

Perceptual ratings and prosodic features of English speech in bilingual children in Canada

Youran Lin, Stephanie Limacher, & Karen Pollock
Department of Communication Sciences and Disorders, University of Alberta, Edmonton, Alberta

BACKGROUND

Foreign Accent

- L2 learners' speech differs from native speakers (Munro, 1998).

Perception and Acoustics of Foreign Accent

- Perception: Intelligibility, accentedness and comprehensibility (Munro & Derwing, 1995).
- Acoustics: Speech sound and prosodic features (Behrman, 2014).
- Teachers' impression: Prosody has stronger impacts (Celce-Murcia, Brinton, & Goodwin, 1996).

Research Gaps

- More focus on demographic features (e.g. Flege, Munro, & MacKay, 1995).
- Prosody rated impressionistically (Anderson-Hsieh, Johnson, & Koehler, 1992).
- Limited investigation in children within "critical period" (Johnson & Newport, 1989)

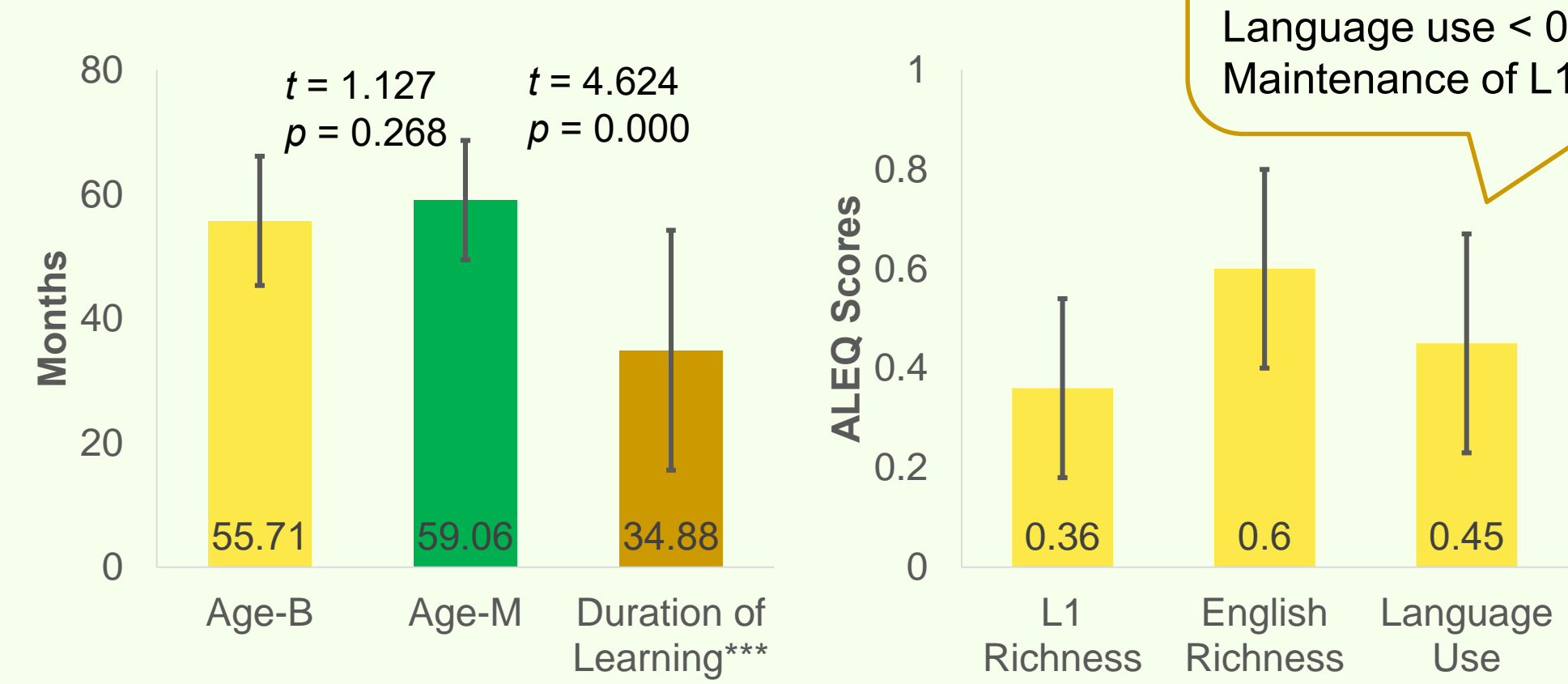
RESEARCH QUESTIONS

- Do bilingual children who have been exposed to English since an early age have detectable foreign accents?
