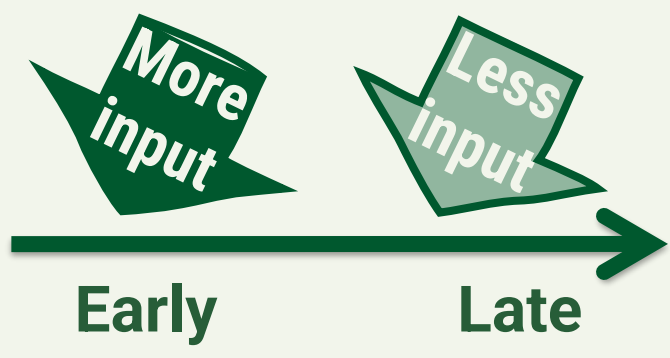


BACKGROUND

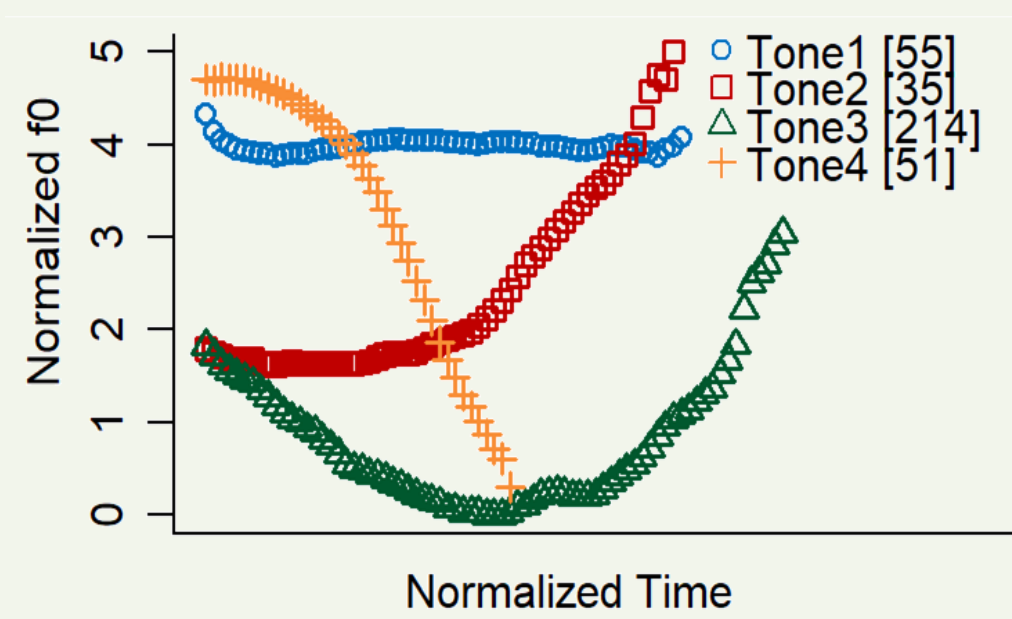
The roles of age and input in phonetic learning

- Age matters
 - Critical Period Theory^[1]
- Input matters
 - Speech Learning Model^[2]
 - But how much and what kind of input is needed?
- Previous evidence: **1-yr school input sufficed** in two-way bilingual education when students receive **authentic teacher and peer input**^[3, 4]
- Does this stay true when the minority language's phonology has a **unique dimension that does not exist** in the majority language?



Mandarin lexical tones

- A non-existent dimension in English!
- Development: Tone1 > Tone4 > **Tone2** > **Tone3**^[5]



A Chinese bilingual program

- Location:** Edmonton (Western Canada)
- Instruction:** **50% Mandarin**, 50% English
- Students:** Mandarin, English, and more
- Teachers:** **"Tones"** are hard for students!"

