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Foreign language acquisition of speech from a multidimensional perspective; the case of L2/L3/Ln English

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10 YEARS WA Faculty of English at AMU

Introduction

- Complex linguistic landscape of today -> new perspective in language acquisition research, beyond SLA (e.g. De Angelis 2007)

- A growing body of studies into the acquisition of third language (L3) phonology (Wrembel & Cabrelli Amaro 2018)

- Dynamic approach to multilingualism in line with new research outcomes from neuroscience, sociolinguistics or psychology

Dynamics of multilingualism

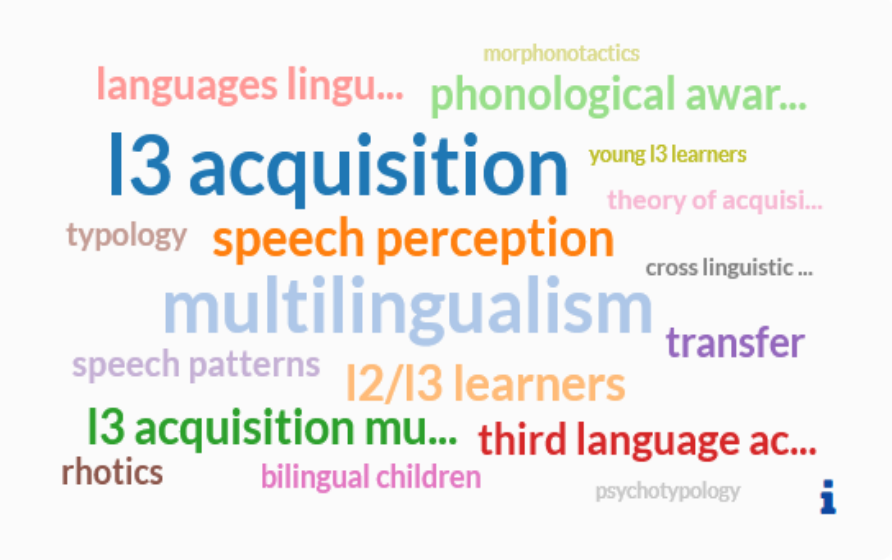
- All languages in multilinguals' repertoire constitute **dynamic systems undergoing continuous change** (Kroll et al. 2012, Sorace 2020)
- **Cross-language interactions** persistent from the very onset of multiple language learning (Kroll 2020)
  - in different linguistic domains i.e. lexis, grammar, and phonology
  - in divergent conditions (irrespective of non/convergent structures or language distance/proximity)
- **Reconfiguration** of cognitive network -> Convergence between L1 and L2 (Sorace 2020)

Dynamics of multilingualism

- L1 phonetic drift from the onset of L2 learning (Chang 2012)
- ”L1 takes a hit” - L1 performance on a lexical decision task altered even after brief exposure to L2/Ln (Kroll 2020)
- Passive language exposure in multilingual environment facilitates new language learning (Bice and Kroll 2015)
  - vowel harmony in an unfamiliar language in uni- vs. multilingual environment (Southern California > Pennsylvania) ERP study

Outline

- Overview of L2 vs. L3 phonological acquisition
  - dynamic cross-linguistic influence
  - (potential) multilingual advantage
- Methodological considerations
- Project insights
  - Production study
  - Perception study
  - Processing study (ERP)
- Ln speech corpus



Comparing bilingual and trilingual speech

- Traditionally – conflating bi- & multilingualism
- Evidence for distinctness (neuro-, psycholinguistics)
- Quantitative differences
- Qualitative differences
- Extended interactions between languages
- Prior linguistic knowledge
- More extensive previous learning experience
- Increased metalinguistic awareness
- Enhanced language learning strategies

(De Angelis, 2019)

Comparing bilingual and trilingual speech

- Cross-linguistic Influence (CLI)
- Enhanced perceptual sensitivity
- Facilitation in learning new phonologies
  - Increased metalinguistic awareness
  - Trilingual advantage (potential)

Cross-linguistic Influence (CLI)

- Quantitative differences
- SLA: L1-based transfer (one-to-one)
- TLA: multidirectional & complex CLI

  L1⇔L2, L1⇔L3, L2⇔L3 …

- Qualitative differences
- L1-based CLI in L2/L3 (due to established neuro-motor routines)
- L2-based CLI in L3 (interaction of two non-native languages, 'foreign language effect', 'lateral CLI' (Jarvis & Pavlenko, 2008)

Cross-linguistic Influence (CLI)

- Combined L1 & L2 CLI
  - L1-L2 hybrid values in L3 VOT (e.g. Cardoso & Collins 2010, Dittmers et al., 2018, Wrembel 2015 for L3 French)

- Mixed CLI - Archibald (2022) L1 Arabic, L2 French, L3 English
  - CLI from L2 French for L3 English vowels
  - CLI from L1 Arabic for L3 English consonants

- Structure-dependent CLI - Domene Moreno (2021): German-Turkish heritage speakers learning L3 English
  - perception of vowel length and laterals: Turkish-based CLI
  - production of consonant clusters and vowel length: German-based CLI

Enhanced perceptual sensitivity

- L3 learners tend to outperform L2 learners in target language phonetic discrimination
  - e.g., Antoniou et al., 2015; Enomoto, 1994; Onishi, 2016
  - Kopečková (2014) higher perceptual sensitivity for vowels in young multilingual vs. Polish-English bilingual learners
- Onishi (2016) 'global advantage in phonological perception'
  - L3 learners more sensitive in the discrimination of non-native speech
- BUT also contradictory or mixed results
- No significant differences between monolinguals and bilinguals in discriminating novel speech sound contrasts.
  - e.g., Patihis, Oh, & Mogilner (2015)

Facilitation in learning new phonologies

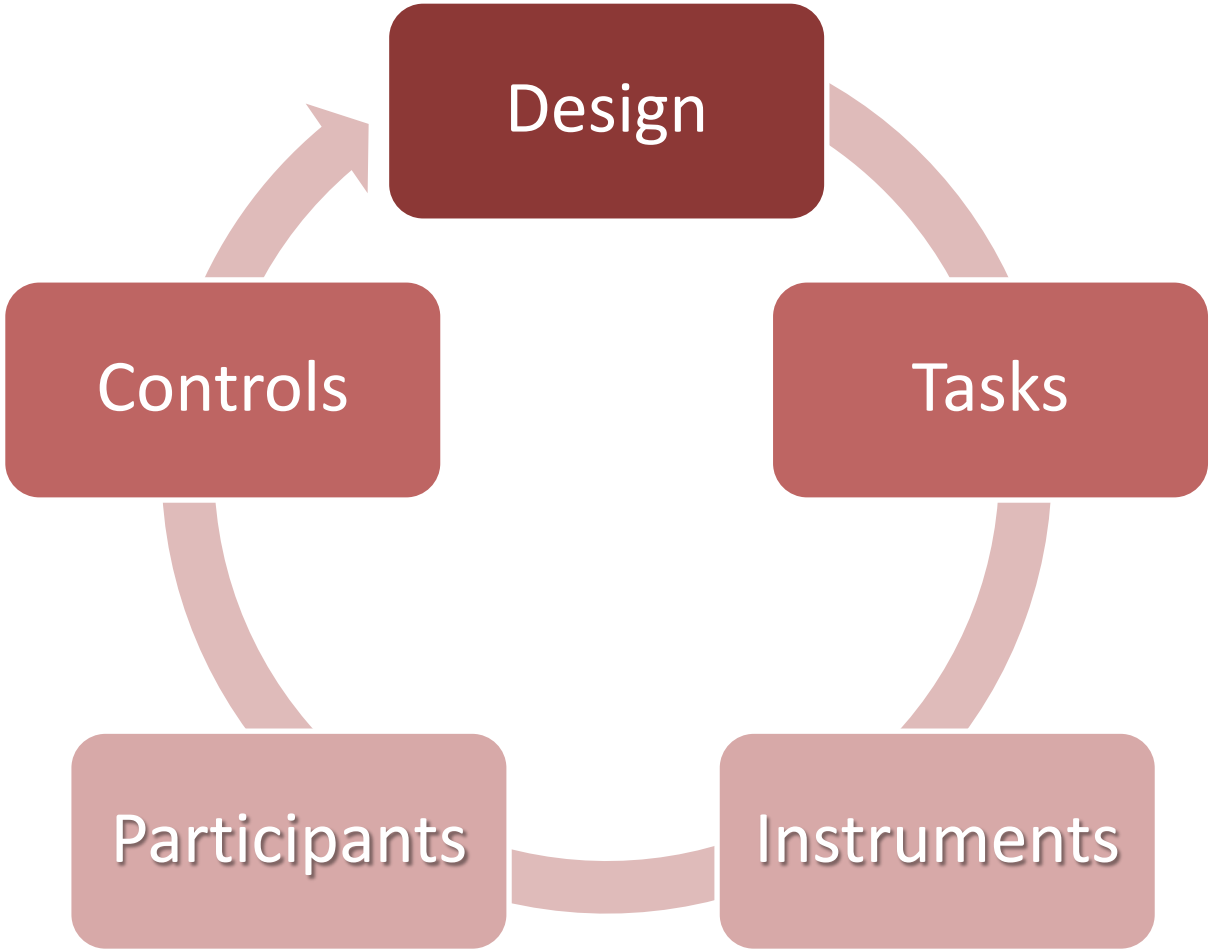
- Amengual (2021) examined VOT in English, Japanese, and Spanish /k/ in three different groups;
  - two groups of English-Japanese bilinguals in a mirror L1/L2 design,
  - a trilingual group with L1 Spanish, L2 English and L3 Japanese.
- Results:
  - both bilingual and trilingual participants able to differentiate VOT in the three languages
  - acquired language-specific timing properties in English, Japanese and Spanish
  - however, bilinguals' VOT productions in L2 converged more on L1 VOT
  - trilingual group - a greater degree of differentiation between their VOT values in L1 Spanish, L2 English and L3 Japanese

Facilitation in learning new phonologies

- Trilingual advantage found in some studies might not reflect a general advantage in phonological acquisition
- Rather: L3/Ln learners can benefit from specific phonological properties of their background languages

- For more -> Gut & Wrembel (forthcoming) ”Comparing Bilingual and Trilingual Phonetics and Phonology” in CUP Handbook of Bilingual Phonetics and Phonology (ed. Amengual 2023)

Methodological considerations



Methodological challenges: Language status

- L1 / L2 / L3 /Ln

- Chronology of acquisition
- Proficiency and use
- -> potential dominance shift

- English as L2 / Ln?

