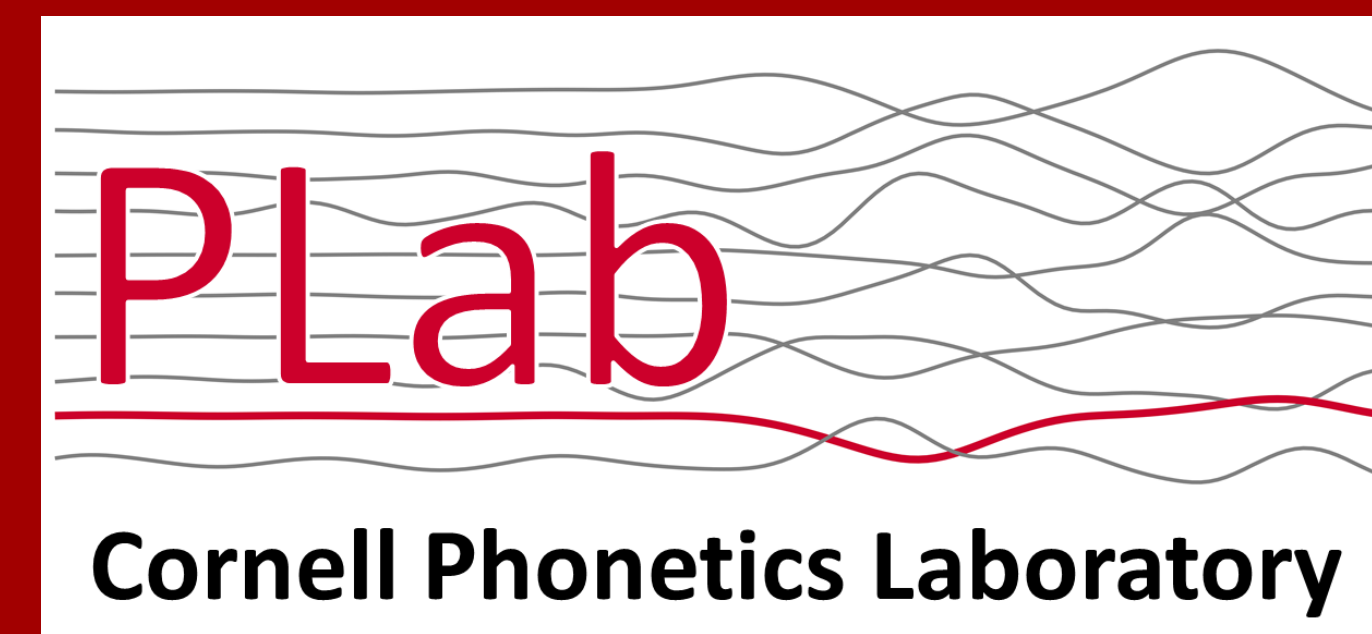


Prosodically-conditioned temporal variation in whispered versus normal speech

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1 Motivation

The vocal folds are abducted during whispered speech. As a result:

1. Whispered speech is **aerodynamically disadvantaged**, as subglottal pressure is exhausted more rapidly.
2. **F0** and F0-related **prosodic information** are **absent**. [1]

Hyp 1: Air-conservation efforts will modulate whisper duration.

Pred 1a: Lengthening of air-conserving gestures (stop closures); shortening of air-consuming gestures (vowels, fricatives). [2]

Pred 1b: Increased inhalation.

Hyp 2: Lack of f0-related prosodic information will influence whisper duration.

Pred 2: Lengthening in prosodically strong positions.

2 Differences in whispered and normal speech production

31 participants: native English speakers.

