



Contrastive Hyperarticulation of Low-Rising Tones in Changsha Xiang and Plastic Mandarin

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Introduction

Two low-rising tones (T2 & T6) in **Changsha Xiang (CSX)** have shown signs of an **incipient merger** [1-3].

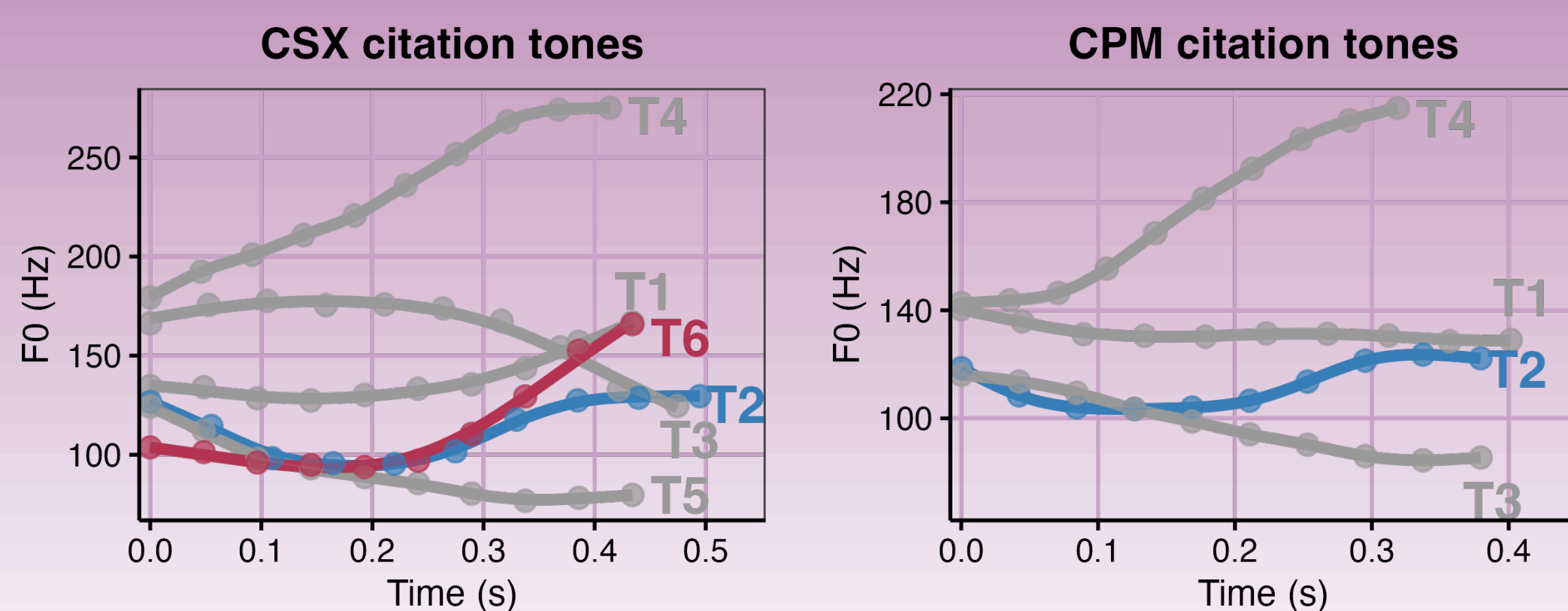


Fig 1. Tone inventories of CSX (left) and CPM (right).

Young CSX speakers also use **Changsha Plastic Mandarin (CPM)** every day, a variety that grew out of Mandarin-Xiang contact [4]. — only one low-rising category:

- **CPM T2** ⊃ {CSX T2 words + some CSX T6 words}.
 - Some of these CSX T6 words contrast with CSX T2 words via aspiration in CPM.