Methodological challenges: Design

- Focus: outcome of L3 acquisition -> process
  - cross-sectional vs. longitudinal
    - several testing times
    - dense data collection
      - DSCT framework, e.g. Kopečková et al.
- Types of L3 learners
  - Foreign language learners (late sequential)
    - Emerging multilinguals
    - Initial state vs. more advanced L3 learners
  - Active bi/multilingual (early, simultaneous) + L3
  - Heritage speakers L1/L2 -> 2L1s + L3

Methodological challenges: Tasks

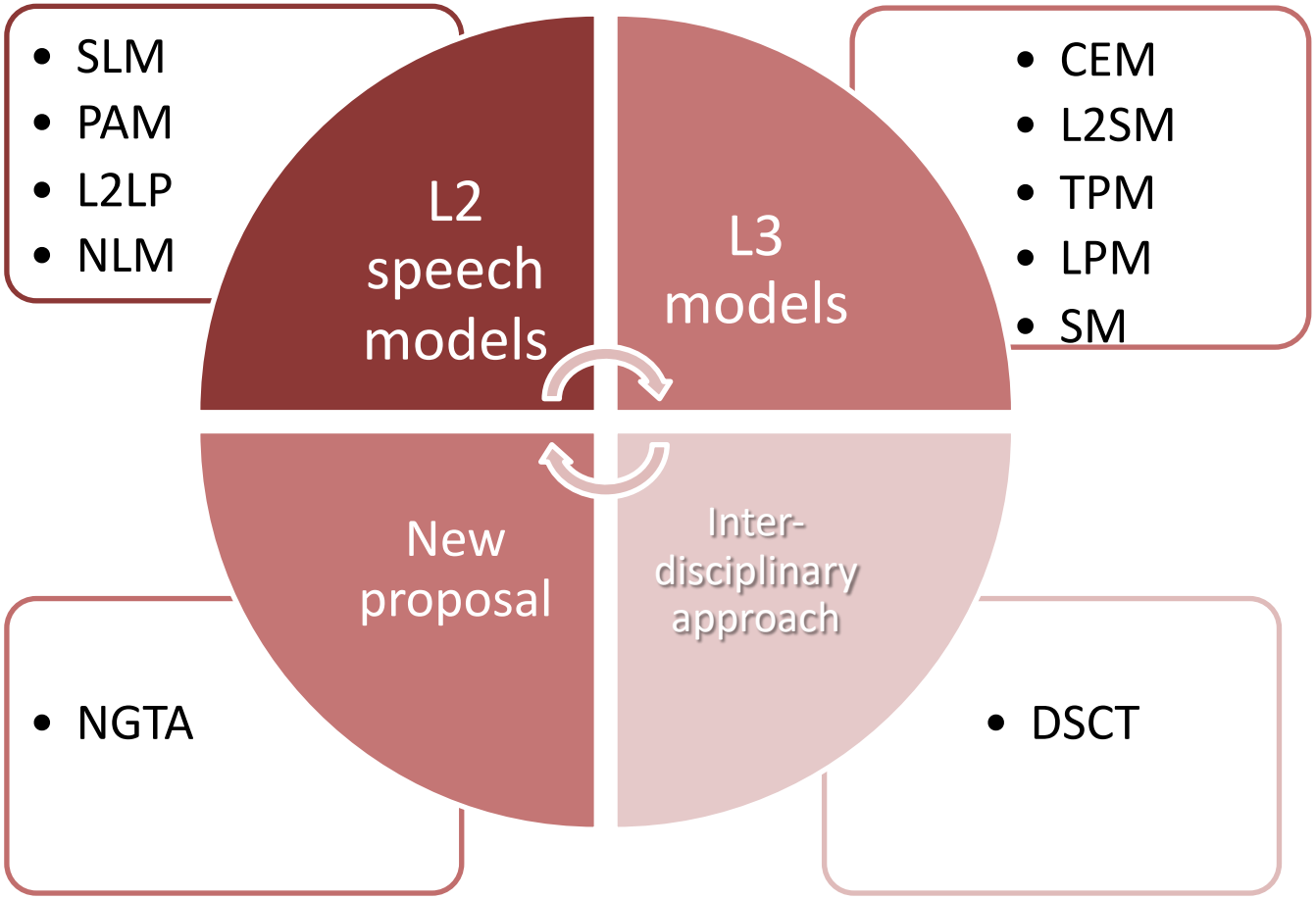
- Tasks and procedures
  - Speech sample elicitation in all (3 or more) languages (!)
  - Degree of control vs. ecological validity
  - Perceptual paradigms - for separate languages or cross-linguistic

- Language modes in testing
  - Induced monolingual (separate testing days)
  - Encouraged multilingual (favouring CLI, code-switching)

Methodological challenges: Controls

- Comparison groups
  - Monolingual controls?
  - Bilingual control groups
    - e.g. Llama & Lopez-Morelos 2016, Hopp & Schmid 2013
  - Mirror-design groups
    - L1 **X**, L2 **Y**, L3 Z vs. L1 **Y**, L2 **X**, L3 Z
    - L1 **X**, L2 Y, L3 **Z** vs. L1 **Z**, L2 Y, L3 **X**
      - e.g. Gut, Wrembel, Kopečková, Balas 2019
  - Same group over time

Theoretical frameworks



Third language (L3) acquisition models

- Cumulative Enhancement Model Flynn et al., 2004
  - All previously learnt languages may influence subsequently acquired languages (if facilitative)
- L2 Status Factor Model Bardel & Falk 2007
  - L2 influence prevails over L1, Psycho & neurolinguistically motivated, greater cognitive similarity of L3 and L2 (not L1)
- Typological Primacy Model Rothman 2011, 2015
  - Typology determines source of CLI, Holistic transfer from L1 or L2
- Linguistic Proximity Model Westergaard et al. 2017, 2019
  - CLI from L1 and/or L2 based on structural similarity
  - property-by-property transfer
- Scalpel Model Slabakova 2017
  - In line with LPM + cognitive and experiential factors

INSIGHTS FROM L3 PROJECTS

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OPUS-19-HS project CLIMAD ”Cross-linguistic influence in multilingualism across domains: Phonology and syntax”

GRIEG-1 ADIM “Across-domain investigations in multilingualism: Modeling L3 acquisition in diverse settings”

CLIMAD study design

- L1 Polish, L2 English (B1/B2), L3 Norwegian (A1)

- 24 participants at T1 (17 at T3), aged 20
- 1st-year students in Norwegian modern language BA programmes
  - University of Szczecin
  - Poznań College of Modern Languages (WSJO)
- Participant profiles:
  - Language History Questionnaire LHQ (Zhang et al. 2014)

Study design

- Three data collection times (T1, T2, T3)
  - T1 in November 2021
  - T2 in March 2022
  - T3 in June 2022
- Three sessions
  - speech production (vowels, VOT, sibilants/retroflexes)
  - speech perception (as above)
  - grammaticality judgements (syntactic features)
- Fieldwork mode
- L3 vs. L1, L2 language blocks (different days)

June 2021

Pilot study:
- remote recordings, perception study, grammaticality judgements
- 16 participants
- recordings of control speakers (remote)

T1 November 2021

Study:
- on-site recordings, perception study, grammaticality judgements

- 24 participants with L1 Polish - L2 English - L3 Norwegian

T2 March 2022

- production, perception, grammaticality judgements

- Control Norwegian participants

T3 June 2022

-

- Data collection
- Drop outs

-

Exploring spectral overlap in L1 Polish, L2 English and L3 Norwegian vowels

Jarosław Weckwerth, Magdalena Wrembel, Anna Balas, Kamil Kaźmierski

PRODUCTION STUDY

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Production study design

- Aim: to elicit all the vowel phonemes in 3 languages
- Tasks: sentence and word reading
- Stimuli:
  - 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

