Cue weighting in the perception of English tenseness contrast by Polish and Croatian subjects

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In this talk

- What are the strategies in the perception of the English tenseness distinction in L2 learners of English?
- Do the strategies differ depending on the phonological make-up of L1?
- Do all L2 listeners over-rely on durational cues?

Overview

- Introduction: acoustics and perception of the tenseness contrast in English high vowels.
- Study design.
- Results.
- Conclusions.

Perception of tenseness contrast

- English vowels differ acoustically both in quality and duration.
- The majority of English dialects, among those Standard American, rely predominantly on spectral cues.
- Some dialects rely on both spectral and durational cues to similar extent (e.g. Southern British, Escudero 2001).

Starting point: over-reliance on durational cue

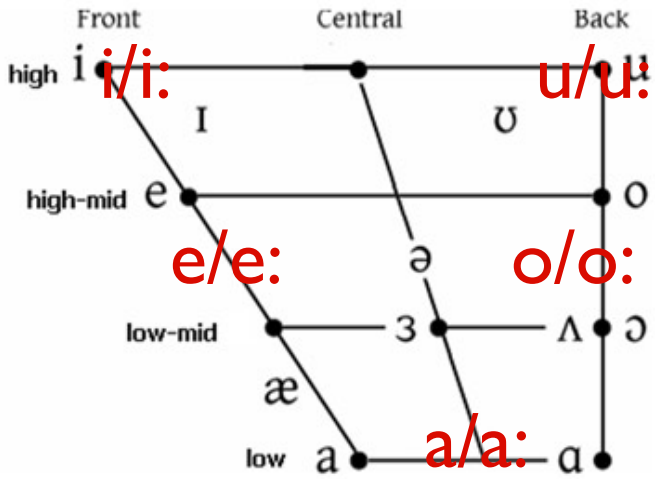
- ...for L1 which has a phonemic vowel length distinction: Japanese, Hungarian, Arabic, Korean,
- AS WELL AS for L1 which has no phonemic vowel length distinction: Spanish, Catalan, Mandarin, Russian.
- (Altenberg and Vago 1987, Bohn 1995, Cebrian 2002, Escudero 2001, 2005, Flege and Bohn 1989, Flege, Bohn, and Jung, 1997, Kondaurova and Francis 2004, 2006, Minnik-Fox and Maeda 1999, Morrison 2006, Munro 1993, Wang 1997).

Bohn's Desensitization Hypothesis

- "[W]henever spectral differences are insufficient to differentiate vowel contrast because previous linguistic experience does not sensitize listeners to those spectral differences, durational differences will be used to differentiate the non – native vowel contrast." (Bohn 1995: 294 – 295)

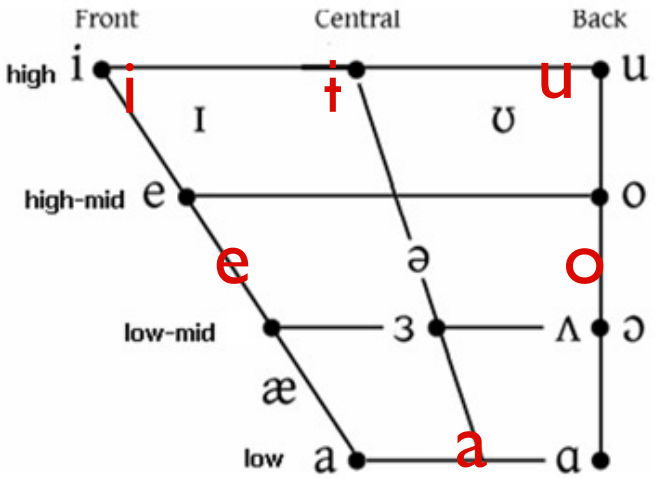
L1 inventories

- Croatian



Vowel length distinction

Polish



No length distinction
Extra quality contrast in front high vowels

Research questions

- Do Polish subjects also over-rely on the durational cues in the perception of the contrast in the front vowels, or do they use the spectral strategy known from their L1?
- Do Polish subject over-rely on the durational cues in the perception of the contrast in the back vowels?
- How does duration reliance in Polish subject differ from that in Croatian subjects (who have phonemic length in their L1)?

Experiments

- 2 experiments:
- forced choice identification task
- AXB experiment

Identification test: design

IdentificationEElWithPictures_Feb23

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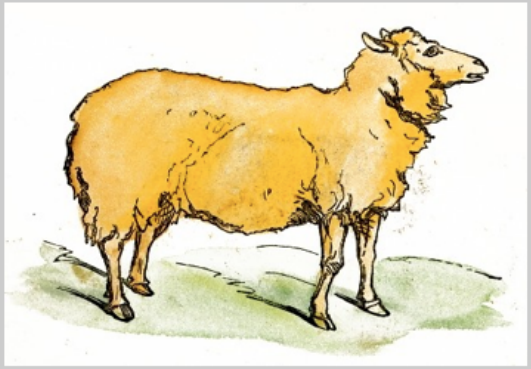
Say whether the sound is like
the vowel in SHEEP or like the vowel in SHIP.



1 (poor)	2	3	4	5 (good)

Identification: participants

- 14 Croatian subjects: 10 advanced, 4 non-advanced
- Polish subjects: 16 in the identification test (13 advanced, 3 non-advanced)
- American control group: 7 subjects

Stimuli

- 25 different stimuli for the continuum between [i] and [ɪ] and 25 stimuli for the continuum [u]-[ʊ]
- Each stimulus repeated 2
- For each continuum: stimuli differed in duration (5 uneven steps from 85 to 150 ms) and quality (5 steps).