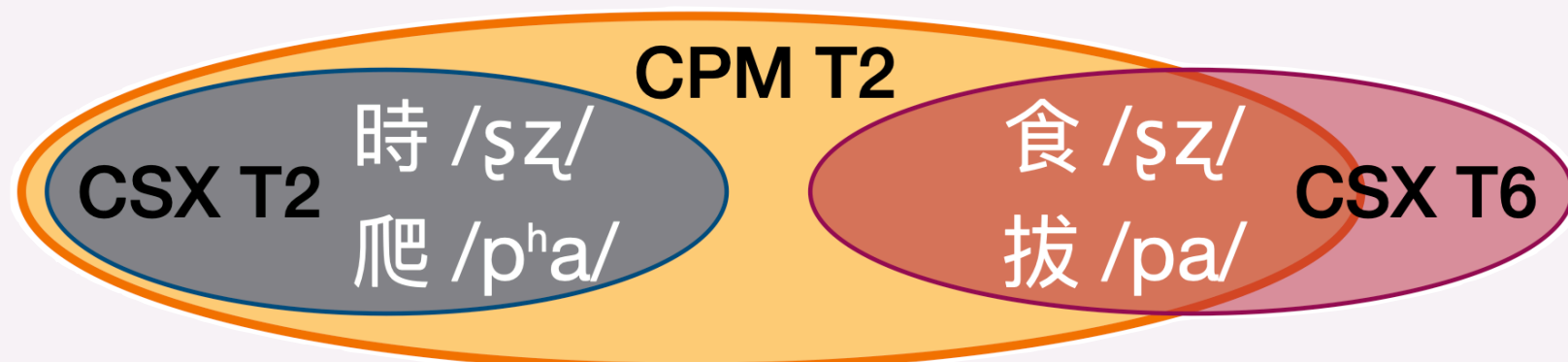


Fig 2. Correspondence relation between CPM T2 and CSX tones.

CPM T3 sandhi [5]: T3 (low-falling) → low-rising / __ T3.

- **Incomplete neutralisation in Standard Mandarin (SM):** Sandhi rising T3 is lower than the lexical rising T2, with the divergence more pronounced toward the endpoint [6]. ⇒ How about CPM sandhi T3?

Three sources of low-rising in CPM:

- **CSX T2 (henceforth T2),**
- **CSX T6 (henceforth T6),** and
- **CPM sandhi T3 (henceforth T3).**

⇒ Spoken words would become highly confusable unless some phonetic differentiation is retained.

Contrastive hyperarticulation (phonetic enhancement in minimal-pair contexts) reveals latent distinctions in suspended contrasts [7].

Research questions

1. Do CSX-CPM bilinguals **merge CSX T2 and T6** in each language? Are they **hyperarticulated** in minimal-pair competitor contexts?
2. In CPM, is **sandhi T3 neutralised** with CSX T2 or T6? Does it induce **hyperarticulation** of CSX T2 or T6, and vice versa?

Method

Participants: 12 CSX-CPM bilinguals (6 females, age 20–27).

Procedure: **Word naming task** [8] online via Gorilla [9] (Fig 3).

