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The dynamics of multilingualism: exploring and modeling the acquisition of third language phonology

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Outline

- Dynamic nature of multilingualism
- Introduction to L3 phonological acquisition
- Methodological & theoretical challenges
- New research insights
- Project results and way forward

Aims

- To advance our understanding of the acquisition of speech from a multilingual perspective
- To anchor it within a broader debate on multilingualism
- To zoom in on some theoretical and methodological considerations in research on third language (L3) phonological acquisition
- To offer a state-of-the-art overview of findings


многоязычие
বহুভাষাবাদ
multilingüismo
çoxdillilik
bahubahasa
बहुभाषावाद
багатомовність
multilingualism
шматмоўе
meertaligheid
wielojęzyczność
多种语言
mnohojazyčnost
multilinguismo
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多言語使用
לשוניות
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Introduction

- Multilingualism - a norm rather than exception in the contemporary world
  - large part of the population speaks several languages on a daily basis
  - default state of linguistic competence
  - ”a natural state of a humankind” Aronin 2019

- ”Monolingualism is the illiteracy of the 21st century” Gregg Roberts

Introduction

- Multilingual acquisition - a **dynamic and diversified** process
- **New insights** into language learning beyond investigations into the first (L1) and second language (L2) (Flynn et al. 2004)
- Dynamic approach to multilingualism is in line with newest **research outcomes** from neuroscience, sociolinguistics or psychology (e.g. Kroll 2020, Sorace 2020)

Defining bi-/multilingualism

Perfect foreign language learning, not accompanied by loss of the native language, it results in bilingualism, nativelike control of two languages

Bloomfield (1933)

Minimal bilingual skill: contact with possible models in a second language; “receptive bilingualism”, ”passive knowledge”

Diebold (1961)

The alternate use of two or more languages by the same individual; mutually modifying linguistic practices varying in degree, function, alternation, and interference

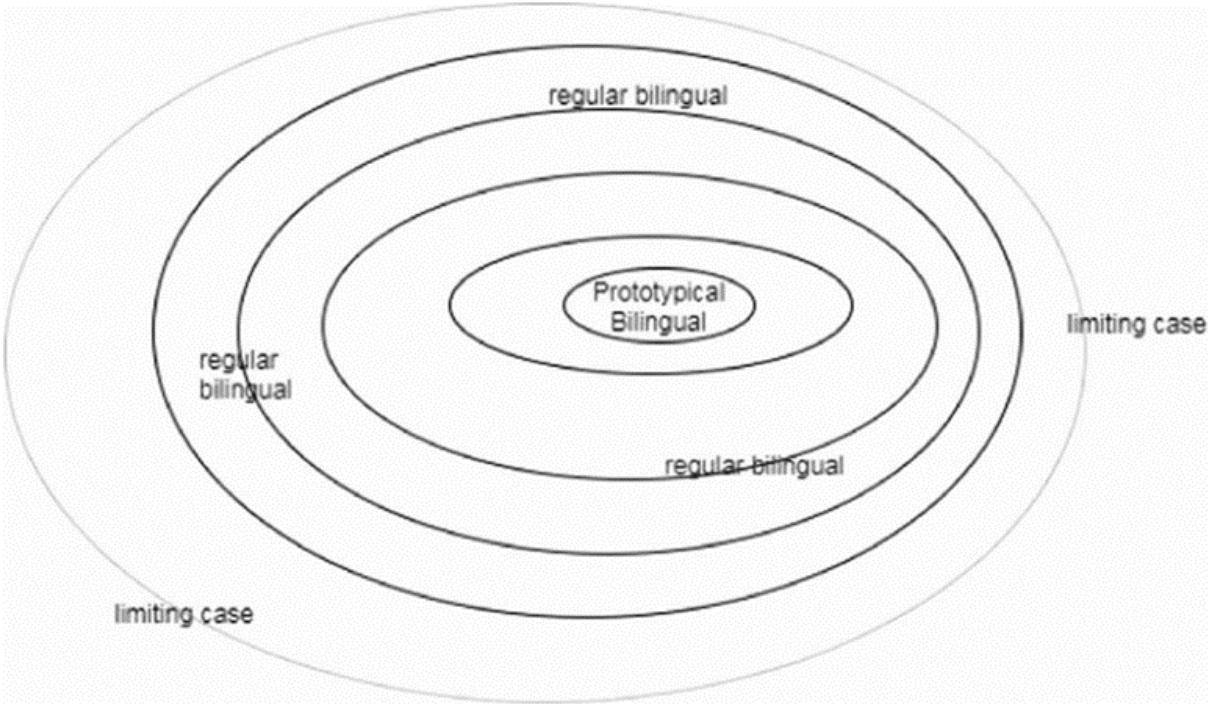
Mackey (1962)

Bilingualism is the regular use of two or more languages (or dialects) in everyday life

Grosjean (2008)

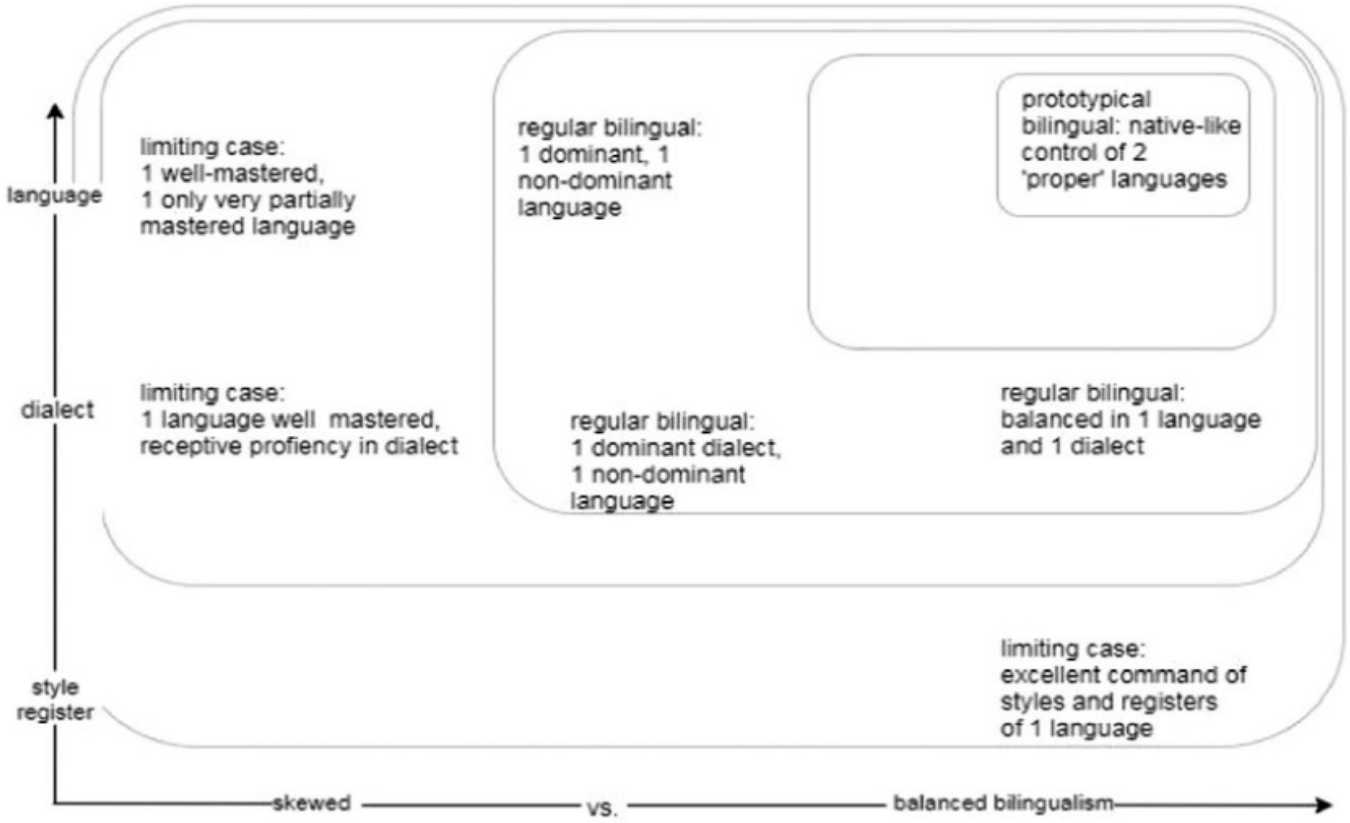
Conceptualising bi-/multilingualism

- Not a categorical variable (Luk & Bialystok, 2013)
- A natural category - Berthele (2021):
  - radiality, gradient membership, fuzzy boundaries



Conceptualising bi-/multilingualism

- Natural category of bilingualism along two dimensions:
  - balance
  - language status (Berthele 2021: 86)



Bilingualism vs. multilingualism

- 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)

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 affecting linguistic and non-linguistic processing -> 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

