

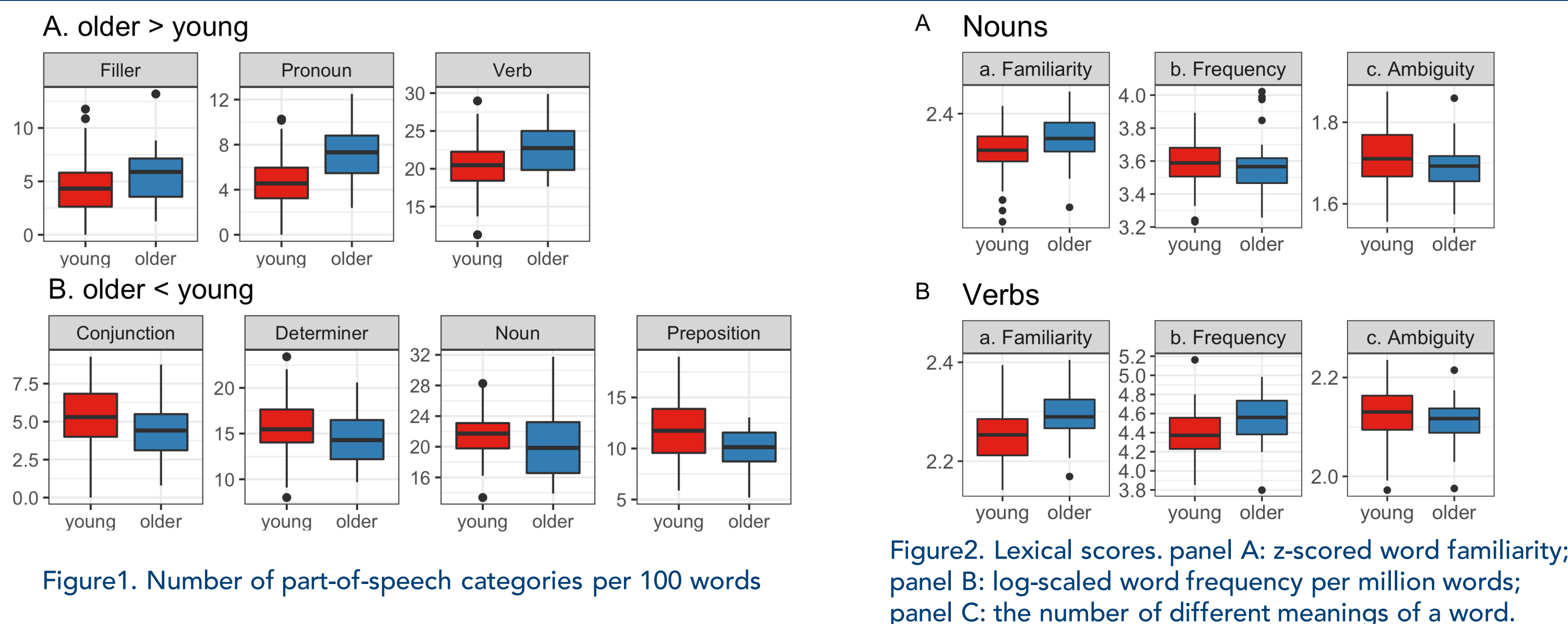
Introduction

- Language use is affected by factors such as age and sex.
- An understanding of these factors is essential to studies of speech in neurodegenerative disease.
- While age and sex have received considerable attention in the literature, results are mixed.
- Also, few studies have considered both lexical and acoustic features at the same time, which leaves a major gap in our understanding of the effect of age and sex on language use.
- In this study, we analyze both lexical and acoustic features from 1-minute speech samples using novel, objective, reproducible, fully automated methods.

Methods

- We examined Cookie Theft picture descriptions produced by 37 older (52-89y, mean=68y) and 76 young (18-22y, mean=20y) participants.
- Using a natural language processing tool, we automatically tagged part-of-speech categories of all tokens and rated nouns and verbs for five lexical features: word frequency, familiarity, concreteness, age of acquisition and semantic ambiguity.
- Using a speech activity detector, we automatically segmented speech samples into speech and silent pause segments; extracted acoustic features such as total speech time, mean speech segment duration, and mean pause duration; and measured pitch percentiles.