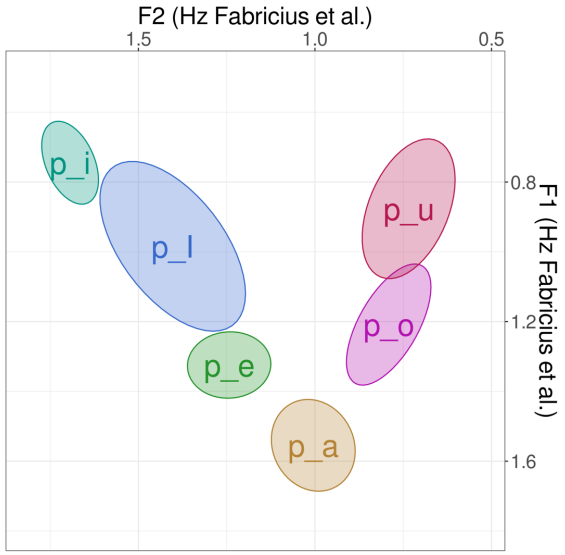
- Forced alignment (WebMAUS, Kisler et al. 2017)
- Target vowel boundaries manually corrected by four phoneticians
- Measurements:
  - Averages of the first three formants, in the central portion (30–70%) of each vowel
  - Vowel durations

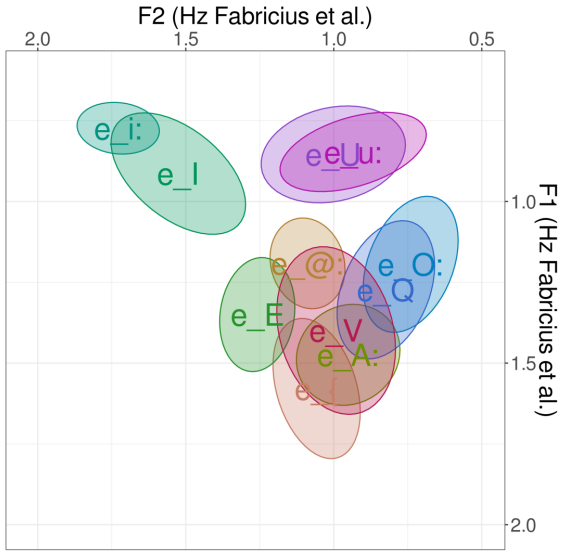
Research questions

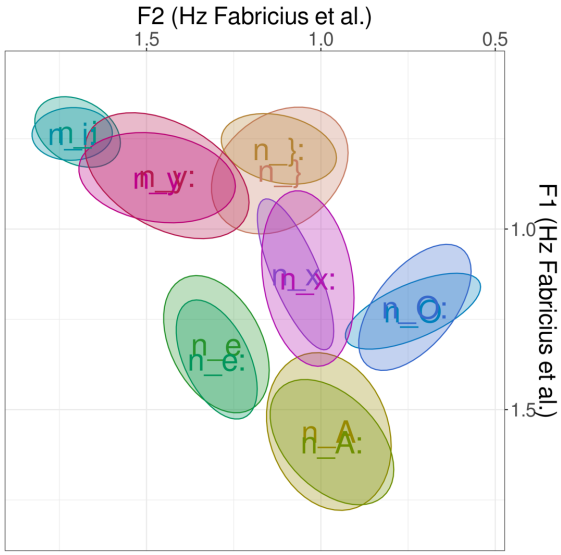
- What are the interactions between the three vocalic subsystems in multilingual learners?
- Are new categories formed in L3?
- What are the sources and directions of CLI?
  - Do the L1 and L2 have a facilitative/non-facilitative influence on the L3?
- Are the L1/L2/L3 systems stable over time?
  - Does category overlap change?
    - Pillai scores (Nycz & Hall Lew 2013)
  - Does category compactness change?
    - SDs

Results

- L1 Polish L2 English L3 Norwegian



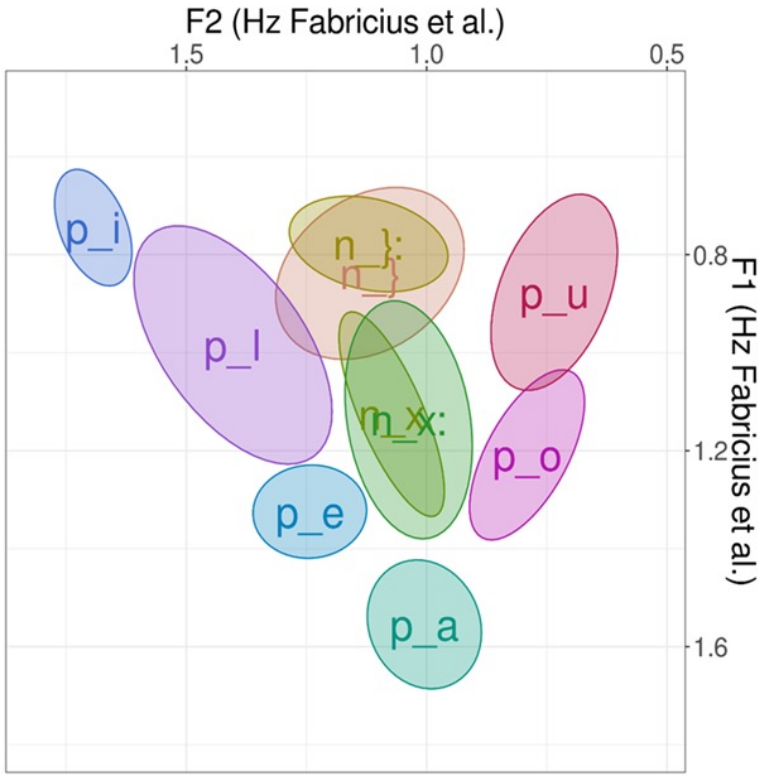




- Additional L2 and L3 spectral categories found in areas unoccupied by L1 vowels
- Some differentiation between L2 and L3

Results: estimating spectral overlap between vowel categories

Norwegian /ʉ(ː)/ /ø(ː)/ separate from Polish



Pillai score measures (0 – 1)

- GUD vs. pl /ɨ/: 0.69
- GUD vs. pl /u/: 0.75
- LØP vs. pl /ɛ/: 0.45
- LØP vs. pl /ɔ/: 0.58
- GUD vs. GOOSE: 0.21
- GOOSE vs. pl /u/: 0.33
- the higher the value, the greater the difference between the two distributions