Dynamics of multilingualism
- language representation in the brain

- Robust **neuroplastic changes** in brain areas in multilinguals
- Functionally separate language-specific regions in each language, in addition to shared language areas (Połczyńska et al. 2016)
- Greater **bilateral hemispheric** involvement
- More **widespread activations** in less profficient L2/Ln (Połczyńska 2017, 2020)

L3 PHONOLOGY: NEW INSIGHTS

Reseach in L3 speech

- Third language acquisition (TLA): zooming in on L3 phonology
  - an understudied domain, e.g. Hammarberg 1997; Cabrelli Amaro 2012
  - growing body of research, e.g. Cabrelli Amaro & Wrembel 2018
- Upsurge of interest
  - **ICPhS** workshop on L3 phonology – Freiburg 2007
  - Workshop on Advances in the Investigation of L3 Phonological Acquisition at **SLE 2014** Poznań
  - Workshop “Modelling the acquisition of foreign language speech: old meets new” at **SLE 2017** Zürich
  - Special poster session at **ICPhS 2019** Melbourne ”Theoretical and methodological challenges in L3 phonological acquisition”
  - Special session on L3 phonology at **ISB 2021**

Key research areas (1)

Sources and nature of cross-linguistic influence (CLI) on L3 phonology

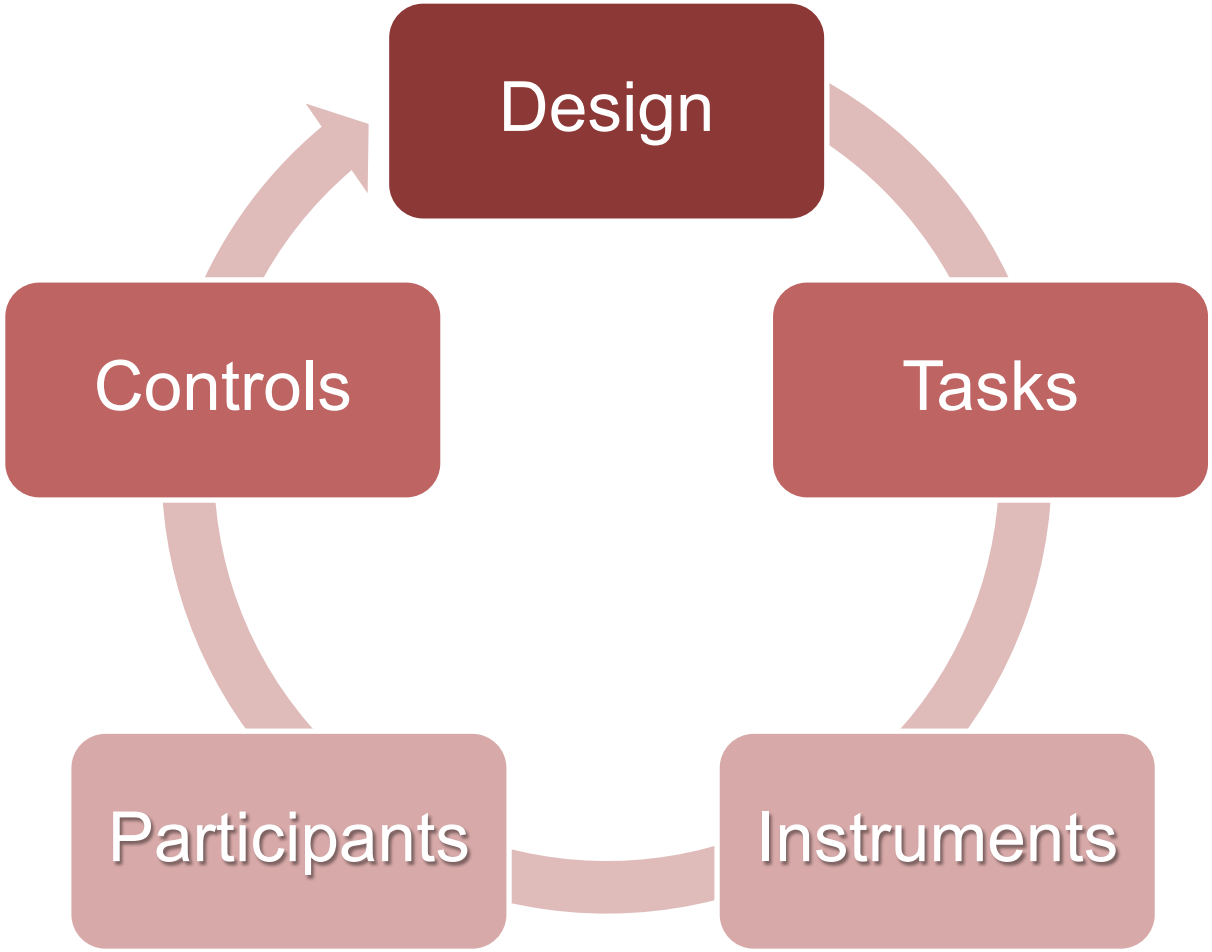
- L1→L3, L2→L3, L2→L1, L3→L1, etc
- Simultaneous or sequential influence
  - Barkley 2010 - simultaneous L1 English and L2 Spanish influence on L3 BP (also Wrembel 2015)
  - Hammarberg & Hammarberg 2005 - sequential influence of L2 German then L1 English on L3 Swedish (Wrembel 2010)
- Multiple sources of CLI across different phenomena
  - Wrembel 2010, 2012, 2016 - hybrid VOT productions in L3
  - Blank and Zimmer 2009 - hybrid vowels in L3
- Transfer determined by complexity of subsystems
  - Benrabah 1991 - Arabic/French bilinguals acquiring L3 English
  - consonants transferred from Arabic, vowels from French

Key research areas (2)

Bilingual advantage/facilitation in L3 phonology

- Multilingual advantage in perception of novel contrasts
  - Antoniou et al. 2015, Enomoto 1994, Kopečková 2015, Tremblay & Sabourin 2012, Onishi 2016, Wrembel et al. 2019
- No differences between monolingual and bilingual acquisition of novel contrasts
  - Díaz 2011, Gabriel et al. 2014, Patihis et al. 2015
- Conflicting evidence possibly due to differences in:
  - typological distance
  - acquisition context
  - language dominance and proficiency

Methodological considerations



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)
  - Heritage speakers L1/L2 -> 2L1s

Methodological challenges: Tasks

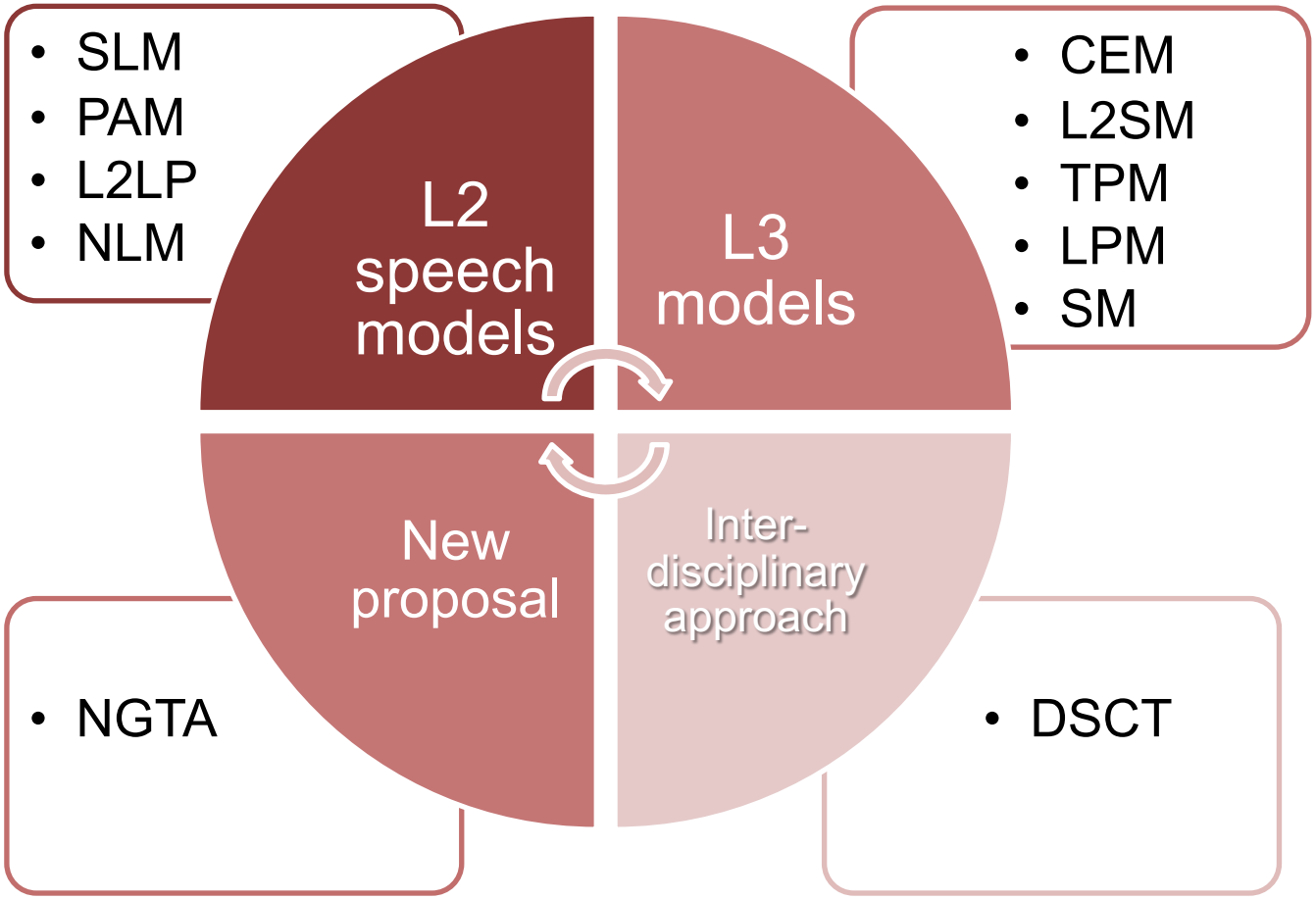
- Tasks and procedures
  - Speech sample elicitation in all (3 or more) languages
  - Degree of control vs. ecological validity
  - Perceptual paradigms - for separate languages or cross-linguistic