Research question

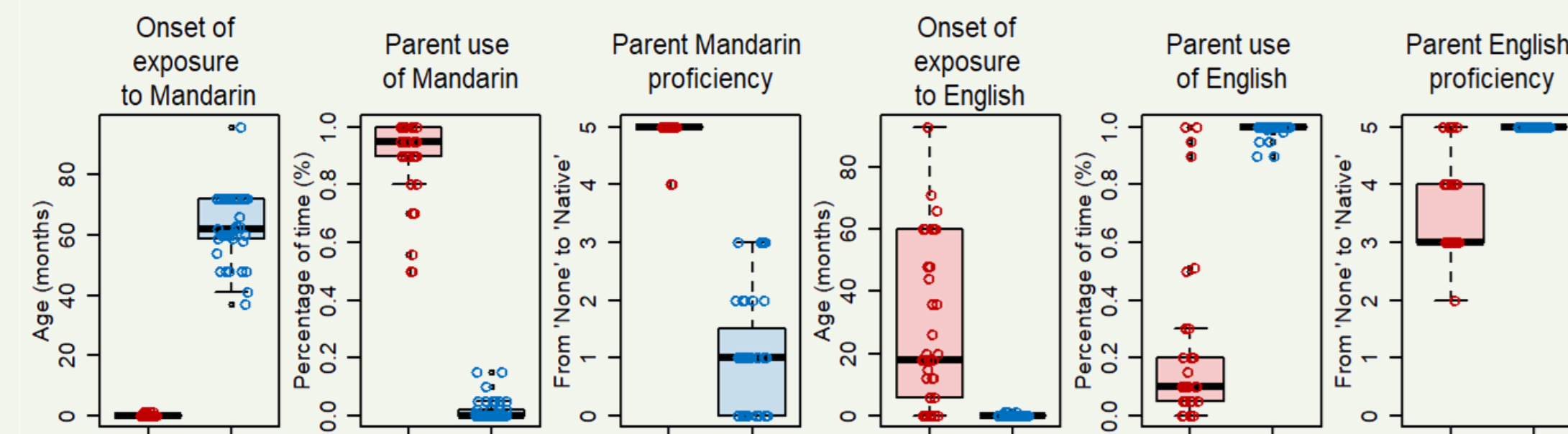
Can **home input** difference be levelled out through **school input** in students' **phonetic** learning of Mandarin tones?

METHOD

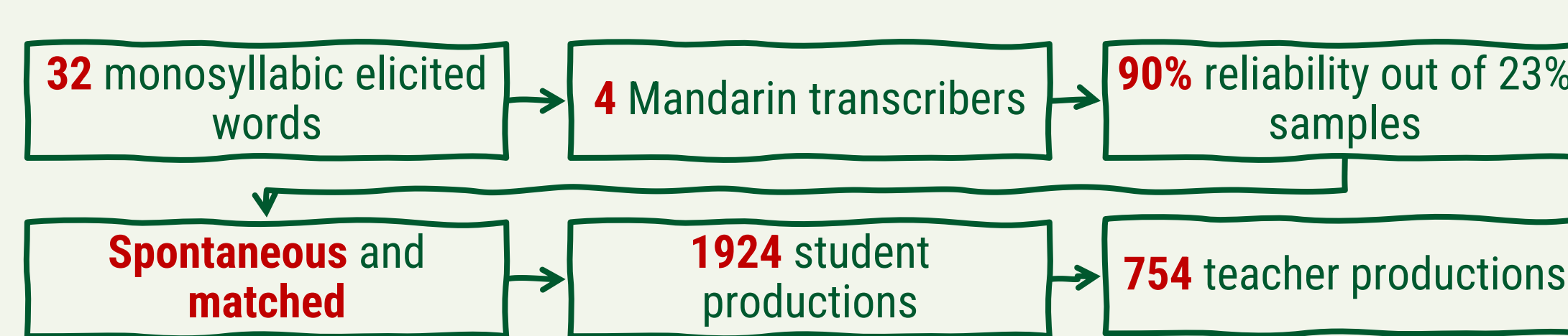
Participants

- 12 Chinese teachers**
- 56 students**
 - 3 grade levels
 - 2 groups
 - The 2 groups **differed** in their home language environments

