

Background

Changes to speech and language occur across frontotemporal dementia (FTD) subtypes, including impairments in naming, agrammatism and increased word finding difficulty.¹⁻⁵ Assessing language abilities may help to characterize disease severity and progression in FTD, and detect effects of treatment. Mobile devices and advances in natural language processing (NLP) enable objective, detailed, remote assessment of language, offering potential advantages over current clinical tools. In order to determine the feasibility of remote language assessment and the aspects of speech affected in behavioral variant FTD (bvFTD) and primary progressive aphasia (PPA), we collected speech samples over a one year period using a remote, digital speech assessment tool.

Objectives:

- 1) Test the feasibility of remote speech assessments in individuals with FTD variants.
- 2) Use natural language processing to characterize the aspects of speech that change over one year.

Methods

- Thirty-six individuals (20 M, 16 F; mean age at baseline = 61.3 years) with variants of FTD were recruited from the community.
- FTD subtypes included behavioral (n = 21), semantic (n = 6), non-fluent (n = 1), logopenic (n = 4) and unspecified (n = 4) variants.
- In this observational study, participants completed a tablet-based speech assessment (including picture description, phonemic and semantic fluency tests, and object naming) at months 1, 2, 3, 6, 9 and 12 (Figure 1).
- Verbal responses were recorded, transcribed and analyzed using NLP, producing >500 speech variables.
- Scores on standard language tests at baseline were compared to healthy controls using t-tests (Figure 2).
- Change over time was tested in selected speech variables (pauses, total words) and exploratory speech composites (information units, global coherence) using linear mixed effects models controlling for age and sex (Figure 3).

Figure 1: Remote assessment adherence over 1 yr

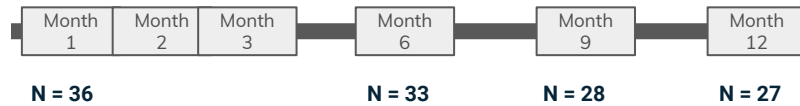


Figure 2: Language impairments in FTD on standard tasks

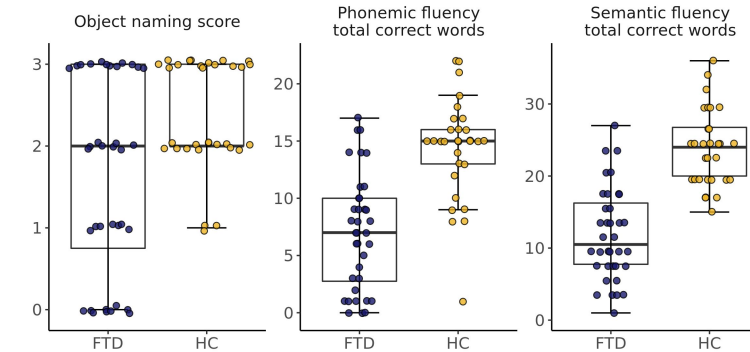
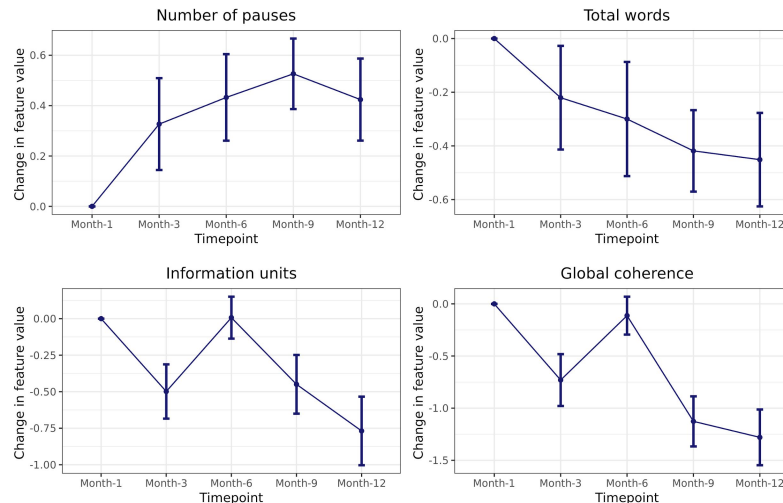


Figure 3: Speech variables show increasing impairment over 1 yr



Results

- Study adherence was good (92% at 6 months, 75% at 12 months). The lower adherence at 12 months was partly due to complications from the COVID-19 pandemic.
- At baseline, individuals with FTD variants showed impairments compared to a control sample on object naming, phonemic and semantic fluency (p 's < 0.01).
- Over one year, individuals with FTD showed increases in the number of pauses, decreases in the number of words used, and decreases in the information content and global coherence of picture description (p 's < 0.05).
- Information content reflects the number of items correctly identified in the picture, and global coherence measures the semantic relatedness of words used to the items in the picture. These content-based exploratory composites may be more sensitive to differences between picture stimuli.

Conclusions

This study demonstrates that remote language assessments are feasible, with caregiver assistance, in FTD populations. Remote assessments allow for frequent patient monitoring without the need for clinical visits, reducing the burden on patients and their caregivers. Our results replicate standard findings of reduced naming and fluency in FTD, and indicate that language features reflecting the amount, rate and information content of speech are affected in FTD and decline over a 12-month period. Remote language assessments represent an innovative tool for characterizing language changes and disease progression in FTD.

References

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