- Are prosodic features of their speech production correlated to the perceptual ratings of their foreign accents?

METHODS

Participants

- 17 bilingual and 17 monolingual children



Language use > 0.5:
Shift towards English use in the home
Language use < 0.5:
Maintenance of L1

The Alberta Language Environment Questionnaire (ALEQ) provides information on a child who is learning English as L2 (<https://www.ualberta.ca/linguistics/chescentre/questionnaires#ALEQ>)



Sentence Imitation Task

(Hack, Todd, & Bernhardt, 2012)

- The elephant ate a banana plant.
- [ðɪ 'ɛləfənt eɪrə bə 'næənə plænt]

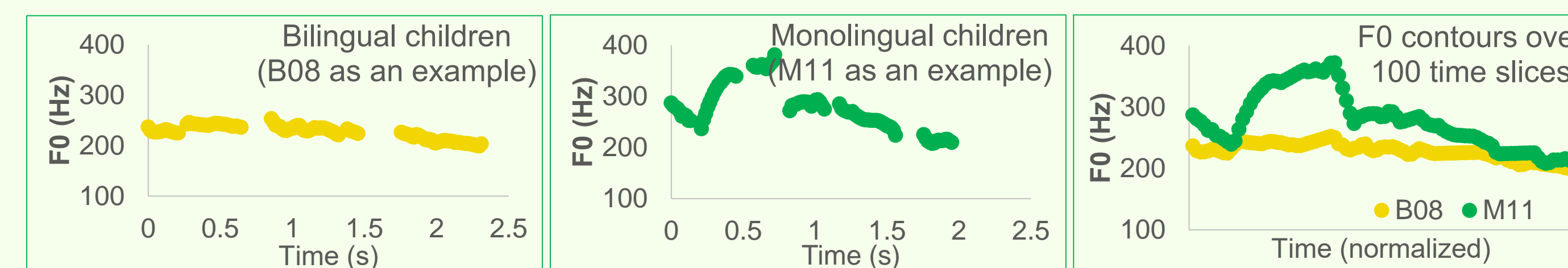
Perceptual Ratings

- 10 SLPs who were experienced in bilingual cases
- 9-point Likert scales
- Accentedness: Native-like vs. non-native
- Incomprehensibility: Easy to understand vs. hard to understand

ACOUSTIC ANALYSIS

F0 Variability = Standard deviation of F0 over 100 time slices

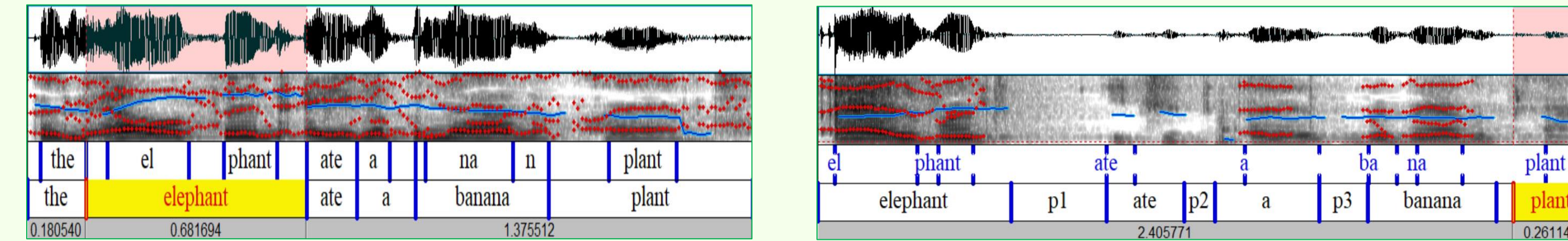
- F0: Fundamental frequency, the acoustic counterpart of pitch



