

Extrinsic talker normalization facilitates speech perception via rapid accumulation of talker-specific phonetic detail

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Summary

- Extrinsic **talker normalization** facilitates speech perception by using talker-specific information to **recalibrate** the perceptual system.
- We investigated how the **accumulation of talker-specific phonetic detail** and perceptual recalibration over time impacts the facilitatory effect of talker normalization.
- Orthogonal interference of indexical variability on speech processing has been demonstrated such that talker variability introduces delay in identifying spoken words.
- Orthogonal interference of indexical variability was greatest in the no-carrier condition, less in the short-carrier condition, and least in the long-carrier condition.
- Extrinsic talker normalization facilitates speech processing via rapid accumulation of talker-specific detail.
- Interference of indexical variability in the low-information carrier condition was not different from the high-information carrier condition, when the lengths of low-information and high-information carriers were matched.

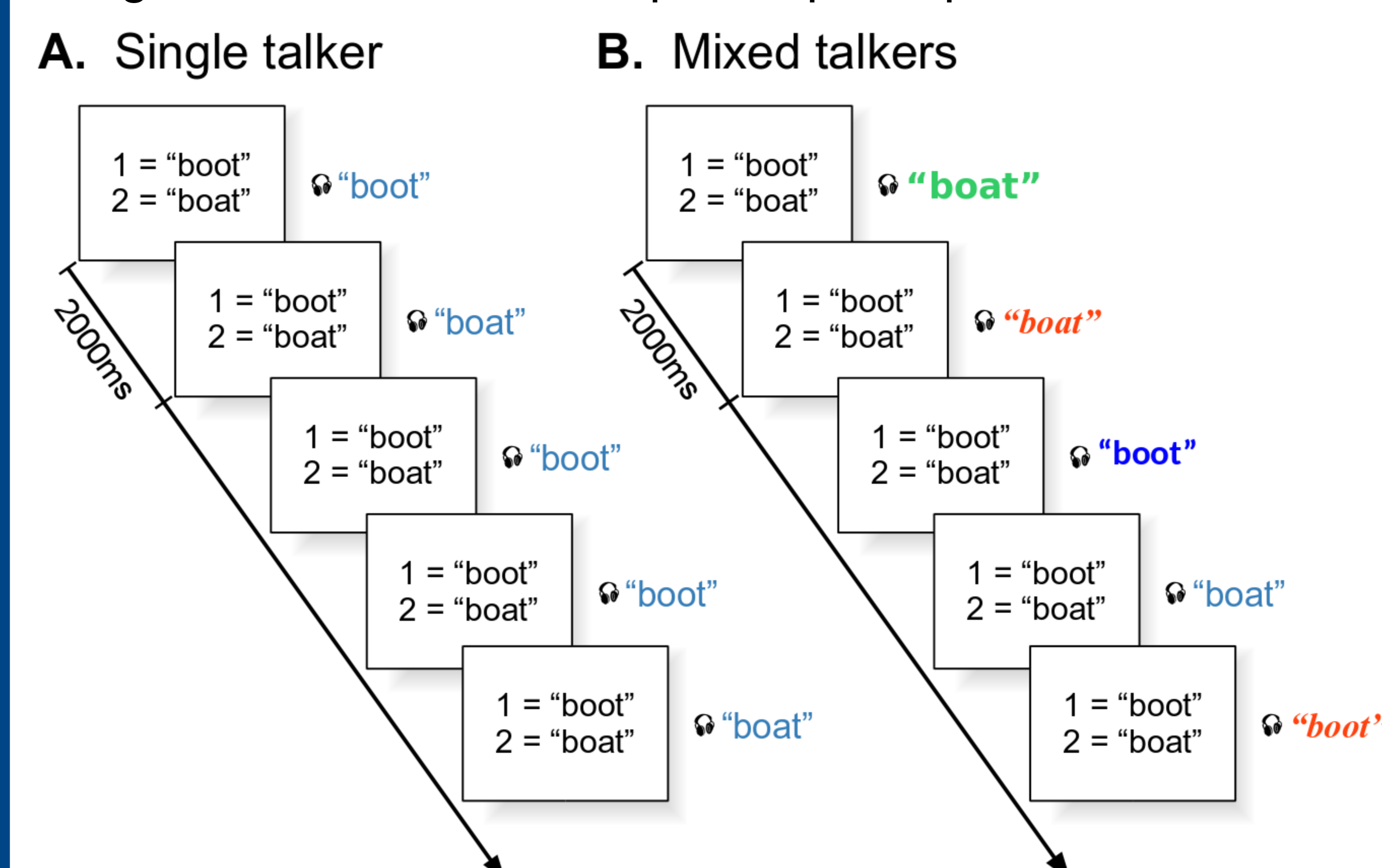
Methods

Participants

- Native English-speaking adults (N=24 in each experiment) with no known or suspected speech, language or hearing impairments
- Participants who completed Experiment 1 did not participate in Experiment 2.