- 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
  - 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
  - Language learning is cumulative
  - All previously learnt languages may influence subsequently acquired languages (if facilitative)
- L2 Status Factor Model Bardel & Falk 2007
  - L2 influence prevails over L1, 'foreign language effect'
  - Psycho & neurolinguistically motivated: greater cognitive similarity of L3 and L2 (not L1)
- Typological Primacy Model Rothman 2011, 2015
  - Typology determines source of CLI
  - Structural proximity determined by parser at early stages of L3 acquisition
  - Holistic transfer

Third language (L3) acquisition models (2)

- Linguistic Proximity Model Westergaard et al. 2017, 2019
  - facilitative and non-facilitative CLI from L1 and/or L2
  - based on structural similarity with previous language
  - property-by-property transfer not holistic transfer

- Scalpel Model Slabakova 2017
  - In line with LPM
  - cognitive and experiential factors:
    - structural linguistic complexity of properties
    - misleading input
    - construction frequency in L3
    - patterns of language activation or use

Interdisciplinary approaches

- Dynamic Model of Multilingualism Herdina & Jessner 2002
  - Stems from dynamic systems complexity theory DSCT
  - Holistic perspective of multilingualism
  - Non-linearity of lng growth (changes over time)
  - Interdependence between lng systems
  - Variability of the process
    - Depends on sociological, psychological, individual factors
    - Emergent properties
    - Multilingual is NOT a sum of monolinguals
  - High degree of complexity -> unpredictable outcomes

- **$LS_1+LS_2+LS_3+LS_n$+ CLIN + M = MP**

New proposal

- Natural Growth Theory of Acquisition (**NGTA)**
  Dziubalska-Kołaczyk & Wrembel, 2017, 2021
- A holistic theory of language
  - explains acquisition in all relevant aspects (i.e. L1, L2, L3, cross-linguistic influence, language attrition and death)
  - interdisciplinary and open to transdisciplinarity
  - extralinguistic factors, functionalist perspective
- Stems from Natural Phonology
  - Donegan & Stampe 2009, Dressler 1984, 1996, Dziubalska-Kołaczyk 2002, 2009, 2012
- Enhanced by Complexity Theory
  - Kretzschmar 2015

Natural Growth Theory of Acquisition

- Assumptions:
  - a gradual dynamic emergence of Ln phonology
  - shaped by the input from L1 and other Ln(s)
  - influenced by typology, universal preferences, and context
- Predictions:
  - principled and data-driven explanations
  - derived from linguistic and extralinguistic variables
  - forming a network of interdependencies

  - Dziubalska-Kołaczyk & Wrembel (2016, 2017, 2022)

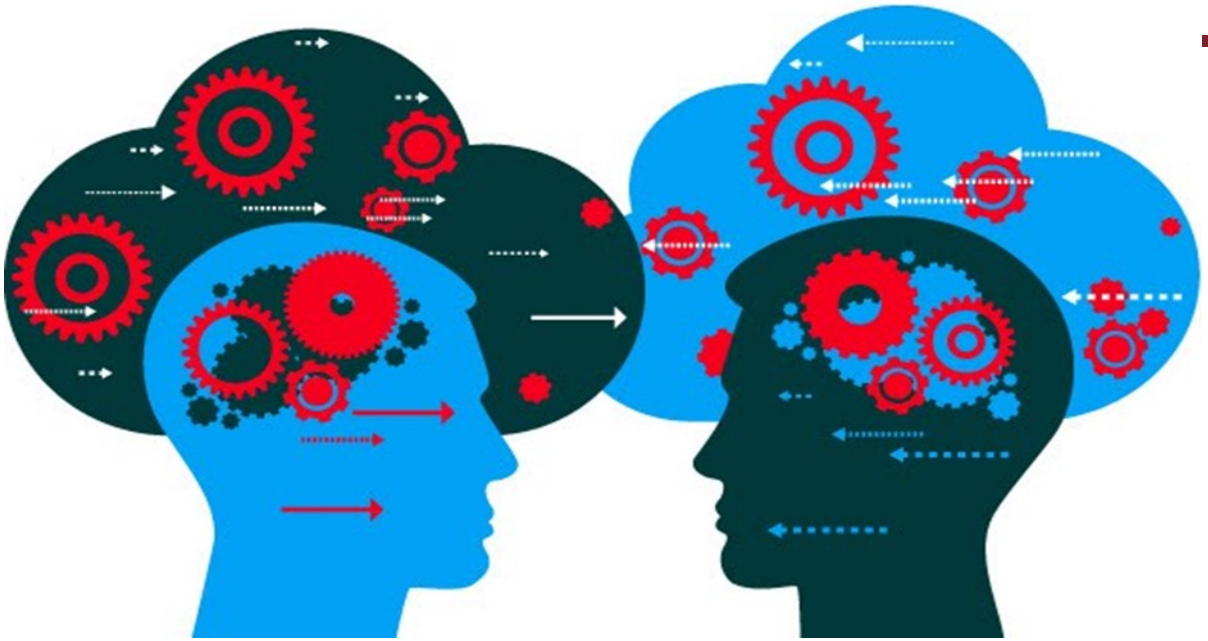
NGTA: General assumptions

- **GA I:**
  - **A**: All three linguistic variables (L1, Ln, preferability generalizations) have influence on the process
  - **B**: Their influence is moderated by the configuration of extralinguistic factors in a given acquisition situation

- **GA II:**
  - Acquisition process is dynamic and proceeds as the function of time and language learning experience
  - The older the multilingual learners, the more complex the interdependencies among variables

NGTA: General assumptions

- **GA III:**
  - We distinguish two levels in language acquisition process, motivated by Kahneman (2011)
  - Level 1 is automatic (involuntary and instinctive) e.g., articulatory routines and phonetic perceptual constraints; grounded in implicit, procedural knowledge
  - Level 2 is conscious (mindful, cognitively-based) as manifested by any aspect of meta-awareness; relates to explicit, declarative knowledge

