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Investigating multilingual vocalic space: Spectral overlap and separation in three vowel systems

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10 YEARS 
Faculty of English at AMU

Introduction



- Part of a larger project investigating multilingual acquisition in L1 Polish – L2 English – L3 Norwegian learners
 - *Cross-linguistic influence in multilingualism across domains: Phonology and syntax* (CLIMAD)
- Longitudinal design (T1, T2, T3)
- Aim: exploration of cross-linguistic interactions in multilinguals' vowel systems

Overview: L3 vowel acquisition



- Missaglia 2010
 - Italian-German child bilinguals, L3 English
 - Bilingual advantage for learning vowels in L3
- Sypiańska 2013, 2016
 - L1 Polish, L2 Danish and L3 English
 - Focus: Polish /ɛ/, Danish /e, ɛ, æ/ and English /e/
 - L3 influenced L1 and L2 vowel formants,
 - Multilinguals' vowel space subject to reshaping in all three languages -> less peripheral, different from monolingual baseline data

Overview: L3 vowel acquisition



- Kopečková et al. 2016
 - L1 German, L1/L3 Polish (Heritage speakers), L2 English
 - Great individual variability in vowel production in all three languages
 - Language status is a factor shaping multilingual phonological subsystems

Study design: participants



- 24 participants at T1 (17 at T3), aged 20
 - 11 female participants reported on here
- 1st-year students in Norwegian modern language BA programmes
 - University of Szczecin
 - Poznań College of Modern Languages (WSJO)
- L1 Polish, L2 English (B1/B2), L3 Norwegian (A1)
- Participant profiles:
 - Language History Questionnaire LHQ (Zhang et al. 2014)

Study design: time points



- Three data collection times (T1, T2, T3)
 - T1 in November 2021
 - T2 in March 2022
 - T3 in June 2022
- Each time, two days essentially in fieldwork mode
- About one hour at each session
 - speech production
 - speech perception
 - grammaticality judgements

Study design: tasks



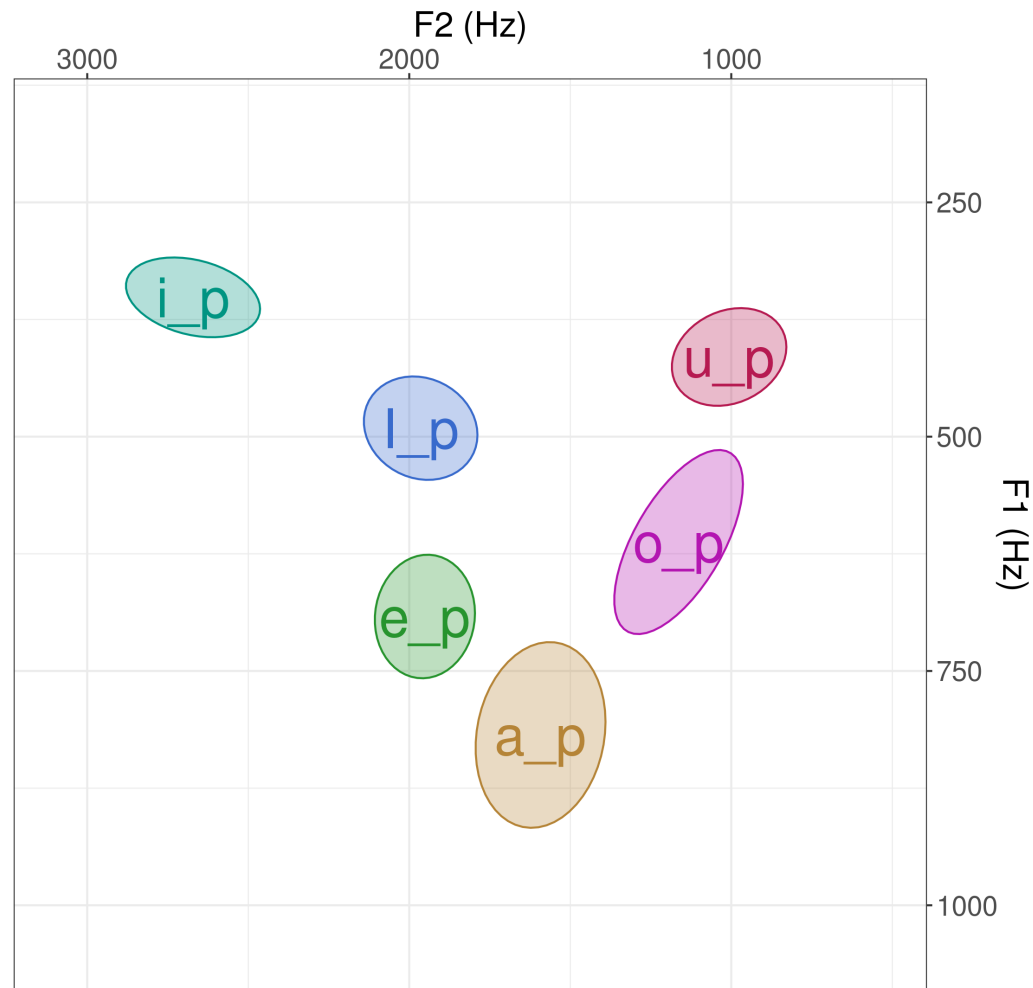
- Several tasks
- Here, reading of sentences and isolated words to elicit all the vowel phonemes in the 3 languages
- Real and nonce words in (dVd, dVt) in a carrier sentence and in isolation, e.g.
 - There is the same vowel in “god” and “dod”
- Three language blocks (L1, L2, L3)

