

Levels of proficiency in the L2 and the L3 as an interaction effect in L3 Norwegian

Jolanta Sypiańska

Zuzanna Cal



ADAM MICKIEWICZ
UNIVERSITY
POZNAŃ



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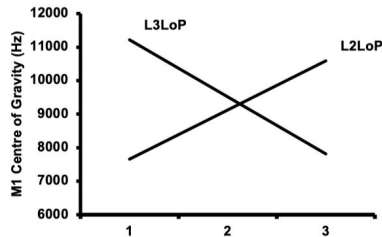
L2 and L3 proficiency in L3 literature

- high level of proficiency in the L2 leads to greater cross-linguistic influence (CLI) to the L3 (e.g. Gut 2010; Hammarberg 2001; Sánchez 2014)
- low proficiency in the L3 favours CLI from the L2 which then subsides in favour of the L1 as a source of influence (e.g. Hammarberg & Hammarberg 2005; Llama & Cardoso 2018; Llama et al.2010; Tremblay 2006; Wrembel 2010)
- analyses of L2 and L3 proficiency as separate effects
- the switch from the L2 to the L1 source of influence as a consequence of a change in both L2 and L3 proficiency -> interrelatedness of these two factors

Previous research on the interaction of L2 and L3 proficiency

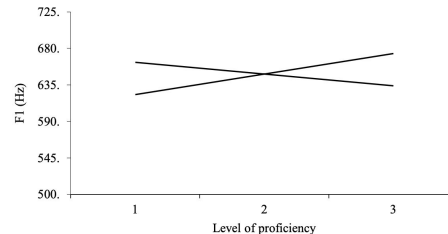
Sypiańska and Cal (2020)

- spectral moments of the apico-alveolar Spanish sibilant produced by L1 Polish/L2 English/L3 Spanish speakers
- significant effects of both L2 and L3 proficiency
- interaction effect of L2 and L3 proficiency

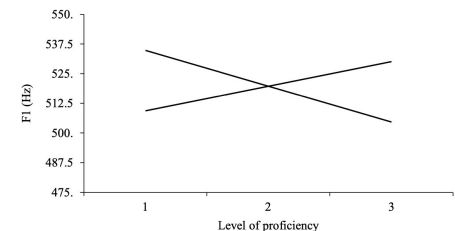


Cal and Sypiańska (2020)

- F1 and F2 in the Spanish vowels /a, e, i, o, u/ produced by L1 Polish, L2 English, L3 Spanish speakers
- no effect of L2 and L3 proficiency
- interaction effect found for F1 in /a/ and /e/



The interaction effect between L2LoP and L3LoP for F1 in /a/.

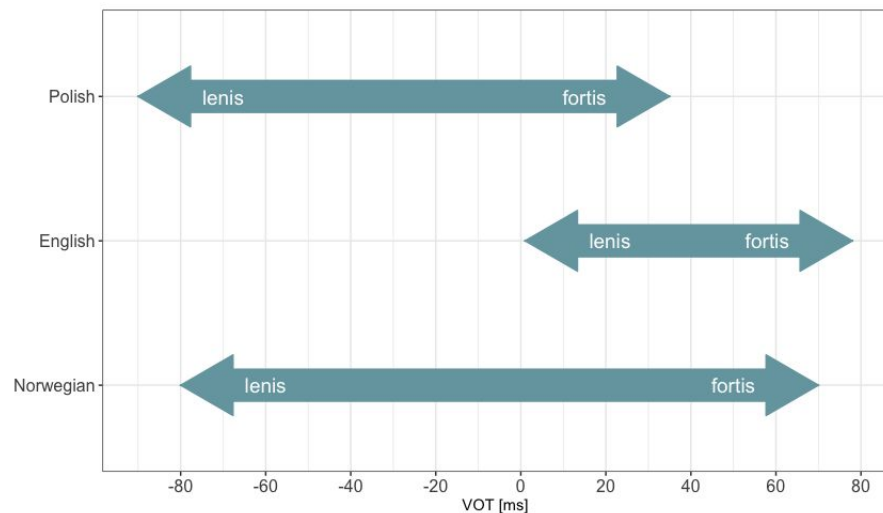


The interaction effect between L2LoP and L3LoP for F1 in /e/.