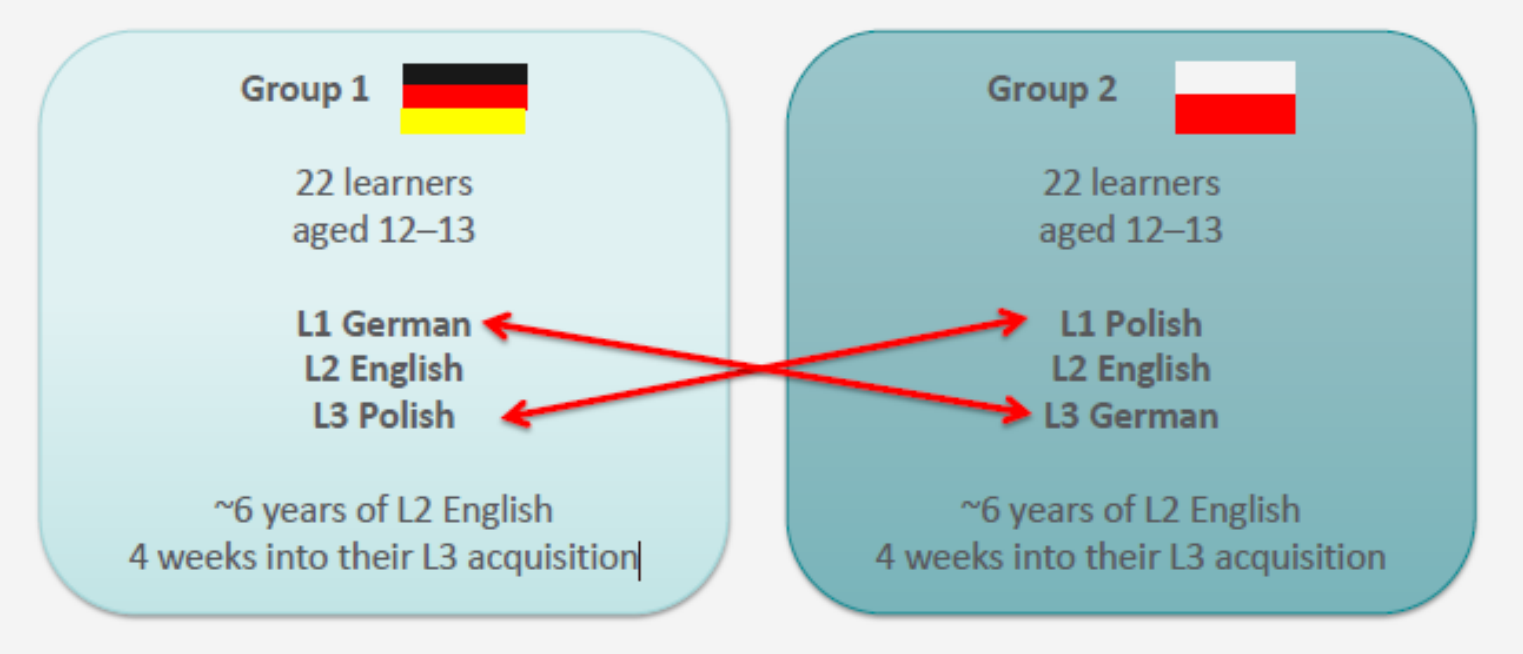


PROJECT FINDINGS

"Multi-Phon" project

- Large-scale international project (2017-2019)
- Longitudinal design – 3 data collections (T1, T2, T3)
- Pool of 40 young sequential multilinguals
- Parallel studies in Polish and German schools
- Tested in L1, L2 and L3
- Battery of production and perception tests
- Aim: to explore phonological CLI in multilingual adolescent learners

Project scope



4 weeks into L3 instruction → **4 months into L3 instruction** → **9 months into L3 instruction**

Research foci

- Developmental trajectories of L3 and L2 phonologies
- Cross-linguistic interactions over time
- Production and perception interface
- Effects of language proficiency and L1 group
- Interindividual variation

PERCEPTION VS. PRODUCTION

WREMBEL, M, GUT, U., KOPEČKOVÁ, R., BALAS, A. (2022) IJM

Perception-production link in foreign language learning

- Four scenarios:

1. Perception > production
2. Perception = production (aligned, co-evolve)
3. Production > perception
4. Dissociation (no direct link)
   - e.g. perceptually salient sounds but challenging in motor-articulatory execution

Rhotics

- Rhotics – interesting phenomenon
  - complex articulations within and across languages (Ladefoged & Maddieson 1996)

- Different realisations in all three languages:
  - Polish [r] - alveolar trill or tap
  - English [ɹ] – (post)alveolar approximant
  - German [ʁ] - uvular fricative (or trill)
- Different markedness standing
  - alveolar trill/ tap > post-alveaolar approximant > uvular trill (from the least to most marked)
  - Articulatory difficulty vs. universal frequency

Production

- Task: delayed repetition in L1, L2, L3
- Stimuli:
  - Target words embedded in carrier sentences (in L1, L2, L3)


- Tokens with word-initial and word-medial rhotics as single onset consonant
- Recordings
  - portable digital recorder Roland R-26
  - at 44.1 kHz sampling rate with 16 bit quantization
- Auditory analyses
  - 3 independent raters (phonetically trained)
  - classification as target / non-target

Perception

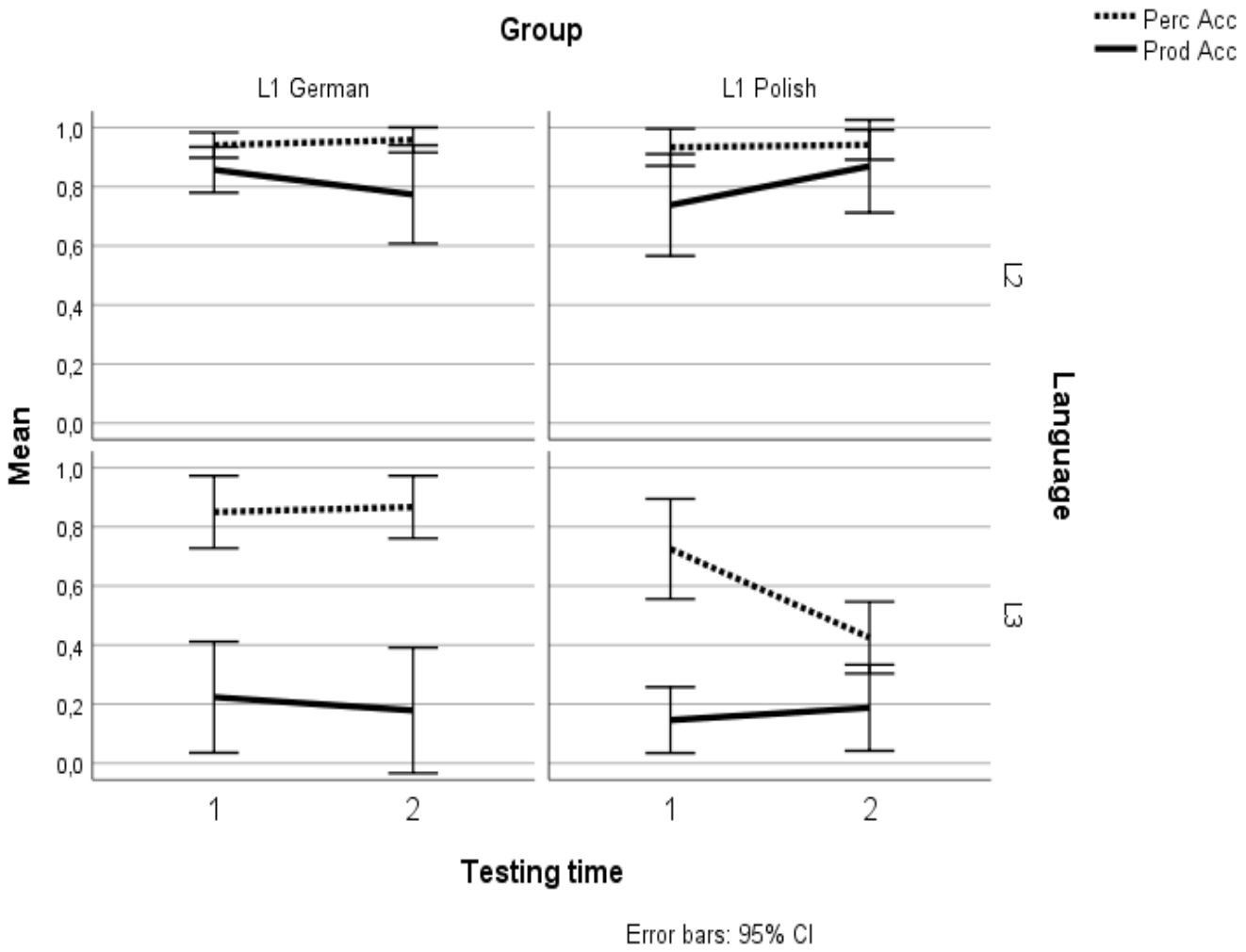
- Forced-choice goodness task
  - randomised and counterbalanced in E-prime, ISI= 500ms,
  - two renditions of the same phrases differing on the last stimulus items

L3 German  

- Stimuli – 5 items x 2 languages x 2 repetitions
  - **English:** *ring, rabbit, red, round, giraffe*;
  - **German:** *rot, Regen, Reise, Fahrrad, verloren*;
  - **Polish***: ryba, ręka, rok, chora, stara*
- Measures: accuracy & RT

L2 English  

Results: Perception vs. production



Results: Perception vs. production

Production:

- **L1 Polish group** -> L2 > L3

at T1 ($Z = 2.98$, $p < 0.05$)

and T2 ($Z = 2.98$, $p < 0.05$),

Wilcoxon signed-rank test

- **L1 German group** -> L2 > L3

at T1 $t = 6.57$, $p < 0.05$

and T2 $t = 5.99$, $p < 0.05$)

Production over time:

- **L1 Polish group**

L2 accuracy increased from T1 to T2 ($Z = 2.03$, $p < 0.05$)

- **L1 German group**

No significant change

Perception:

- **L1 Polish group** -> L2 > L3

at T1 ($t = 2.63$, $p < 0.05$)

and T2 ($t = 8.26$, $p < 0.05$)

- **L1 German group** L2 = L3

Perception over time:

- **L1 Polish group**

L3 perception decreased in accuracy from T1 to T2 ($Z = 2.43$, $p < 0.05$);