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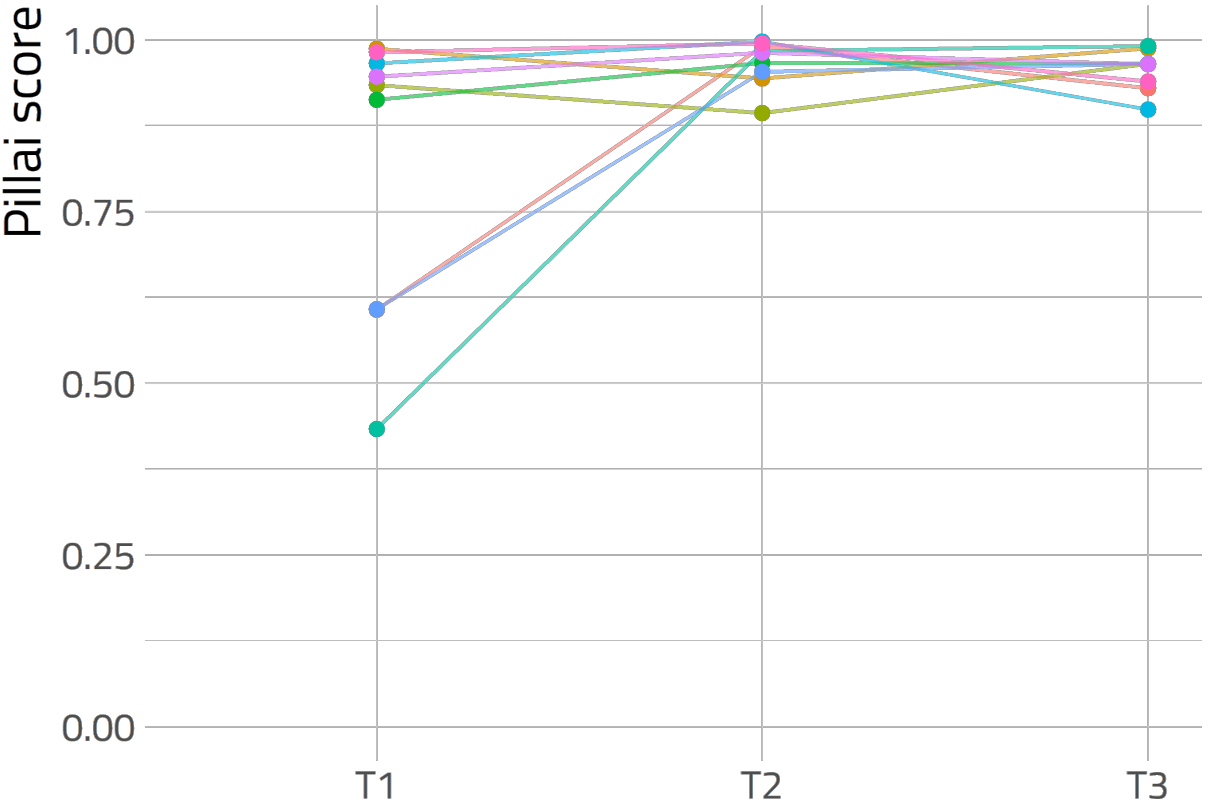
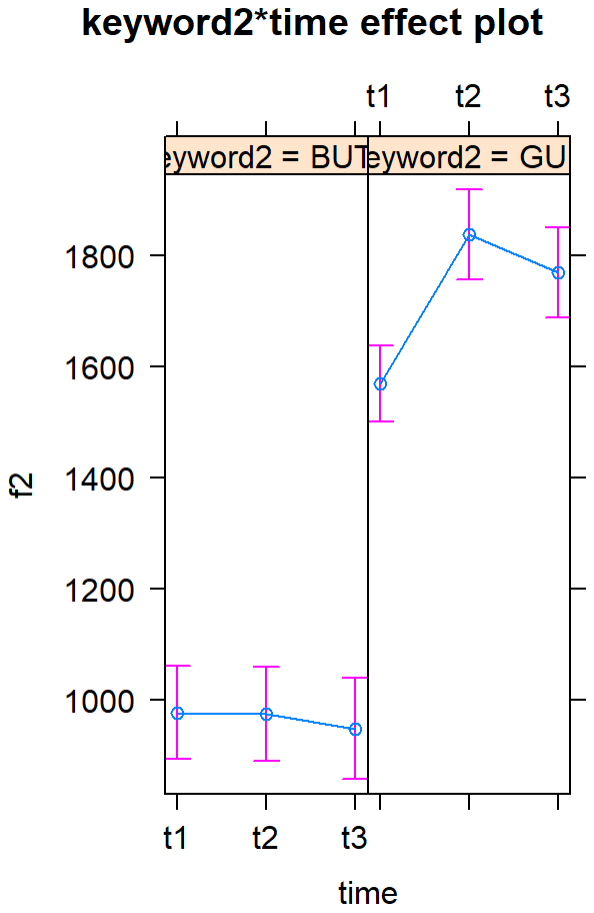
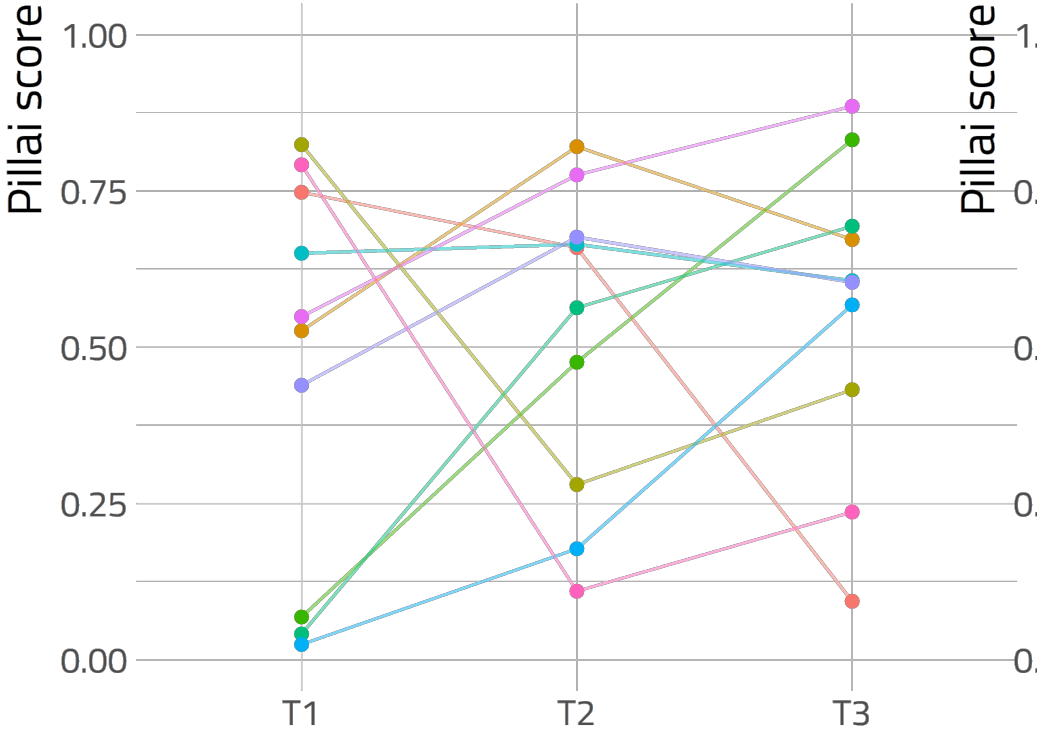
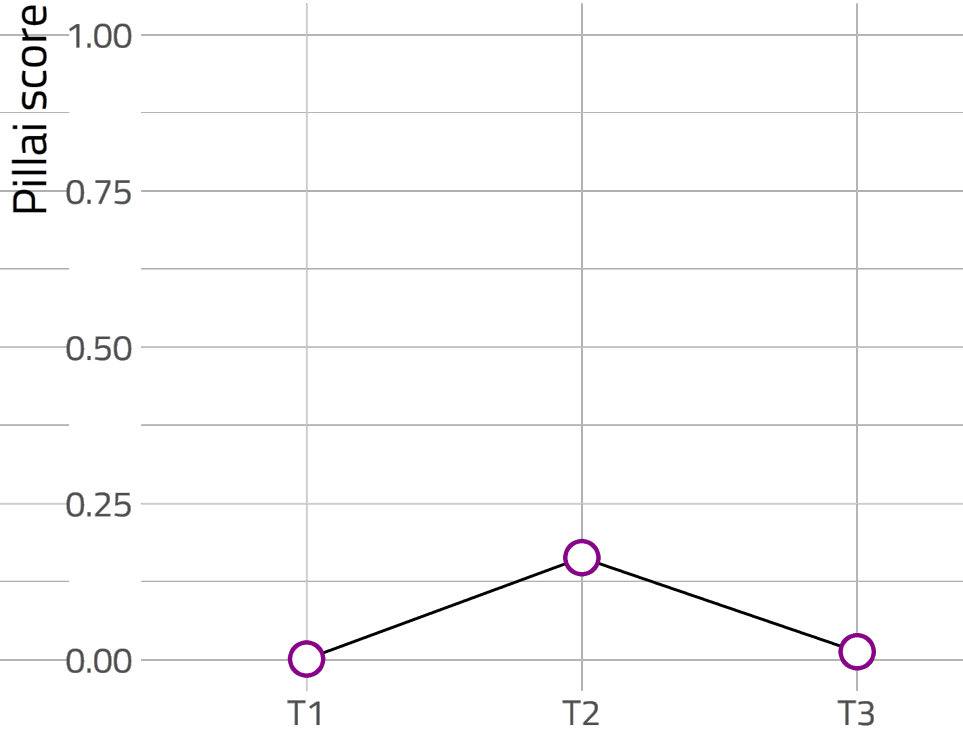
Nor /ʉ(ː)/ vs. Pol /u/ at T1, T2, T3