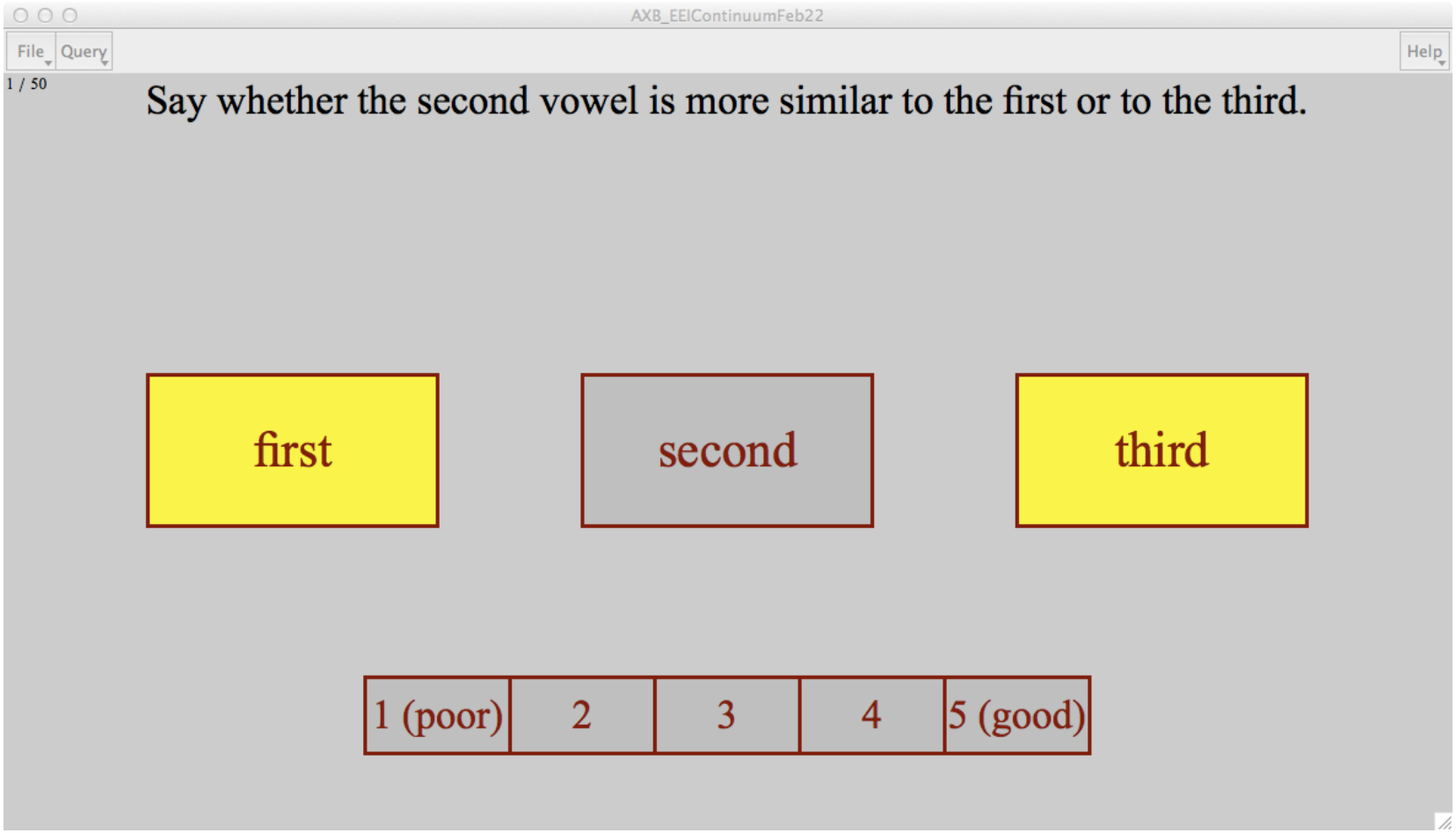
Problems

- The non-advanced (especially Croatian subjects) had no two separate back categories, the front categories were also unstable.
- >>> AXB experiment

AXB test

- The same 50 stimuli from the identification experiment
- every stimulus appeared once in an AXB and once in an BXA triads.
- The same 14 Croatian subjects as in the identification; for the Polish group, 7 subject who took also the identification test and 7 subjects who didn't.
- More Polish non-advanced participants than in the identification.