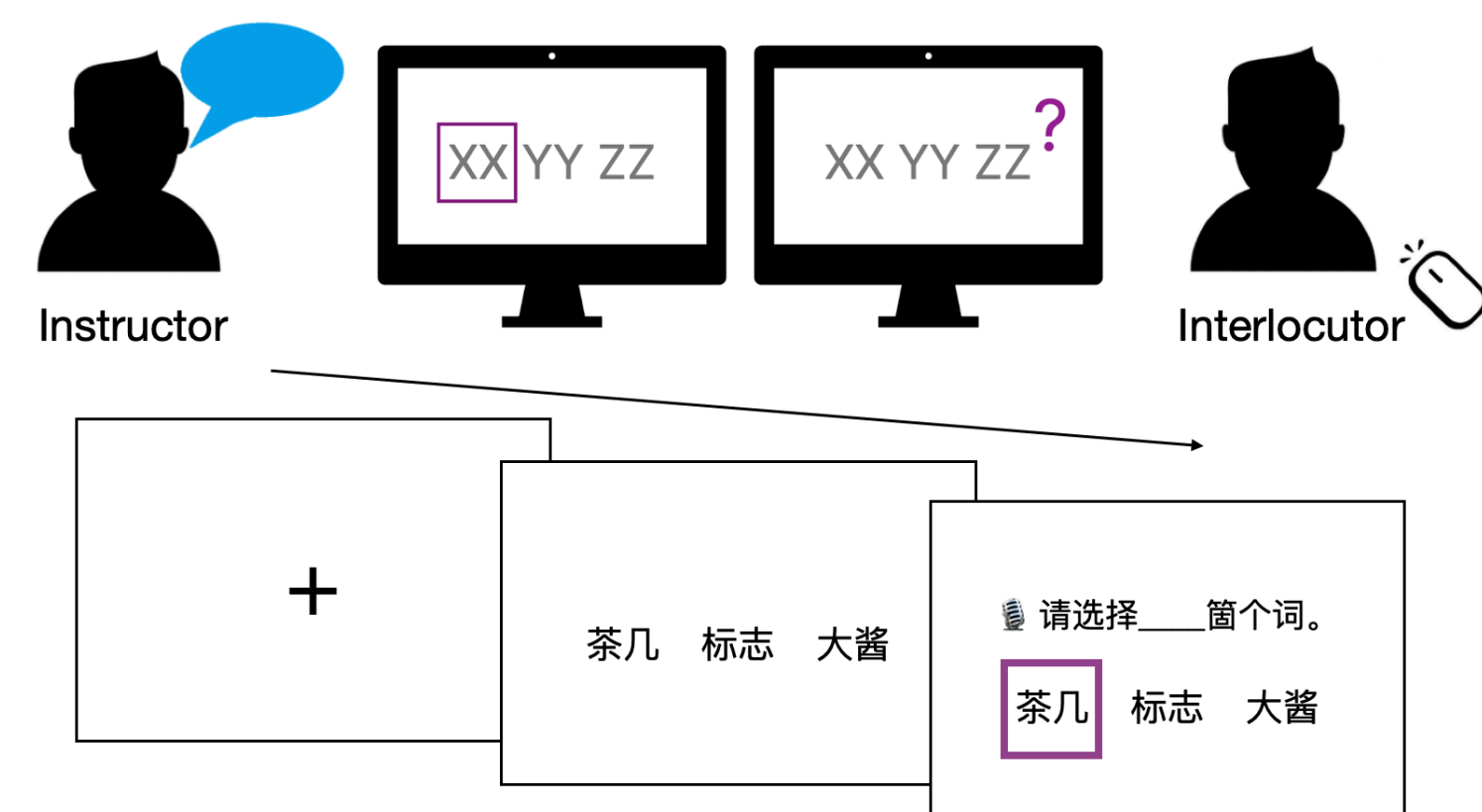


Fig 3. Procedure of the word naming task.

i) Display of 3 disyllabic words (**1 target + 2 distractors**) for 2s.

ii) Target word - highlighted by a purple box.

- Target position (left/middle/right) - randomised across trials.
- Competitor conditions (whether one of the two distractors is a minimal-pair competitor or not):

	Distractor 1	Target	Distractor 2
Competitor-Present	實心 /sz6 ɛɪn1/	時薪 /sz2 ɛɪn1/	菜刀 /ts'ai4 tau1/
Competitor-Absent	桂花 /kuei4 fa4/	時薪 /sz2 ɛɪn1/	菜刀 /ts'ai4 tau1/

*As stated, tone labels (T2, T3, T6) refer to CSX tone categories (source) and apply throughout the poster.

iii) Participants read aloud the prompt, “請選擇 [target] 箇/這個詞” (Please choose the word [target]), believing that they were instructing an interlocutor to identify the target word.

Materials (four sets, see Table 1 for examples):

Session 1, in CSX:

- **T2/T6:** 9 pairs of T2/T6-initial words;

Session 2, in CPM:

- **T2/T6:** equivalent cognates of Session 1 (3 of the 9 pairs contrast in aspiration),
- **T2/T3:** 3 pairs of T2/T3 + T3 words,
- **T6/T3:** 3 pairs of T6/T3 + T3 words.