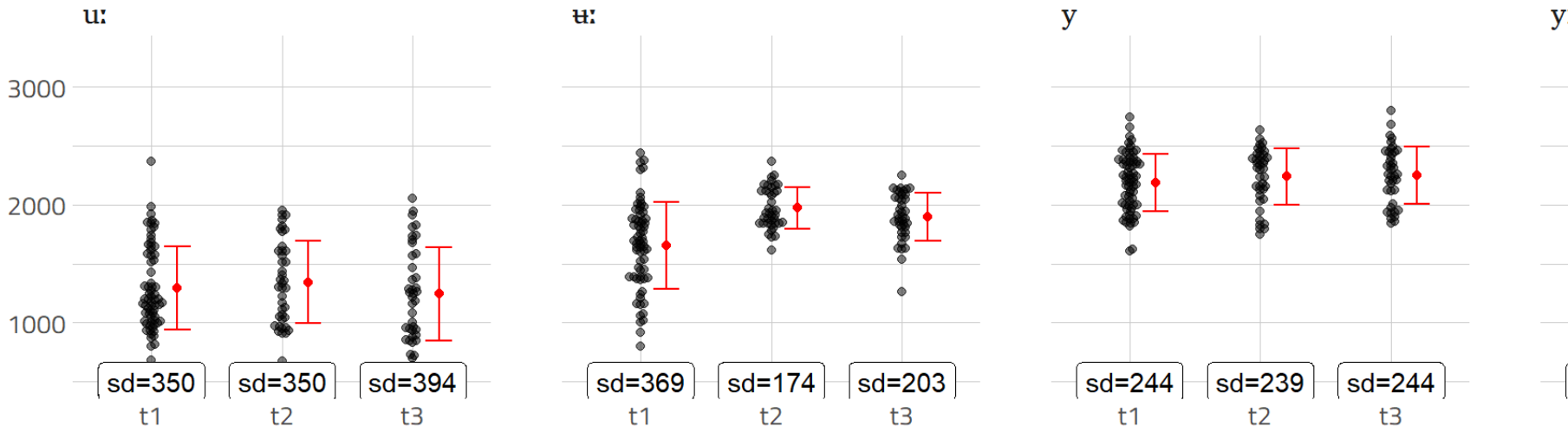


Nor /ʉ(ː)/ vs. GOOSE at T1, T2, T3

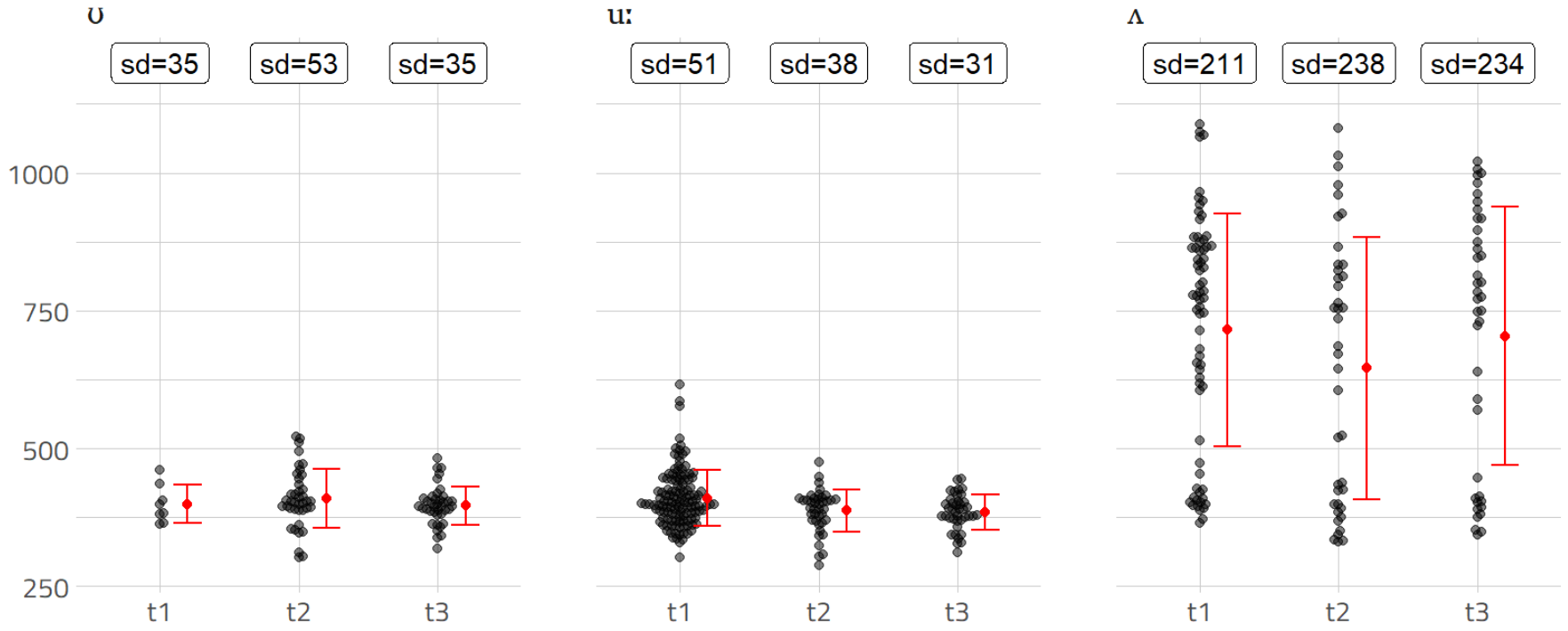




L3 GUD: descreased diffusion T1-T3



L2 STRUT: L3-to-L2 interference?



Discussion

- Multilingual learners try to keep their vocalic systems apart
  - > new phonological categories formed in L3 Norwegian
  - > L2 English less stable, subject to variability
  - > L1 Polish remains stable
- There are interactions between the three vocalic subsystems in multilingual learners?
  - > prevailingly L1>L3, but some L2>L3

- Phonological development over time in L3 Norwegian

Discussion: CLI sources and directions

- CLI from L1/L2 -> L3
  - Individual variability in Nor BOK
    - Realized as [o] via Polish orthography
    - Realized as [ʉ] based on GOOSE?
- Reverse CLI from L3 -> L2
  - STRUT F1 very diffuse as a result of interference from Norwegian (!) orthography
- Evidence of CLI from L2 -> L3
  - GUD and pl /u/ increase separation
  - GUD starts and continues in overlap with GOOSE
- NO reverse CLI L2/L3 -> L1

Perception in L2 and L3: The relationship between English and Norwegian vowel assimilation patterns and the Euclidean distances

Anna Balas, Magdalena Wrembel, Jarosław Weckwerth, Kamil Kaźmierski, Zuzanna Cal, Karolina Rataj

PERCEPTION STUDY

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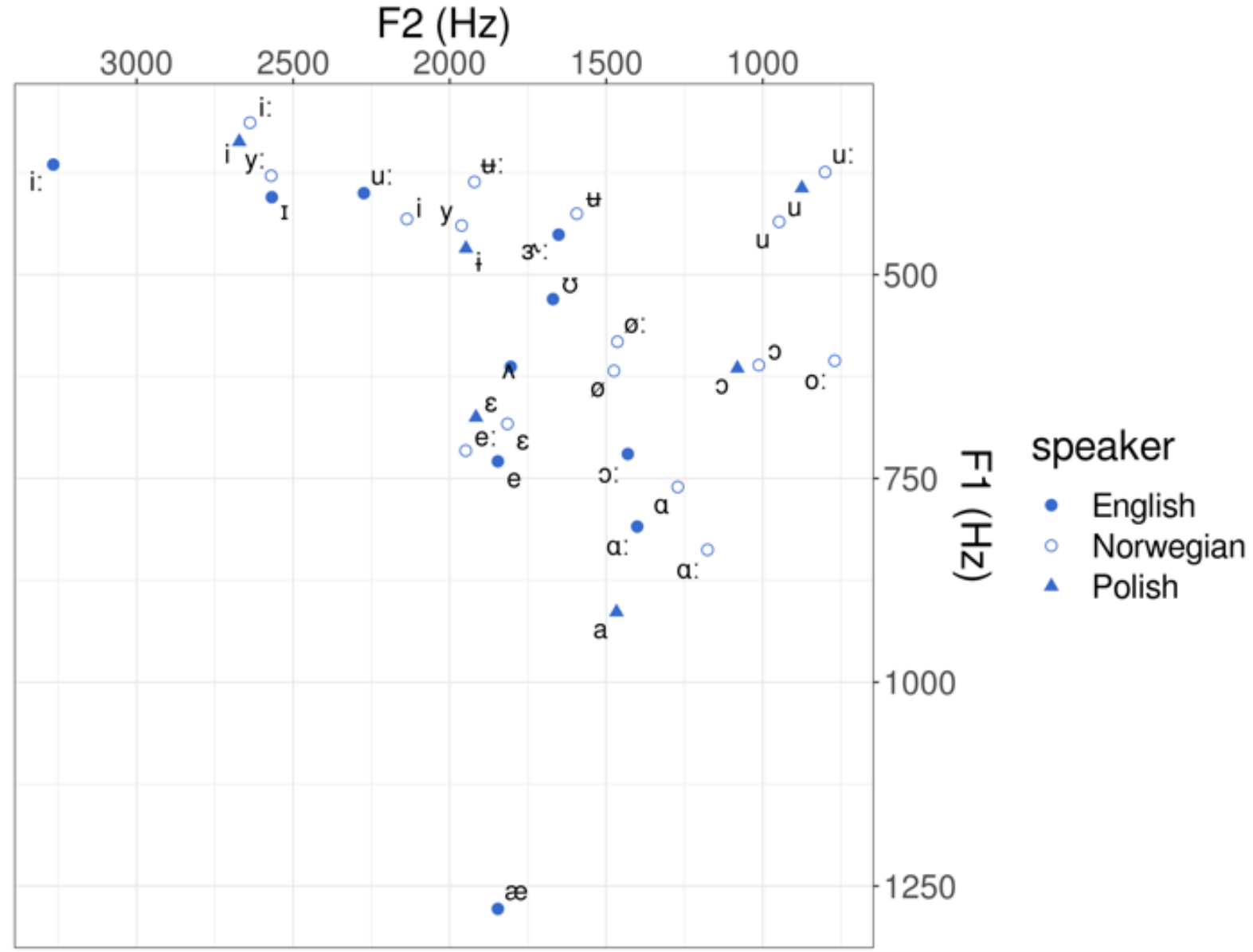
Aim & rationale

- To explore the **relationship between L2 and L3 perception** and acoustic similarity
- To examine **perceptual assimilation patterns** for L3 Norwegian and L2 English vowel assimilated to L1 Polish vowel categories
- To compare the relationship **between perceptual patterns and acoustic distance** between the vowels operationalized as Euclidean distance

- So far studies focused on
  - L2 perceptual assimilation (Best & Tyler 2007, Tyler et al. 2014),
  - relationship between vowel perception and their acoustic parameters (Strange et al. 2003, Escudero et al. 2012, Alispahic et. al. 2017)
- **No previous such studies on L3 nor comparing L2 and L3**

Polish, English and Norwegian vowels



Hypotheses

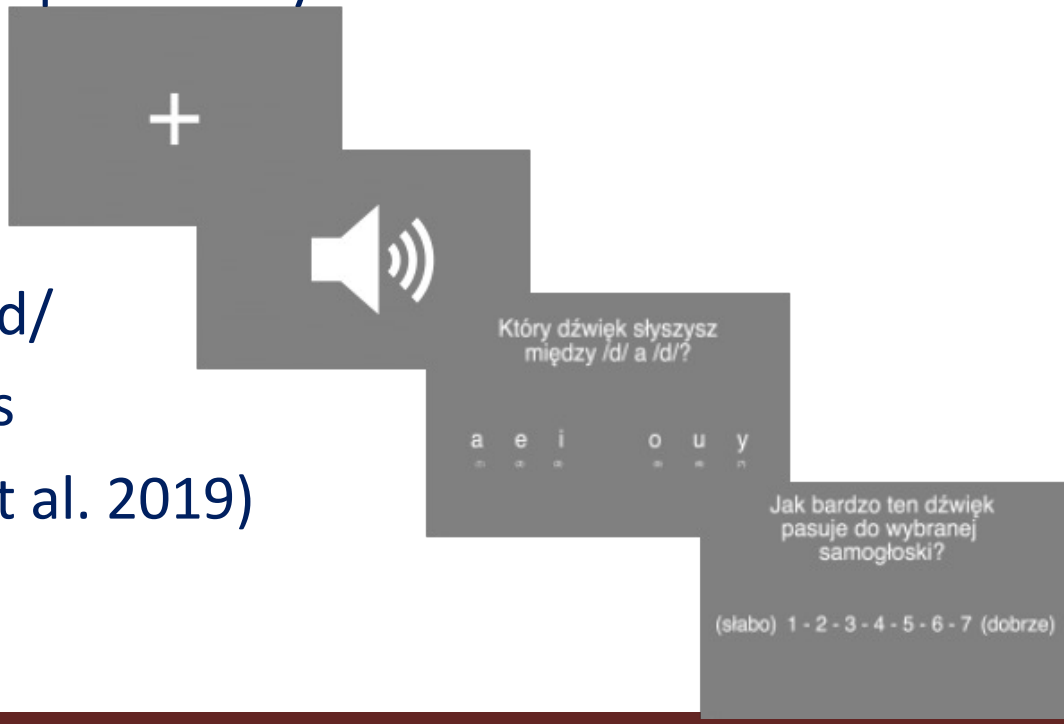
- H1: The smaller the Euclidean distance between two vowels, the higher the likelihood of assimilating a given L2 English/L3 Norwegian vowel to an L1 Polish vowel category.
- H2: The Euclidean distance predicts assimilation better in L3 than L2.
- H3: If we take into account the Euclidean distance, L2 vowels should be perceived as worse exemplars of L1 categories than L3 vowels.