The VOT study: Aim

- to analyse the effects of L2 and L3 level of proficiency and particularly the interaction effect of the two factors, on the perception of fortis and lenis word-initial stops in L3 Norwegian by L1 Polish, L2 English speakers

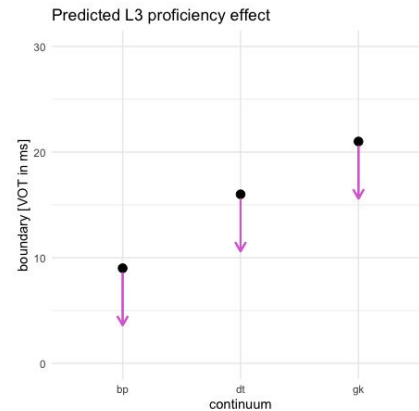
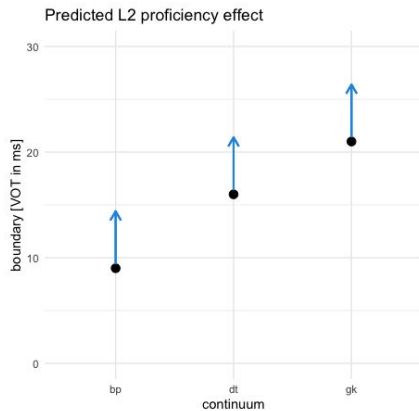
this is a re-analysis of Cal 2023 data!



The VOT study: Research questions and hypotheses

RQ1: Is there an effect of L2 and L3 proficiency as separate factors on the perceptual boundary in b~p, d~t and g~k continua in L3 Norwegian??

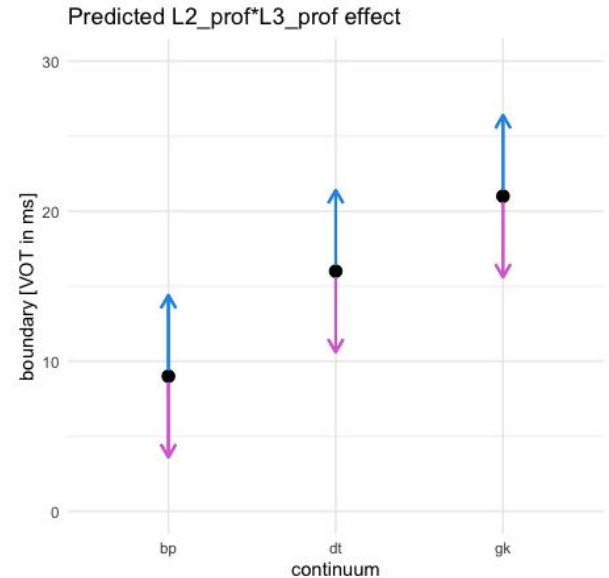
H1: We predict an effect of L2 and L3 proficiency as separate factors on the perceptual boundary.