Processing and measurement

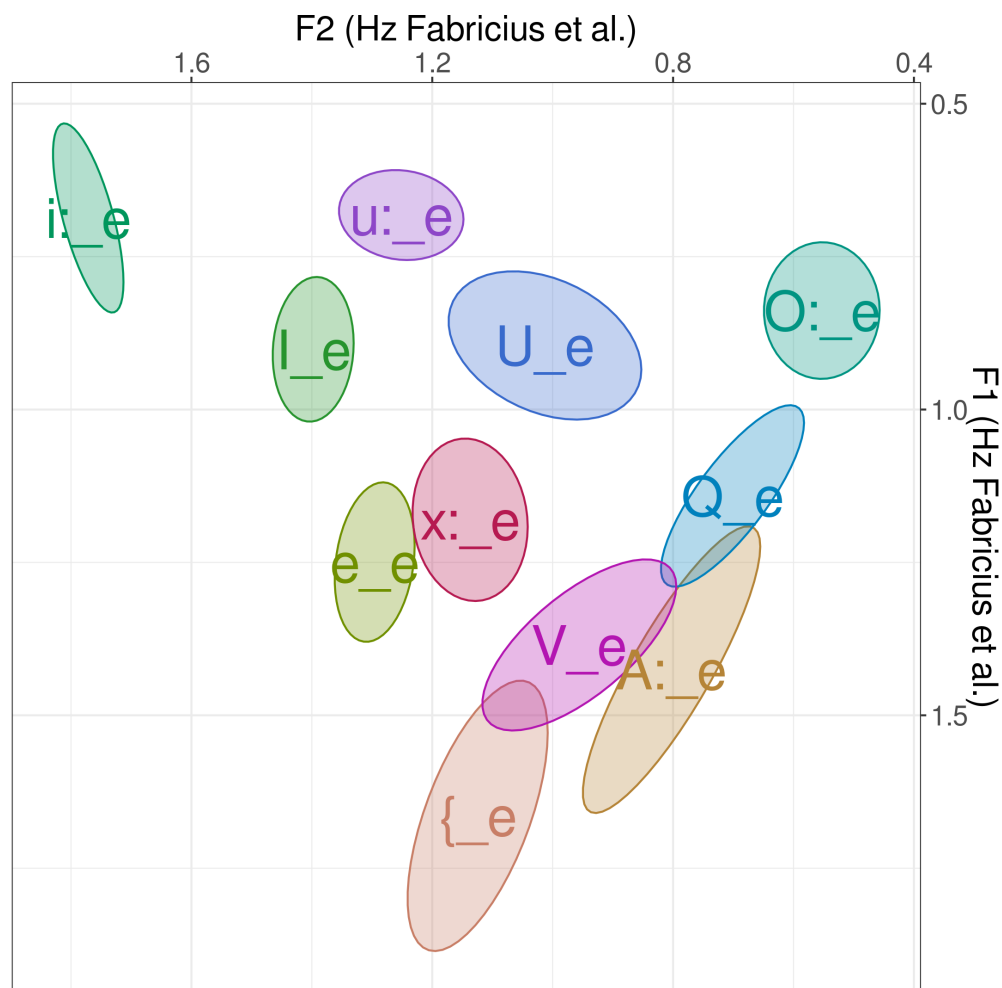


- Forced alignment (WebMAUS, Kisler et al. 2017)
- Target vowel boundaries manually corrected by four phoneticians
- Averages of the first three formants measured in the central portion (30–70%) of each vowel
- Durations also measured