Methodology

- Participants N=24 L1 Polish
  - Mean age: 19.86
  - 17 females, 7 males
- L2 English
  - Advanced/intermediate
  - mean of language learning: 12.23 yrs
- L3 Norwegian
  - Beginner: 2 months of intensive instruction
  - Instructed setting

Methodology

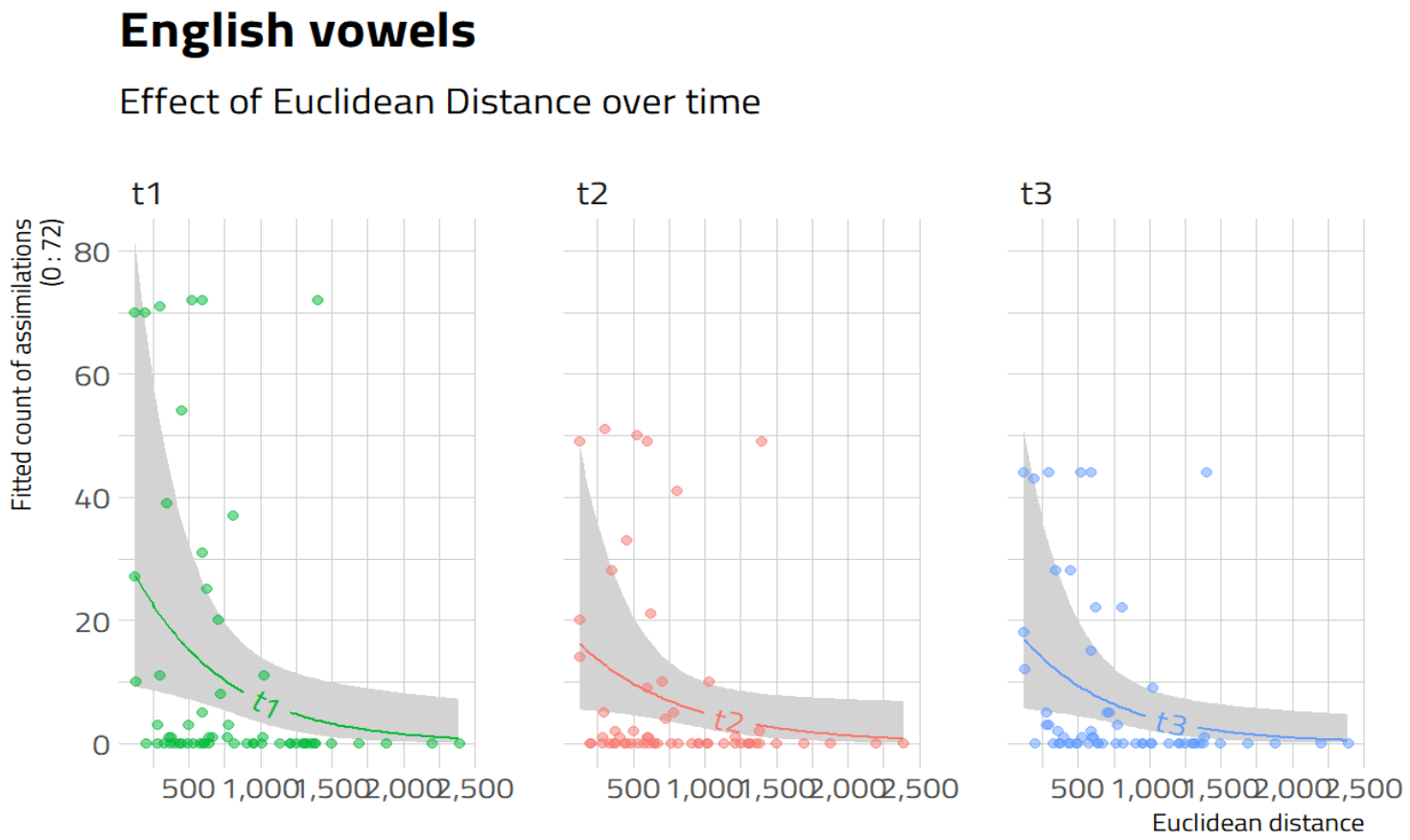
- Perceptual assimilation task
  - 10 English and 16 Norwegian monophthongs to six Polish vowel categories (orthographic labels)
- Two language blocks, on separate days
- Goodness of fit ratings
  - Likert scale from 1 to 7
  - 1 (weak fit) -- 7 (good fit)
- Stimuli: embedded in /dVd/
- Randomised, 3 repetitions
- Run in PsychoPy (Peirce et al. 2019)



Results

NORWEGIAN stimuli	Polish vowel labels <i>	<y>	<e>	<a>	<o>	<u>
TID /i:/	100% 5.77					
FIN /i/	33.33% 5	37.5% 5.41	26.39% 5.21			1.38% 3
STED /e/		88.89% 5.14		6.94% 5.6	1.39% 2	
LYS /y:/	70.83% 4.59	23.61% 5	1.39% 1			4.17% 4.33
SYND /y/	16.66% 5.25	62.5% 4.64	8.33% 5.17		2.78% 5	8.33% 2.33
LØP /ø:/		9.72% 3.57	19.44% 5.14	5.56% 3.75	58.33% 4.45	6.94% 3.2
SØNN /ø/		11.11% 3.25	36.11% 4.35	8.33% 5	33.33% 4.29	6.94% 3.2
ROM /u/					72.22% 5.08	27.78% 4.9
GUD /ʉ:/	2.78% 7	18.06% 4.23	1.39% 1		1.39% 1	75% 4.72
SLUTT /ʉ/	1.39% 3	23.61% 4.11			9.72% 5	63.89% 4.65
ENGLISH stimuli						
FLEECE	100% 5.8					
KIT	37.5% 5.03	34.72% 5.84	27.78% 6.15			
DRESS		98.61% 6.03		1.39% 5		
GOOSE						100% 5.15
FOOT	1.39% 7	4.17% 4.67			43.06% 4.61	51.39% 3.86

Results: Euclidian distance & assimilations



Discussion

- A negative binomial model to capture whether F1-F2 Euclidean distance is related to how often a given L2 Eng / L3 Nor vowel is assimilated to a given L1 Polish vowel
  - ED is negative and significant (z = -6.751, Pr(>|z|) = 1.46e-11***) for L2 & L3
  - T1 – the strongest effect in both L2 and L3