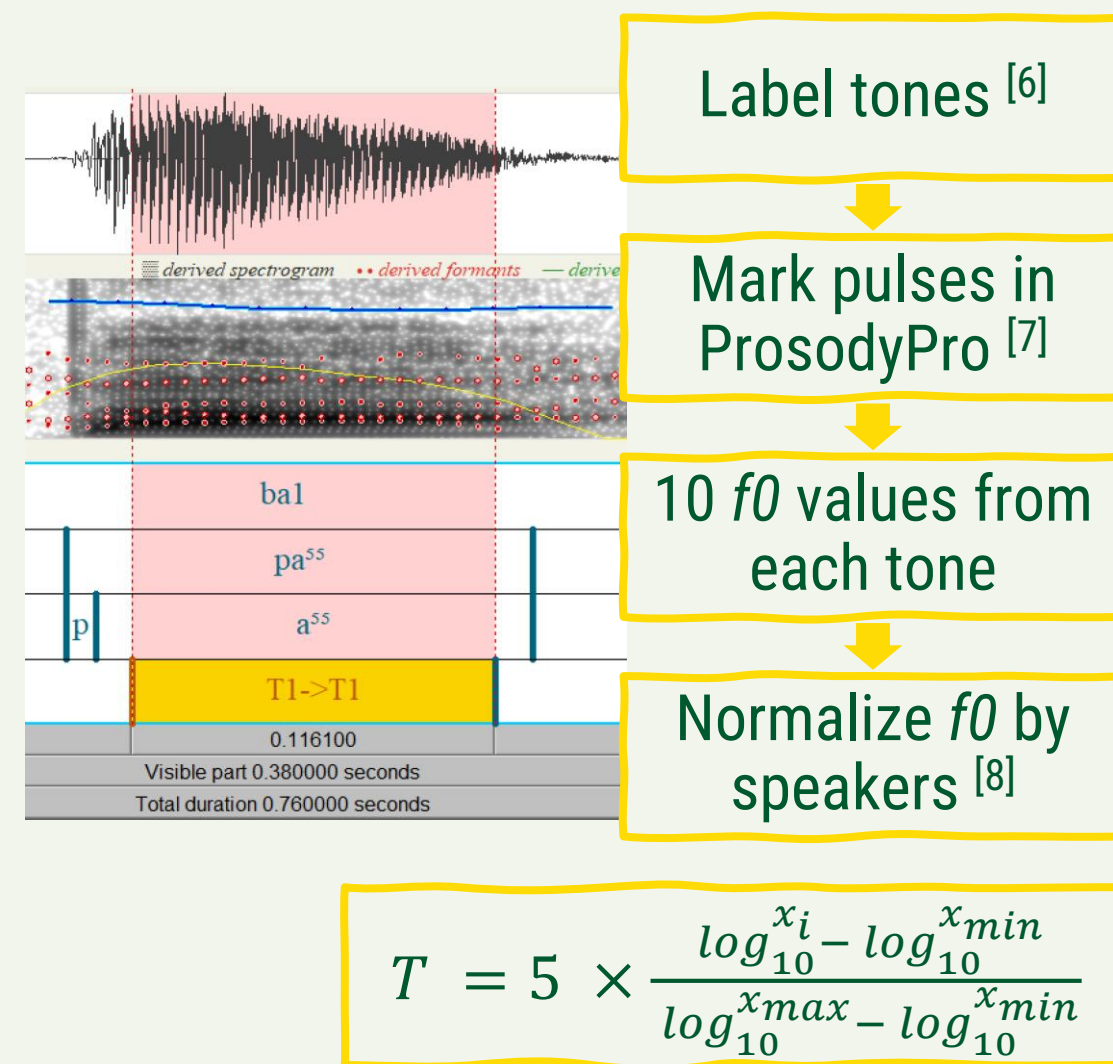
	Heritage Language (HL)	Second Language (L2)
Grade1	N = 15	N = 16
Grade3	N = 11	N = 14
Grade5	N = 12	N = 14