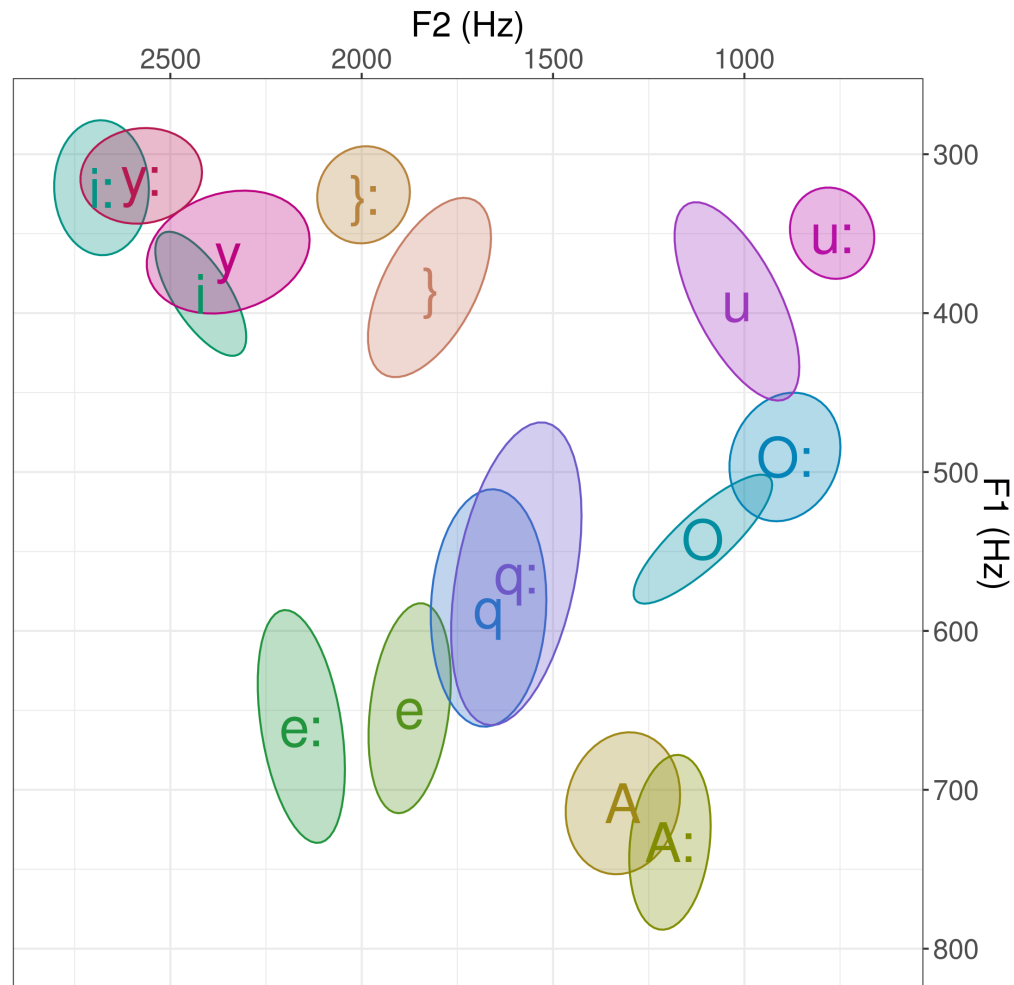
Polish at T1



Reference English



Reference Norwegian



Research questions



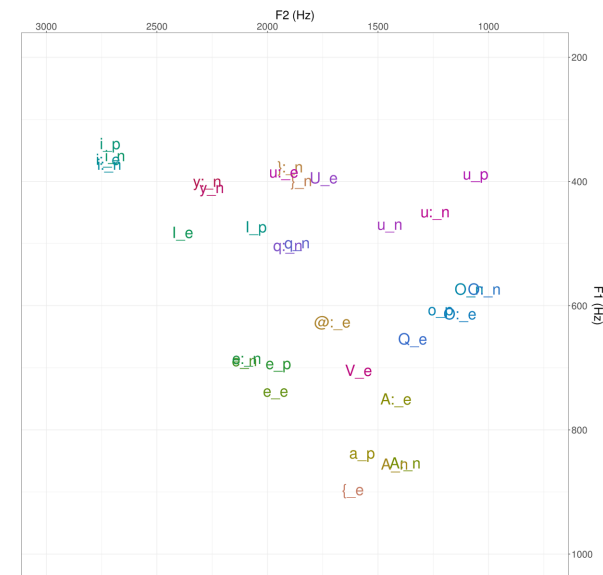
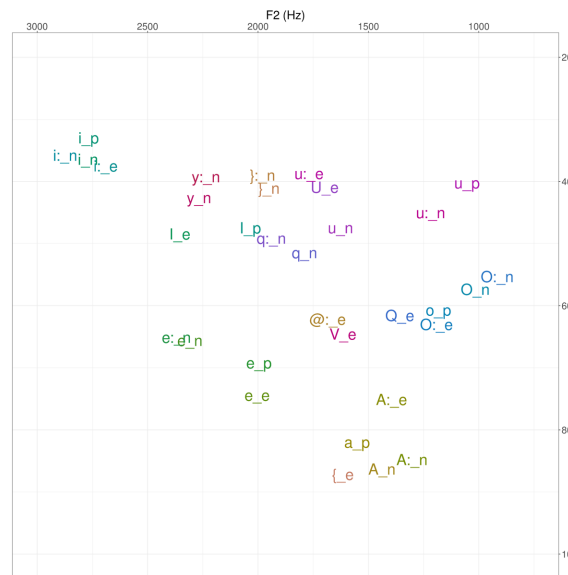
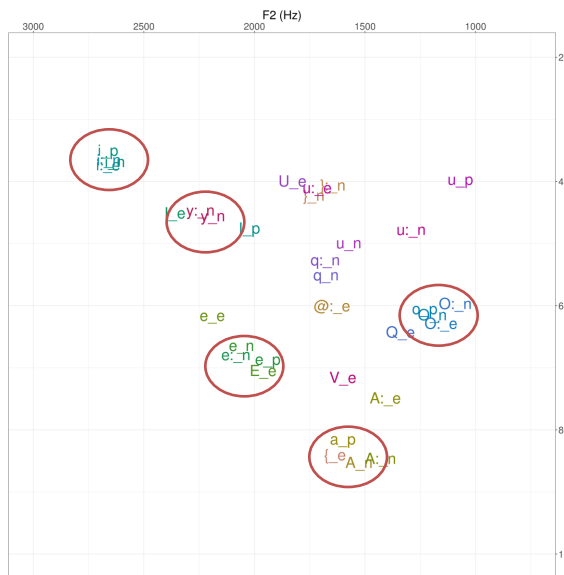
- What are the sources and directions of CLI?
 - Do the L1 and L2 have a facilitating/detrimental influence on the L3?