Analysis

- Response times were analyzed using linear mixed-effects models with fixed factors including indexical variability and carrier lengths and random effects terms of within-participant slopes for indexical variability and carrier length and random intercepts for participants.



Experiment 1

Stimuli

Target words ("boot", "boat") and varying lengths of carrier phrases were recorded by 4 native speakers of American English (2 male, 2 female).

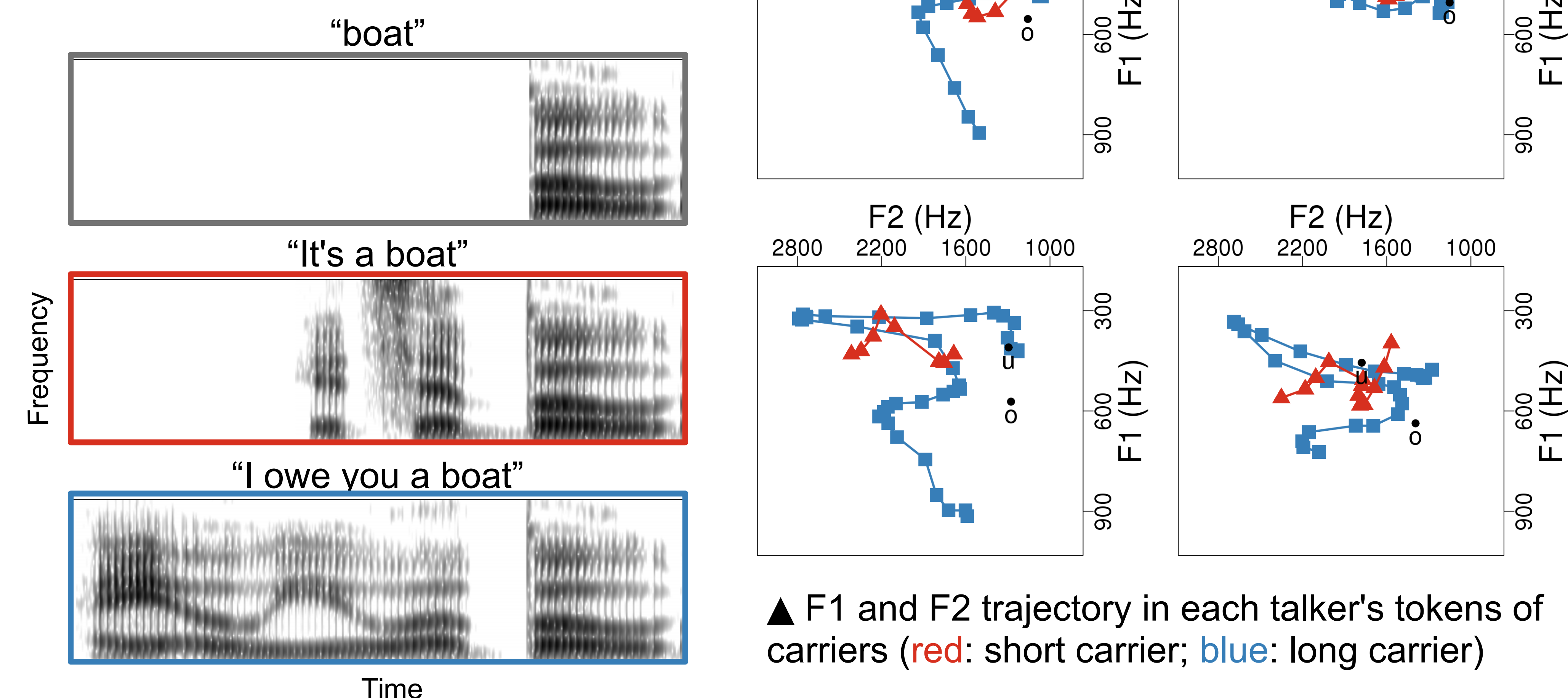
• No carrier

• Short carrier:

- "It's a ..." (mean duration: 340 ms)