L2 remained stable

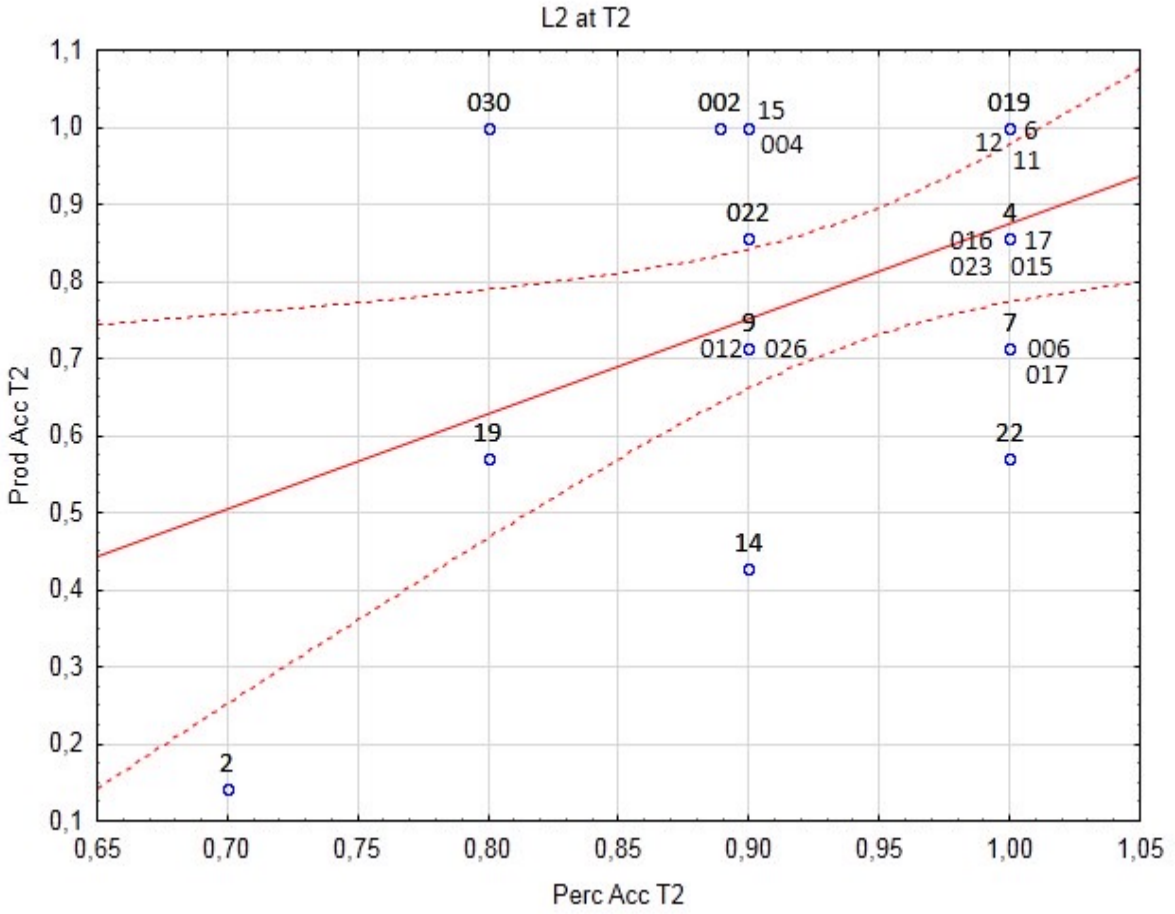
- **L1 German group**

No significant change

Results: Correlation trajectories for L2

In L2

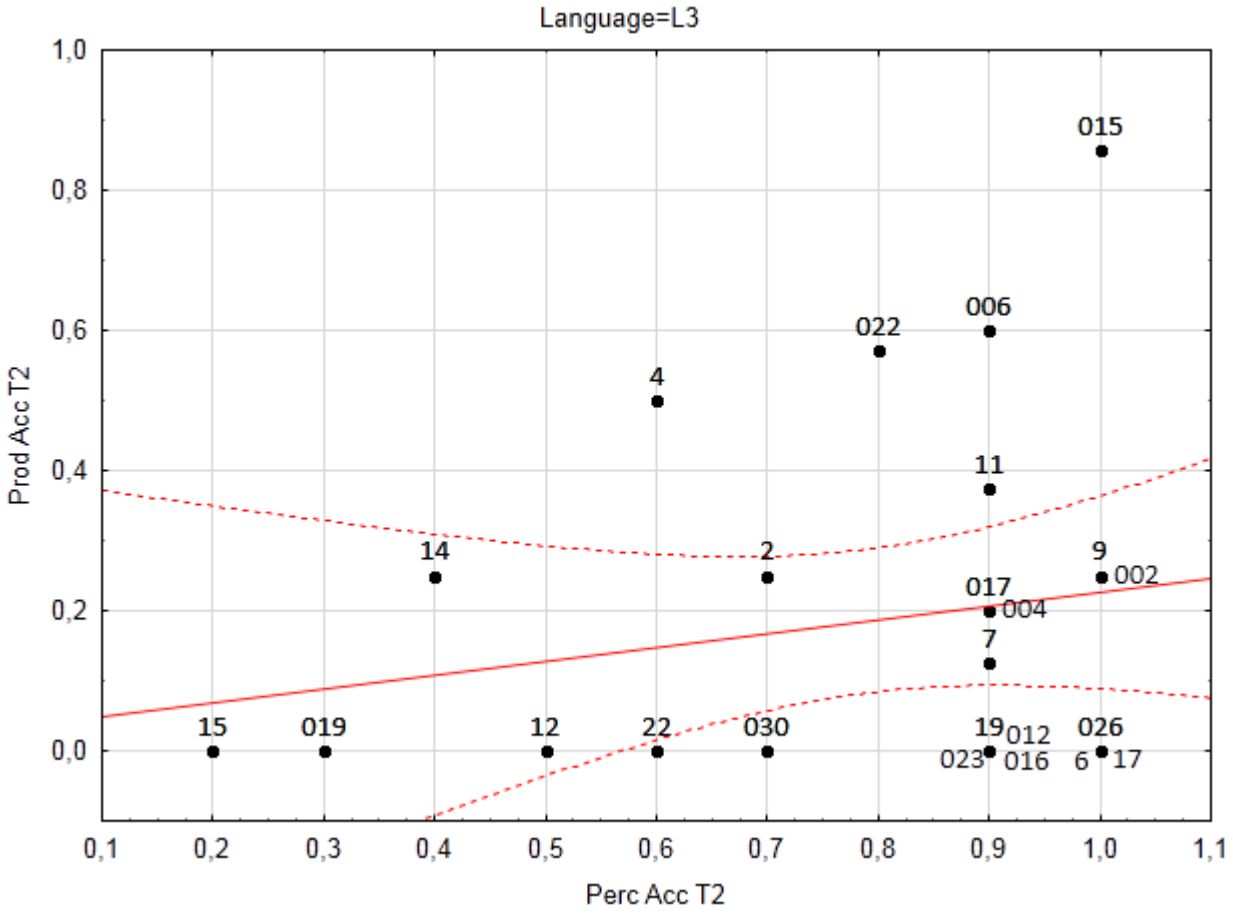
- Both modalities aligned, co-evolving
- High perception + mid / high production accuracy
- For both L1 groups
- At T1 and T2



Results: Correlation trajectories for L3

In L3

- Scores scatterred across the spectrum
- Performance on two modalities unrelated -> dissociation



Results: Individual perceptuo-productive patterns and change trajectories

Participant	L2 English		L3 German / L3 Polish	
	Relationship type at T1	Relationship type at T2	Relationship type at T1	Relationship type at T2
L1 Polish				
2	dissociation	dissociation	dissociation	dissociation
4	perc = prod	prod = perc	dissociation	perc = prod
6	perc = prod	perc = prod	dissociation	dissociation
7	perc > prod	perc = prod	dissociation	dissociation
9	perc = prod	perc = prod	dissociation	dissociation
11	perc = prod	perc = prod	dissociation	dissociation
12	perc = prod	perc = prod	dissociation	dissociation
14	dissociation	perc = prod	dissociation	dissociation
15	perc = prod	perc = prod	dissociation	dissociation
17	perc = prod	perc = prod	dissociation	dissociation
19	perc = prod	perc = prod	dissociation	dissociation
22	perc > prod	perc > prod	dissociation	dissociation
L1 German				
002	perc = prod	perc = prod	dissociation	dissociation
004	perc = prod	perc = prod	dissociation	dissociation
006	perc > prod	dissociation	perc > prod	dissociation
012	perc = prod	perc = prod	dissociation	dissociation
015	perc = prod	perc = prod	perc = prod	perc = prod
016	perc = prod	perc = prod	dissociation	dissociation
017	perc > prod	perc > prod	dissociation	dissociation
019	perc= prod	perc = prod	dissociation	dissociation
022	perc = prod	perc = prod	perc = prod	dissociation
023	perc = prod	perc > prod	dissociation	dissociation
026	perc = prod	perc > prod	dissociation	dissociation
030	perc = prod	perc = prod	dissociation	Dissociation