- Are the L1/L2/L3 systems stable over time?
 - Does category overlap change?
 - Does category compactness change?

Measures

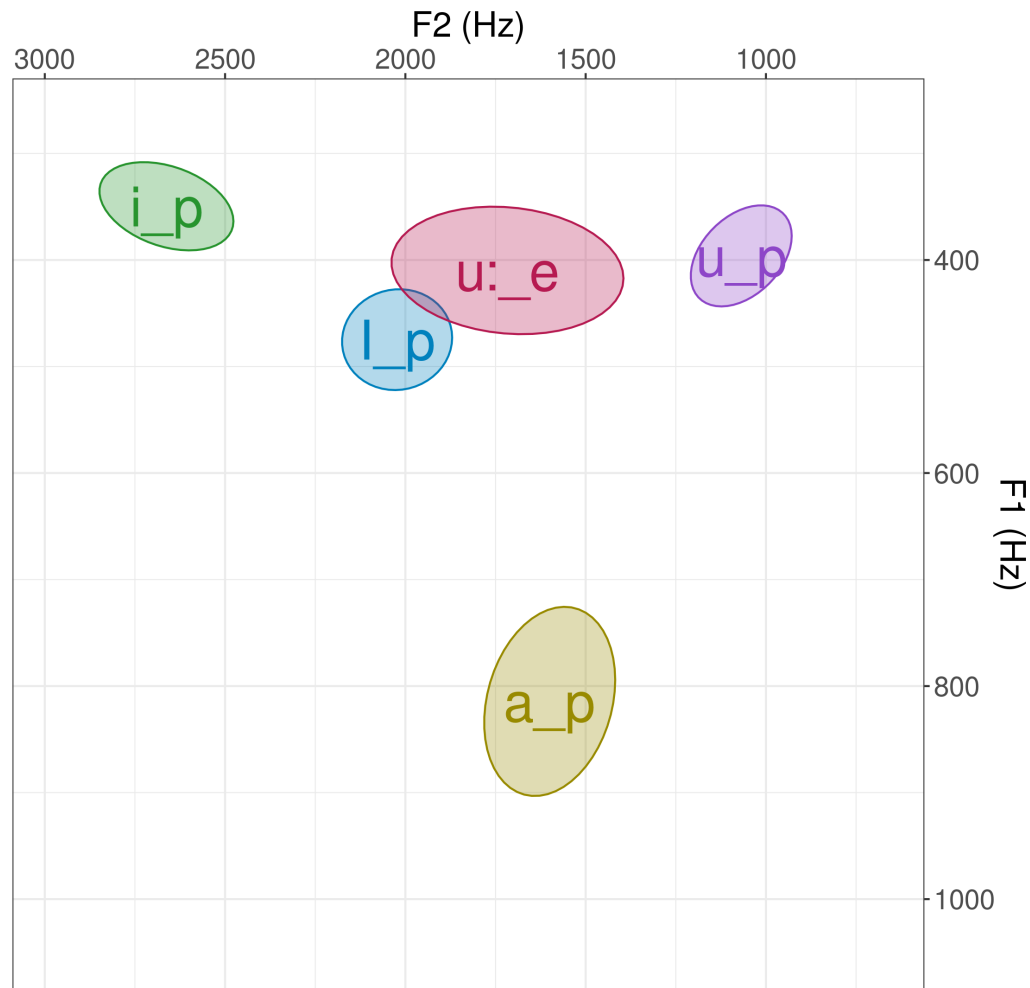


- Does category overlap change?
 - Pillai scores (Nycz & Hall Lew 2013)
 - Mixed effects models for F1 and F2 (Nycz & Hall Lew 2013)
- Does category compactness change?
 - SD?

