

Lexical stress discrimination by simultaneous and late bilinguals

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Introduction

Categorical perception

Abundant evidence for categorical perception (CP) of phonemes from studies with speech continua.

- **Crosslinguistic differences (L1)**
Language-specific acquisition starting at 6–8 months (e.g. Werker & Tees, 1984; Kuhl 1992).
- **Second language learners (L2)**
Phonological categories can be acquired in an L2, depending on experience, the exact phonetic contrast... (e.g. MacKain, Best & Strange, 1981).
- **Simultaneous bilinguals (2L1)**
Little is known about simultaneous bilinguals: 2 distinct phonological systems (Sundara & Polka, 2008), or predominant reliance on 1 dominant language (Sebastian-Gallés et al., 2005).

Present study: CP of lexical stress

- Many languages (e.g., German) have contrastive lexical stress.
- Some (e.g., French) have no lexical stress.

L1: The presence/absence of contrastive lexical stress affects prosodic perception (adults: Dupoux et al., 1997, infants: Skoruppa et al., 2009; Höhle et al., 2009; Bijeljac-Babic et al., 2012).

L2: Lexical stress difficult to acquire (Dupoux et al. 2008), and results in important individual variability, linked to degree of exposure to spoken language (Boll-Avetisyan et al., 2016).

2L1: Sensitivity to lexical stress depends on language dominance (adults: Dupoux et al., 2010; infants: Bijeljac-Babic et al., 2012, but Abboub et al., 2015).

- Lexical stress is acoustically highly variable
 - Different acoustic cues (intensity, duration, pitch)
 - Depends on position in the word or sentence...
- Do we draw on abstract categories (trochee Xx) vs. (iamb xX) when perceiving stress?

Hypotheses

Populations (adults)	CP?
L1 with contrastive lexical stress	Yes
L1 without contrastive lexical stress	No
Simultaneous bilinguals, 2L1, one with and one without contrastive lexical stress	Individual differences
L1 without , adult L2 with contrastive lexical stress	Individual differences