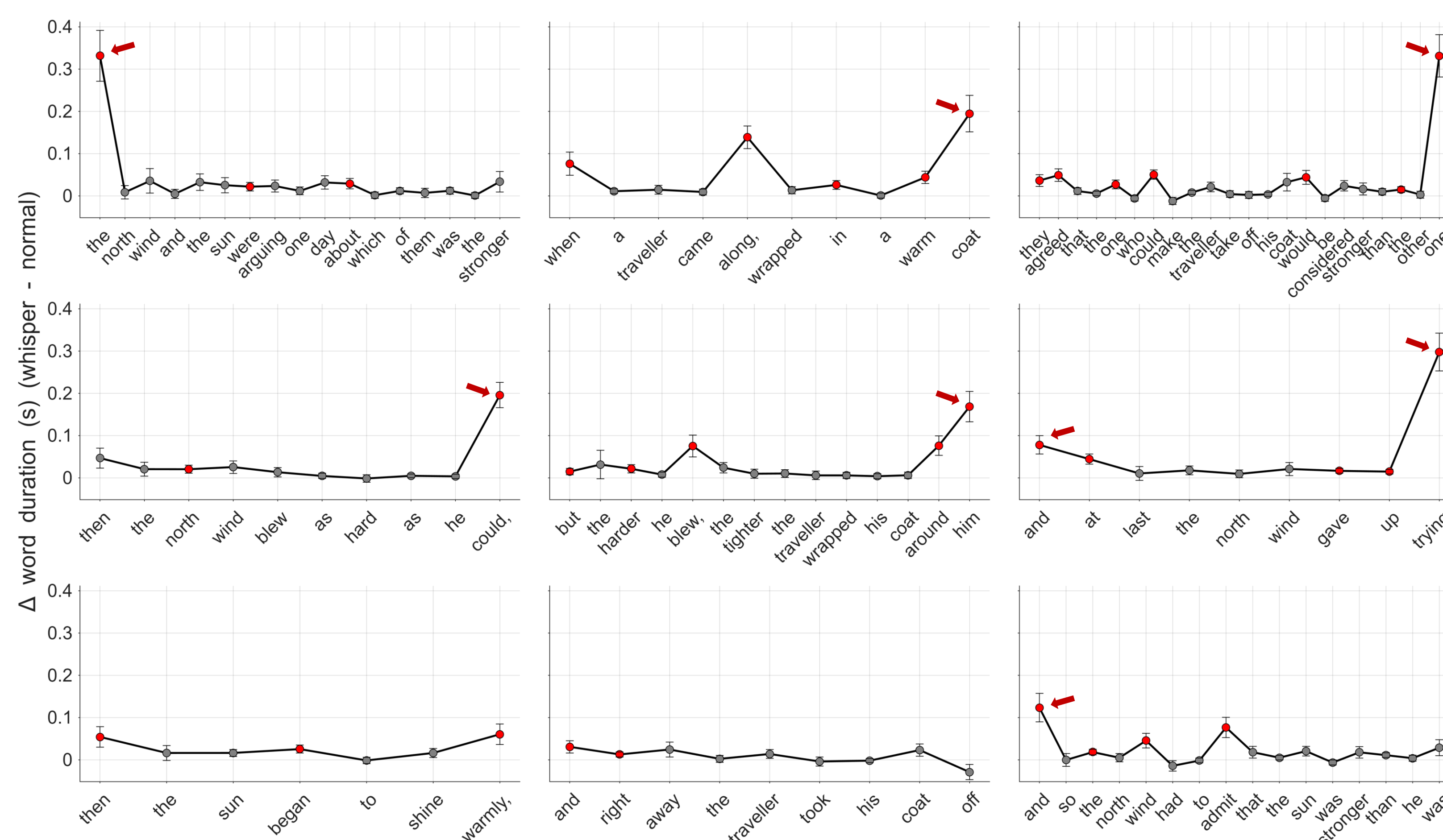
Task: The North Wind and the Sun passage read both whispered and normally.

Four measures of temporal differences by production mode:

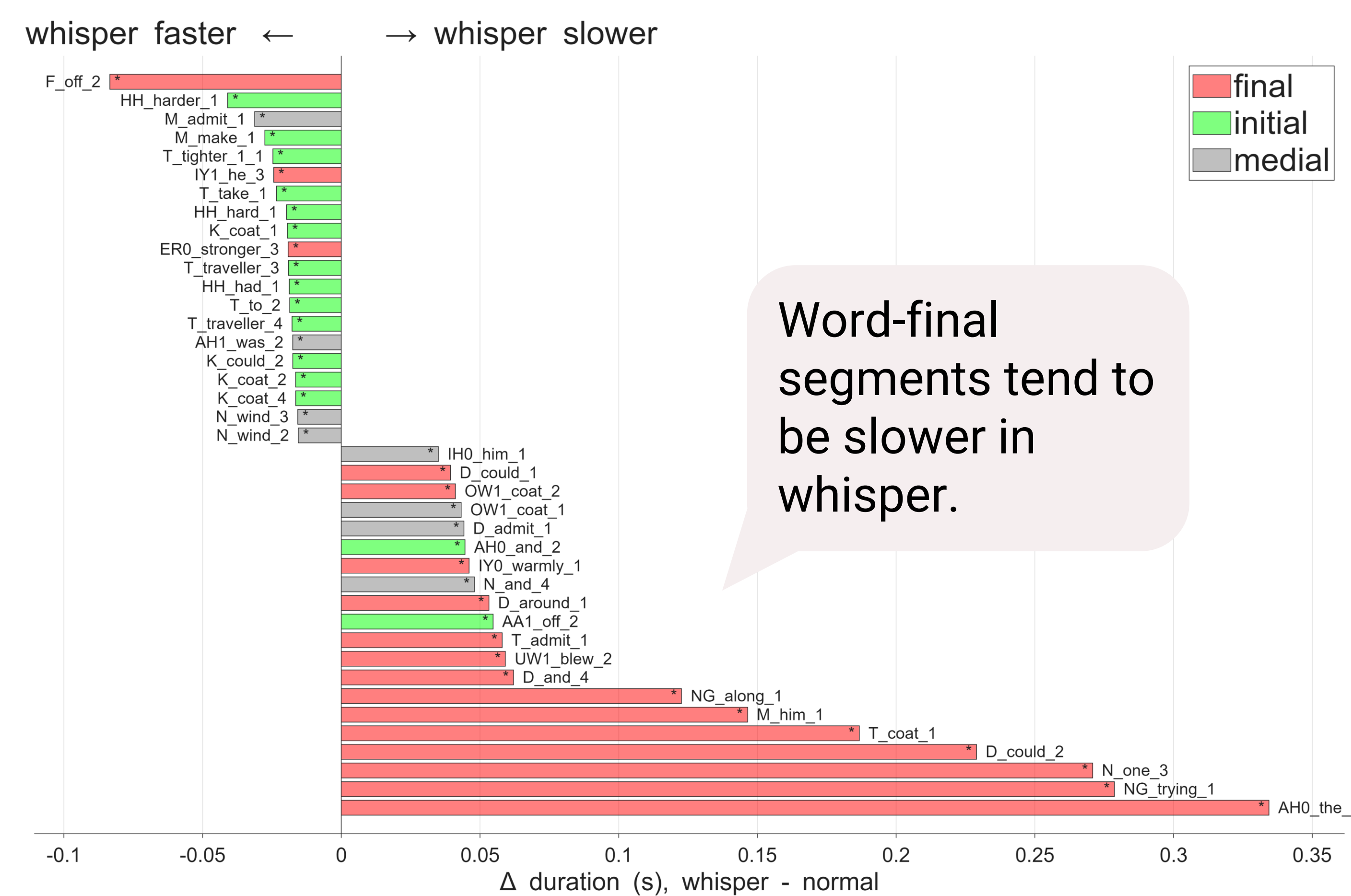
- Word duration, Segment duration
- Speech rate, Unfilled pause proportion