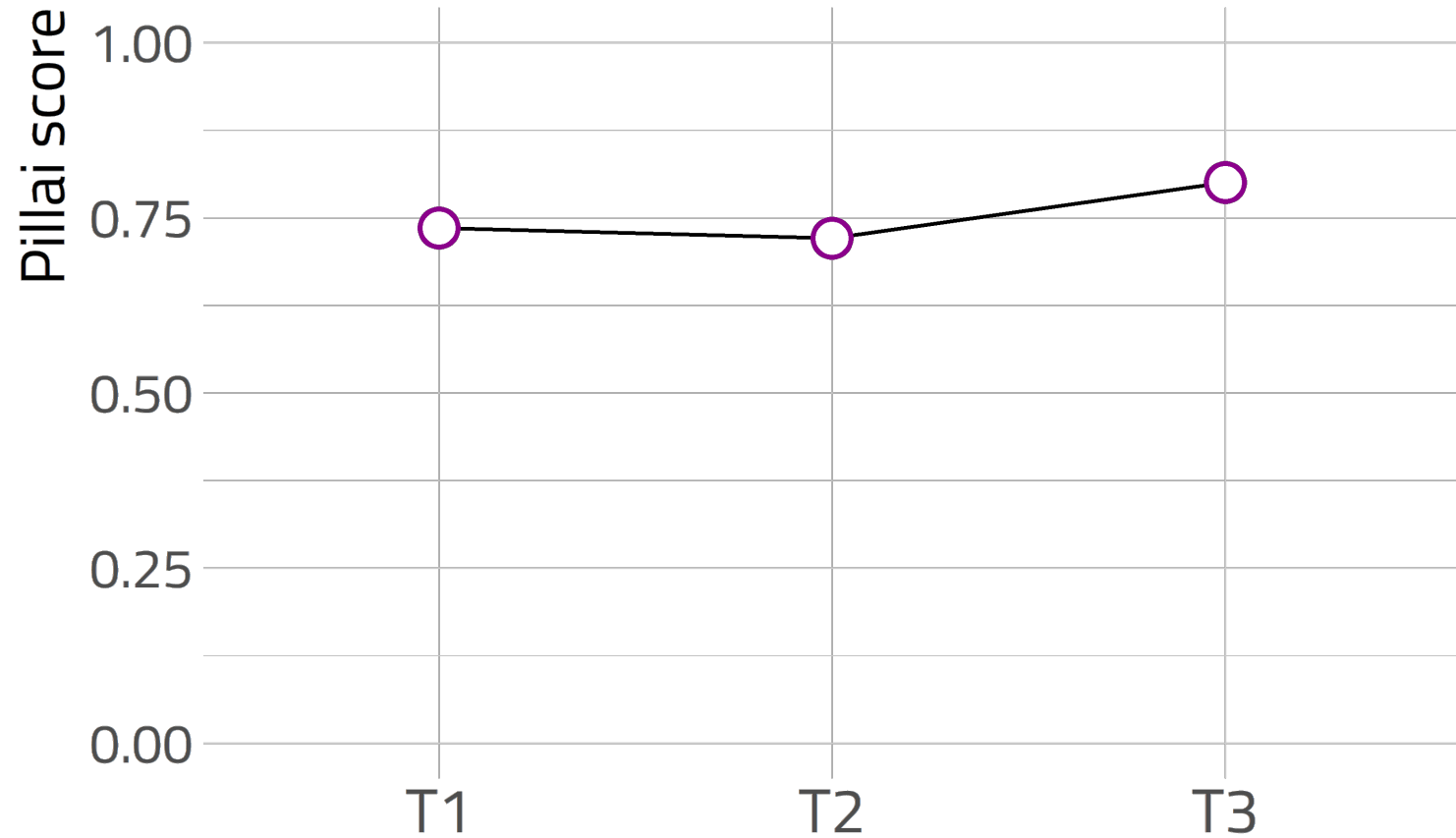
All systems at T1, T2 and T3



GOOSE vs. pl /u/ at T1

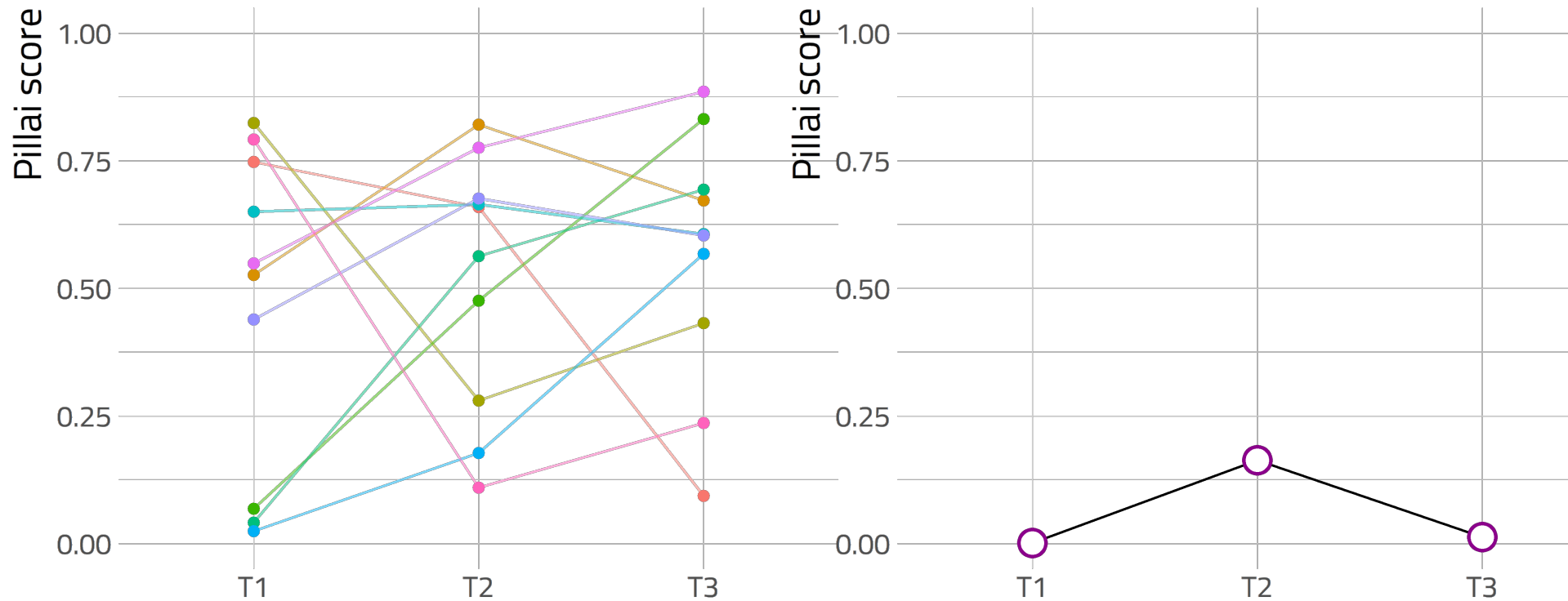


GOOSE vs. pl /u/ at T1, T2, T3