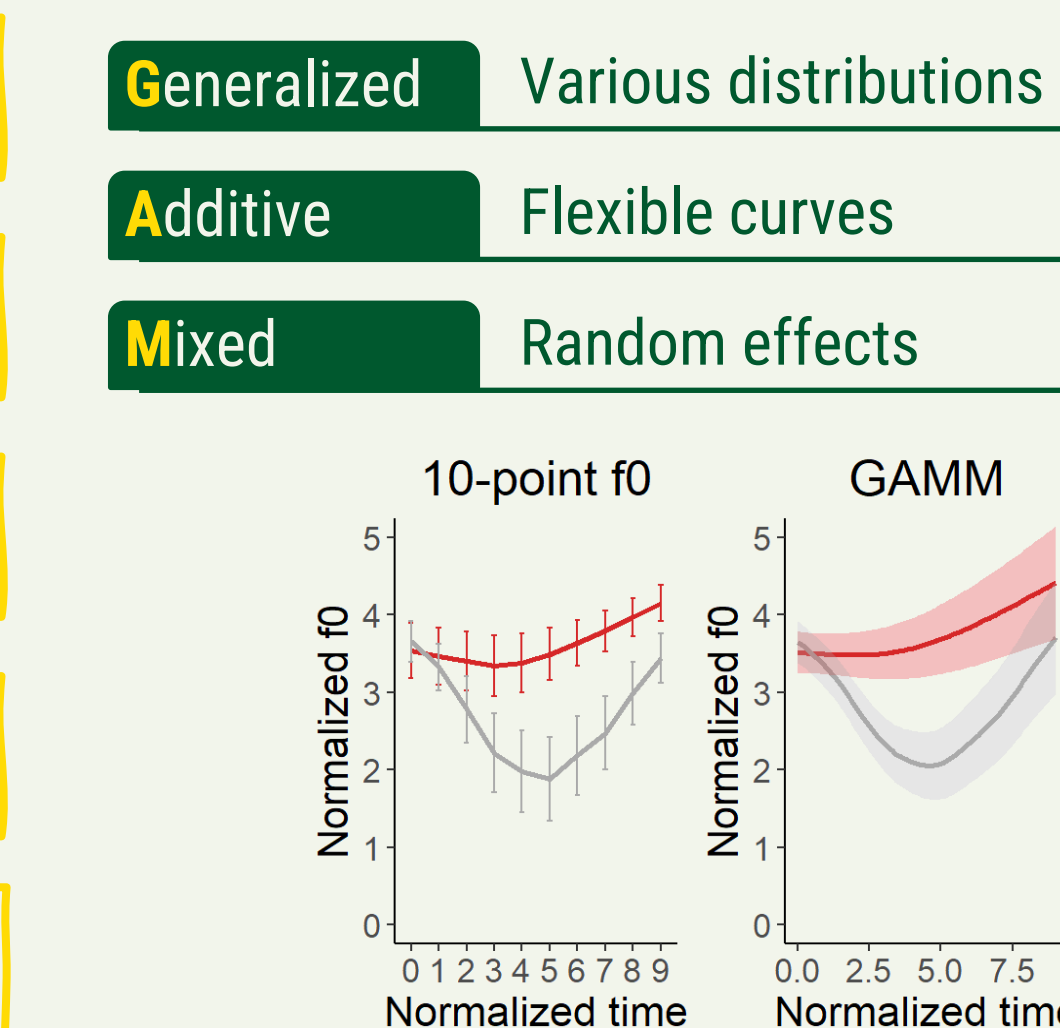
Speech samples



f0 extraction



GAMMs [9]



DISCUSSION

Key findings

- The roles of input interacted with **tone**

Tone1 Did not vary much across grades
Tone4 Resembled teacher references

- Tone1 and Tone4 are **early-developmental**^[3]
- Group differences **levelled out in school**^[1, 2]

Tone2 Converged in higher grades

- Both groups **continued refining** Tone2's phonetic features through schooling

Tone3 Was **less similar** to teachers in the L2 group in higher grades

- Schooling experiences did not help L2 students** refine Tone3's phonetic features



Listen to children's productions

- Results **differ** from previous evidence^[2, 3]
 - For **tone**, the learning of **challenging** targets is more impacted by **home input**, and **school input was insufficient**