3 Whispered speech exhibits prosodically-conditioned phrase- and word-boundary lengthening.

1. Difference in word duration between whisper and normal positively correlates with prosodic phrase boundaries.

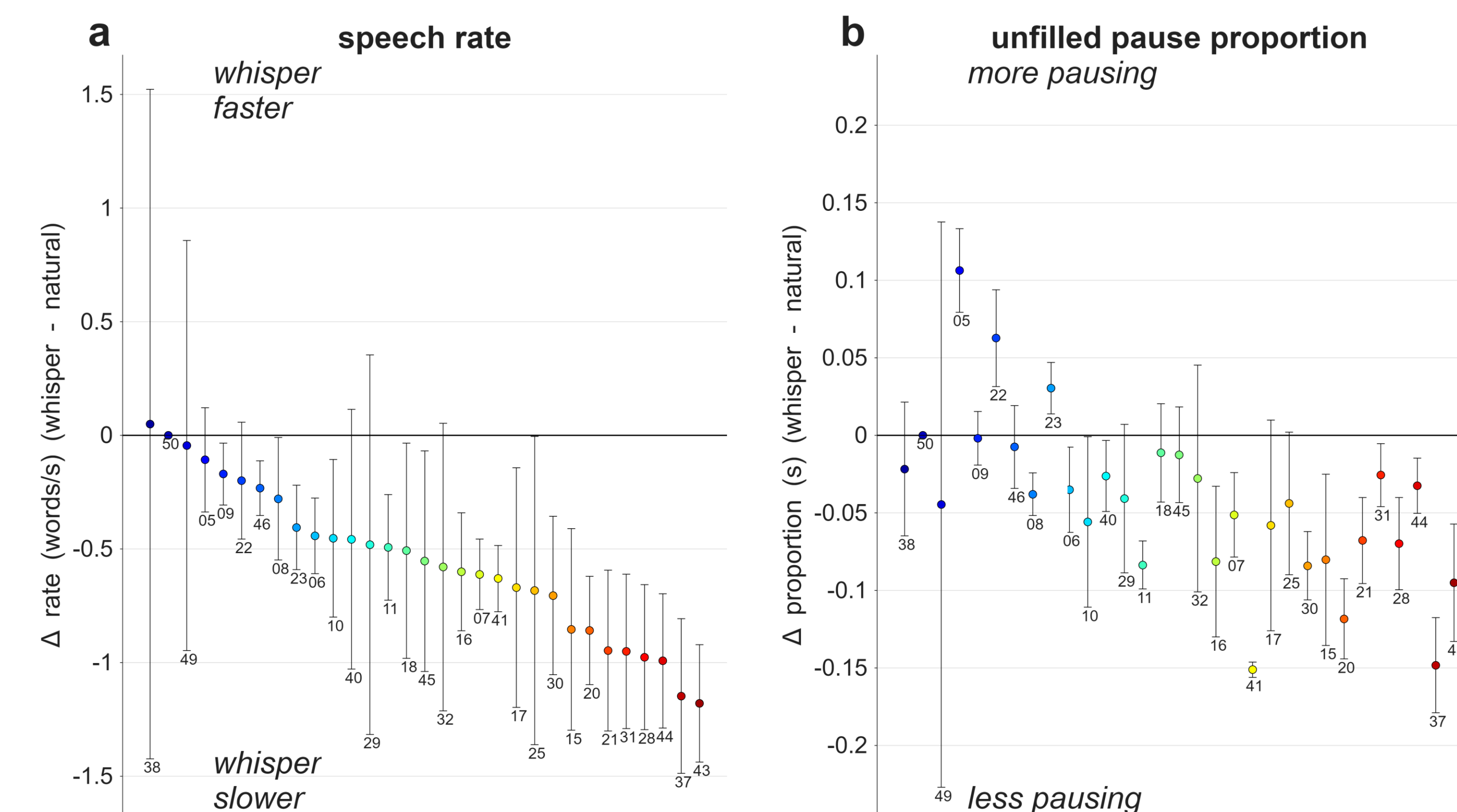


2. Significant lengthening of word-final segments; shortening of word-initial segments. No effect of segment type (air-conserving/consuming).



4 Speakers speak at a slower rate but pause less overall while whispering.

Slower whispered speech rate and lower proportion of unfilled pauses suggest less inhalation despite greater overall airflow.



5 Discussion

Conclusion: Whispered speech exhibits **prosodically-conditioned** (not aerodynamically motivated) **temporal differences** from normal speech, suggesting compensation for the absence of f0-related prosodic cues.

Future work: Further study is needed to determine whether these prosodic adjustments are to (1) facilitate listener comprehension or (2) to augment feedback during production.

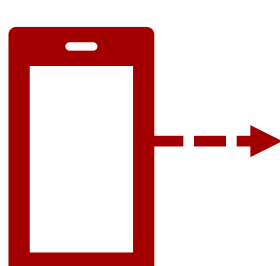
6 Take-aways

- ① Whispered and normal speech differ in their temporal realization.
- ② Lengthening/shortening of words and segments during whisper suggest an influence of the absence of f0-related prosodic information, not a compensation for increased airflow.

7 References

- [1] Tartter, V. C. (1989). What's in a whisper? *J. Acoust. Soc. Am.* 86(5), 1678-1683.
- [2] Schwartz, M. F. (1972). Bilabial Closure Durations for /p/, /b/, and /m/ in Voiced and Whispered Vowel Environments. *J. Acoust. Soc. Am.* 51(6B), 2025-2029.

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