Discussion: modulating factors

Universal and L-specific learnability of sounds

- Both L1 groups did equally well at acquiring L2 English alveolar approximant, which may pose less articulatory difficulty than trills (Catford 2001)
- L3: high perception, low production accuracy because of high perceptual salience of L3 rhotics vs. their motor-articulatory difficulty

Discussion: modulating factors

L1 group effect:

- Moderate correlation only for the L1 Polish group at T2
- Individual correlation analyses: both L1 groups — aligned perceptuo-productive performance in L2, while in L3 dissociation

Development over time

- Improvement only in L2 production accuracy for the L1 Polish group
- Insights from individual trajectories suggest a more dynamic picture, esp. in L2

Conclusions

Relationship between domains

Perception & production co-evolve

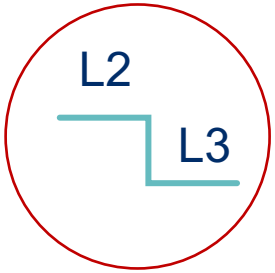
Modalities aligned in L2; dissociation in L3

Individual variability – different patterns attested

modalities aligned, co-evolving (perception = production) –> L2

perception accuracy high, but production low -> L2, L3

performance on two modalities unrelated (dissociation) –> L3



Effect of language proficiency

Learners perform better on L2 perception and production tasks than on L3 perception and production over time

CLIMAD PROJECT

Study Design

- Participants:
  - L1 Polish/L2 English/L3 Norwegian
    - Formal instruction
    - Onset of L3 learning
  - Norwegian controls
- 3 testing times (longitudinal study)
- 3 tasks
  - Production
  - Perception (Balas et al. SLE 2022)
  - Grammaticality Judgements (Żychliński et al. SLE 2022)

Timeline

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
- Analysis under way

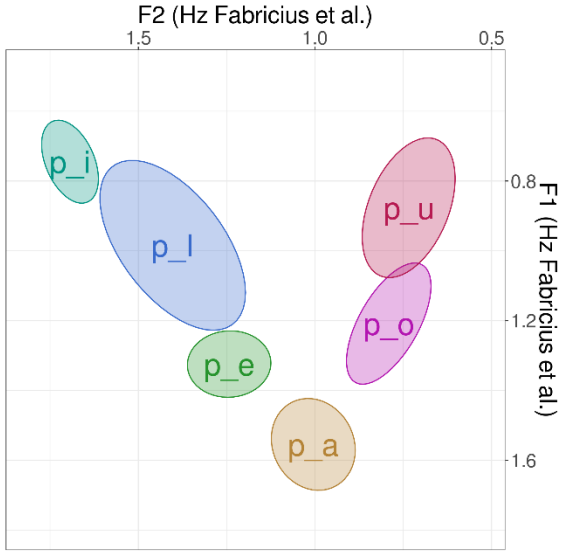
Production study

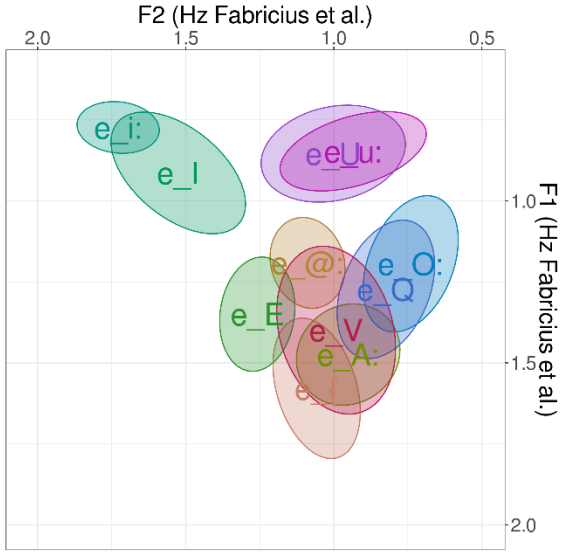
Weckwerth, Wrembel, Balas, Rodriguez (2022)

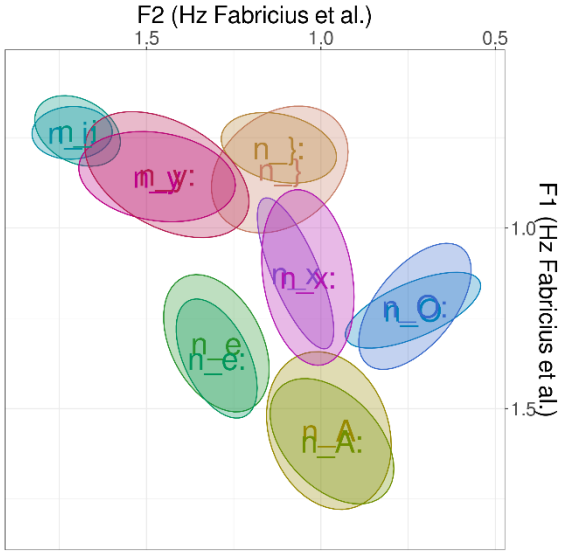
- Aim: to explore spectral overlap in L1 Polish, L2 English and L3 Norwegian vowels
- Design:
  - Reading real and nonce words in (dVd, dVt) in a carrier sentence and in isolation
  - Three language blocks (L1, L2, L3)
- First three formants and vowel durations measured
- Participant profiles:
  - Leap-Q Language Experience and Proficiency Questionnaire (Marian et al. 2007)

Production study: Results

L1 Polish L2 English L3 Norwegian



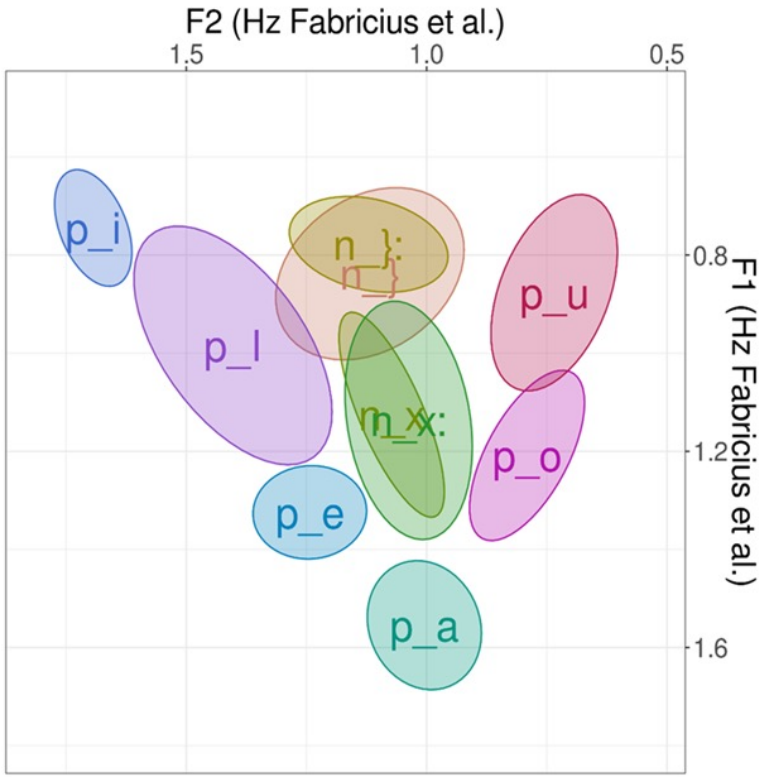




- Additional L2 and L3 spectral categories found in areas unoccupied by L1 vowels
- Some differentiation between L2 and L3