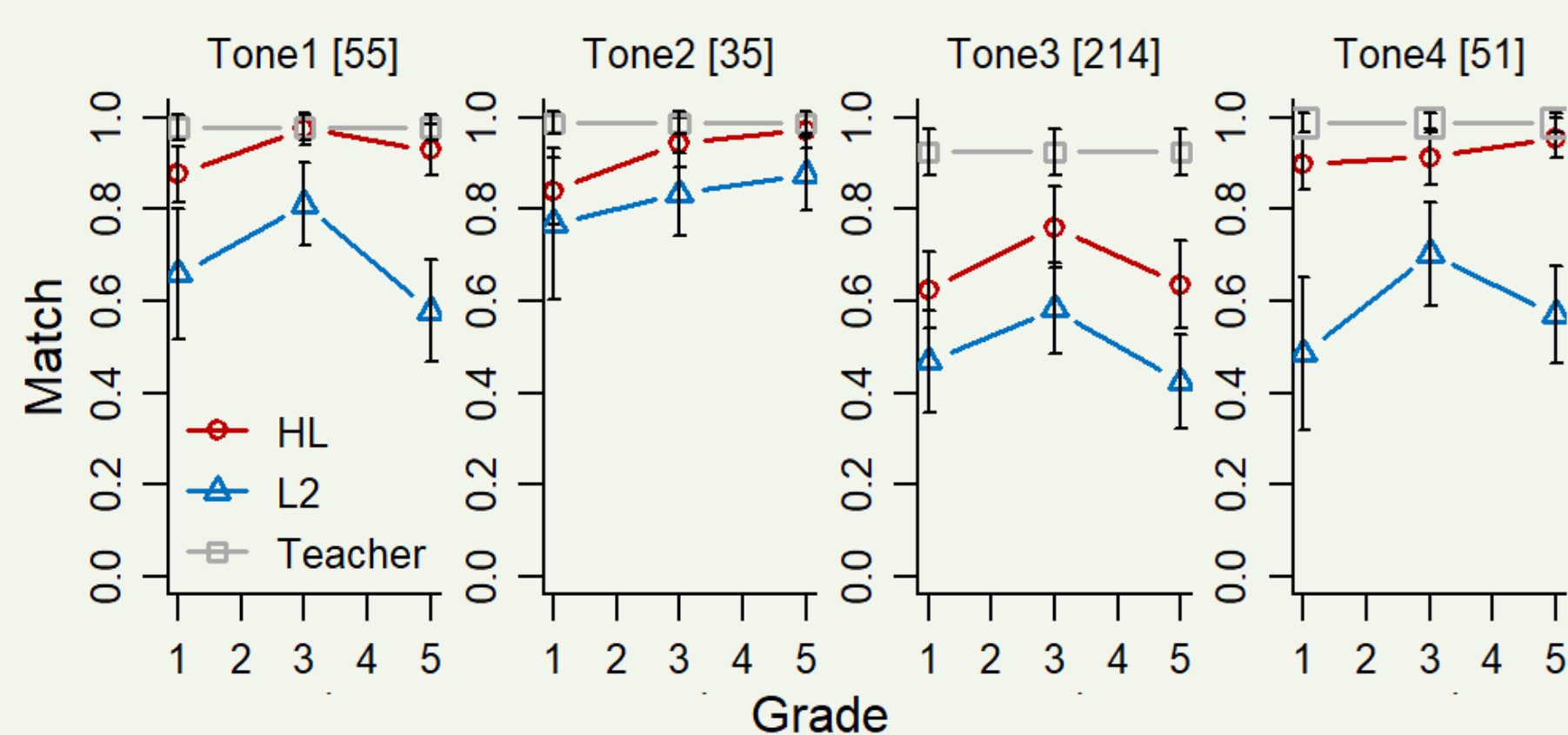
Implications

- L2 speech theories and research should consider **diverse L1-L2 pairs**
- Maybe **age** still has a role
 - It is challenging for non-tonal learners to **assign linguistic significance to suprasegmental information** in L2^[10]
- Bilingual education programs should provide **long-term support for L2 pronunciation learning**