AXB


AXB_EEIContinuumFeb22
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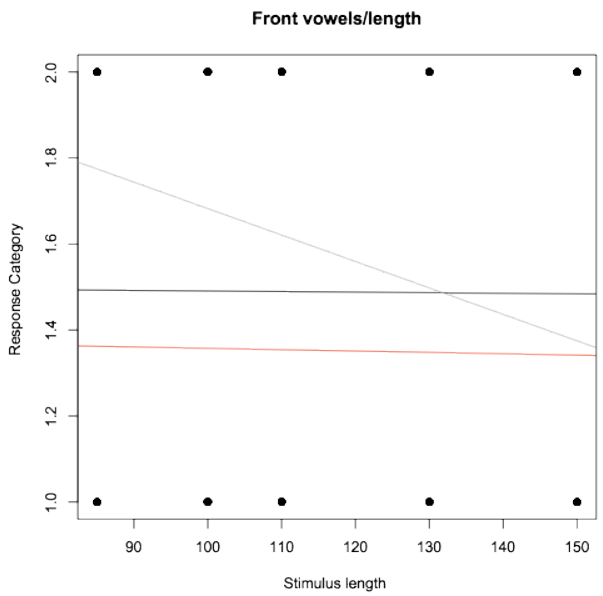
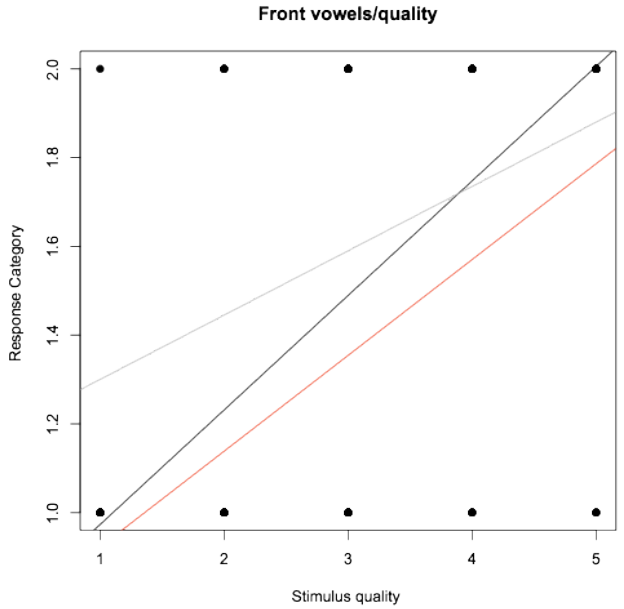
1 / 50
Say whether the second vowel is more similar to the first or to the third.
first
second
third
1 (poor)
2
3
4
5 (good)

Linear model: identification (pilot)

Pol: black
Cro: grey
Eng:red





Linear model: identification task

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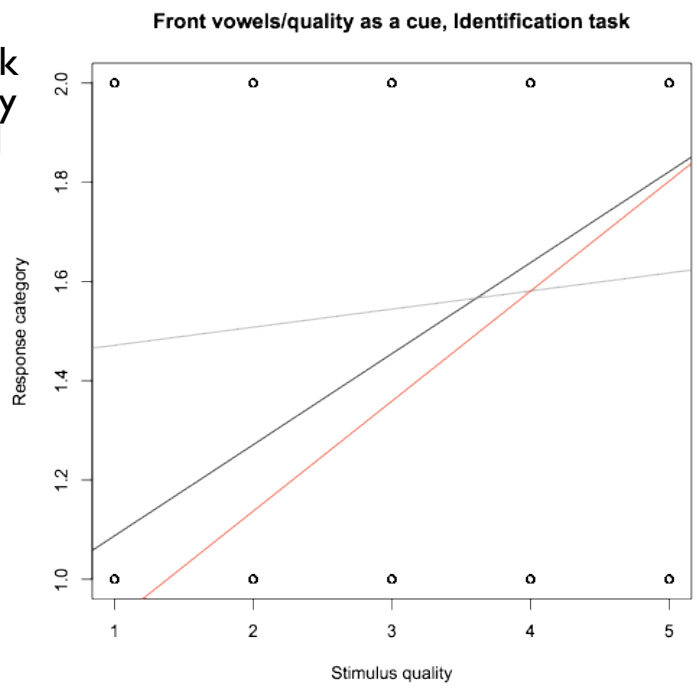
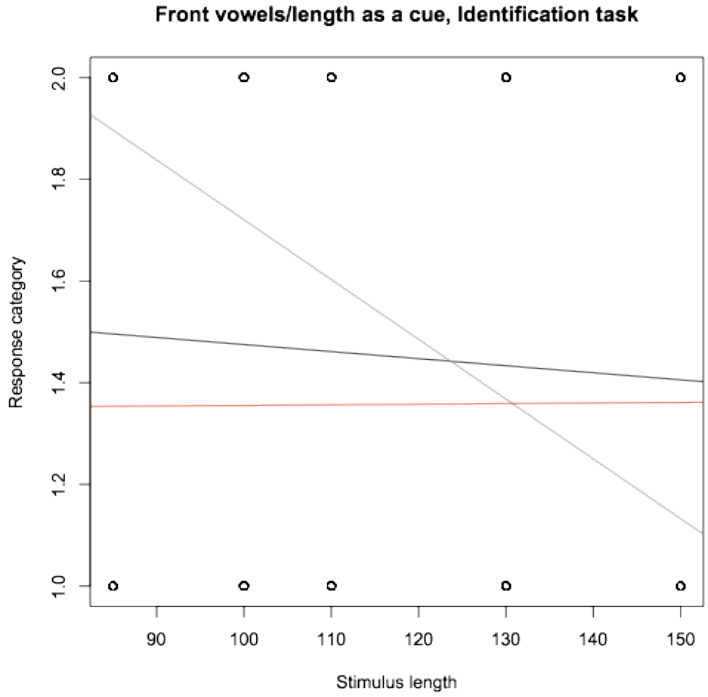
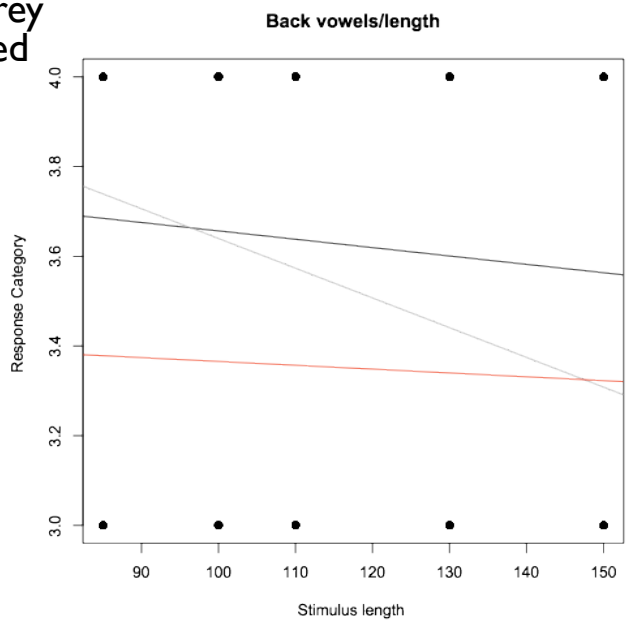
Cro: grey
Eng:red