The VOT study: Research questions and hypotheses

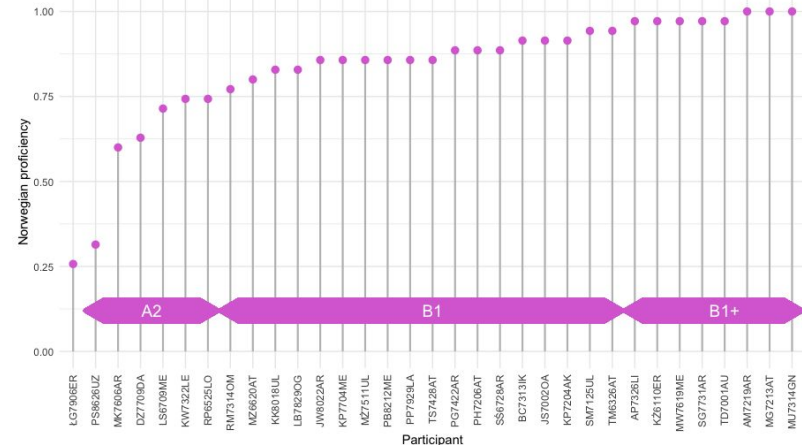
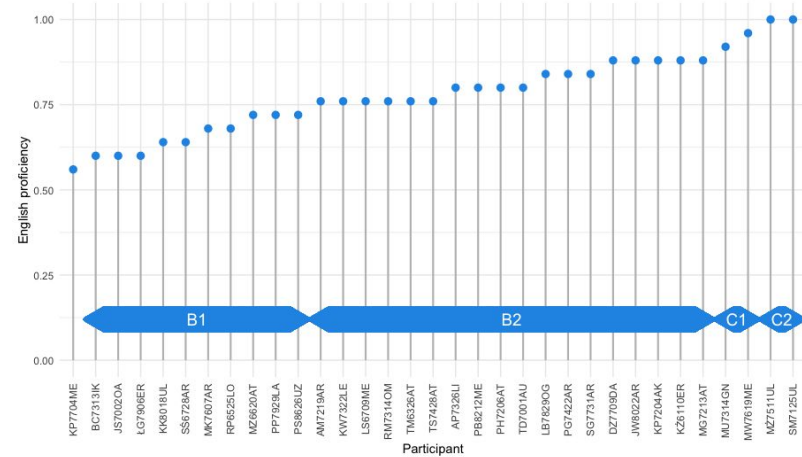
RQ2: Is there an interaction effect of L2 and L3 level of proficiency on the perceptual boundary in b~p, d~t and g~k continua in L3 Norwegian? And what is the nature of this interaction effect?

H2: We predict an interaction effect of L2 and L3 level of proficiency on the perceptual boundary in L3 Norwegian in which the effects of the proficiency levels will have opposite directions.



Participants (based on Cal 2023)

- 33 speakers of L1 Polish, L2 English, L3 Norwegian
- 28 females, 5 males, 1 non-binary person
- mean age = 21.27 (SD=2.07)
- students of Norwegian studies in Poland
- Language History Questionnaire (Li et al. 2006)
- L2 and L3 proficiencies measured by means of standardised placement tests



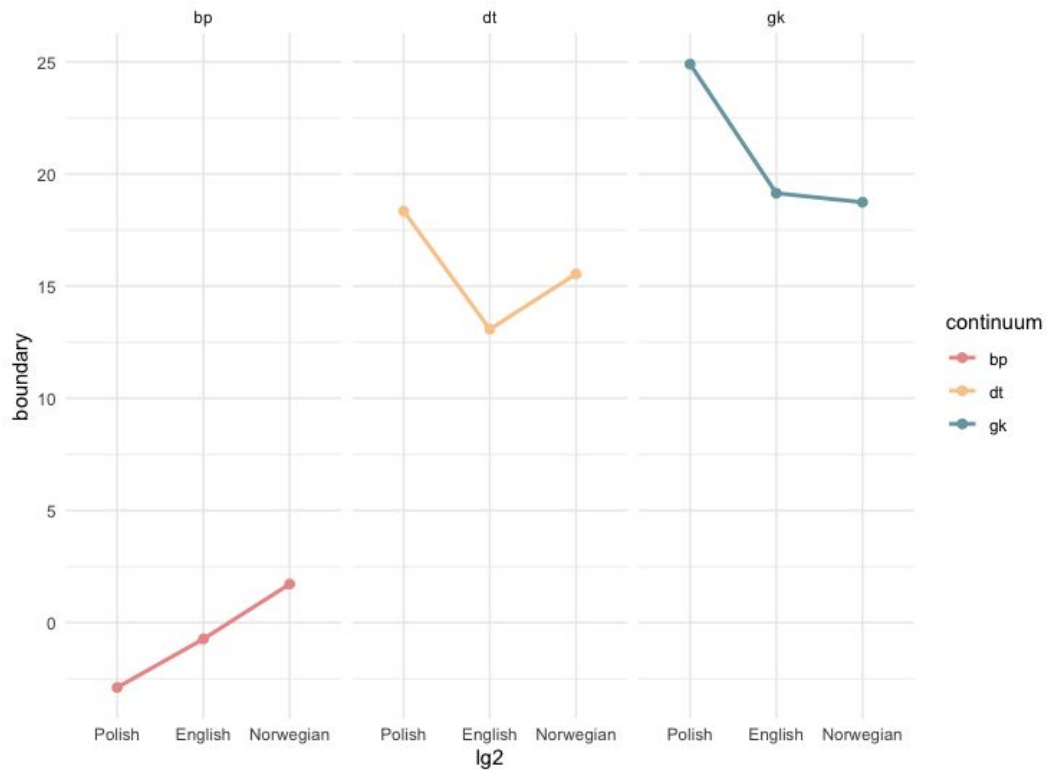
Method (from on Cal 2023)

