

Native variety influence on speech segmentation in a novel language

Václav Jonáš Podlipský, Kateřina Chládková, Nikola Paillereau, Šárka Šimáčková



Palacký University
Olomouc



Institute of Psychology
The Czech Academy of Sciences



CHARLES
UNIVERSITY

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Parsing foreign speech into words: contributing cues



- Prosodic cues: prominence of syllables (Nazzi et al. 2006)
 - Language-specific vs universal biases
- Statistical cues
 - syllable-to-syllable **transition probabilities (TPs)**, higher within and lower between words (Jusczyk & Aslin 1995, Saffran et al. 1996, Aslin et al. 1998)
 - **phonotactic probabilities (PPs)** of specific segments in the specific positions within a word (Vitevitch & Luce 2004, Dal Ben et al. 2021)

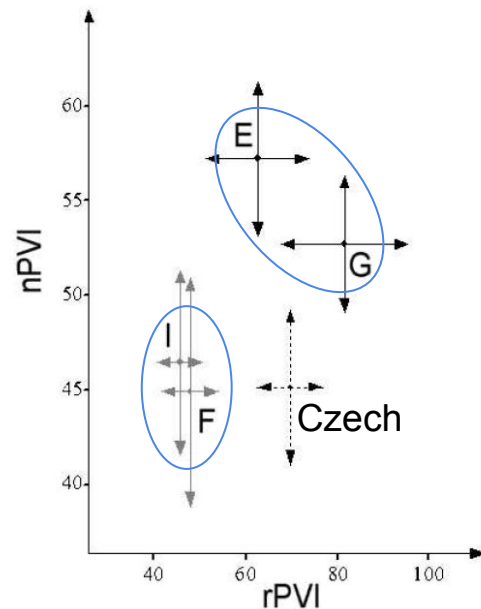
Word segmentation: open questions

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- Language-specific vs universal biases
(Ordin et al. 2017, Matzinger et al. 2021)
 - Compare performance of listeners with different L1 backgrounds
- Ordin & Nespors (2016): language-specific use of prosodic and TP cues for word segmentation in German vs Italian listeners
 - However, they did not control for PPs that of course differ between two different languages
- We remove the PP confound by comparing segmentation by speakers of varieties of the same language

Czech prosody

- Stress placement: word segmentation for speakers of fixed-stress languages understudied
 - Bohemian Czech, Moravian Czech - word-initial stress
 - Silesian Czech - penultimate stress
- Stress cues:
 - Silesian Czech - duration cues stress, unlike in Bohemian and Moravian
 - Czech rhythm not neatly classifiable in terms of the putative classes



from Dankovičová & Dellwo 2007⁴

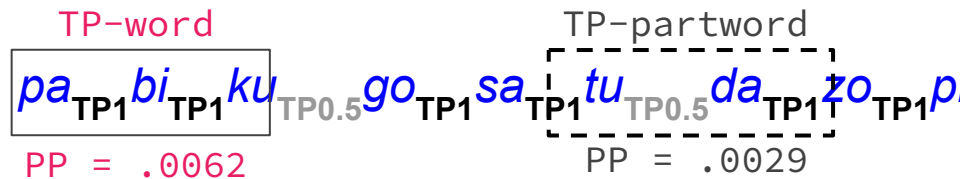
Artificial-language word-learning study

- How do TPs, PPs, and prosodic cues contribute to word segmentation for Czechs?
- How does native variety influence word segmentation?

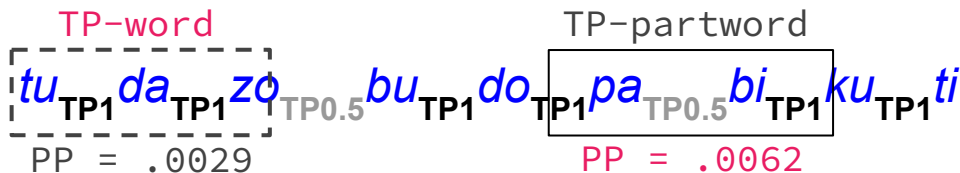
Stimuli - Artificial languages

1. with only **TPs and PPs**
(congruent vs incongruent)
2. with both **statistical**
and prosodic cues
(raised pitch and longer vowels
in **initial or penultimate** syllables),
3. and with **prosodic** cues only
(fixed syllable order)