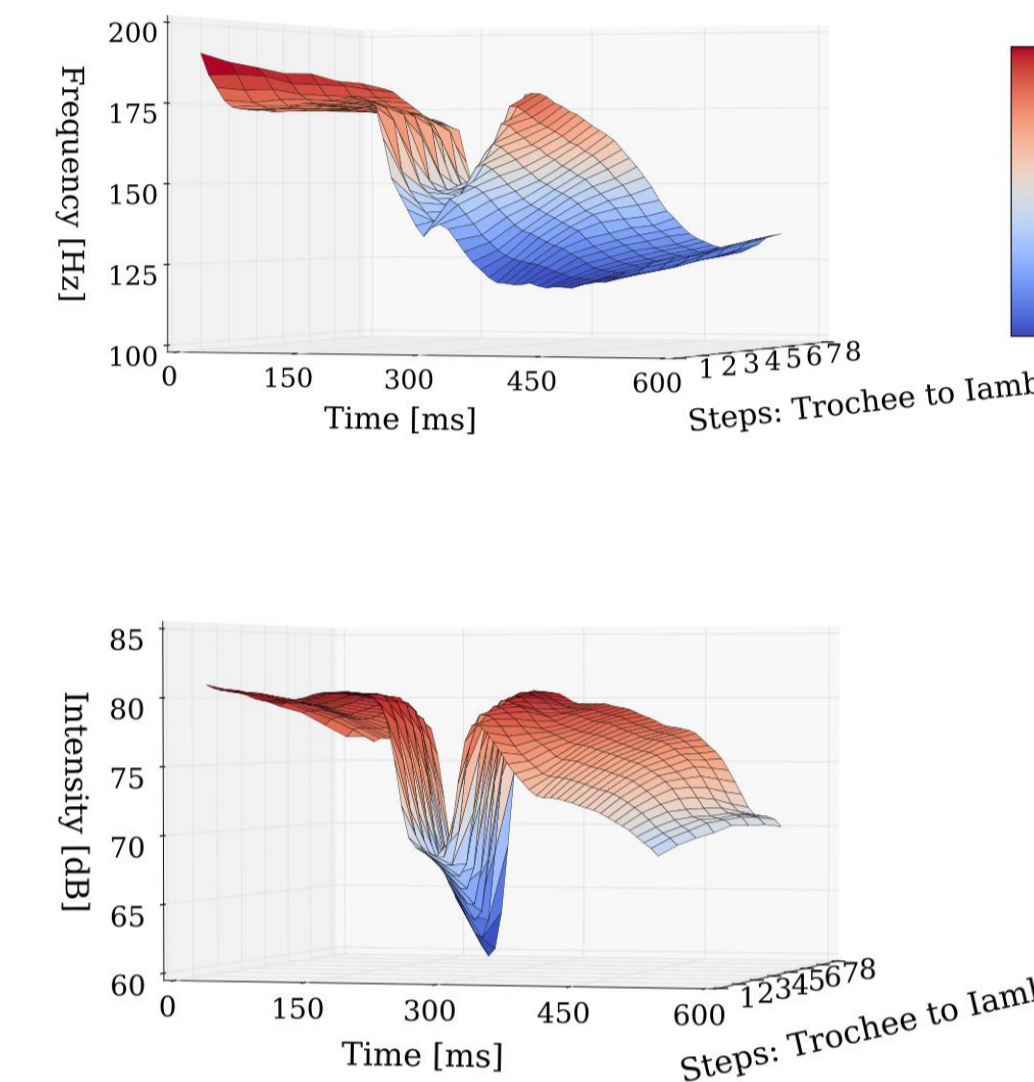
Material

8 step lexical stress continuum of /gaba/

Acoustic manipulation:

Trochee	32	211	91	243
step 2	32	193	93	258
step 3	32	175	96	273
step 4	32	157	98	288
step 5	32	139	100	304
step 6	32	121	103	319
step 7	32	103	105	334
Iamb	32	86	108	350

Table 1: Segment duration in ms



Identification Task

Participants: 40 monolinguals (20 French-, 20 German-speaking)

Task: Is X more similar to A or to B?

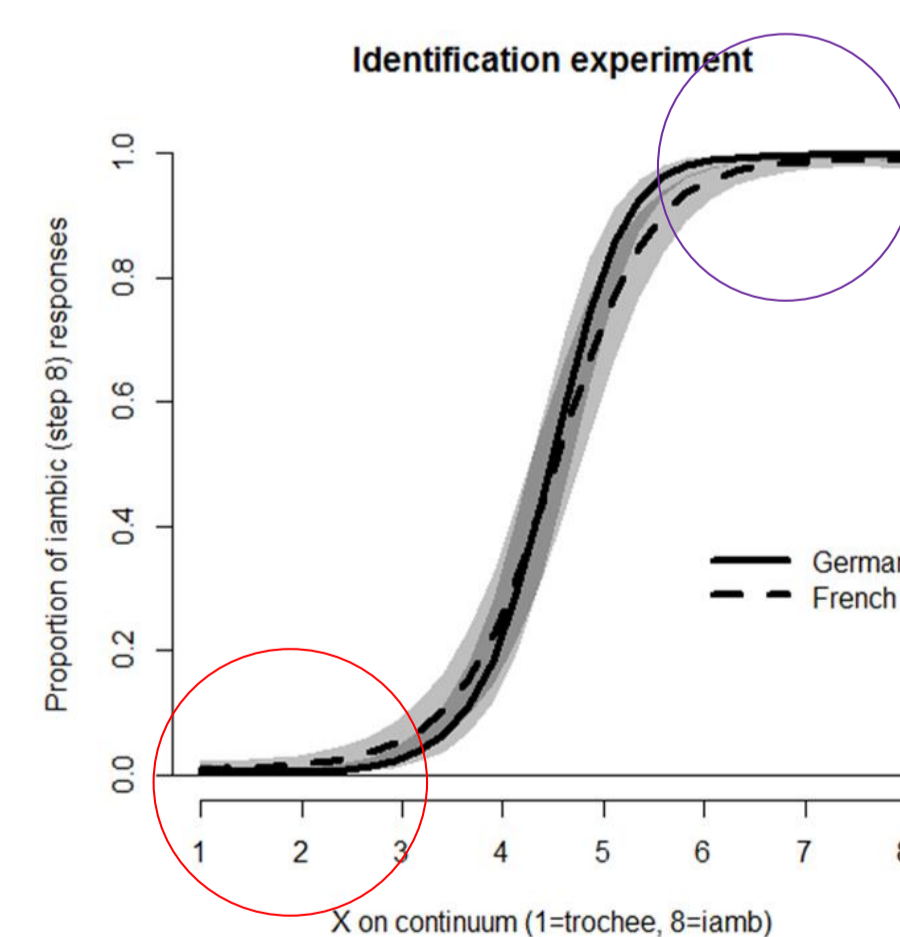
Trial structure: 160 AXB triplets

- X: Any of the 8-steps (1-1-8, 1-6-8, 8-4-1 etc.)
- AB frame: 1 X 8 or 8 X 1

Results

Analysis: GAMMs with X as non-linear smooth factor

- Significant nonlinear effect of X
- Only marginal effect of Group ($\chi^2(2) = 2.42, p = .089$)