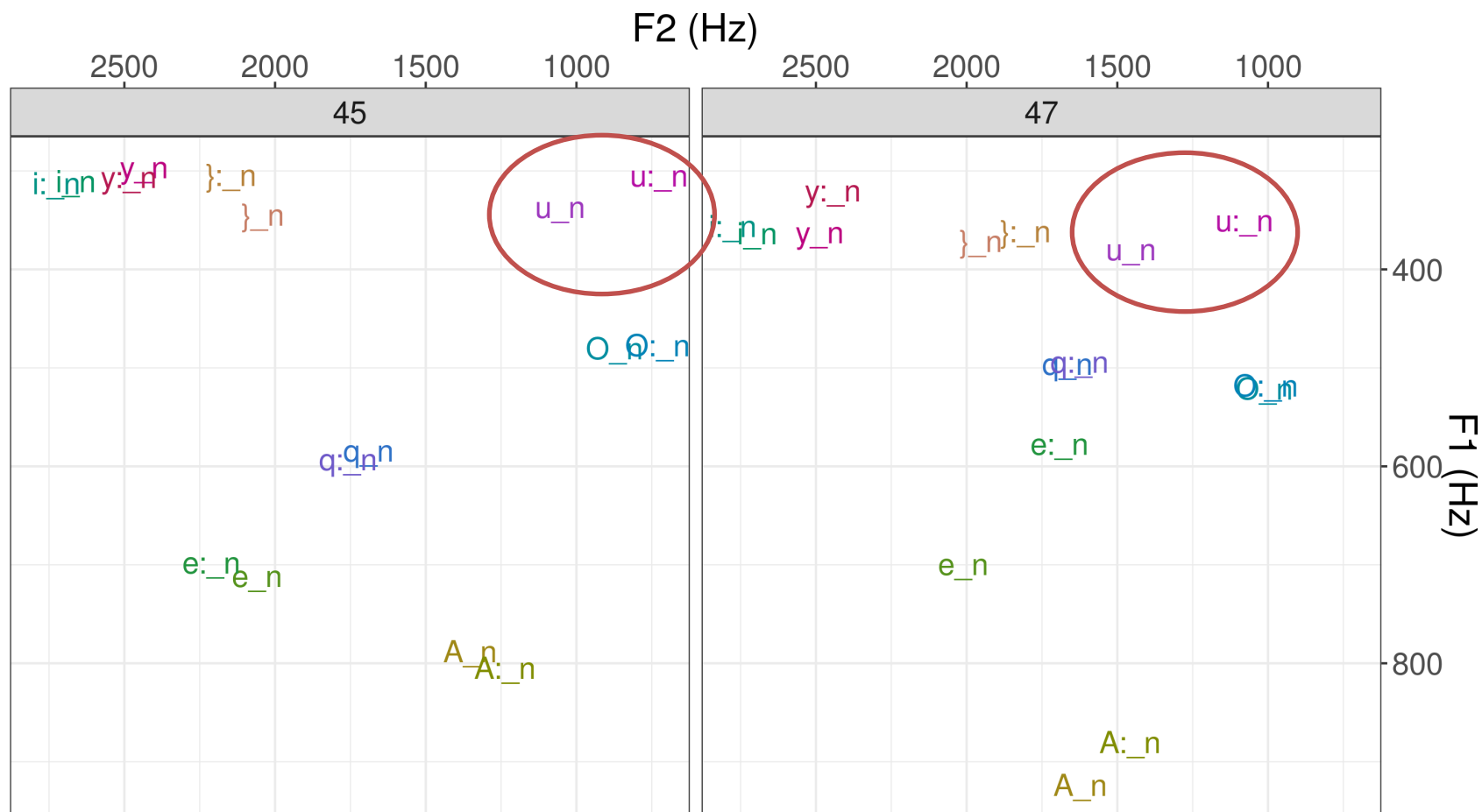




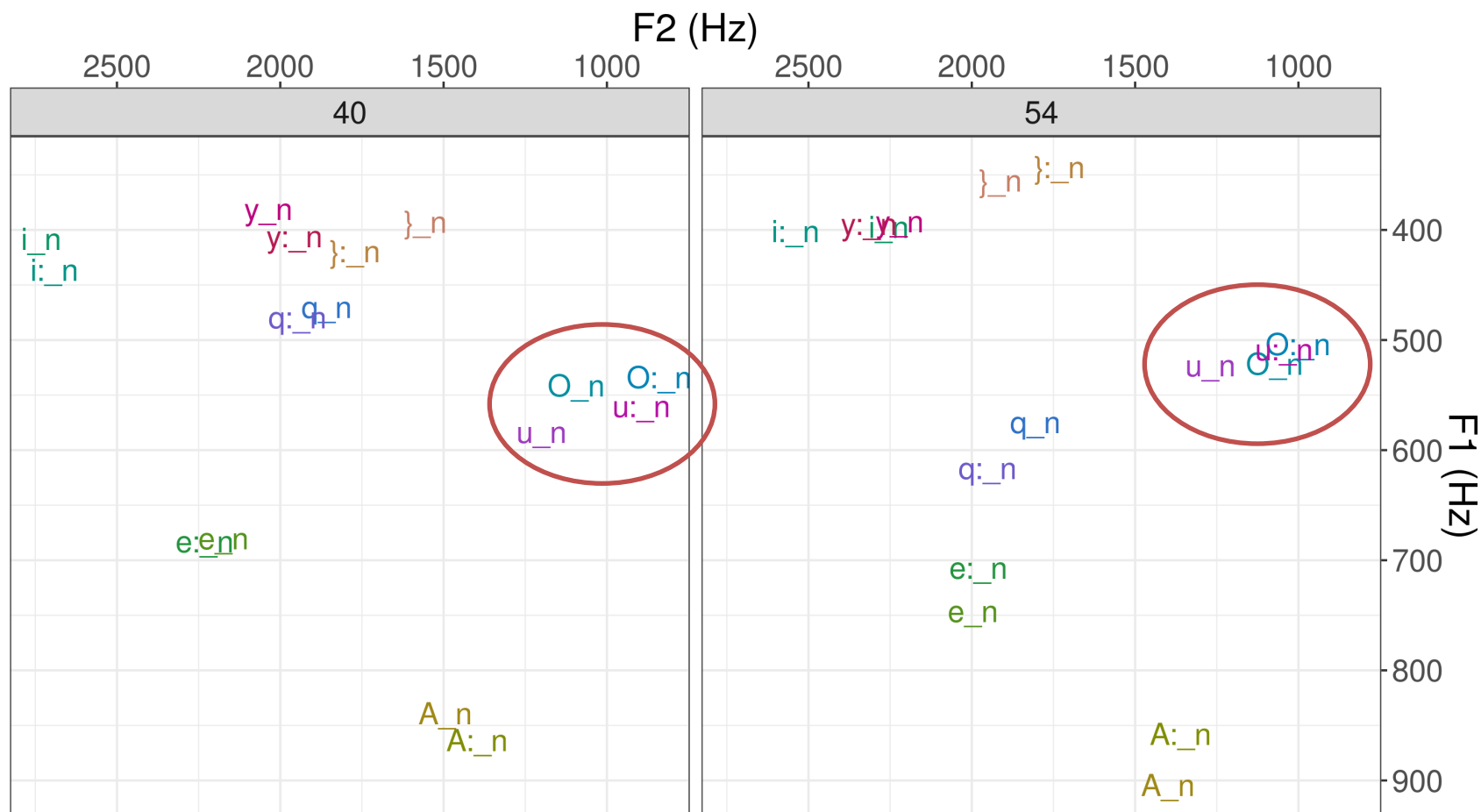
no /ʈ(ɔ)/ vs. GOOSE at T1, T2, T3



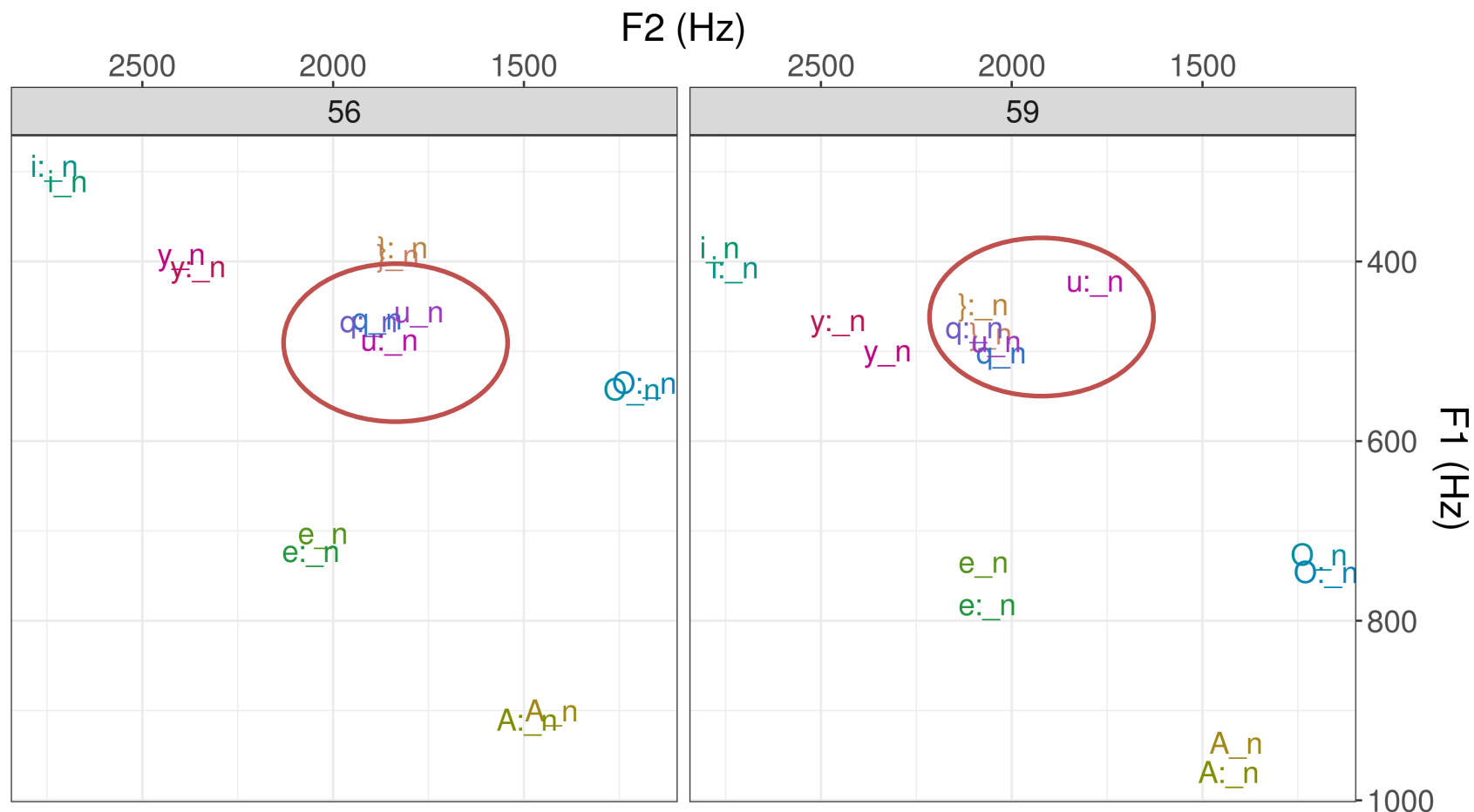
no /u(:)/: Individual variability