- Three continua in L3 Norwegian, one per place of articulation (labial, coronal, velar)
- -100 - 100 ms with 21 steps, each of 10 ms
- stop-initial one-syllable minimal pairs produced by a native speaker of Norwegian
- *par-bar, ta-da, kar-gard*

Method (from Cal 2023)

- a two-alternative forced-choice (2AFC) task
- participants were presented with one word from the continuum and asked whether they heard a voiced or voiceless consonant at the beginning
- conducted in PsychoPy (Peirce et al. 2019)
- three separate language blocks
- each block preceded by a language mode introduction by means of watching a short video in the respective language
- accuracy scores that were transformed with the use of logistic regression to obtain constant (b_0) and slope (b_1) values that were then used to calculate the perceptual boundary locations with the following formula: $-LN(b_0)/LN(b_1)$ (Aliaga-García & Mora 2009)

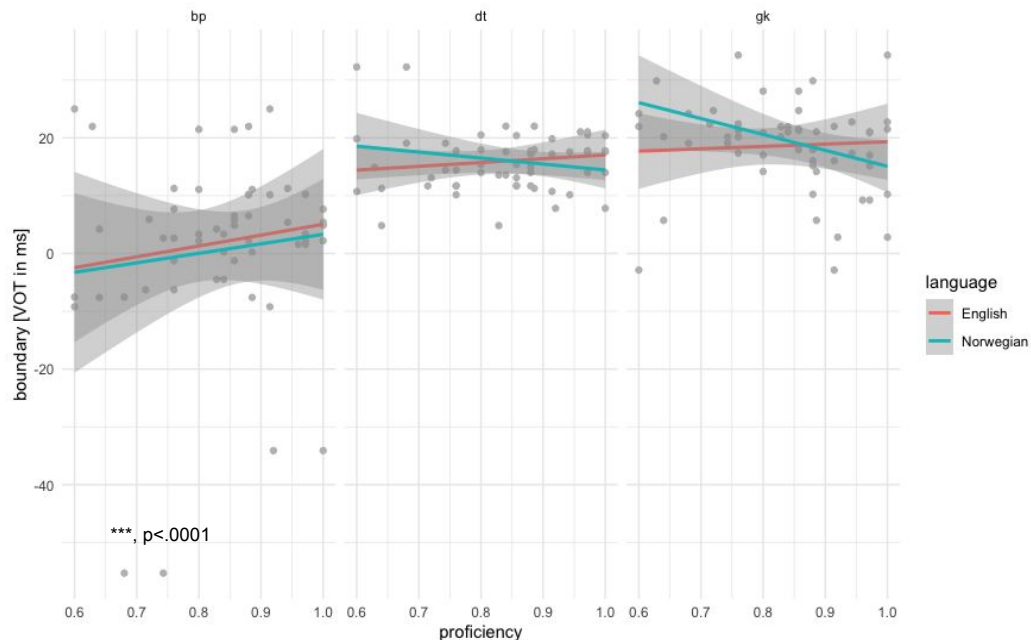
Results (from Cal 2023)



Results

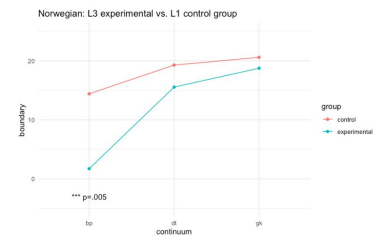
multiple linear regression in R: $\text{boundary} \sim \text{continuum} * \text{L2_proficiency} * \text{L3_proficiency}$

- no main effect of L2 and L3 proficiency
- interaction effect between $\text{L2_proficiency} * \text{L3_proficiency}$ found only for b-p continuum ($F=19.191, p<.0001$)