Discussion

Probable effect of psycho-physic sensitivity (similar finding by Hallé et al., 2004).

Not ideal task to measure phonological CP.

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Discrimination task

Participants:

- 40 monolinguals (20 French-, 20 German-speaking)
- 40 bilinguals
 - 20 simultaneous French-German bilinguals (2L1)
 - 20 French late L2 learners of German (L2)

Task: Is X = A or B?

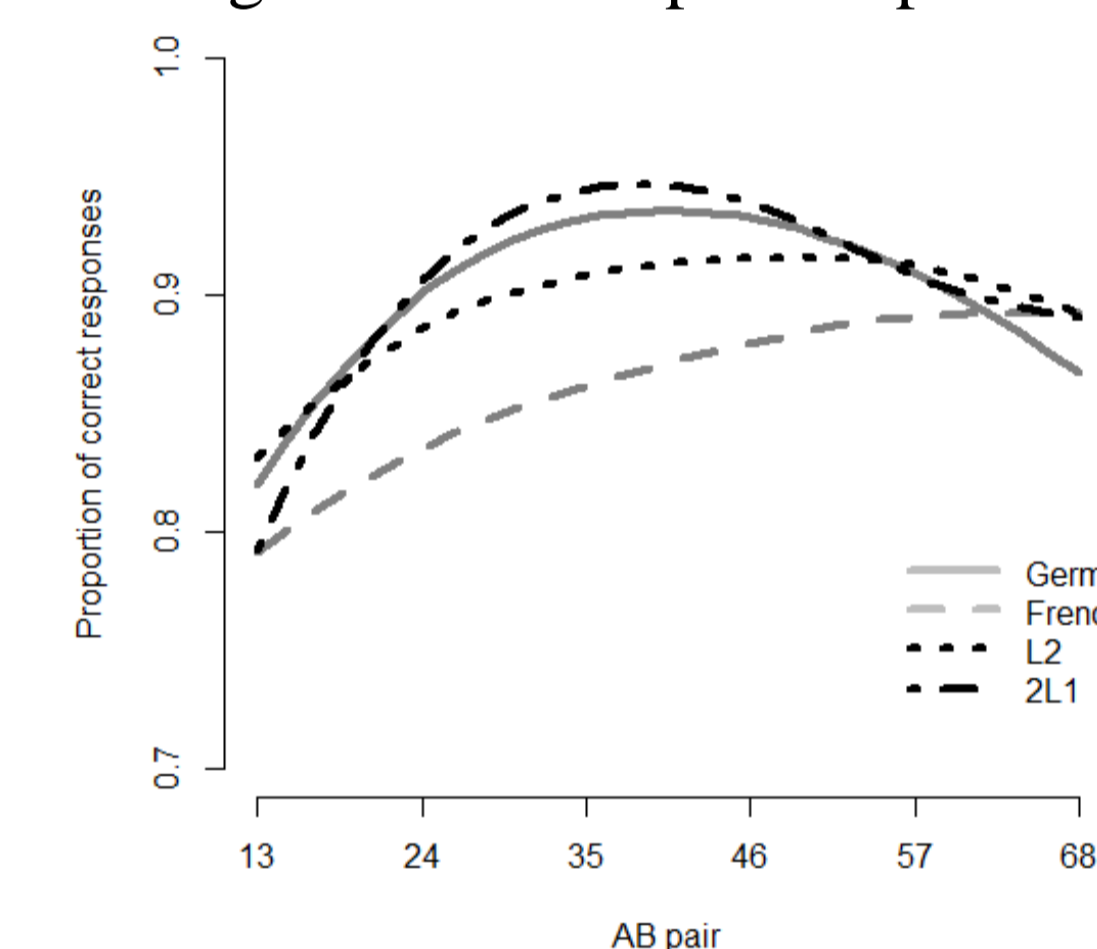
Trial structure: 240 AXB triplets

- X: Any of the 8 steps (e.g. 1-1-3, 2-4-4, 5-5-3 etc.)
- Either A or B are = X, the other A or B is at 2 steps distance