Table 1. Examples of word pairs used in the study

Pair	Session	σ1 tone (source)	Target/competitor (differ in σ1 tone source*)
1	CSX	T2	時薪 /sz2 ɛɪn1/ (hourly wage)
		T6	實心 /sz6 ɛɪn1/ (solid)
2	CPM	T2	時薪 /ʃz2 ɛɪn1/ (hourly wage)
		T6	實心 /ʃz6 ɛɪn1/ (solid)
3	CPM	T2	眉骨 /mei2 ku3/ (brow ridge)
		T3	美股 /mei3 ku3/ (American stocks)
4	CPM	T6	直飲 /tʃz6 ɪn3/ (direct drinking)
		T3	指引 /tʃz3 ɪn3/ (guidance)

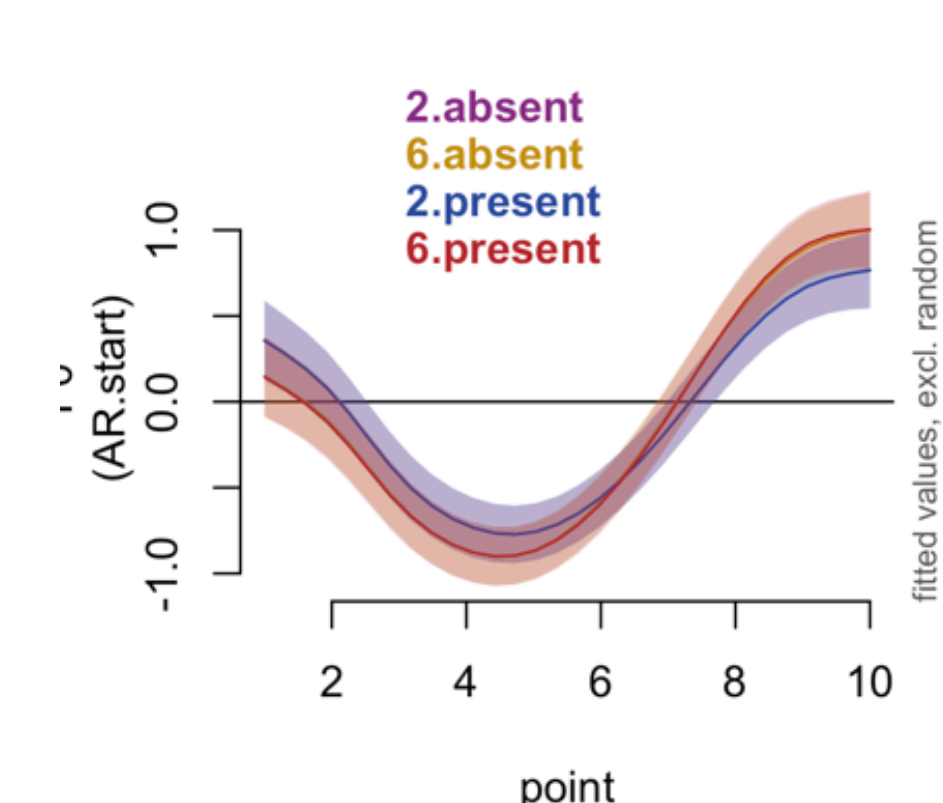


Fig 4. CSX f0 contours: T2 vs T6 across competitor conditions. Shaded bands: 95%-confidence interval.