TP/PP congruent



TP/PP incongruent



Artificial-language word-learning study

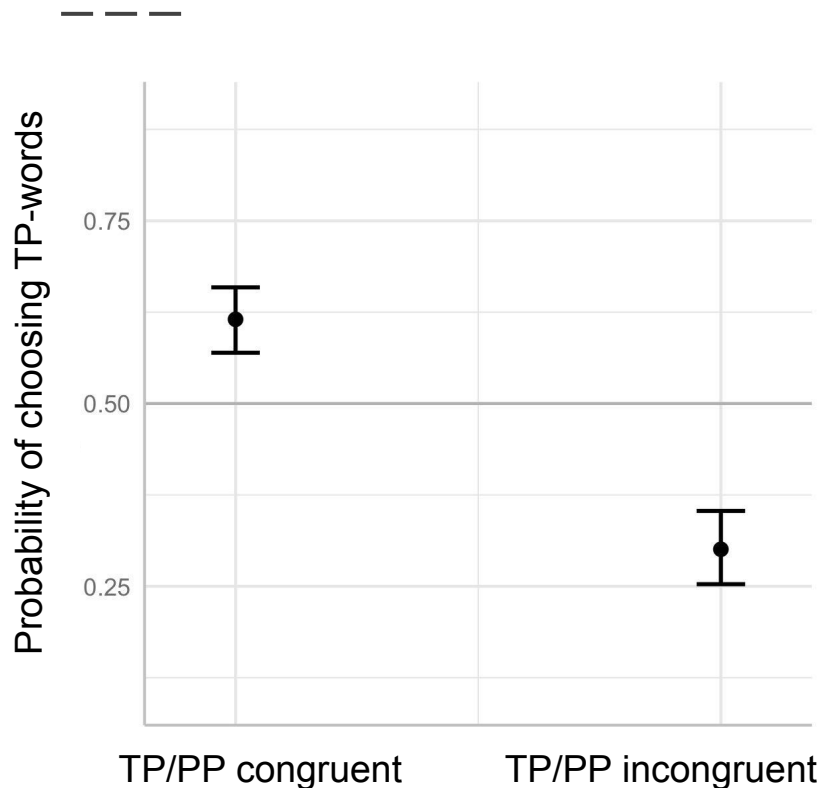
Participants

- Bohemian ($n = 333$), Moravian ($n = 109$), and Silesian ($n = 158$) Czech adults

Procedure: online experiment

1. Exposure to 3.3 minute streams of speech in the artificial languages
 - naturally-produced, automatically-concatenated but fully-coarticulated, with edited F0 and segment durations
 - near-replicating the languages by Aslin et al. 1998
2. 2AFC post-test (6 trials only)
 - participants heard pairs of syllable triplets and decided which one was more likely a word in the heard language

