A COMPARISON OF DIFFERENT CONNECTED-SPEECH TASKS FOR DETECTING MILD COGNITIVE IMPAIRMENT USING MULTIVARIATE PATTERN ANALYSIS

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Background
Mild cognitive impairment (MCI) is an umbrella term that describes a clinically detectable transition stage from typical to pathological aging. Word-retrieval difficulties are the main difficulties in MCI and early Alzheimer’s disease (e.g., Taler & Phillips, 2008). A growing consensus indicates that a multidimensional and ecologically valid way to detect language deficits is needed in both typical and pathological aging, such as connected-speech assessment (Boschi et al., 2017).

Methods
Participants: 16 English-speaking participants with MCI (12 females; 70.8±6.4 years old) and 16 cognitively healthy controls (12 females; 70.8±6.4 years old) from the Delaware corpus available on DementiaBank (Lanzi et al., 2023)

Materials: Four connected-speech tasks (a picture description, a story narrative, a story recall, and a procedural narrative)

Lexical-semantic features: word revision ratio, repetition ratio, filled pauses ratio, word replacement ratio, core lexicon, propositional idea density, open/closed class words ratio, and the lexical frequency

Statistical analyses: Two-way analysis of variance (ANOVA) + Multivariate pattern analyses (MVPA)

Results
Main effect of group
MCI = Higher proportion of revisions (F(1,123) = 4.729, p = 0.032), fewer CoreLex checklist words (F(1,123) = 5.506, p = 0.021)

Main effect of task
Propositional idea density (F(3,123) = 11.706, p < 0.001), lexical frequency of each noun (F(3,123) = 16.375, p < 0.001), and CoreLex (F(3,123) = 397.854, p< 0.001).

MVPA results
The story recall could distinguish the two groups above chance (accuracy: 65.6%). CoreLex and lexical frequency = features that contributed the most to the classification.

Research questions
1) Do people with MCI perform differently than cognitively healthy controls on lexical-semantic features, in four types connected-speech tasks?
2) Can the pattern of lexical-semantic features classify participants with MCI, using MVPA?
3) If so, which connected-speech task and which lexical-semantic feature would be more discriminant to detect MCI?

Discussion
- Connected-speech tasks can detect subtle language changes in people with MCI.
- By using MVPA, the pattern of lexical-semantic features could significantly predict participants’ membership (MCI or HC) in one of the four tasks.
- The story recall task could discriminate participants with MCI above chance

References

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