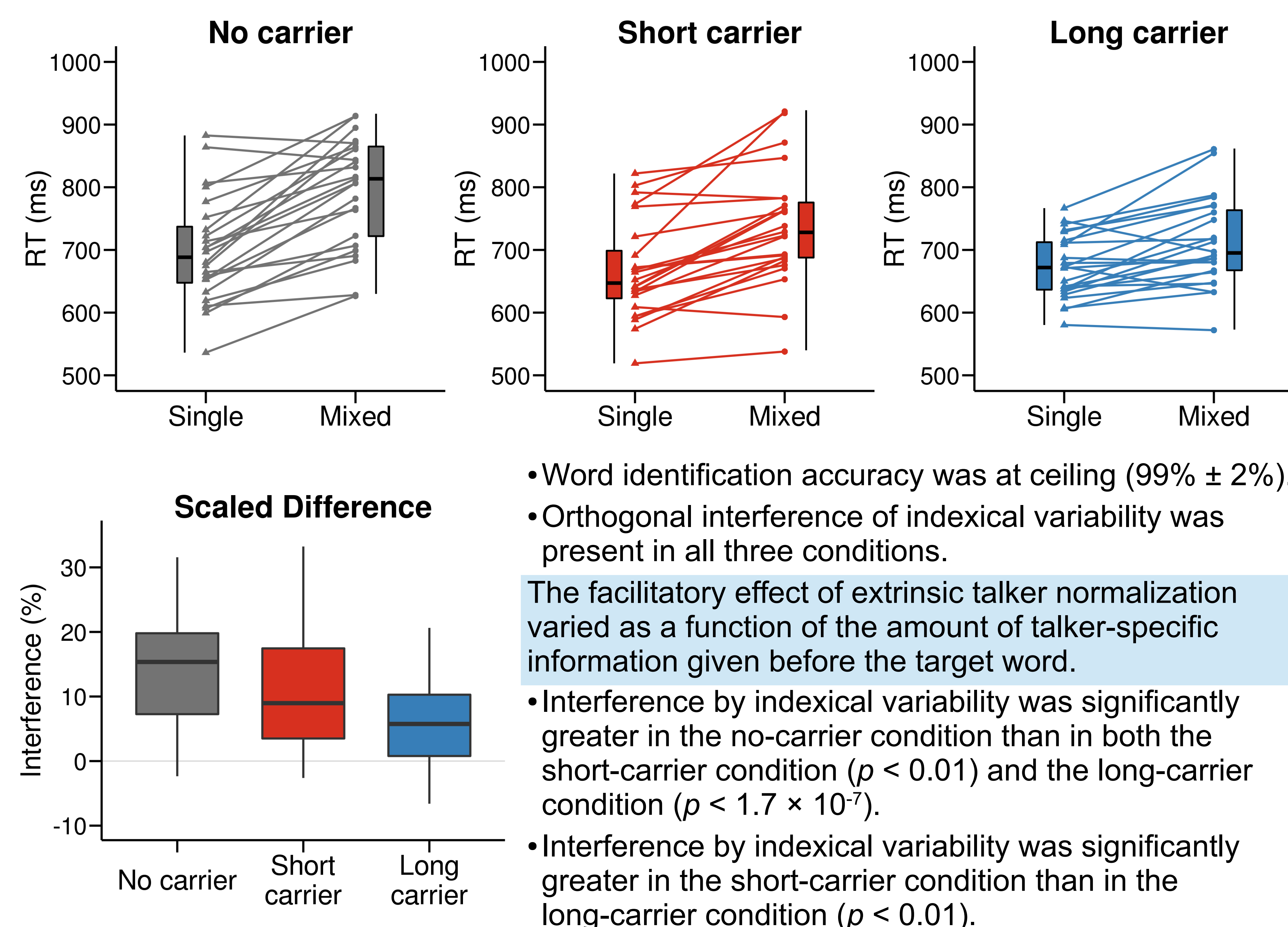
• Long carrier:

- "I owe you a ..." (mean duration: 613 ms)



▲ F1 and F2 trajectory in each talker's tokens of carriers (red: short carrier; blue: long carrier)

Results



Experiment 2

Stimuli

Target words ("boot", "boat") and carrier phrases were recorded by 4 native speakers of American English, the same as those who recorded for Experiment 1.