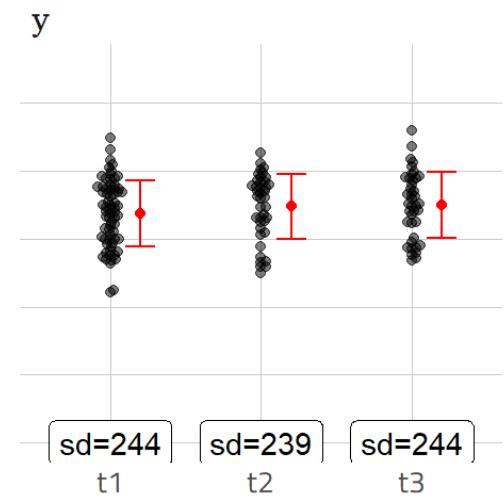
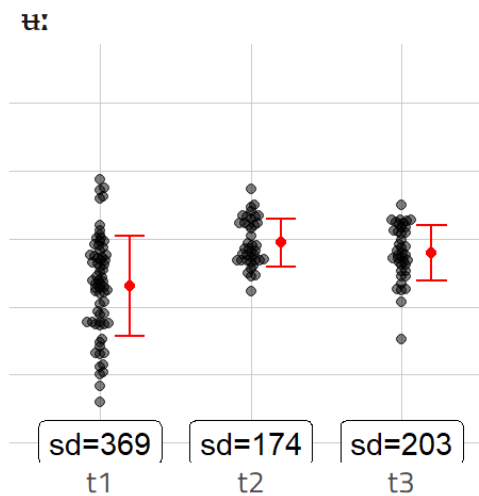
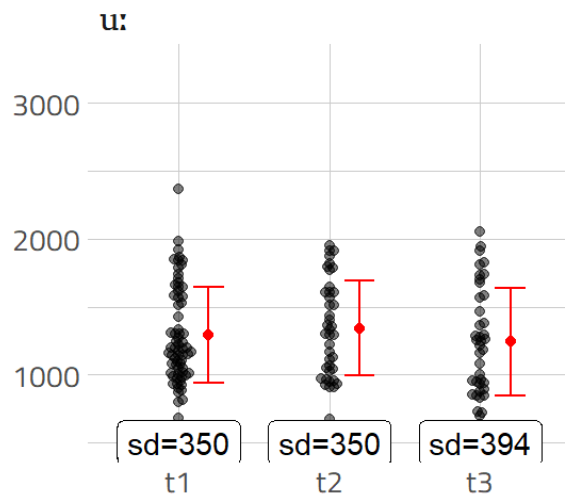
no /u(:)/: Individual variability