Results: estimating spectral overlap between vowel categories

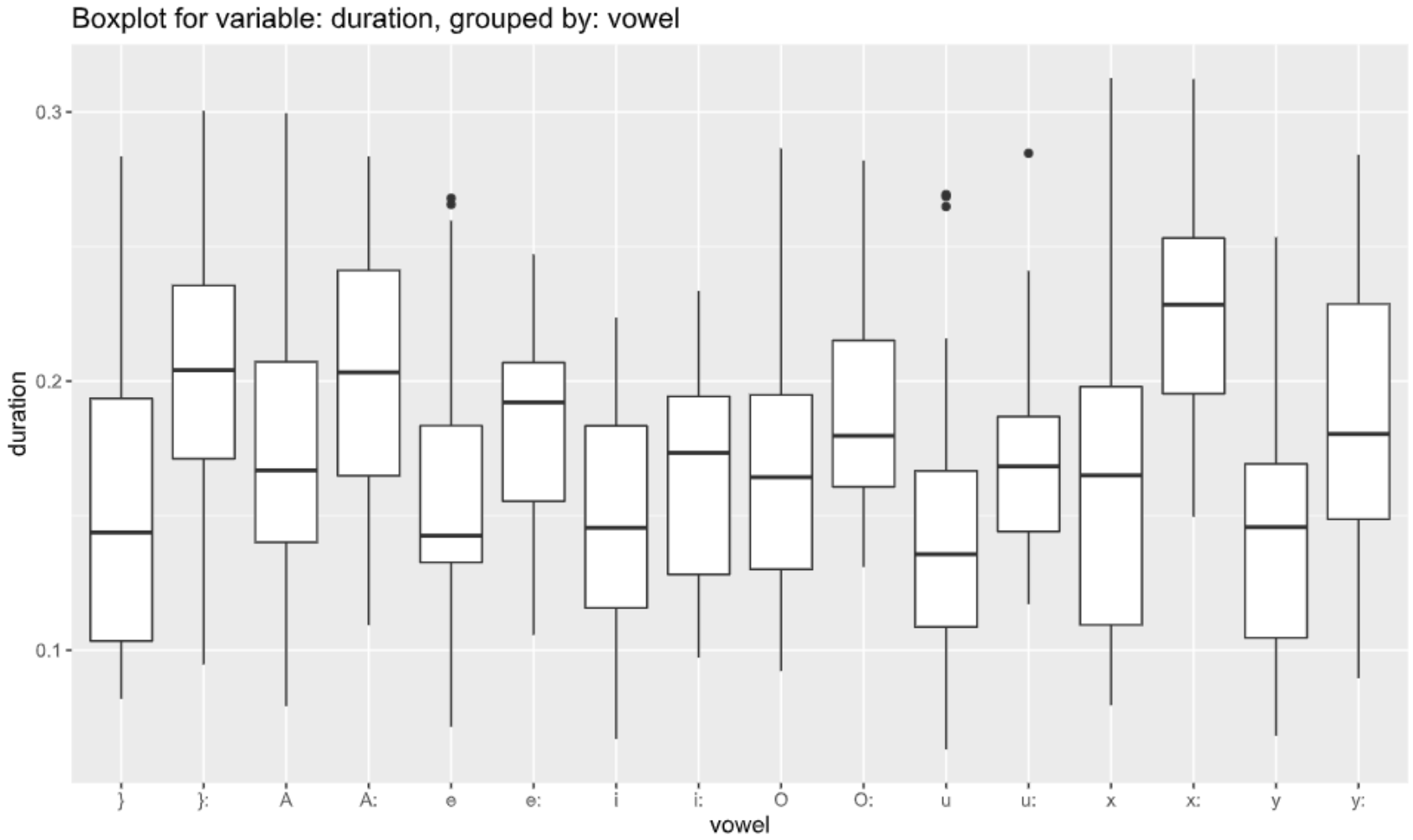
Norwegian /ʉ(ː)/ /ø(ː)/ separate from Polish



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

Production study: Duration for L3 Norwegian



Production study: Discussion

- RQ1: Do multilingual learners keep their vocalic systems apart?
  - language-specific phonological categories in L3
  - English L2 less stable, subject to variability
- RQ2: What are the interactions between the three vocalic subsystems in multilingual learners?
  - prevailingly L1>L3, but some L2>L3
- RQ3: What drives the overlap between pairs of cross-linguistically adjacent vowels?
  - main predictor – intensity of L3 use

Perceptual assimilation study

Balas, Cal, Rodriguez, Rataj, Wrembel, Kaźmierski (2022)

- **Aim**: To investigate the relationship between perceptual assimilation of L3 Norwegian to L1 Polish vowels and their acoustic similarity (via Euclidean distance and lip rounding)
- **Participants**: L1 Polish L2 English L3 Norwegian speakers (n=16), B1
- **Tasks**: (1) assimilation of 16 Norwegian vowels to 6 Polish vowel categories and (2) goodness of fit ratings
  - BEST, BOK, DAG, FIN, GUD, LØP, LYS, NOK, RAD, ROM, SLUTT, SØNN, STED, SYND, TAKK, TID
  - 6 Polish vowel categories /i, ɨ, e, a, ɔ, u/ presented as orthographic labels
- **Stimuli**: nonse words in /dVd/ framework (1 for each vowel) presented 3 times (e.g., dåd, dedd, did)

Perceptual assimilation study: Hypotheses

- (1) the smaller the Euclidean distance* between two vowels, the higher the likelihood of assimilating a given Norwegian vowel to a Polish category
- (2) lip rounding and duration differences may influence the assimilation patterns

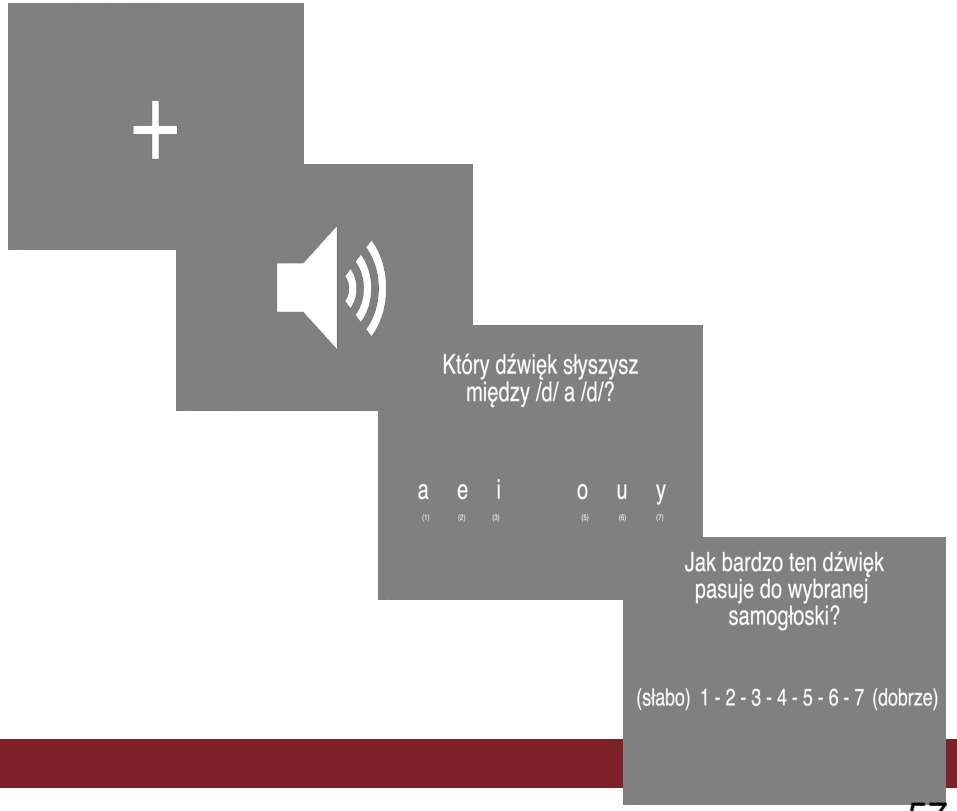
- *Euclidean distance is typically calculated using the mean F1 and F2 values in Hertz for each category or pairs of vowels
- F1 inversely related to vowel height, F2 – to vowel backness

Perceptual assimilation study: procedure

Run in PsychoPy

Practice session + **experimental session** (16x3)

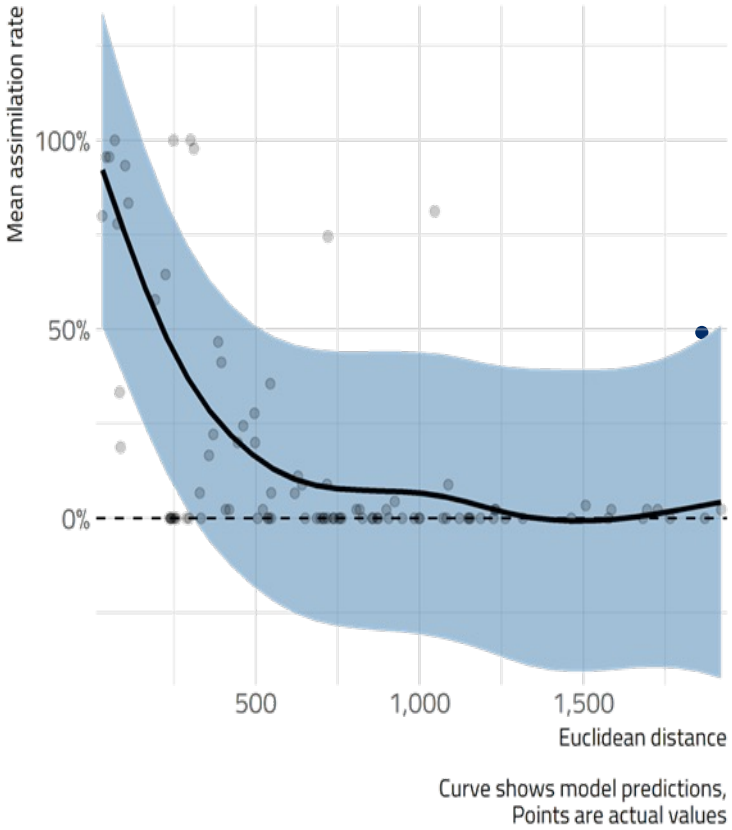
- Instructions
- Fixation point
- Auditory stimulus
- Task 1: Vowel choice (6s)
- Task 2: Likert scale (6s)
  - 1 (weak fit) -- 7 (good fit)
- *ISI (1.5s)*