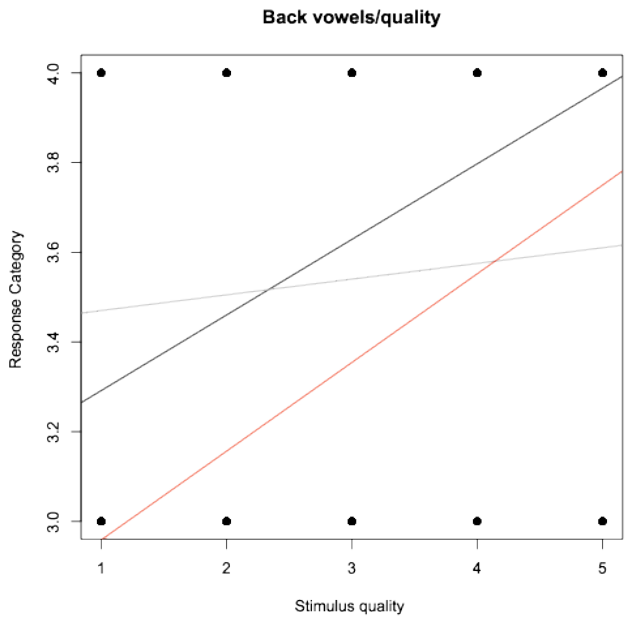




Linear model: back vowels/ identification (pilot)

