

The Relationship between Voice Onset Time and Vocal Onset f_o in Children



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Introduction

The pediatric vocal mechanism is drastically different than that of adults.

- Infant lamina propria is a single layer
- Vocal ligament develops ~4 years of age

Research question: Do the significant developmental changes in vocal anatomy impact vocal control for speech production?

This study examined voice onset times (VOT) from **voiceless consonant + vowel** productions

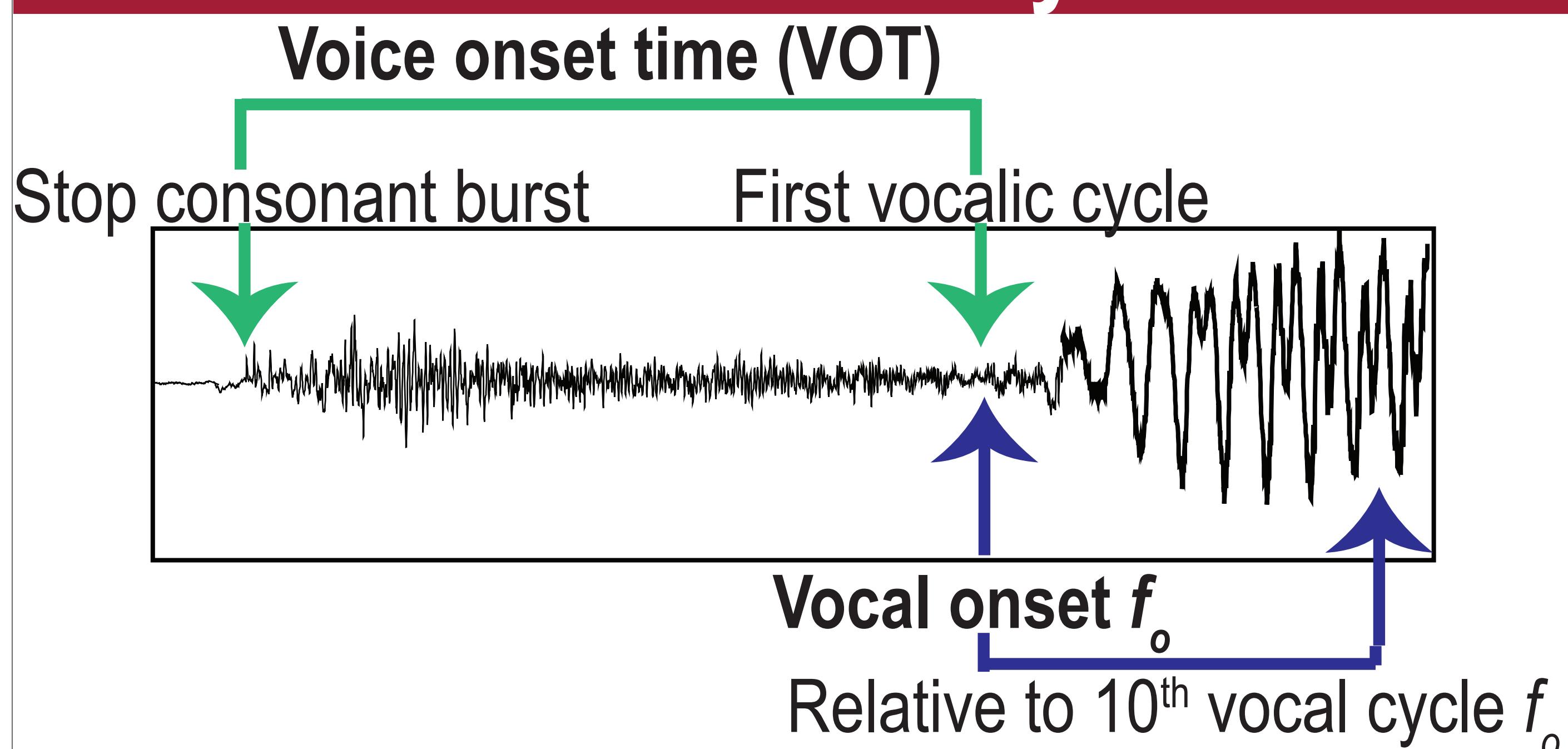
- Requires vocal control
- Developmental pattern
 - *Early childhood* (~1- 4 years): voiceless VOTs become more accurate and longer
 - *Late childhood* (~4- 8 years): average VOT comparable to adults, continued variability

Participants

Selected from the Arizona Child Acoustic Database

- **Younger:** 2.58-3.92 years, 7 female, 6 male
- **Older:** 4.33-6.83 years, 12 female, 11 male

Acoustic Analysis



VOT: Time between the release of the burst of the voiceless stop and start of the vowel