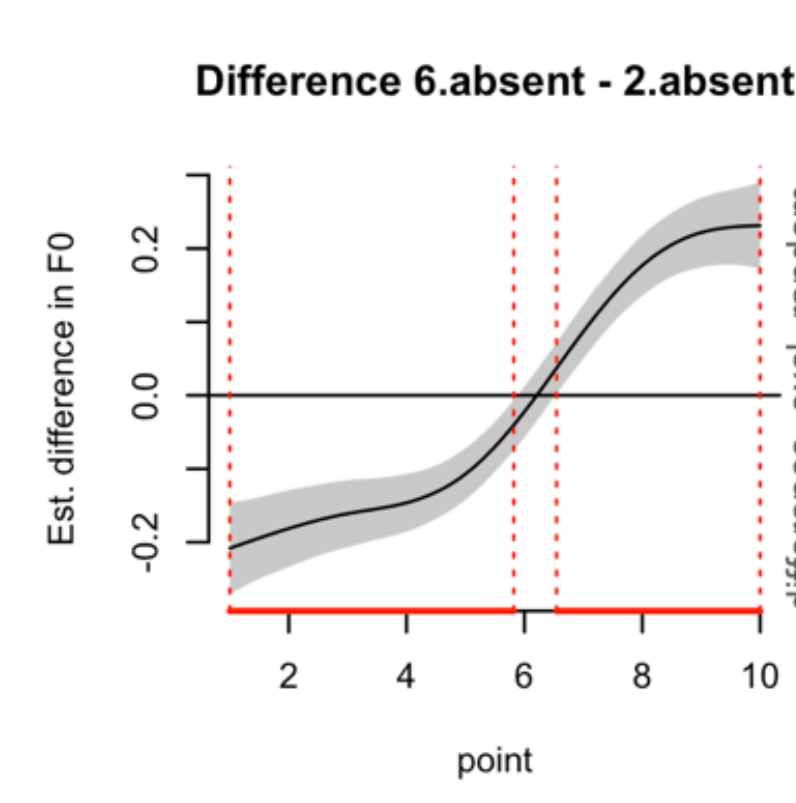


Fig 5. Difference curves between T2 and T6 in CSX in competitor-absent (left) and competitor-present (right) conditions. Significant intervals are marked in red between dotted lines.

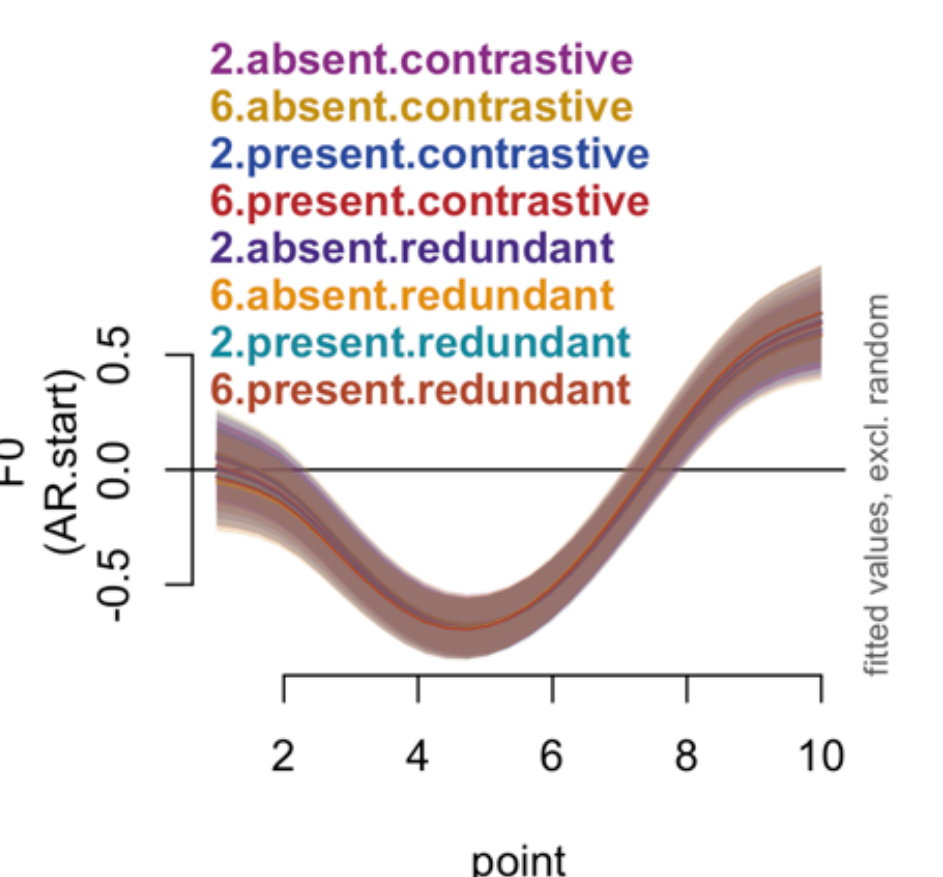


Fig 6. CPM f0 contours: T2 vs T6 across competitor conditions & phonological status of f0.