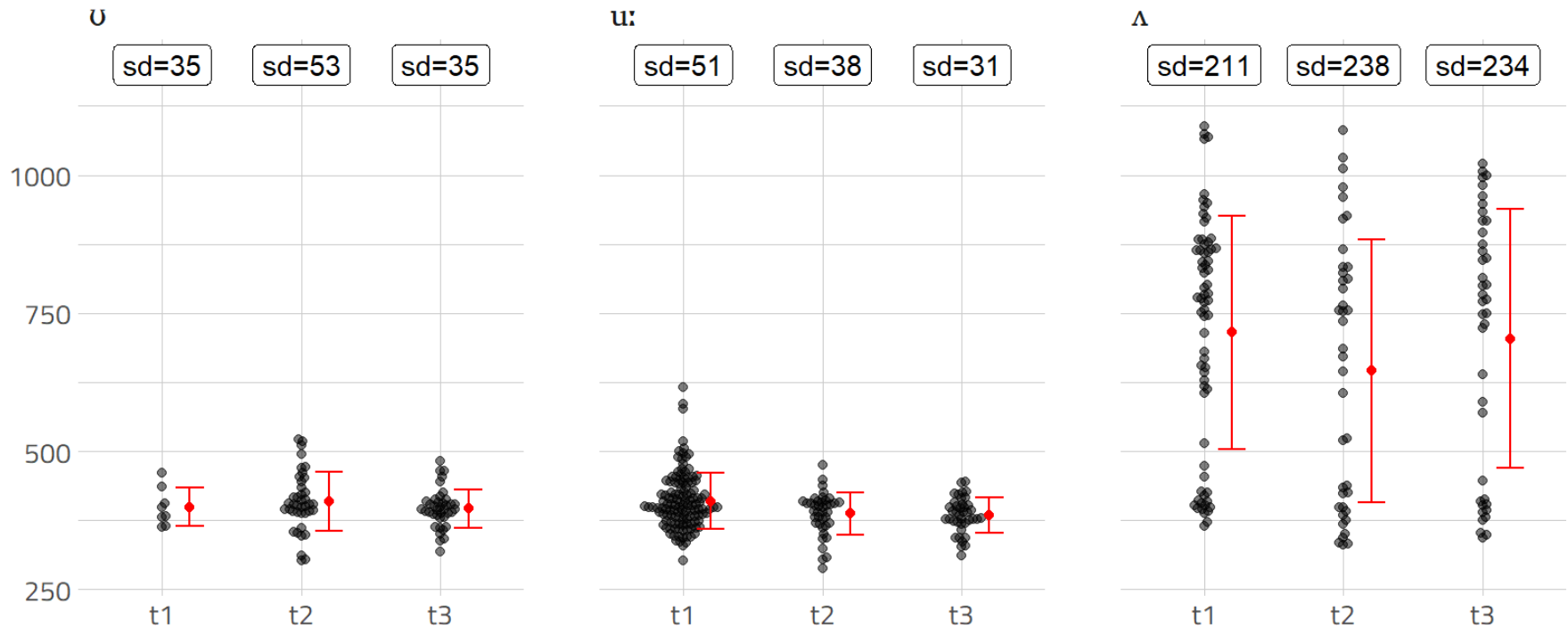
no /u(:)/: Individual variability



GUD: decreased diffusion



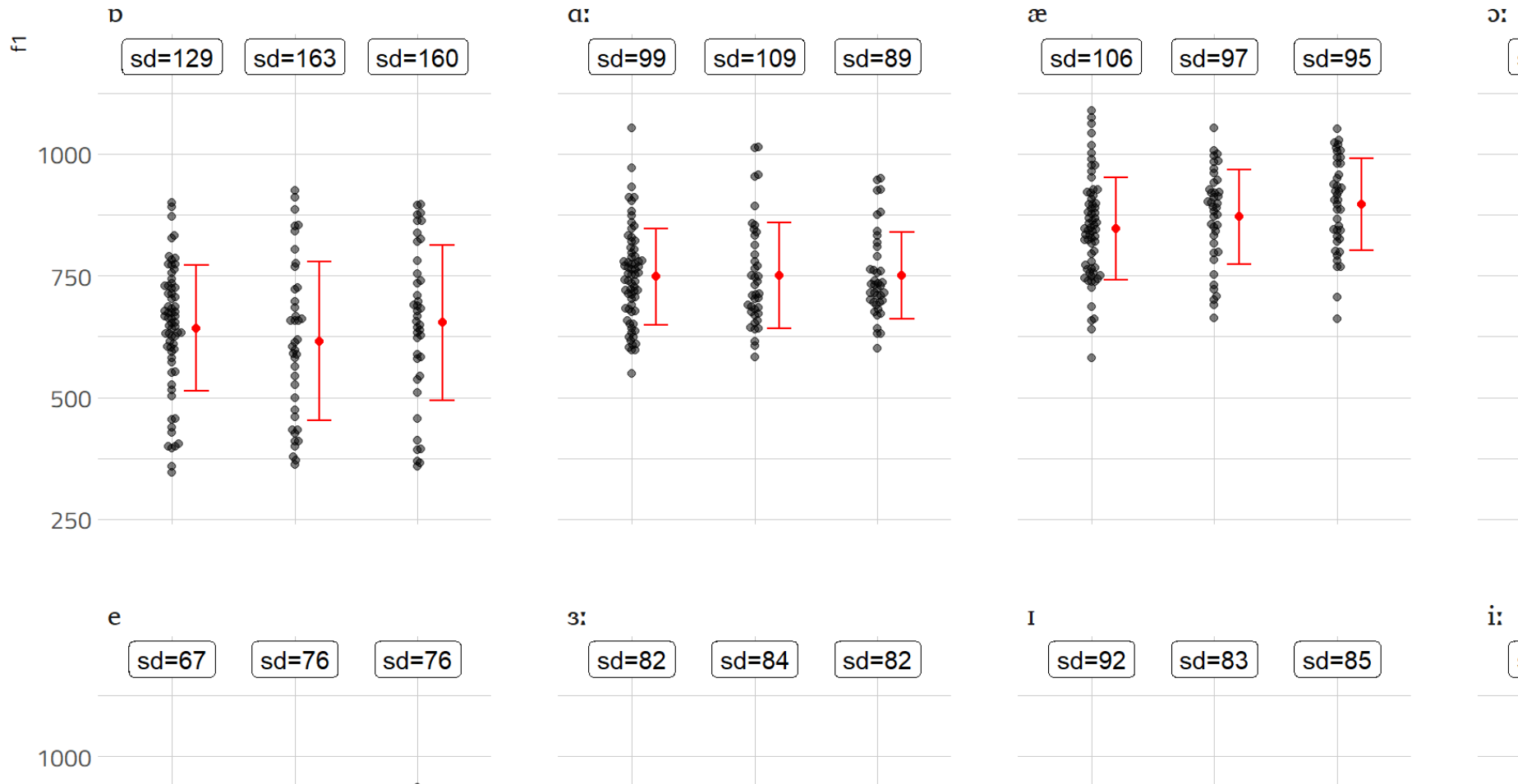
STRUT: L3 interference?



LOT: dialectal variation?



F1 of English vowels over time



Discussion: CLI sources and directions



- Evidence of facilitative CLI from L2 to L3 :
 - (Phonological development over time in L3)
 - GUD and pl /u/ increase separation
 - GUD starts and continues in overlap with GOOSE

Discussion: CLI sources and directions



- CLI from L1/L2 to L3
 - Individual variability in BOK
 - Realized as [o] via Polish orthography
 - Realized as [ʊ] based on GOOSE?
- Reverse CLI from L3 to L2
 - STRUT F1 very diffuse as a result of interference from Norwegian (!) orthography

Discussion: Are the systems stable?



- L1 categories stable spectrally
- Some L3 categories change over time
 - GUD, SLUTT increase in F2
- Some L2 categories change over time
 - GOOSE increases in F2



Future directions

- A detailed analysis of T3
- We will be trying to investigate the effect of overt instruction
 - The main project participants are 1st-year students with no history of stays in Norway
- A further developmental trajectory to be investigated (T4, T5)
- The patterns identified will be subject to in-depth analysis in another project

Acknowledgement



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References



- Kisler, Thomas, Uwe D. Reichel & Florian Schiel. 2017. Multilingual processing of speech via web services. *Computer Speech & Language* 45. 326–347.
- Kopečková, R., Marecka, M., Wrembel, M., & Gut, U. 2016. Interactions between three phonological subsystems of young multilinguals: The influence of language status. *International Journal of Multilingualism* 13 (4), 426-443.
- Kristoffersen, Gjert. 2000. *The phonology of Norwegian*. Oxford: Oxford University Press.
- Missaglia, F. 2010. The acquisition of L3 English vowels by infant German-Italian bilinguals, *International Journal of Multilingualism* 7(1): 58-74.
- Nycz, Jennifer & Lauren Hall-Lew. 2013. Best practices in measuring vowel merger. *Proceedings of Meetings on Acoustics* 20. 60008. (166th Meeting of the Acoustical Society of America.)
- Sypiańska, J. 2016. Multilingual acquisition of vowels in L1 Polish, L2 Danish and L3 English. *International Journal of Multilingualism*.
- Sypiańska, J. 2013. *Quantity and quality of language use and attrition of L1 Polish due to L2 Danish and L3 English*. Unpublished PhD thesis, AMU Poznań.

Polish categories over time



Polish vowels at T1 vs. T3