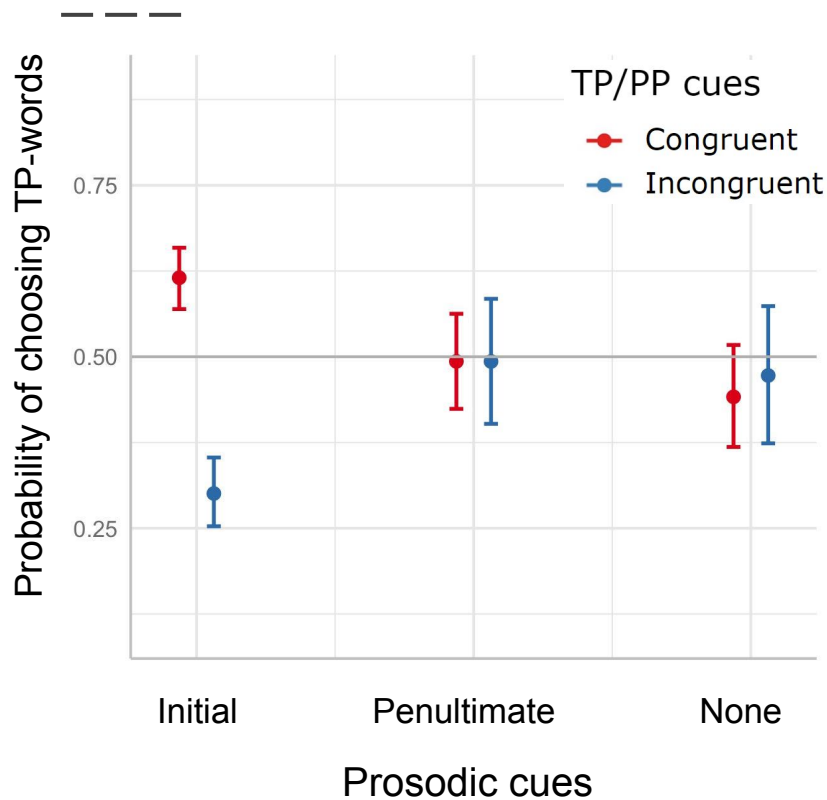
Results: TP and PP cues



**glmer (SL ~ prosody * variety *
TP/PPcongruence + trialCentralized +
(1 |subject) + (1|item))**

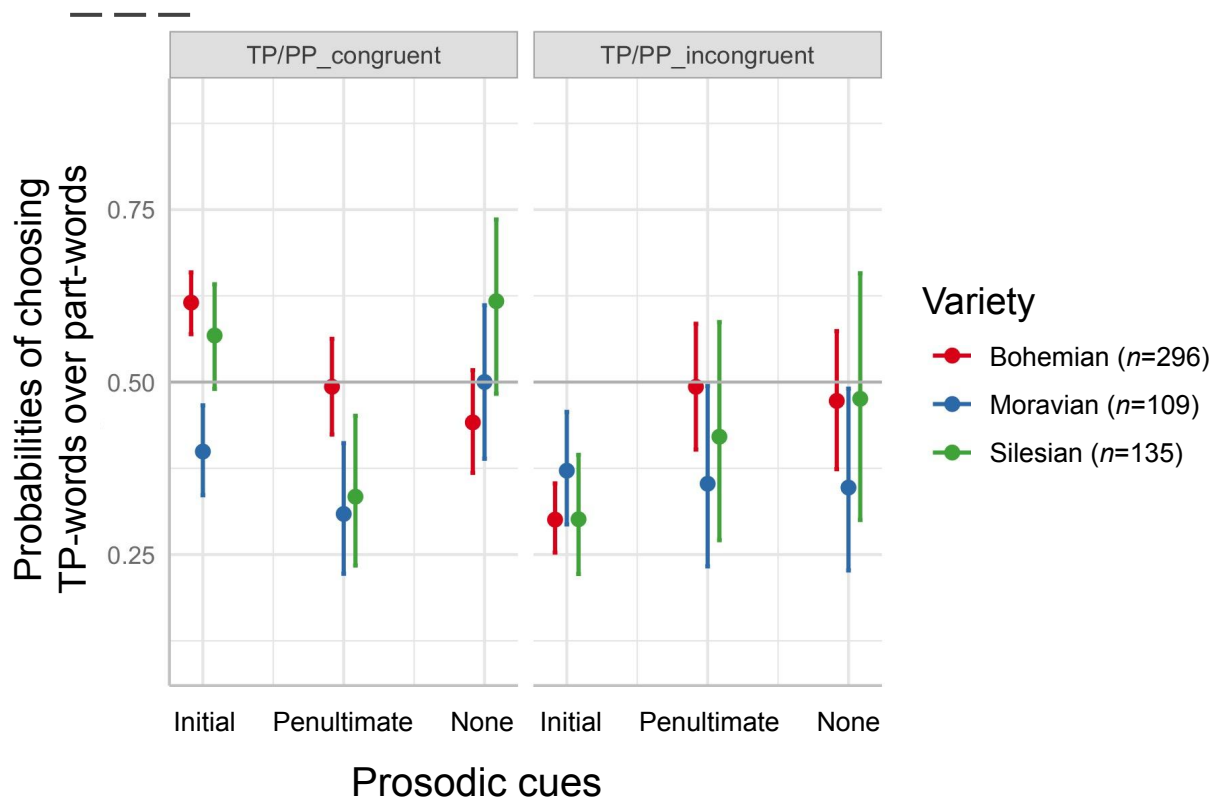
- effect of TP/PP Congruence:
 $t = -2.136, p = .033$
- TP-words were recognized above chance only when reinforced by PP cues
- when TP and PP cues were in conflict, participants were more likely to avoid TP-words, i.e. PP cues overrode TPs