Discussion

- no effect of L2 proficiency and L3 proficiency as separate effects
 - the participants don't make any differences between the boundaries in Norwegian and English -> no differences in the way they hear the boundary in Norwegian and English stops
 - there can be no effect of proficiency if they have one boundary placement for both English and Norwegian
 - but they have acquired the Norwegian and English stops as the perceptual boundaries are in high positive values (and there is L1 drift)
 - also not a representative sample in terms of proficiency at least in L2
- a significant interaction effect for the b~p continuum
 - but the interaction effect is not exactly as we predicted
 - the explanation lies in the way the participants perceived the b~p continuum
 - they do not hear a difference between b~p (also no L1 drift in b~p)
 - similar perception of English and Norwegian b~p
 - thus level of proficiency in L2 and L3 could not have opposite effects



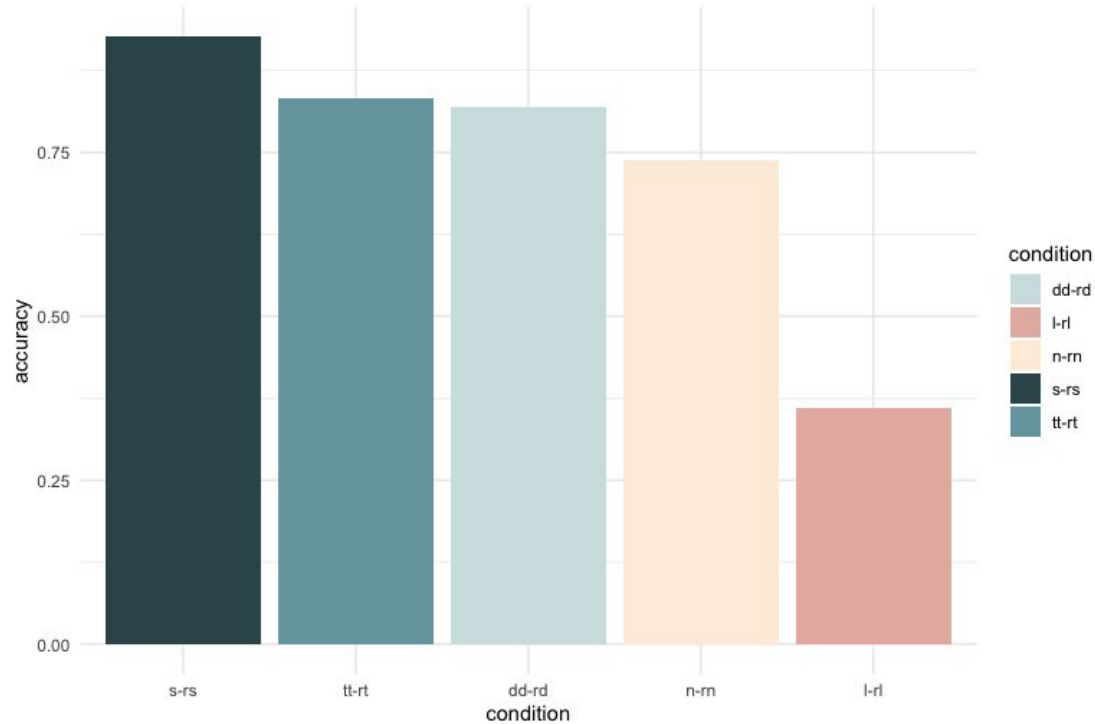
Retroflex study: method (Hwaszcz et al. 2023)

re-analysis of Hwaszcz et al. (2023)

- 33 speakers: L1 Polish, L2 English, L3 Norwegian
- Oddity categorical discrimination in PsychoPy
- retroflexes embedded in non-existing words in [C]/a/[Cr]/a/ pattern and their non-retroflex counterparts [C]/a/[Cn-r]/a/
- investigated retroflexes: /ɮ, d, ʎ, ŋ, ʂ/
- participants presented with three words read by three different speakers
- task: choose the odd one out

	Norwegian	Polish	English
nasal	/ŋ/		
plosive (voiceless)	/t/	[t]	
plosive (voiced)	/d/	[d]	
fricative (voiceless)	/ʂ-ʃ/	/ʂ/	
fricative (voiced)		/z/	
affricate (voiceless)		/tʂ/	
affricate (voiced)		/dʒ/	
approximant	/l/		/r/

