standarized questionaire is that there are only few open-ended questions. This limited the power of CP scores.

Future Works

- Exploring the efficacy of syntactic complexity measures in tracking changes based on speech samples collected from the weekly semi-structured conversations

- This provides a richer linguistic context with far more words unlike responses to the standardized questionnaire

Thank You
Questions, comments, collaboration?

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