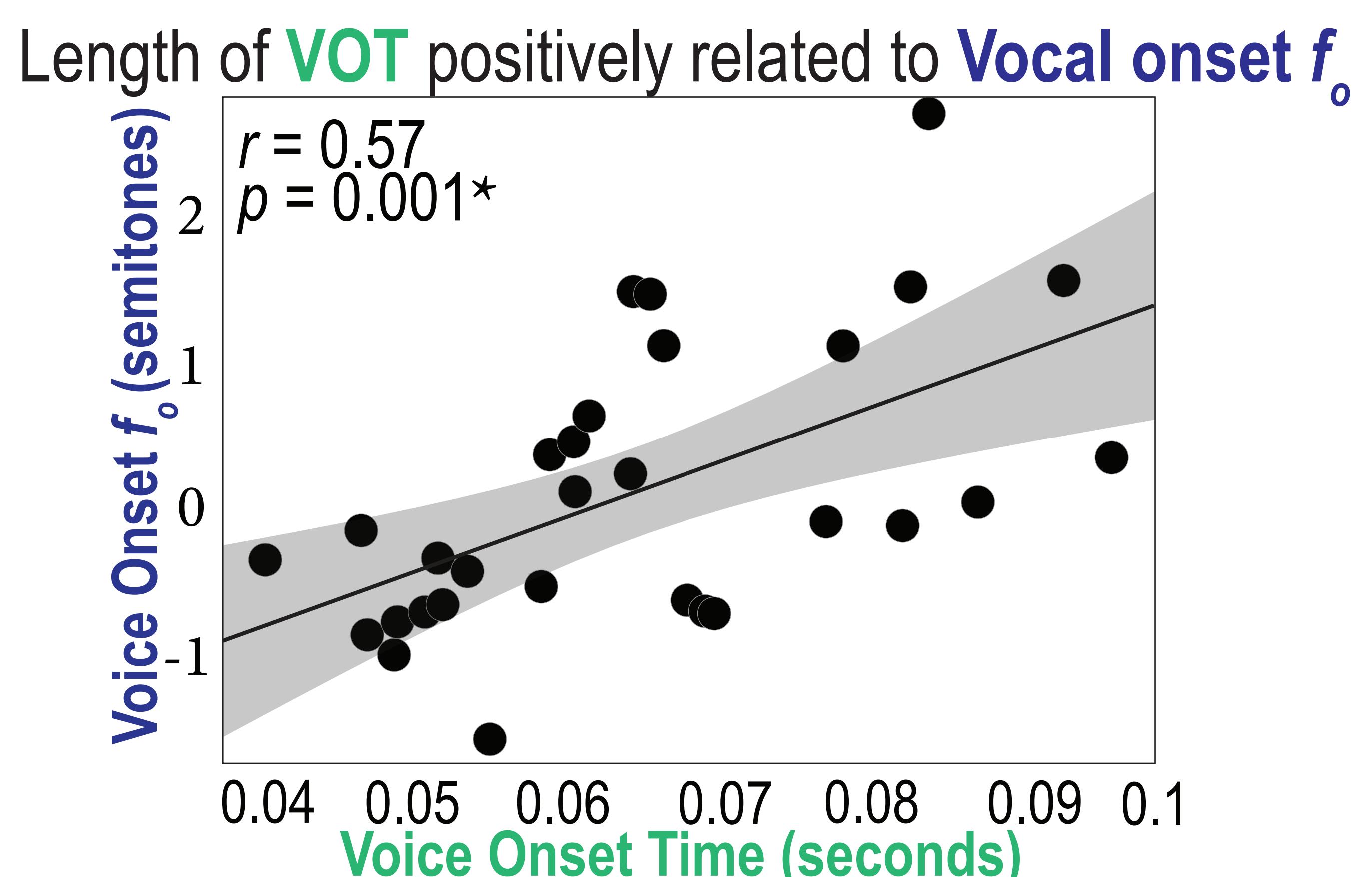
Vocal onset f_o : Fundamental frequency (f_o) of the first vocalic cycle, normalized to the 10th vocal cycle

Vocal onset f_o variability: Variability of onset f_o across multiple productions