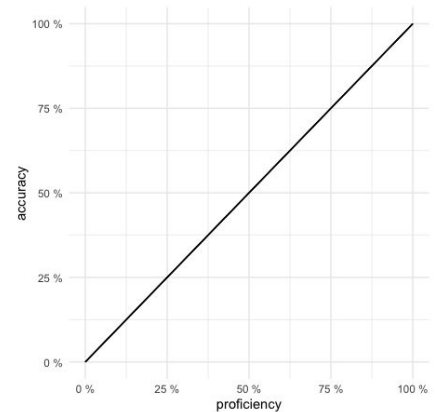
Retroflex study: results (Hwaszcz et al. 2023)



Retroflex study: research questions and hypotheses

RQ1: Is there an effect of L2 and L3 proficiency as separate factors on the accuracy scores in the perception of retroflex-non-retroflex pairs t-tr, d-dr, l-lr, n-nr, s-sr in L3 Norwegian??

H1: We predict an effect of L2 and L3 proficiency as separate factors on the accuracy in perception of the retroflex-non-retroflex pairs.



Retroflex study: research questions and hypotheses

RQ2: Is there an interaction effect of L2 and L3 level of proficiency on the accuracy scores in the perception of retroflex-non-retroflex pairs t-tr, d-dr, l-lr, n-nr, s-sr in L3 Norwegian? And what is the nature of this interaction effect?

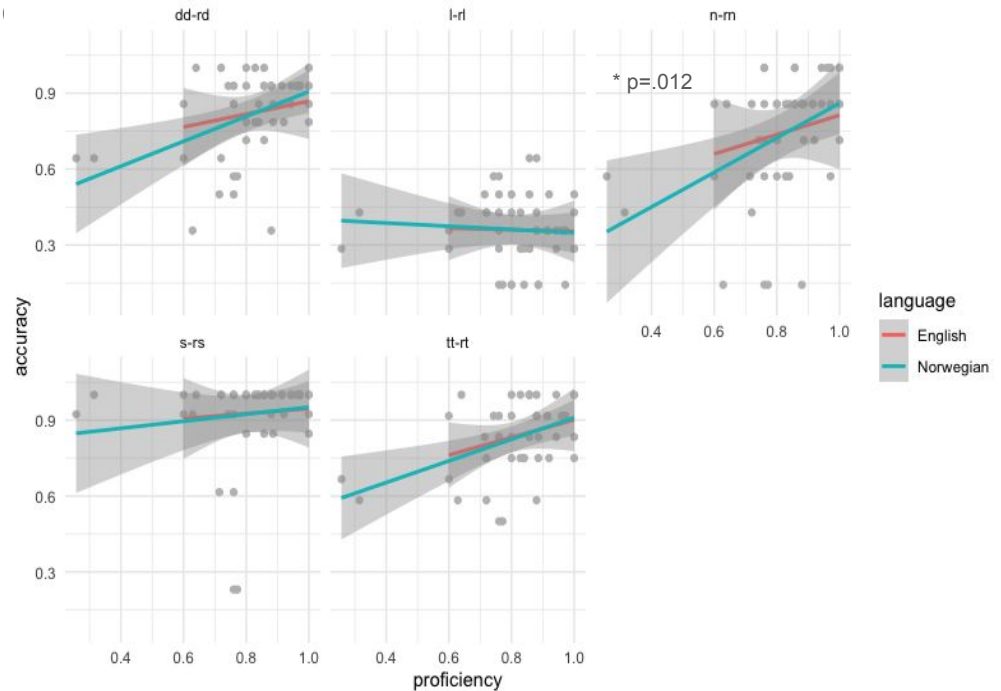
H2: We predict an interaction effect of L2 and L3 level of proficiency on the accuracy scores in the perception of retroflex-non-retroflex pairs t-tr, d-dr, l-lr, n-nr, s-sr in L3 Norwegian in which the effects of the proficiency levels will have the same directions.

because they have the non-retroflex sound in both L2 and L3

Results

multiple linear regression in R: $\text{accuracy} \sim \text{condition} * \text{L2_proficiency} * \text{L3_proficiency}$