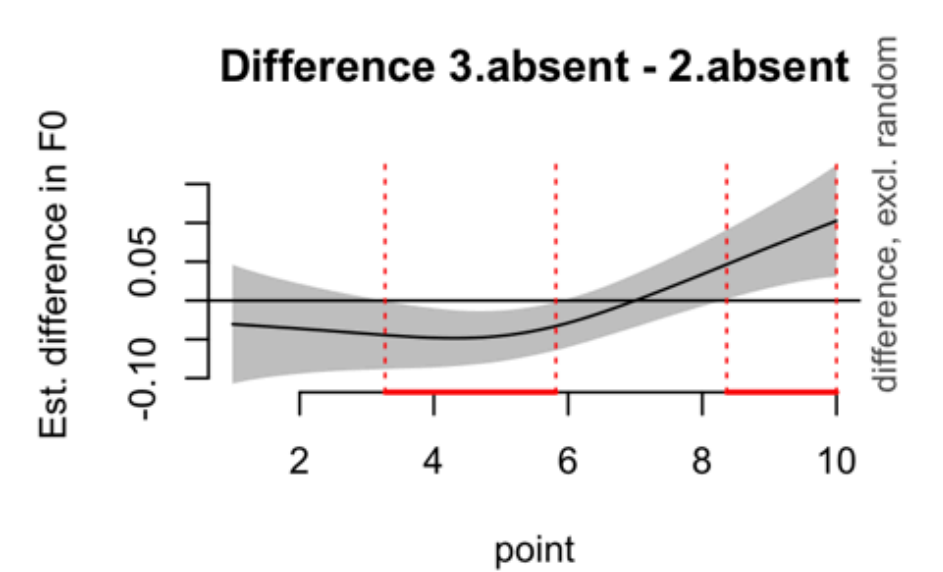


Fig 7. Difference curves between T2 and T3 in CPM. T3 showed lower trough and higher offset than T2 in both competitor conditions.

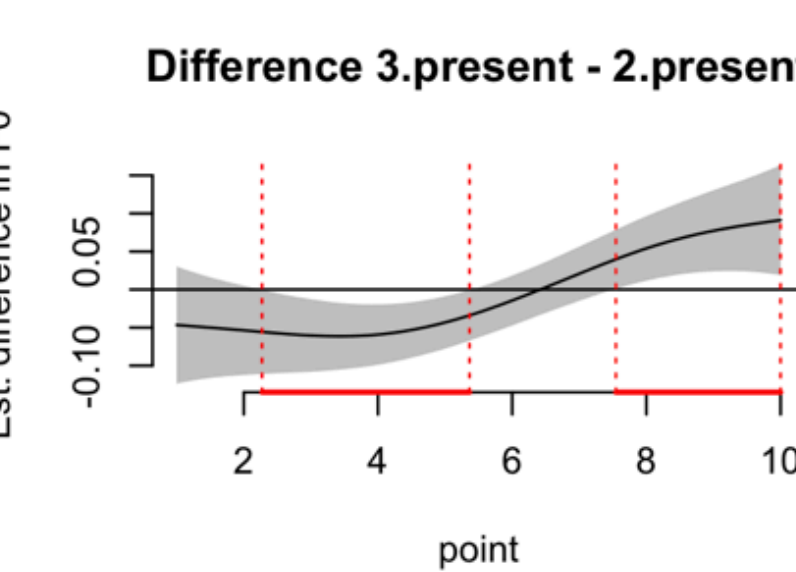


Fig 8. Difference curves between T6 and T3 in CPM. T3 showed no significant difference from T6 in both competitor conditions.