RESULT

Match (accuracy) rates

- Only matched productions will enter acoustic analysis



Modelling f0 contours of matched tones

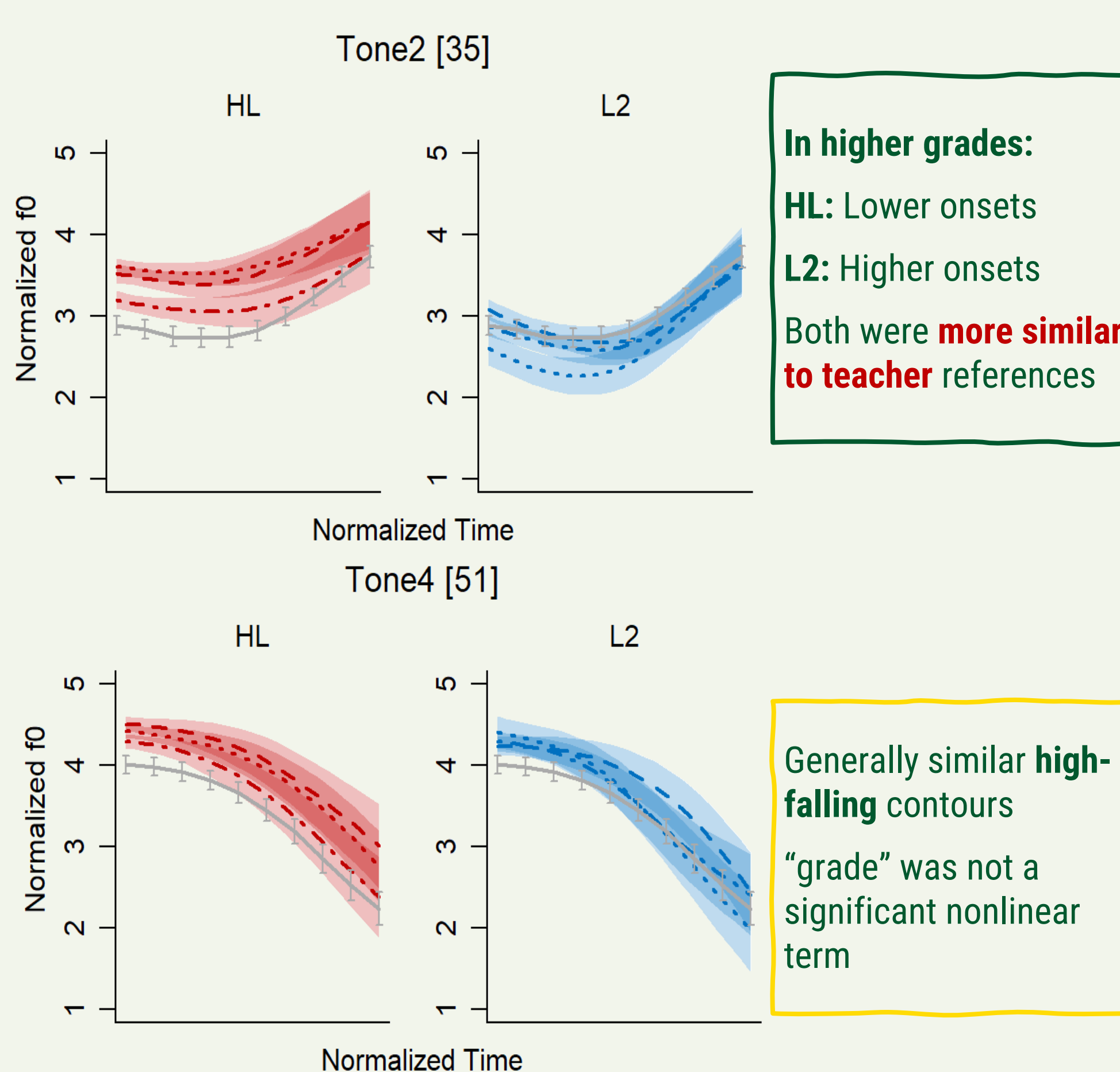
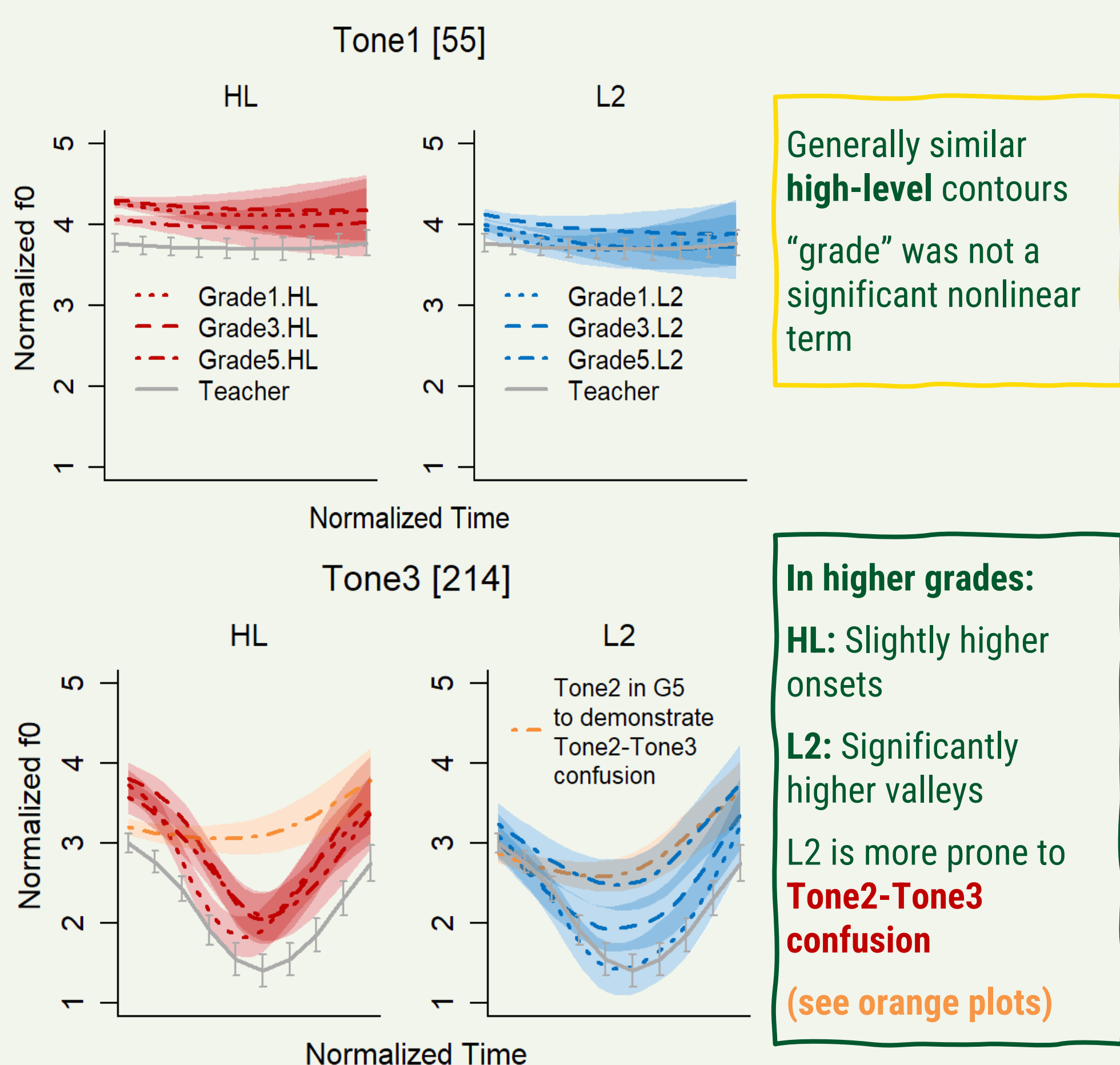
- Fixed effects { **group:** HL and L2 *
grade: Grade1, Grade3, Grade5 *
tone: Tone1, Tone2, Tone3, Tone4
- Random effects { speaker
word token

* Teachers were not included because they did not have a group or grade.

The best-fitting model has three-way interaction of **tone × group × grade**

Group and grade effects in each tone (matched productions): The influences of input **differed across tones**

- The baseline level in each model was **HL.Grade1**. Teachers' **raw data** were plotted in **grey** as a **descriptive reference**.



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