- main effect of L3 proficiency on the discrimination of dd-rd ($F=10.242$, $p=.002$), n-rn ($F=21.140$, $p<.0001$), and tt-rt ($F=4.651$, $p=0.034$)
- no effect of L2 proficiency
- interaction effect between $\text{L2_proficiency} * \text{L3_proficiency}$ found only for n-rn ($F=6.686$, $p=0.012$)



Discussion

- no effect of L2 proficiency as a separate effect
 - not a representative sample in terms of L2 proficiency
- a significant effect of L3 proficiency as a separate factor
 - the greater L3 proficiency, the better discrimination for dd-rd, n-rn, tt-rt
 - no effect in l-rl but the opposition is neutralized in Norwegian
- interaction effect of L2*L3 proficiency on the discrimination of n-rn
 - the direction of the effect of the two proficiencies is the same
 - L2*L3 interaction means that the effect of the two proficiency levels is greater than L2 and L3 as separate effects
 - interaction is only visible in n-rn because it is the only pair in which L1 Polish effect is out of the picture

Discussion

- L2 and L3 proficiency as separate effects in the VOT study
- L3 proficiency as a separate effect in the retroflex study
- interaction effect of L2*L3 proficiency
 - significant only in b~p and n-rn
 - not in opposite directions (contrary to prediction)
 - L2*L3 proficiency has a greater impact than the individual L2 and L3 proficiencies

VOT data

- L2 and L3 VOT although linguistically different is perceived similarly
- the same outcome of greater proficiency in both L2 and L3

retroflex data

- retroflex-non-retroflex pairs are accurately discriminated
- the same outcome of greater proficiency in both L2 and L3
- because one of the sounds in the pair is both in L2 and L3



Dynamic Systems Theory

Two crucial characteristics of language development:

- interconnected subsystems
- self-organization

- nonlinear, chaotic patterns of development

DST: Interconnected subsystems

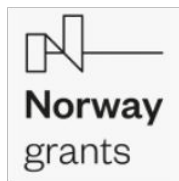
- numerous embedded subsystems that interact dynamically (Thelen & Smith, 1994) and simultaneously
- the state of dynamic system is determined by the state of all of its subsystems
- a state - at a given point in time:
 - attractor
 - repellor

DST: Self-organization

- changes in the environment (e.g. more input of L_n) lead to changes in a subsystem (perturbation)
- “Learning, fundamentally, means the modification . . . of pre-existing capabilities,” and it either competes or cooperates with the learner’s existing capabilities (Kelso, 2003, p. 61)
- pre-existing capabilities include the state of any of the other languages a learner knows (Verspoor, Lowie, & De Bot, 2009)
- self-organization: the system as a whole is shaped by the interaction of lower-level subsystems

Our study

- L1, L2, L3 are embedded subsystems that interact dynamically and simultaneously in the dynamic system=language repertoire (e.g. Kopečková et al. 2016)
- the state of the dynamic system is determined by the state of all three languages
- L2 and L3 proficiency determine the state of the embedded system of L3 (Gut et al. 2023)
- learning of the L2 and the L3 takes place thus L2 or/and L3 proficiency increase(s) and modify pre-existing capabilities (the previous state of the L3)
 - attractor state = when L2 and L3 characteristic are similar then the L2*L3 proficiency interaction effect drives the state of the L3 towards that attractor state (more accurate/better/target-like perception of the L3)
 - repellor state = when L2 and L3 characteristic are different then the L2*L3 proficiency interaction effect makes the state of the L3 move away from what would be more accurate/better/target-like perception of the L3
- self-organized way in which all lower-level subsystems interact



Thank you!

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So far:

- a characteristic that was very different in L2 and L3 (L3 Spanish study)
- a characteristic that was different in linguistic terms but was perceived similarly (L3 Norwegian VOT study)
- a characteristic that was to a great extent similar (L3 Norwegian retroflex study)

Next step:

- investigate the interaction effect when the characteristic is fully similar in L2 and L3 (we expect a very strong interaction effect)
- investigate the interaction effect when the characteristic is very different (for sure) (we expect a very strong interaction effect with opposite directions)