Duration = Total duration of the utterance

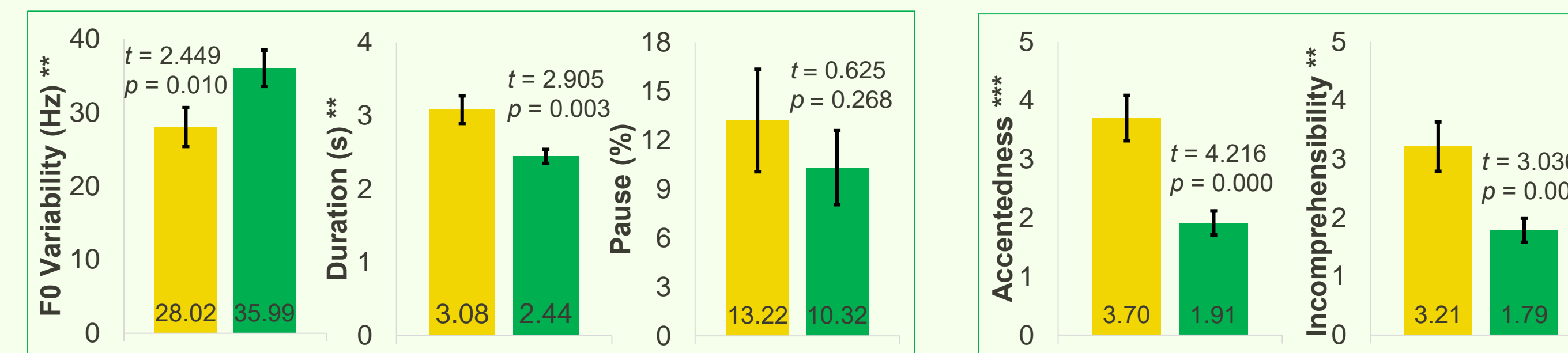
Pause% = Sum of pause duration ÷ Duration × 100%

- Operational definition of a pause: An audible cessation of speech that is longer than 0.1 second