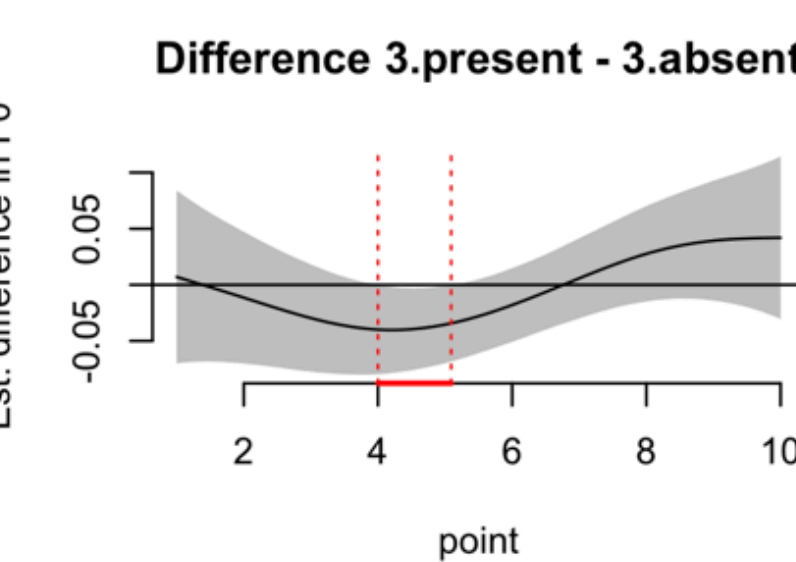
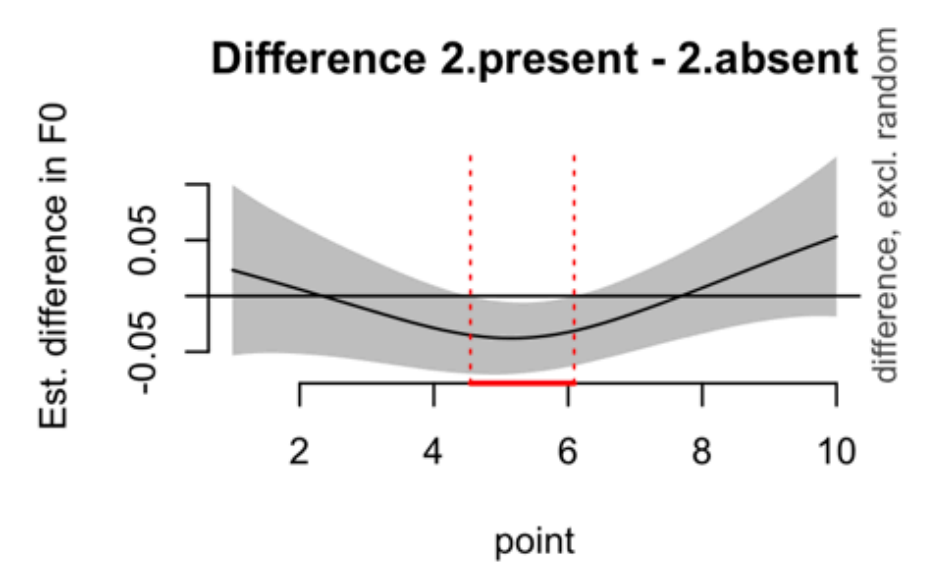


Fig 9. Left: Difference between T2 produced with and without a T3 competitor. Right: Difference between T3 produced with and without a T2 competitor.