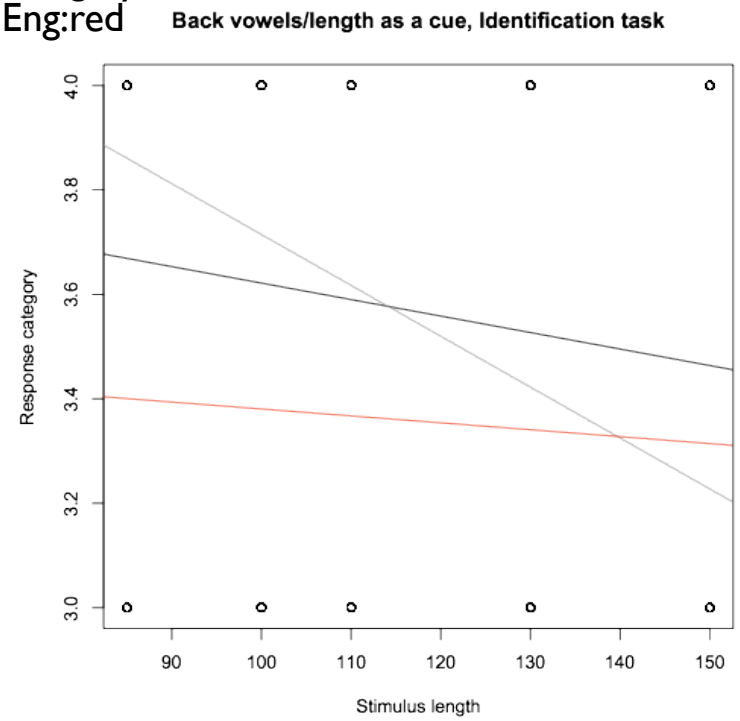
Pol: black
Cro: grey
Eng:red

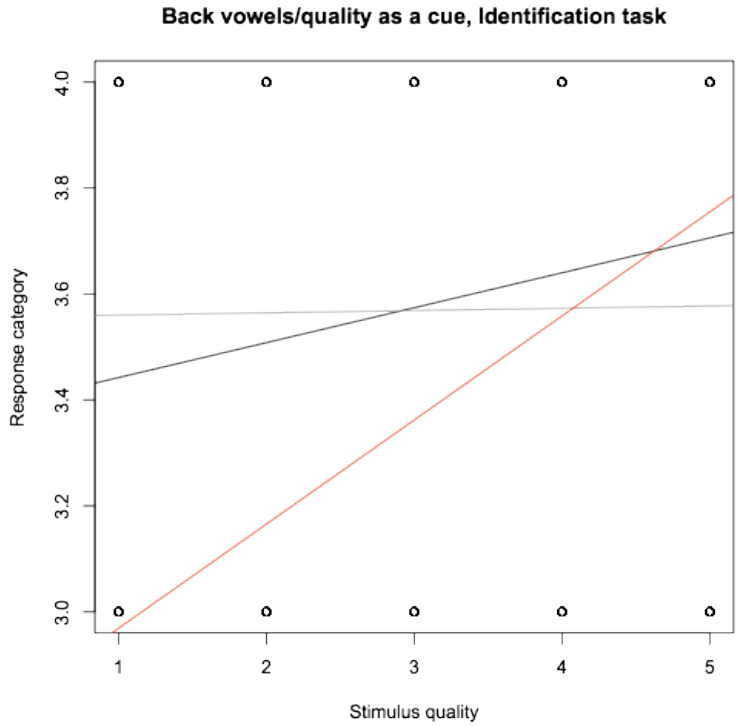




Back vowels results: identification test

Pol: black
Cro: grey
Eng:red



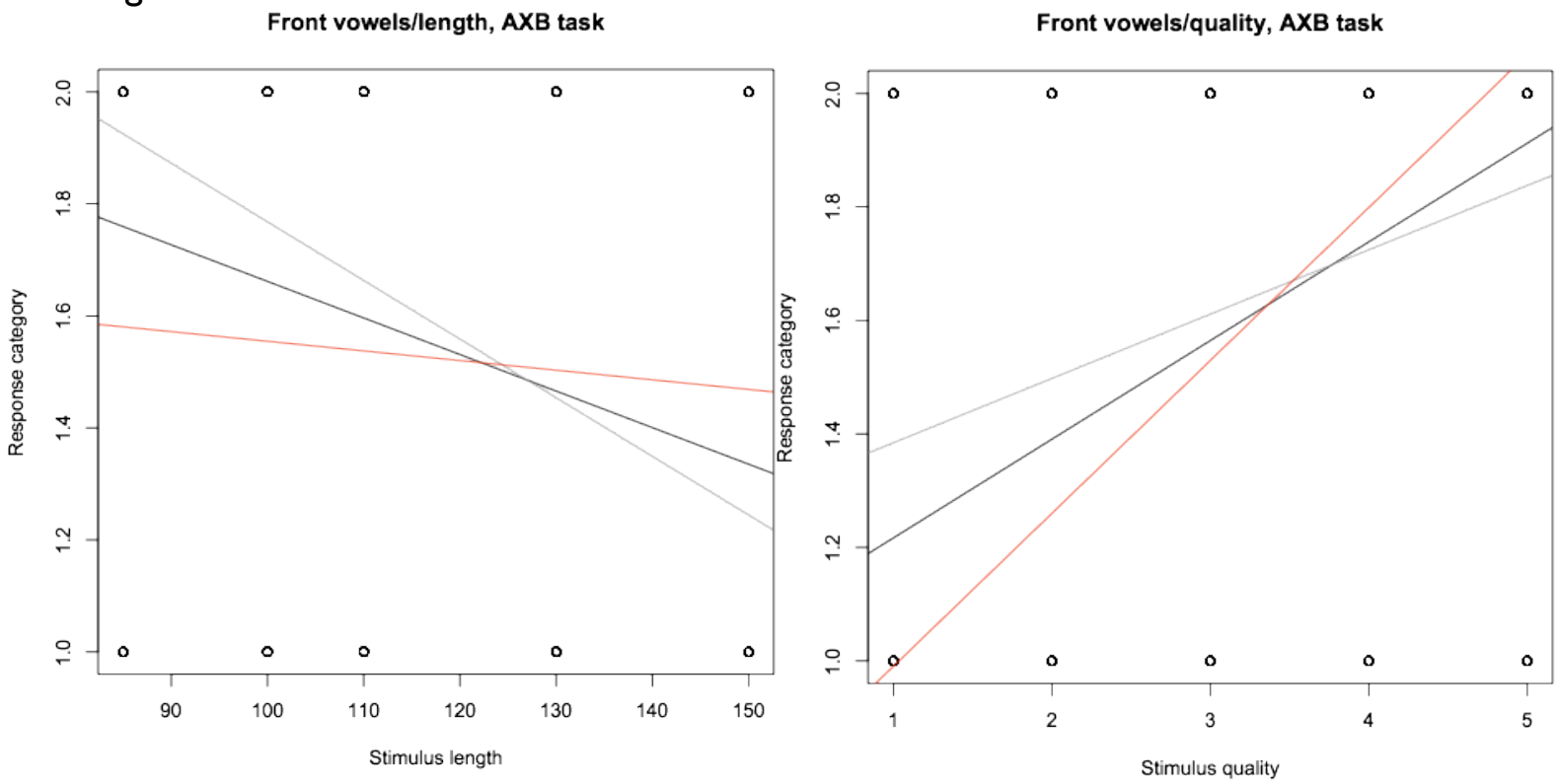


anova: identification

	Pol	Cro	Am	Pol	Cro	Am
	front			back		
length	F=3.4614 p=0.06316	F=283.95 p<2.2e-16 ***	F=0.0096 p=0.922	F=18.468 p=1.928e-05 ***	F=175.48 p<2.2e-16 ***	F=1.1853 p=0.2772
quality	F=316.94 p<2.2e-16 ***	F=7.5496 p=0.006157 **	F=222.72 p<2.2e-16 ***	F=31.206 p=3.126e-08 ***	F=0.1042 p=0.7469	F=149.34 p<2.2e-16 ***