Results: TP and PP cues * Prosodic cues



- TP/PP congruence mattered especially with initial prosodic prominence
- TP/PP-congruence * Prosody interaction: $t = 2.292$, $p = .022$

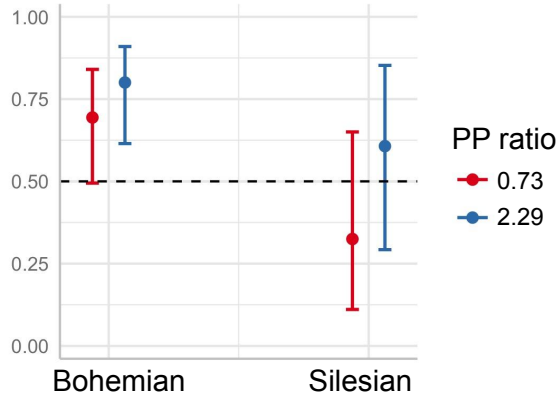
Results: TP and PP cues * Prosodic cues * Variety



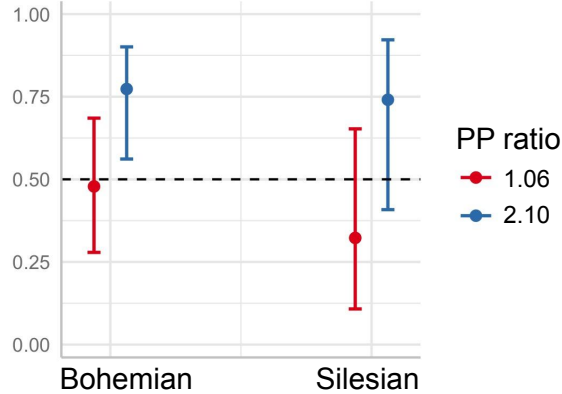
- Further interaction with Variety:
 $t = -2.021, p = .043$
- initial prosodic prominence facilitated segmentation in the Bohemian (initial-stress) variety.

Results: with Prosodic, without TP cues

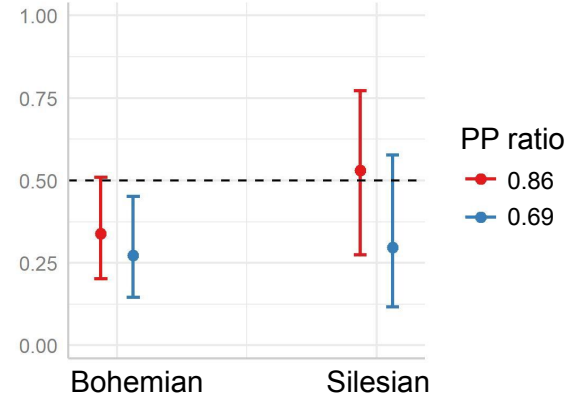
Initial over Final



Initial over Penult.



Penult. over Final



- Variety: $t = -1.728, p = .084$
- PP ratio: $t = 1.663, p = .096$

- PP ratio: $t = 2.647, p = .008$

- **Bohemian Czech** (initial stress) listeners ($n = 37$) showed a preference for
 - initial rather than final prosodic prominence *gosatu > zopiti*
 - initial rather than penultimate (if aided by PP) *pabiku > tudazo*
 - final rather than penultimate (final lengthening) *satuda > dopabi*
- **Silesian Czech** (penult. stress) listeners ($n = 23$)
 - no preference for a particular prosodic prominence found

Conclusions

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- controlling for L1 PPs, for a so-far uninvestigated adult population, **transitional probabilities** between syllables may not universally function as robust cues for parsing speech into words (using the methodology of Aslin et al. 1998)
- unless they are complemented by **phonotactic probabilities** (cf. Dal Ben et al. 2021) and/or **prosodic prominence**
- fixed-stress language, falling outside rhythm classes: the role of prosody in word segmentation seems to be influenced by the stress placement and cue use in the **native variety**
- follow-up: data on infant perception being collected

Thank you!

vaclav.j.podlipsky@upol.cz
chladvkova@praha.psu.cas.cz

www.speakinlab.cz

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