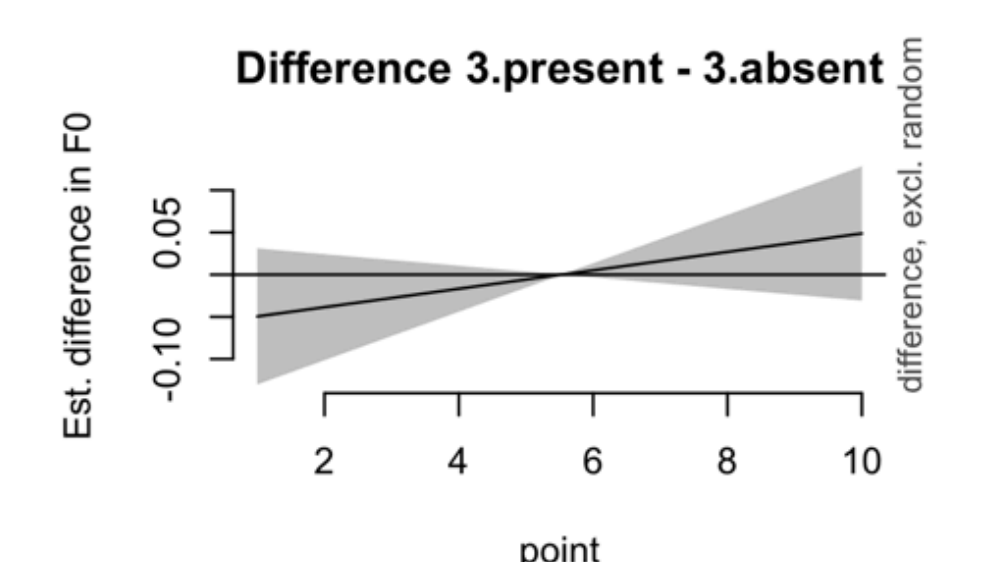
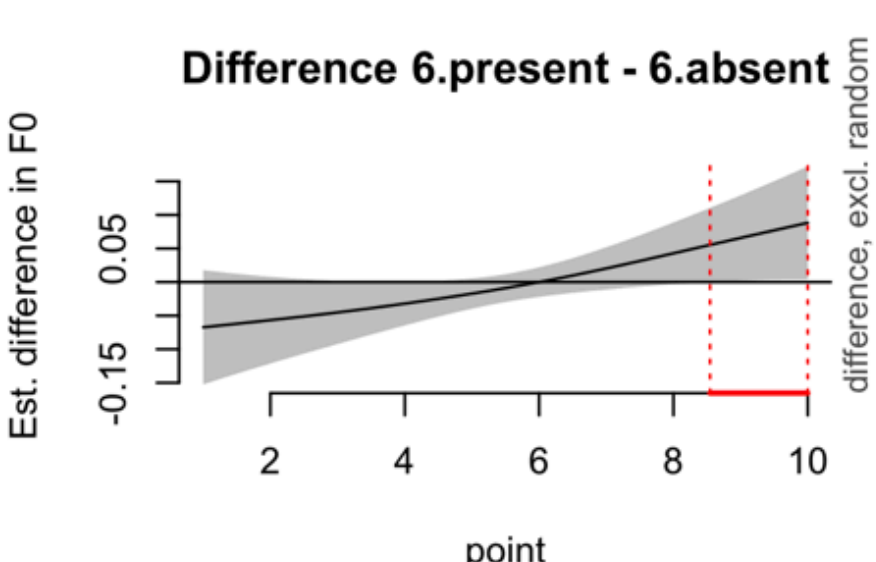


Fig 10. Left: Difference between T6 produced with and without a T3 competitor. Right: Difference between T3 produced with and without a T6 competitor.

Results & Discussion

1. CSX_T2/T6: Not merged yet! **T6 showed a lower onset and a higher offset than T2** (Fig 4 & 5).
2. CPM_T2/T6: no significant f0 contour difference across conditions (Fig 6).
 - Hyperarticulation of T6 induced by T2 - only when just f0 (no aspiration) serves the contrast.
 - **In CPM, T2 and T6 are not as separable as in CSX.**
3. **In CPM, T2 and T3 showed significant differences, whereas T6 and T3 did not** (Fig 7 & 8).
 - Sandhi T3: lower onset, higher offset, and thus steeper slope than T2.
 - Different from the SM sandhi T3 pattern [6, 11].
 - ⇒ Differences between CPM T2 and sandhi T3 **can't be due to residual underlying T3.**
 - Sandhi T3 is acoustically more similar to T6 than to T2. Despite lack of categorical separability for T2 and T6, **subtle distributional differences remain.** ⇒ Representations of T2 and T6 may be gradient.
4. **Asymmetric contrastive hyperarticulation:**
 - **Sandhi T3** induced significant **T2 hyperarticulation** - lower & wider trough (Fig 9, left), and significant **T6 hyperarticulation** - higher offset (Fig 10, left).
 - **T2** induced significant **sandhi T3 hyperarticulation** - lower trough (Fig 9, right), but **T6 did not** (Fig 10, right).
 - Integrating **cascading activation** (planning the target form activates competitors, whose influences spread to later stages of processing) and **gradient representations** (target form is processed based on similarity to stored exemplars):
 - Planning sandhi T3 activates more T6 exemplars (more similar) and fewer T2 exemplars. → More difficult to inhibit the competition from T6 than T2. → Less hyperarticulation of sandhi T3 induced by T6 than T2.
5. **Limitations and future work:** Durational and phonatory properties of tones? Word frequency effect? How about words lacking a minimal-pair competitor?

References

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