Results

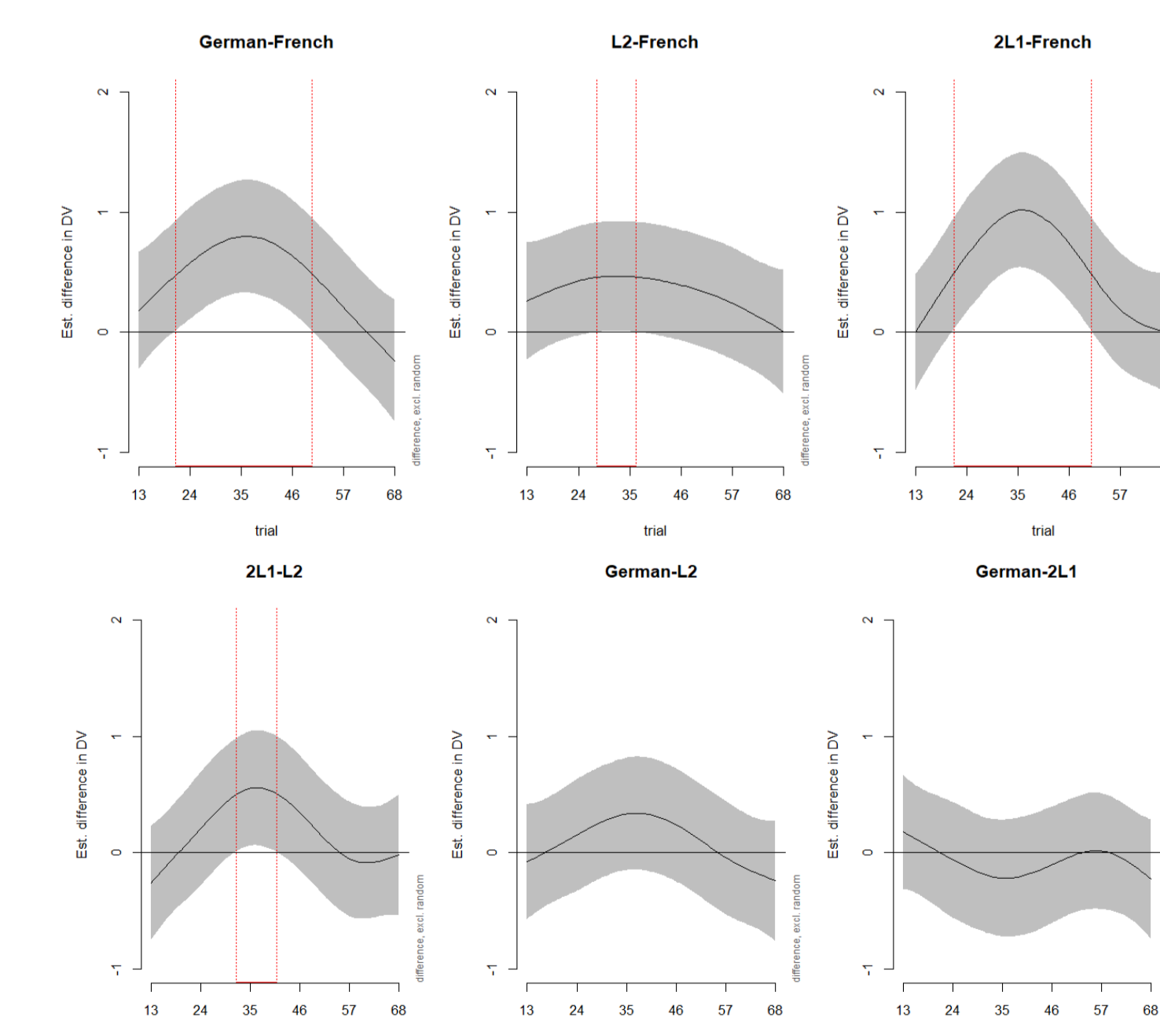
Analysis: GAMMs with AB pair as non-linear smooth factor