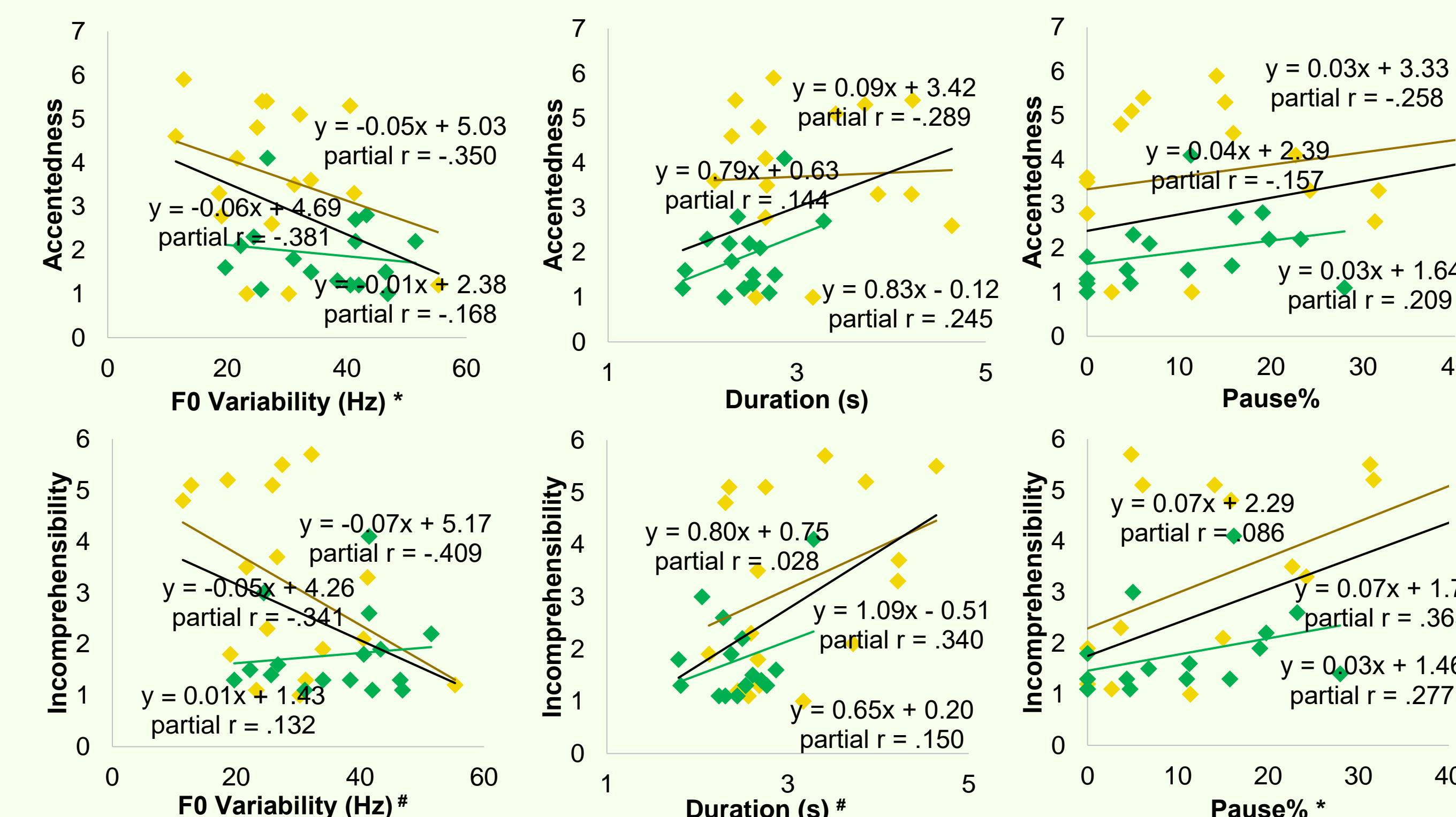
RESULTS

T-tests: Significant differences in both acoustic features and perceptual ratings



Correlation (age & learning time controlled)

- F0 Variability is negatively correlated to Accentedness
- Duration and Pause% are positively correlated to Incomprehensibility



Regression

- Accentedness = $-.051 \times \text{Learning}^{***} - .039 \times \text{F0 Variability}^* + 6.478$
- Incomprehensibility = $-.621 \times \text{Age}^{**} - .042 \times \text{F0 Variability}^* + .712 \times \text{Duration}^* + 4.857$

Legend: ◆ Bilingual ◆ Monolingual # p < 0.1 * p < 0.05 ** p < 0.01 *** p < 0.001

CONCLUSIONS

- Bilingual children have detectable foreign accents even when they have been exposed to English since an early age
- Prosody can be a good descriptor of foreign accents
- Prosodic features are correlated with and have impacts on perceptual ratings of foreign accents

Learning → Accentedness ← F0 variability
Age → Incomprehensibility ← F0 variability, Duration and Pause%

SIGNIFICANCE

- Quantitative, acoustic measurement of prosodic features
- Teaching and learning of English as a second language
- Foreign accent management with visualized feedback
- A bridge between speakers and listeners

FUTURE STUDY

- Control the language backgrounds
- Look at Chinese and English learning in Canada
- Control both chronological age and linguistic age
- Analyze both speech sound and prosodic deviances
- Cross-sectional and longitudinal study

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ACKNOWLEDGEMENTS

- Thanks to Dr. Daniel Aalto, Dr. Trelani Chapman, Dr. Jacqueline Cummine, and Dr. Bill Hodgetts for your suggestions.
- Thanks to the children and their parents for participation. Thanks to the great work of the test administrators and speech raters.
- Thanks to Dr. Elena Nicoladis, Ms. Bryce Hoy, all the organizers and volunteers for this great conference.