- H1: The larger the Euclidean distance, the fewer assimilations predicted

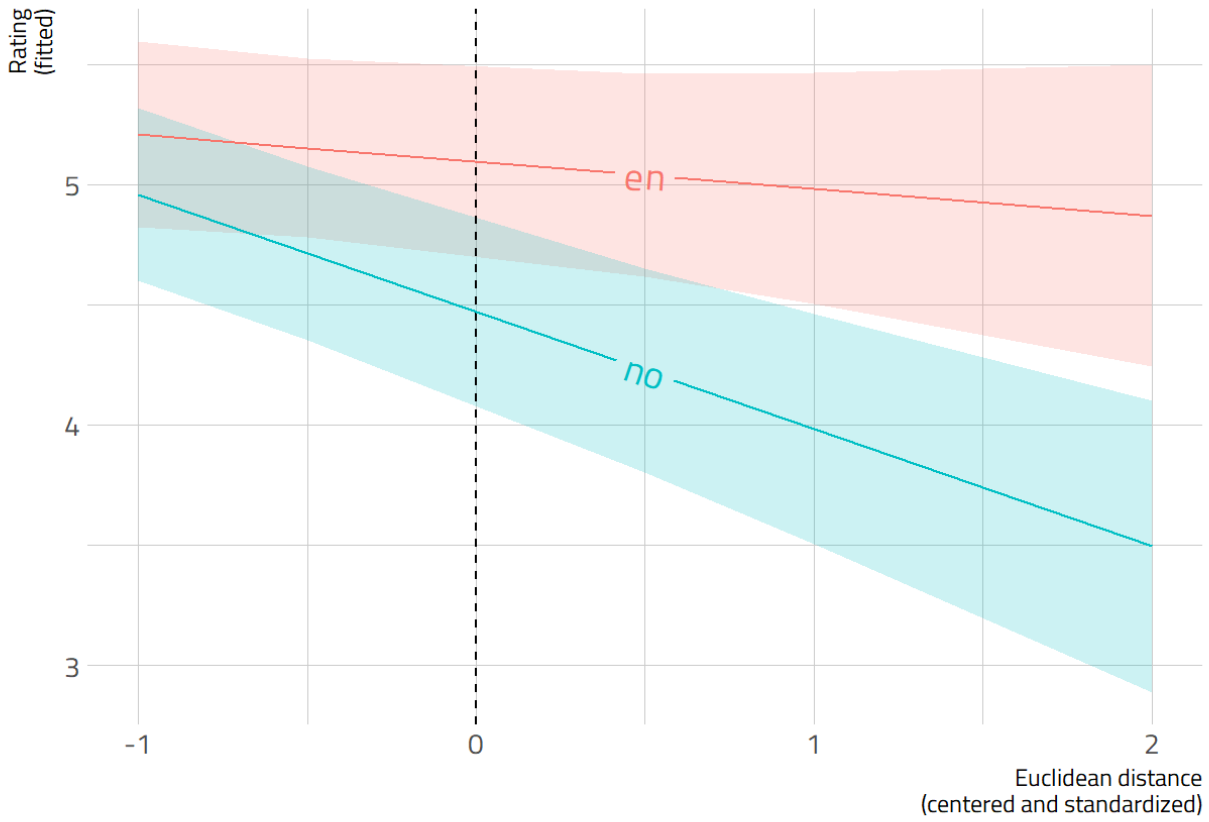
Discussion

- Stronger effect of the ED L3 than L2
  - coefficient in Nor ed_z = -1.7 > Eng ed_z= - 0.61,
  - assimilations in the better-known L2 English have stabilized
- H2: The Euclidean distance predicts assimilation better in L3 than L2 ✓

Discussion

- Mixed effects linear model of **Liker rating** as a function of ED, language (L2, L3) and their interaction; by-participant random intercept.
- Larger Euclidean distance means lower **goodness of fit ratings** in both languages.
- Significant effect of language: L2 English vowels are rated higher than L3 Norwegian vowels.
- H3: If we take into account the Euclidean distance, L2 vowels should be perceived as worse exemplars of L1 categories than L3 vowels. NO!

Results: L2 or L3 vowels as better exemplars of L1?



Interim summary

- The smaller the Euclidean distance between two vowels, the higher the likelihood of assimilating a given non-native vowel to a native category.
- There is a stronger effect of ED in L3 than in L2.
- The perceptuo-acoustic similarity patterns restructured over time; the strongest effect of ED at T1.
- L2 English vowels seem more similar to L1 Polish vowels than L3 Norwegian vowels.

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Cross-linguistic influence in vowel processing in multilinguals

Hanna Kędzierska, Karolina Rataj, Anna Balas, Zuzanna Cal and Magdalena Wrembel

ERP STUDY

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EEG study

- Aim: to examine non-native phonological contrasts perception and processing in L2 and L3
- RQ: Will phonological contrasts be equally easy to detect and process in L2 English and L3 Norwegian?
- Predictions: We predict the MMN to be stronger in native when compared with non-native speech (Jakobyet al., 2011; Liang & Chen, 2022; Näätänenet al., 1997; Song & Iverson, 2018)
  - BUT the scale of the MMN effect in L2 vs. L3/Ln impossible to predict

-> NO previous studies which would focus on such a comparison.

EEG study

Procedure

600 /i/ 60 /ɛ/

600 /ɪ/ 60 /ʊ/

600 /i/ 60 /ʏ/

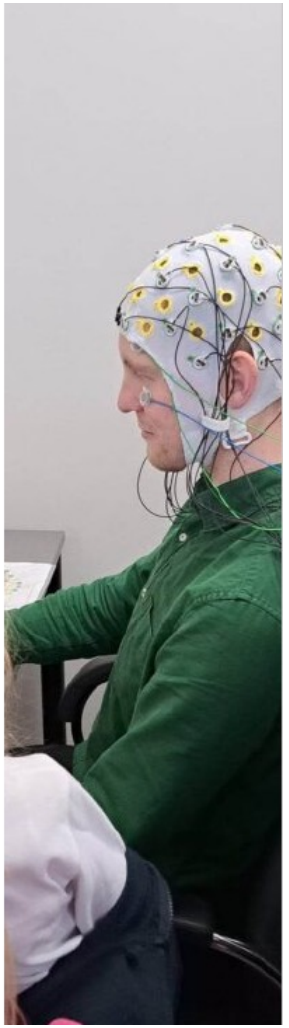
gating task: to assess the participants' speech-specific capabilities, which have been demonstrated to affect non-native phoneme discrimination (Díaz et al., 2016)

consent, surveys

the ERP preparation

ERP stimuli presentation during cartoon watching

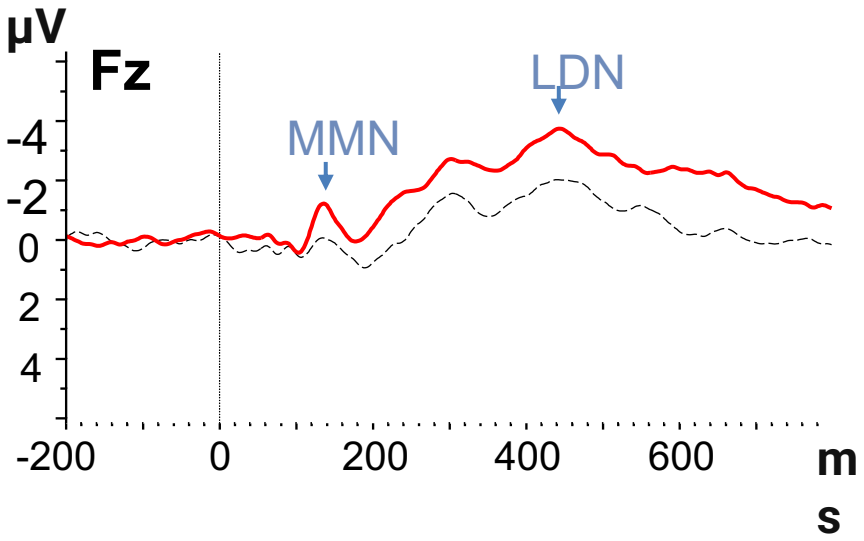
gating task, proficiency tests



Oddball paradigm

Oddball:

a sequence of frequently occurring standard stimuli interrupted by the occasional appearance of deviant stimuli)



MMN:

a negative-going wave deflection of frontocentral distribution with a peak at around 150-250 milliseconds from change onset.

P300 and LDN:

often following the MMN. **P300** is associated with switch of attention, **LDN** involves additional cortical resources to extract the difference.

Experimental stimuli

The Polish /ɨ/-/ɛ/ contrast mainly manifested in height.

The English /ɪ/-/ʊ/ contrast mainly manifested in backness.

The Norwegian /i/-/ʏ/ contrast mainly manifested in roundness.

Vowel	F1	F2	F3	ED
/ɨ/	468	1948	2821	231
/ɛ/	675	1916	2722	
/ɪ/	394	1828	2882	483
/ʊ/	390	1345	2896	
/i/	357	1917	2587	161
/ʏ/	313	2015	2707	

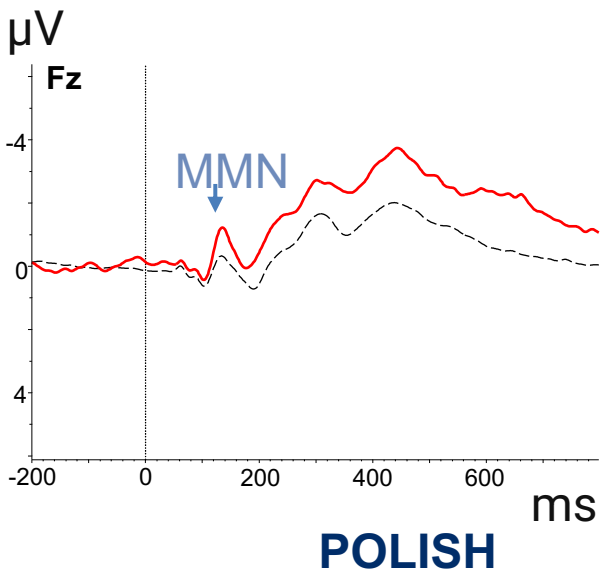
EEG study

- 2 groups – diverse acquisition settings
  - Formal learners in Poland (N=24)
  - Naturalistic learners in Norway (N=17)

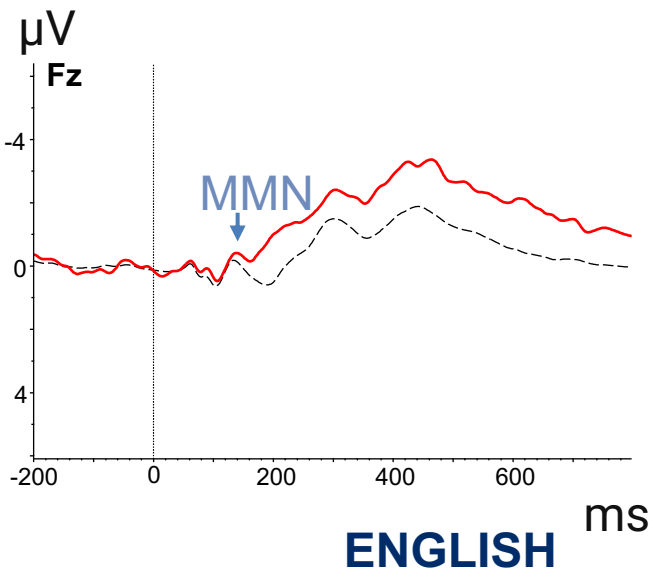
EEG study: Analysis in progress

- Mean amplitudes of ERP time-locked to the onset of investigated phonemes
- Analysis in 3 main time windows:
  - MMN, 3Pb, LDN
- Factors: language (L1 vs. L2 vs. L3) x deviancy (standard vs. deviant) x brain region (frontal vs. parietal)
- Promising results ☺