- Significant Group * AB pair



Separate comparisons of groups

Difference plots, significant differences in red brackets



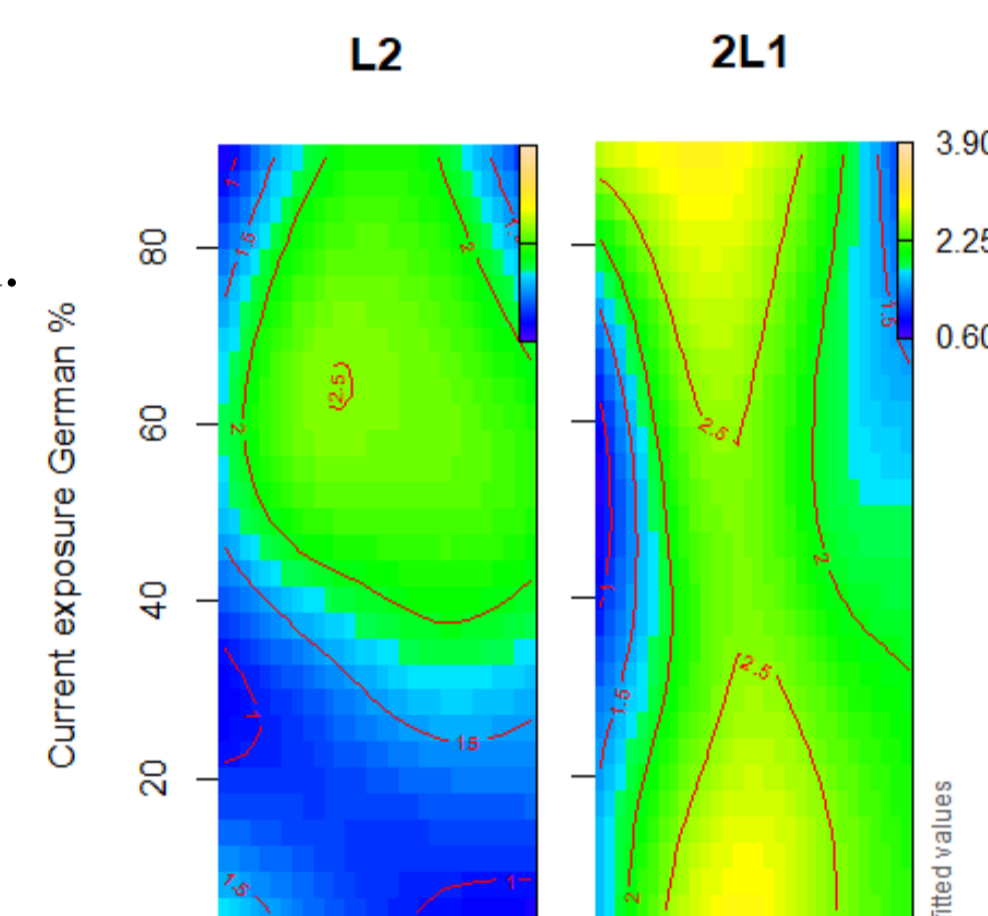
○ Higher accuracy in middle of continuum by German monolinguals and the 2L1 group than by French monolinguals.

○ L2 learners' performance is intermediate between the 2L1 group and French monolinguals.

Individual differences in bilinguals?

Current exposure to German in % (self-estimated) is a predictor of Performance, as model fit improves by adding "current exposure" as smooth factor.

L2 with > 65% exposure to German show higher accuracy (green) when hearing AB pairs from the middle the of continuum.
→ CP



L2 with < 65 % show linear (low = blue) accuracy along the continuum
→ No CP

2L1 show highest accuracy (green/yellow) when hearing AB pairs from the middle of the continuum irrespective of current exposure
→ CP

Discussion

This study of CP of lexical stress complements what we know about phonological CP in mono- and bilinguals:

L1: CP of lexical stress (similar to CP of phonemes/lexical tones) for adults with a contrastive stress language. No CP when language without contrastive stress → reliance on abstract categories

L2: Intermediate performance, with effect of current exposure. Similar to CP of L2 segments after high degrees of L2 exposure (e.g. MacKain, Best & Strange, 1981)

2L1: Simultaneous bilinguals perform like German monolinguals at group level (unlike e.g. Dupoux et al., 2010; Sebastian-Gallés et al., 2005). Next steps: investigate whether there is variability that relates to exposure during participants' infancy.

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