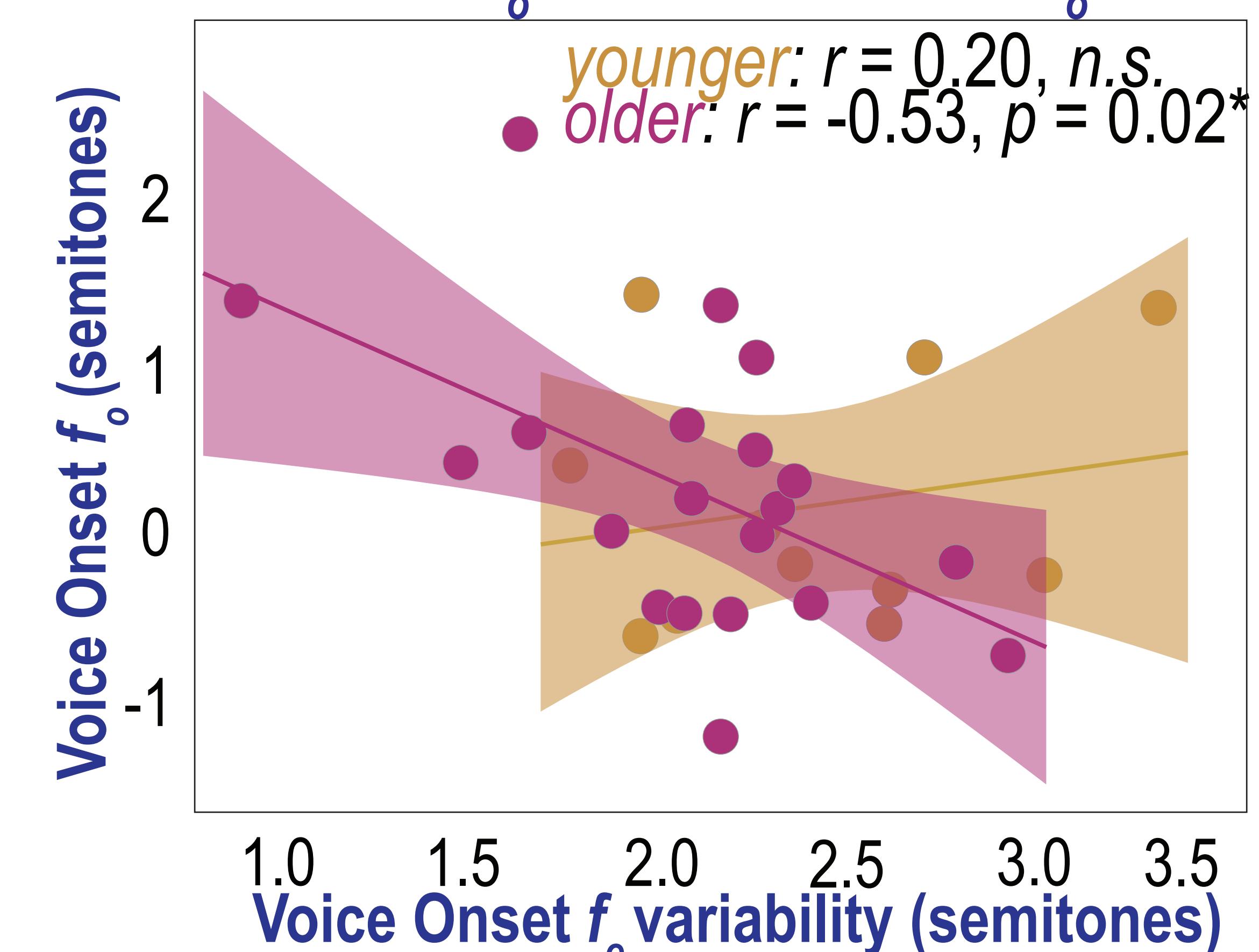
Results

Regression table for Onset f_o
 $R^2 = 0.47, F(5,24) = 4.23, p = 0.007^*$

Predictor	β	95% CI	SE β	t	p
Intercept	-2.80	[-5.58 -0.03]	1.34	-2.09	0.048*
Age group (younger, older)	-0.11	[-0.44 0.22]	0.16	-0.68	0.503
Onset f_o variability	0.15	[-0.61 0.91]	0.37	0.40	0.690
VOT	38.37	[15.17 61.58]	11.24	3.41	0.002*
Age group x Onset f_o variability	0.88	[0.13 1.64]	0.37	2.41	0.024*
Age group x VOT	3.71	[-19.50 26.91]	11.24	0.33	0.744



Older children have negative relationship between **Vocal onset f_o** and **Vocal onset f_o variability**



Discussion

Vocal fold maturational changes did not impact the relationship between length of vocal fold opening (**VOT**) and **vocal onset f_o** .

There was an age effect for the relationship between **vocal onset f_o** and **onset f_o variability**.

- Vocal fold development may impact the method of maintaining vocal fold opening during **voiceless consonant**
- Increased **vocal onset f_o** after a voiceless consonant is related to: 1) increased vocal tension that carries over to the following vowel and (2) increased pressure across the glottis
- **Older** children with increased vocal control (e.g., less **vocal onset f_o variability**) may rely more on vocal fold tension to maintain vocal fold opening
- **Younger** children with immature vocal systems may rely on other factors (such as aerodynamic) to maintain vocal fold opening

References

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COVID Note: Even though I cannot be there in person I would love to talk with you about this poster! Please reach out if you have any questions or comments. liz.heller.murray@temple.edu