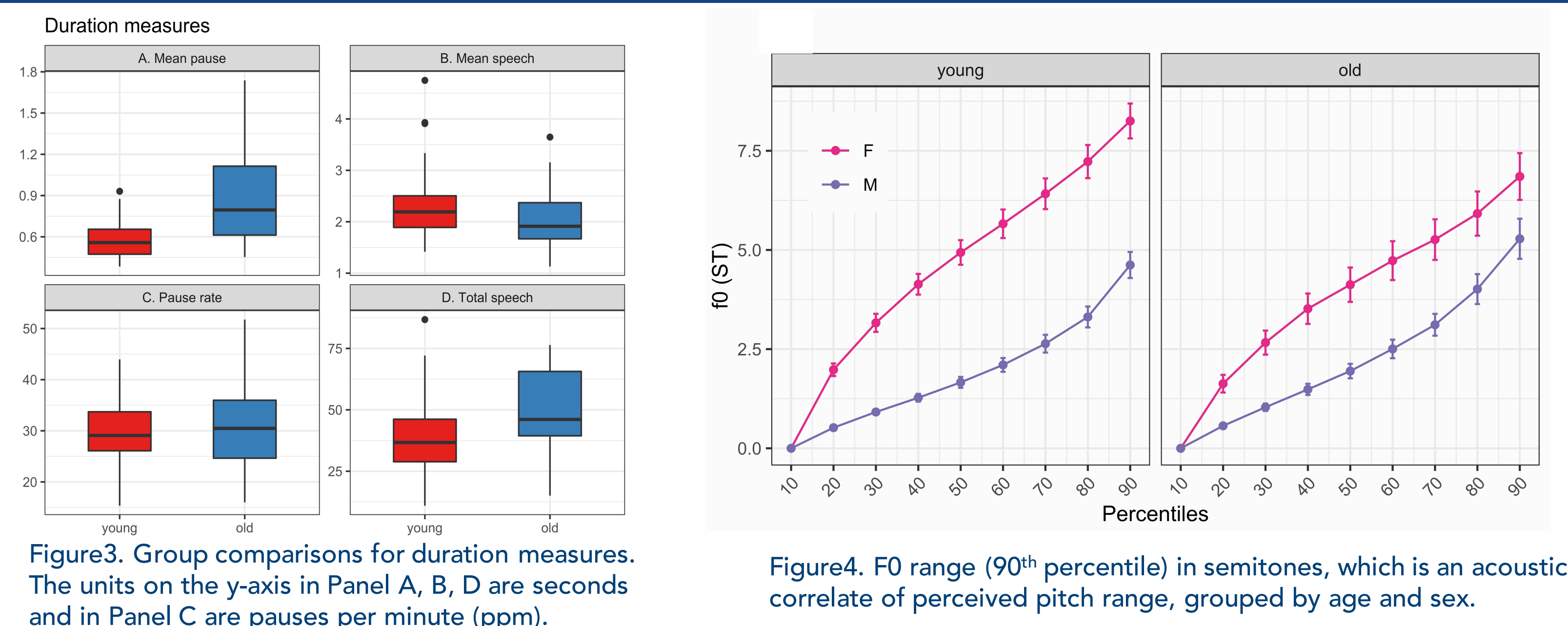
Results: Lexical analysis



Summary

- * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$
- Older speakers produced more fillers*, pronouns**, and verbs**, (Fig. 1A) and fewer conjunctions*, determiners*, nouns*, and prepositions** (Fig. 1B) than young participants.
- Older speakers' nouns and verbs were more familiar (nouns**, verbs***), more frequent (verbs** only), and less ambiguous (nouns* only) compared to those of young speakers. (Fig. 2)
- Older participants produced longer pauses*** (Fig. 3A) and shorter speech segments* (Fig. 3B) with increased total speech time*** (Fig. 3D).
- Age and sex show an interaction in pitch ranges*. (Fig. 4)

Results: Acoustic analysis



Conclusion

- Older speakers' lexical content is less diverse and they use shorter utterances than young participants.
- Age differences are reflected in part in the acoustic properties of speech in picture descriptions.
- Lexical and acoustic characteristics of semi-structured speech samples can be examined using automated methods.

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