Assimilation rates of Norwegian vowels to Polish categories

Norwegian stimuli	Polish vowel labels					
	<i>	<y>	<e>	<a>	<o>	<u>
TID /i:/	95.56% 5.6		2.22% 3		2.22% 4	
FIN /i/	35.56% 4.25	57.78% 5.12	6.67% 4.33			
LYS /y:/	84.09% 4.62	11.36% 3.6			2.27% 1	2.27% 3
SYND /y/	8.89% 3.25	80% 4.67			2.22% 1	8.89% 4.5
STED /e:/	2.22% 4		95.56% 5.05	2.22% 7		
BEST /e/	4.44% 4		93.33% 5.83	2.22% 5		
LØP /ø:/	2.22% 2	20% 4	24.44% 2,91		46.67% 3.67	6.67% 4.67
SØNN /ø/	2.27% 6	27.27% 4.42	20.45% 3.22		40.91% 4.17	9.09% 4
DAG /ɑ:/				1% 5.02		
TAKK /ɑ/				100% 5.13		
RAD /o:/	2.22% 7				97.78% 5.07	
NOK /o/					100 5.05	
BOK /u:/					22.22% 4.7	77.78% 4.94
ROM /u/	2.22% 5				64.44% 4.55	33.33% 5.33
GUD /ʉ:/		16.67% 4				83.33% 3.91
SLUTT /ʉ/		15.91% 4.28	2.27% 2		6.82% 4.33	75% 4.15

Perceptual assimilation study: Results



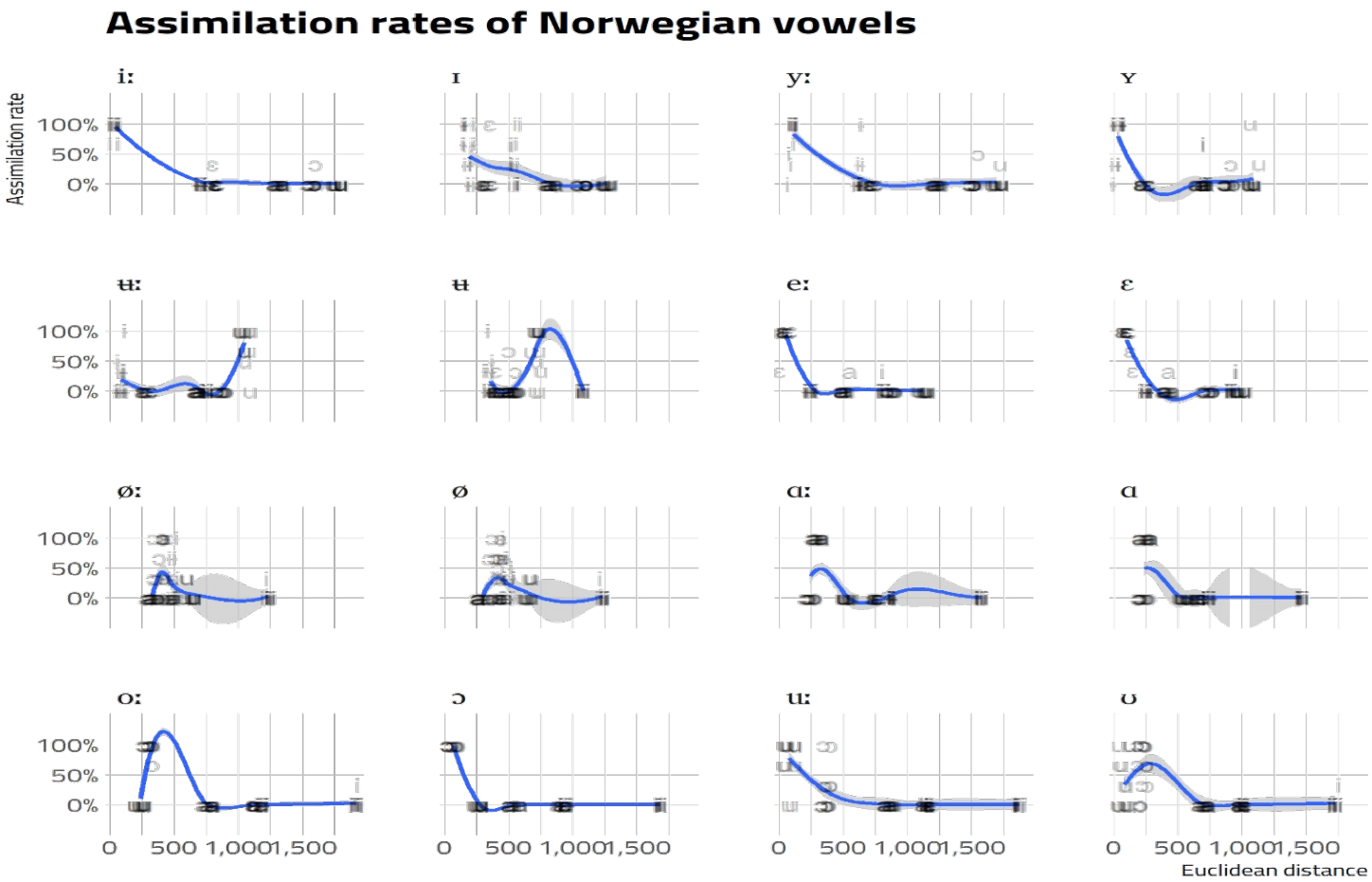
- A mixed-effects model in R to predict assimilation rating as a function of Euclidean distance, length of a Norwegian vowel, markedness with regard to lip rounding and Norwegian vowels.

Euclidean distance effect ($\beta = -0.036$, $p < 0.001$)
-> the larger the Euclidean distance, the lower the assimilation rate

No statistically significant effects of:

- vowel length
- lip rounding, but a dynamic twist…

Assimilation rates of Norwegian vowels to Polish categories



Perceptual assimilation study: Model comparison

- Comparisons of F1_F2_F3 and F1_F2 models, find that F1_F2 model is a better model; both Poisson and GAM
  - # df AIC
  - ## ac_poisson_int_3d 4 1352.331
  - ## ac_poisson_int_2d 4 1210.072

  - # ar_mdl_gam_3d 21.92624 933.5030
  - ## ar_mdl_gam_2d 24.96523 910.0611
- Including an F3 as approximation of lip rounding did not work as expected

➢ Assimilation rates depend on Euclidean distances, both expressed as F1_F2 and F1_F2_F3

EEG study on multlingual perception

Kędzierska, Rataj, Balas, Cal, Wrembel (in progress)

- To investigate the neurophysiological markers of vowel perception in multilingual speakers
  - No previous research
- Selected vowel contrasts in L1, L2 and L3
- Oddball paradigm (frequent *standard* vs. occasional *deviant* stimuli)
- ERP component -> Mismatch Negativity (MMN) to index listeners' sensitivity to phoneme constrasts at pre-attentive level
- Hypothesis: response to change will be reduced for non-native languages (L2/L3) as compared to L1
- RQ: Will phonological contrasts be equally easy to detect in L2 vs. L3/Ln?

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 extend neurolinguistic studies to L3 phonology

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MultiPhon project

- **Grant**: Polish-German Foundation for Science
- **Title**: Phonological cross-linguistic influence in young multilinguals
- **Period**: 2017-2019
- **PI:** Magdalena Wrembel, Ulrike Gut (University of Münster)
- **Team**: Romana Kopečková, Anna Balas, Halina Lewandowska, Iga Krzysik, Christina Nelson

CLIMAD - OPUS project

- **Grant**: Polish National Science Centre NCN
- **Title**: Cross-linguistic influence in multilingualism across domains: Phonology and syntax **(CLIMAD)**
- **Nr**: UMO-2020/37/B/HS2/00617
- **Period**: Jan 2021-2024
- **PI**: Magdalena Wrembel
- **Team**: Anna Balas, Jarosław Weckwerth, Sylwiusz Żychliński, Zuzanna Cal, Karolina Rataj, Nicole Rodriquez

ADIM - GRIEG project

- **Funding**: Norway grants, NCN
- **Title:** Across-domain investigations in multilingualism: Modeling L3 acquisition in diverse settings **(ADIM)**
- **ID nr**: DEC-2019/34/H/HS2/00495
- **Period**: Dec 2021 - April 2024
- **PI**: Magdalena Wrembel, Marit Westergaard
- Collaboration with UiT Tromsø and NTNU Trondheim
- **Team**: Anna Balas, Jarosław Weckwerth, Sylwiusz Żychliński, Zuzanna Cal, Karolina Rataj, Hanna Kędzierska, Kamil Kaźmierski, Anna Skałba

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NARODOWE CENTRUM NAUKI

Thank you! Dziękuję! Mulțumesc!