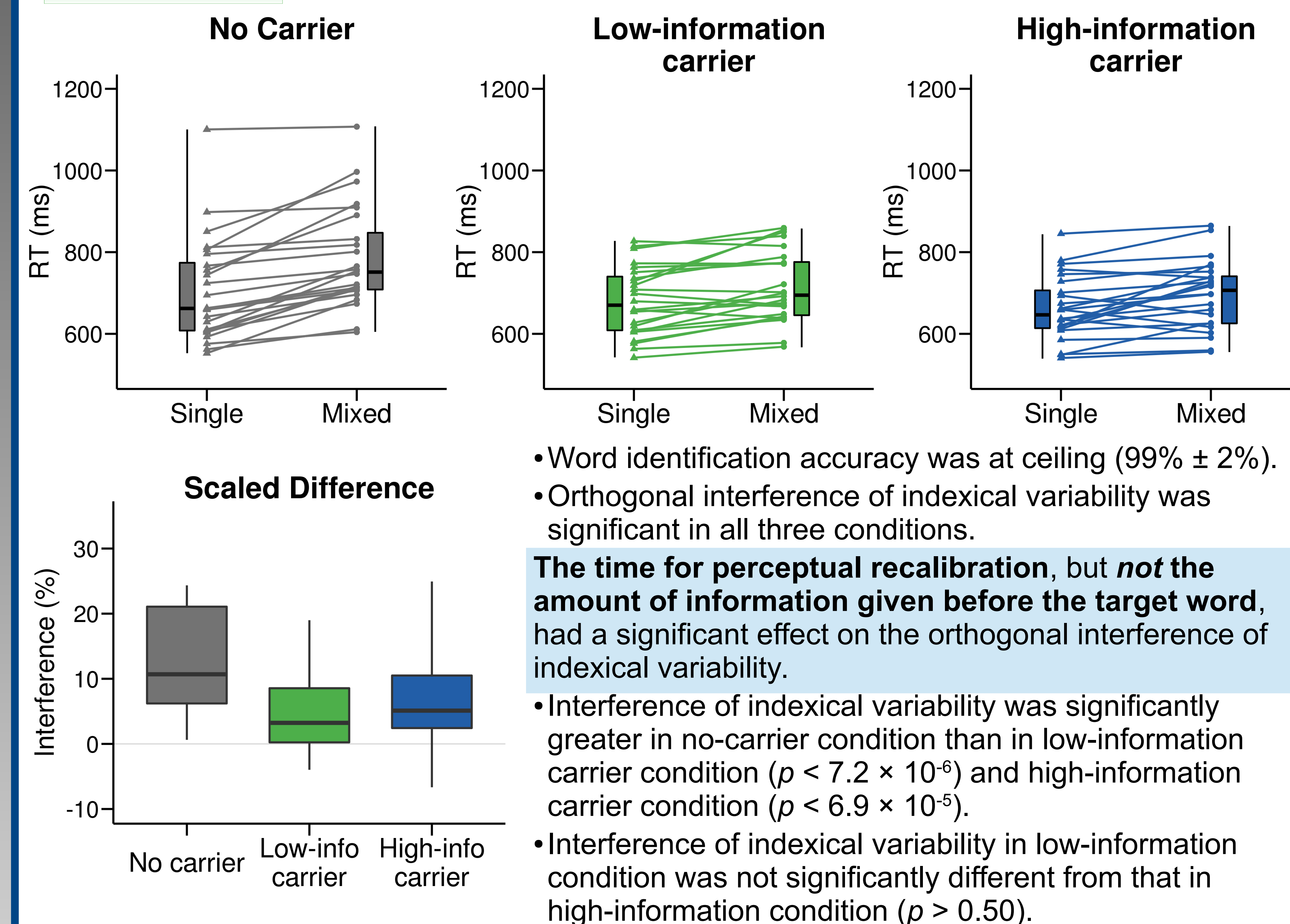
We aimed to separate the effect of the time for perceptual recalibration and the amount of phonetic information given before the target word.

• No carrier

- **Low-information carrier:** Each speaker's recording of "uh" was lengthened to match the length of his/her high-information carrier by using PSOLA method implemented in Praat

- **High-information carrier:** "I owe you a ..." tokens used in Experiment 1 were used in this experiment.

Results



References

Barr et al. (2013). *J. Mem. Lang.* 68, 255-278.
Boersma & Weenink (2008). <http://www.praat.org>
Holt (2006). *J. Acous. Soc. Am.* 119, 4016-4026.
Ladefoged & Broadbent (1957). *J. Acoust. Soc. Am.* 29, 98-104.
Moulines & Charpentier (1990). *Speech Commun* 9, 453-467.
Mullennix & Pisoni (1990). *Perception & Psychophysics*, 47, 379-390.
Nearey (1989). *J. Acoust. Soc. Am.* 85, 2088-2113.
Sjerps et al. (2013). *Attention, Perception & Psychophysics*. 75, 576-587.

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