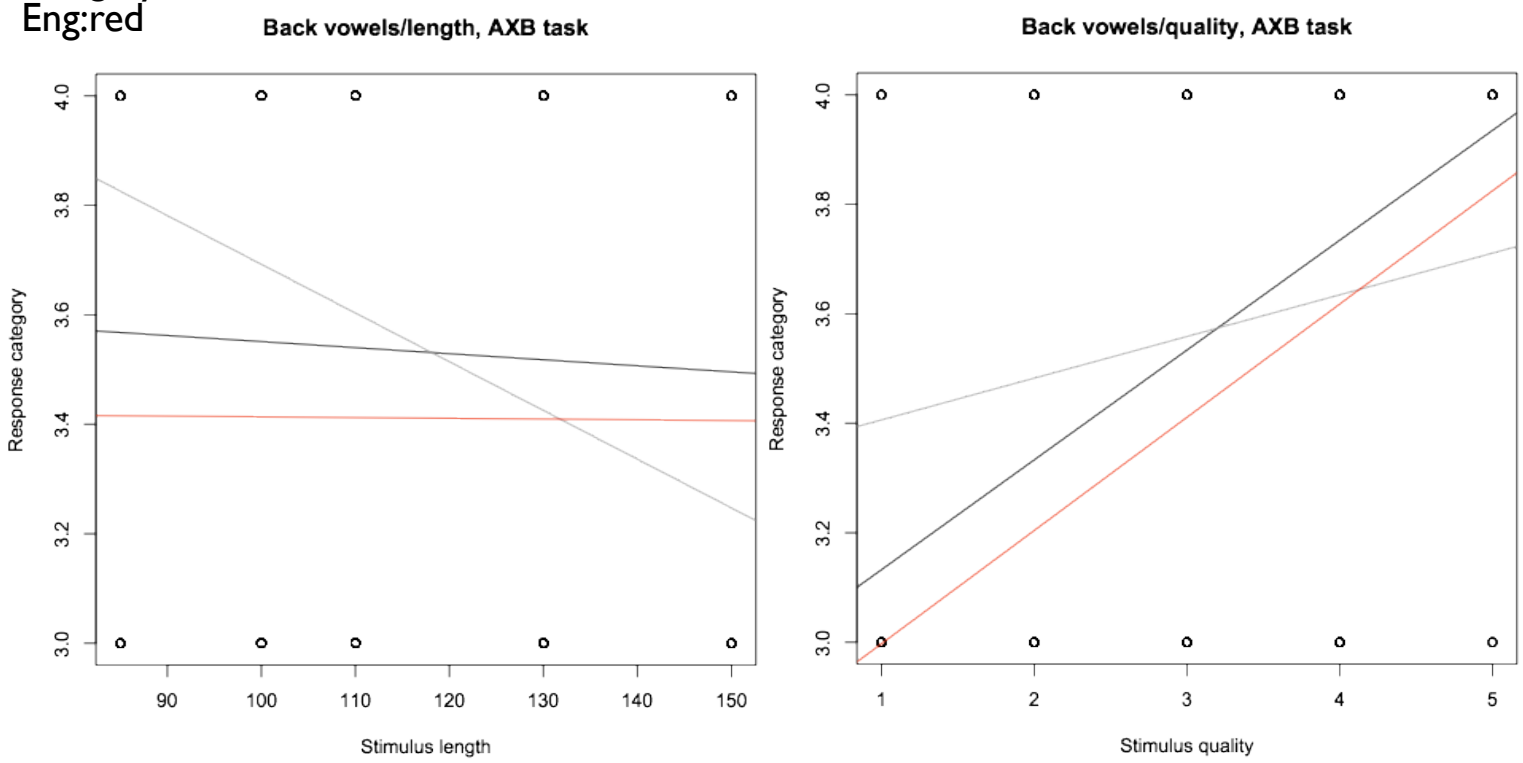
AXB: Linear model

Pol: black
Cro: grey
Eng:red



AXB: back vowels

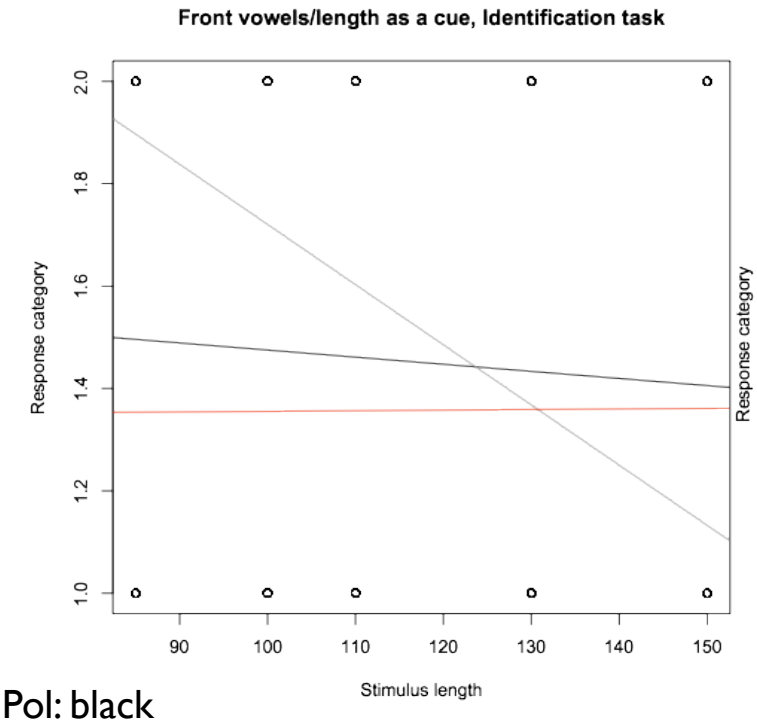
Pol: black
Cro: grey
Eng:red

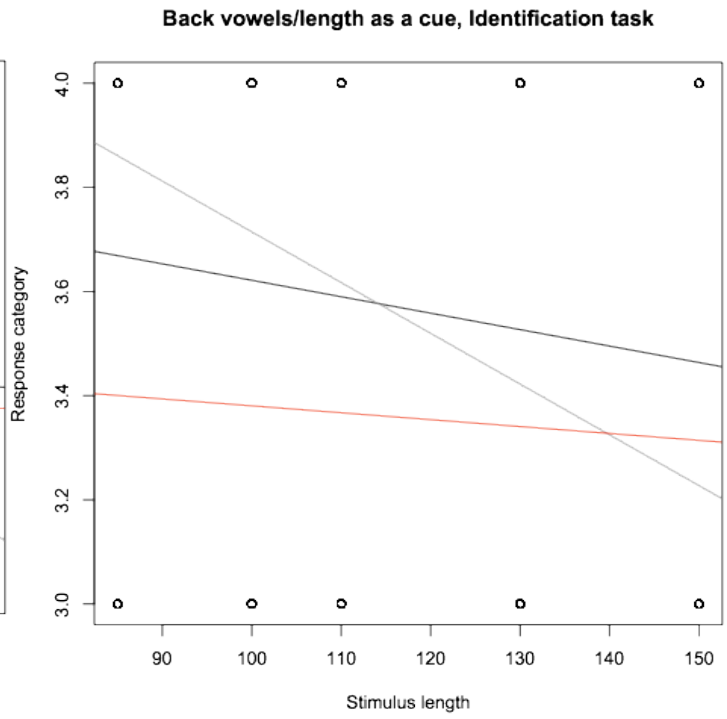


anova: AXB

	Pol	Cro	Eng	Pol	Cro	Eng
	front			back		