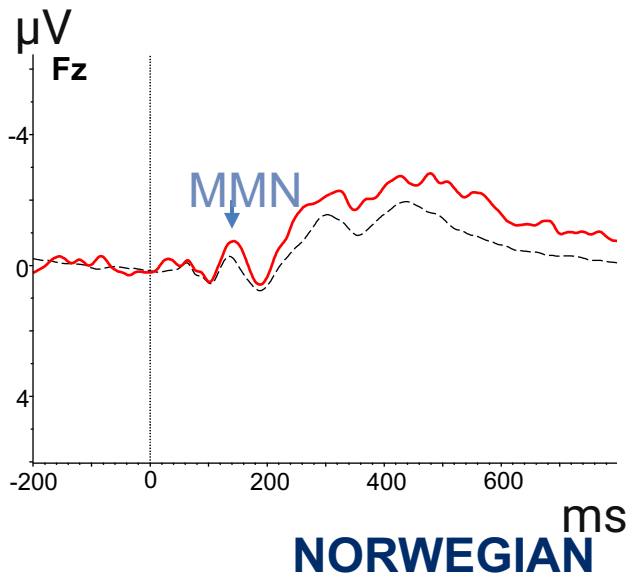
ERP results: AMU



POLISH

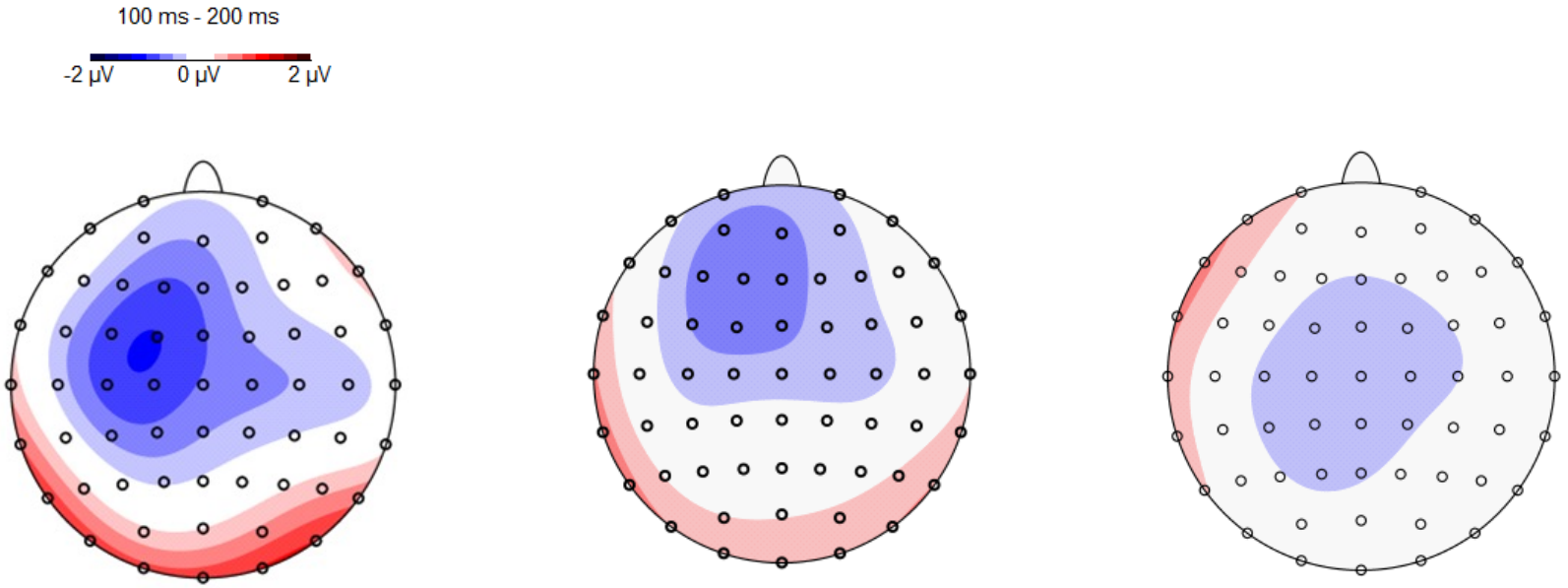


ENGLISH



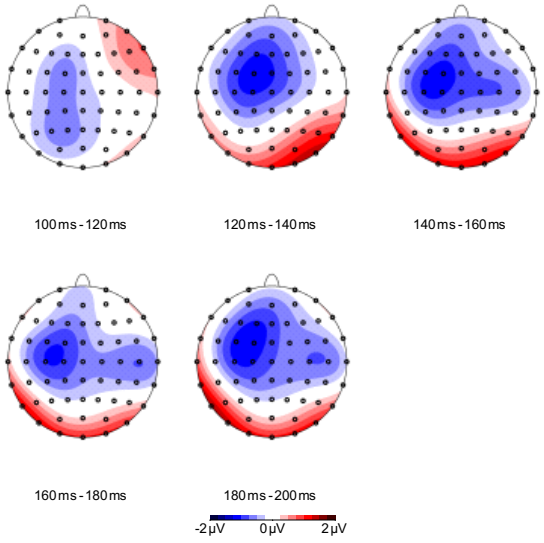
NORWEGIAN

ERP results: AMU



POLISH **ENGLISH** **NORWEGIAN**

ERP results: AMU



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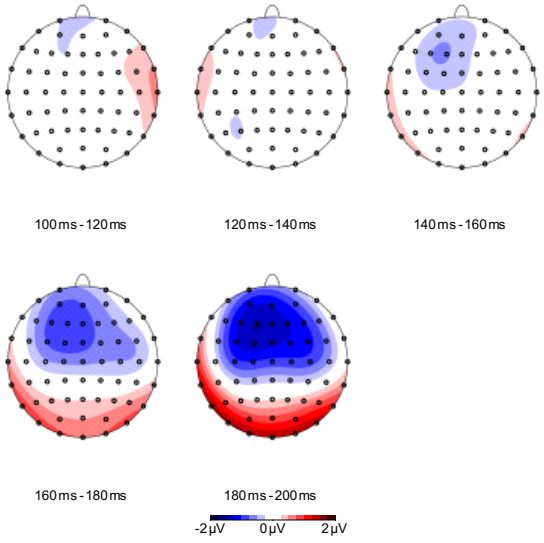
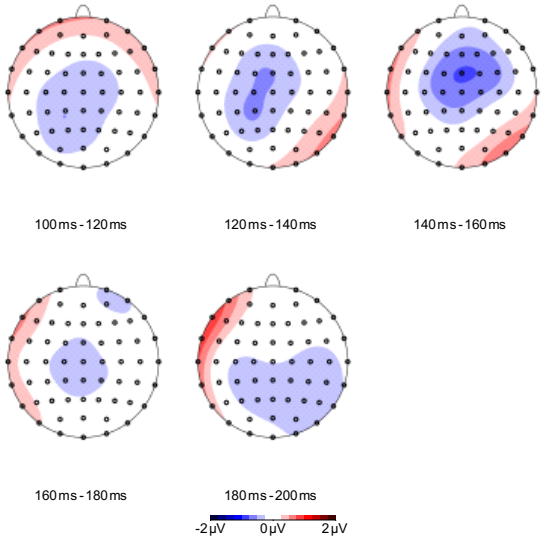


ENGLISH



NORWEGIAN

LnNOR CORPUS

LnNOR CORPUS

The corpus of spoken Norwegian, English and Polish (native and non-native) used in semi-formal, controlled situations as well as (semi)spontaneous speech.

Tasks:

a) word lists reading
b) text reading (North wind and the sun)
c) semi-spontaneous (MAIN picture description)
d) spontaneous (story telling, eg childhood experiences etc.)

- word-aligned with orthographical transcriptions
- error tagging
- LaBB-CAT environment as well as UAM repository
- publicly available

LnNOR CORPUS

Language groups:

a) **L1 Polish, L2 English, L3 Norwegian**
b) L1 Polish, L2 English
c) L1 Norwegian, L2 English
d) L1 Norwegian, L2 English, L3 Polish

So far:

- 119 speakers
- Ca 80 hrs recordings

LnNOR CORPUS

- **Metadata:**

– gender
– age
– language recorded
– other languages known by the speaker
– AoA of the recorded language
– proficiency
– acquisition/learning environment (formal vs. naturalistic or mixed)

– Participant profiles based on LHQ (Language History Questionnaire)

Way forward

- To further pursue theoretical refinement
- To triangulate different methodologies
- To investigate features that pattern differently across languages
- To expand across-domains studies
- To develop multilingual speech corpus

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Thanks to the project team ☺

10 YEARS WA
Faculty of English at AMU

Thank you! Dziękuję! Merci!

PLM http://wa.amu.edu.pl/plm/2023/