length	F=69.474 p=4.11e-16 ***	F=204.56 p<2.2e-16 ***	F=2.185 p=0.1403	F=1.8105 p=0.1789 .	F=129.76 p<2.2e-16 ***	F=0.0142 p=0.9053
quality	F=204.56 p<2.2e-16 ***	F=78.634 p<2.2e-16 ***	F=498.16 p<2.2e-16 ***	F=334.02 p<2.2e-16 ***	F=31.985 p=2.331e-08 ***	F=189.77 p<2.2e-16 ***

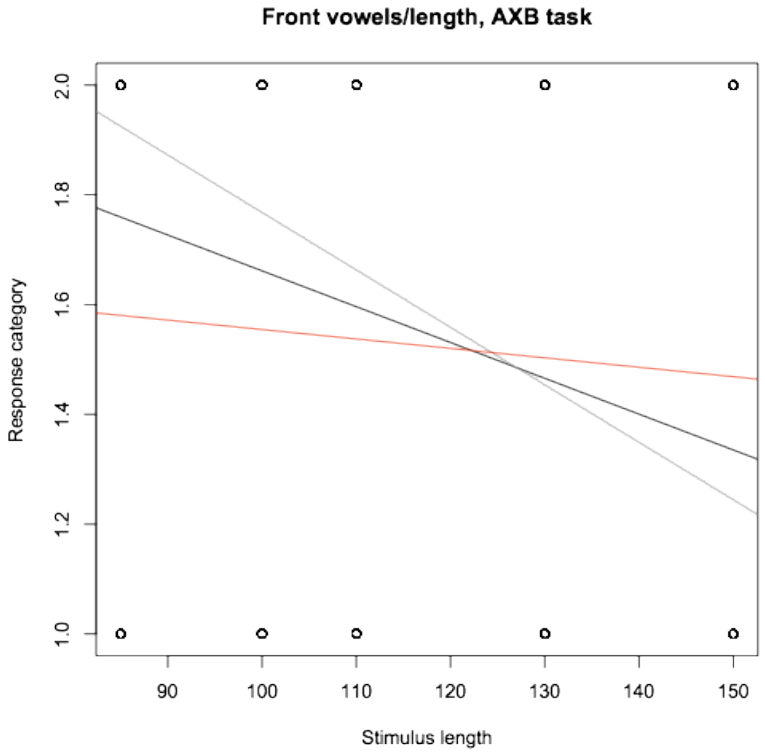
Front versus back vowels: length/identification

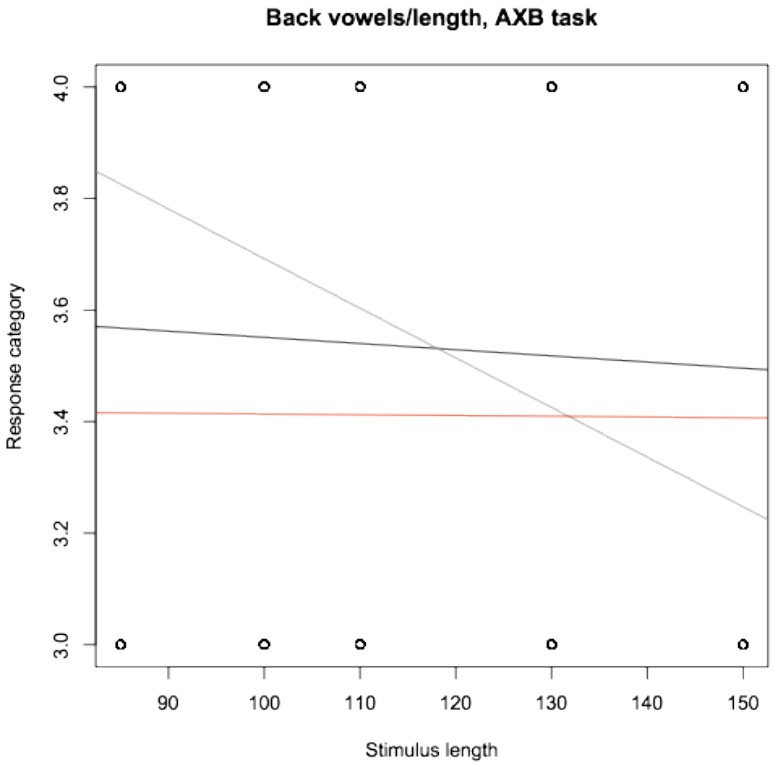




Pol: black
Cro: grey
Eng:red

Front versus back vowels: length/AXB

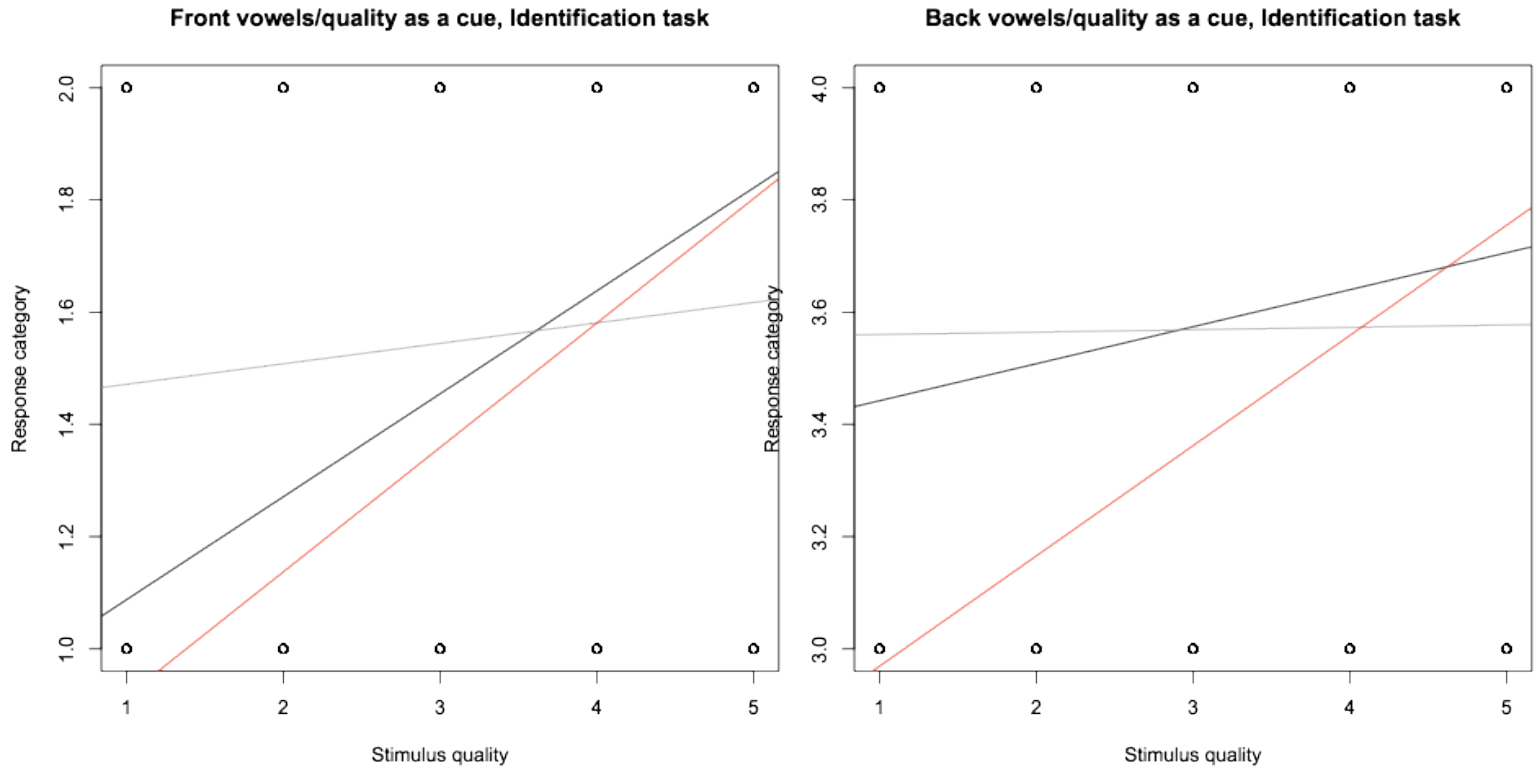




Pol: black
Cro: grey
Eng:red

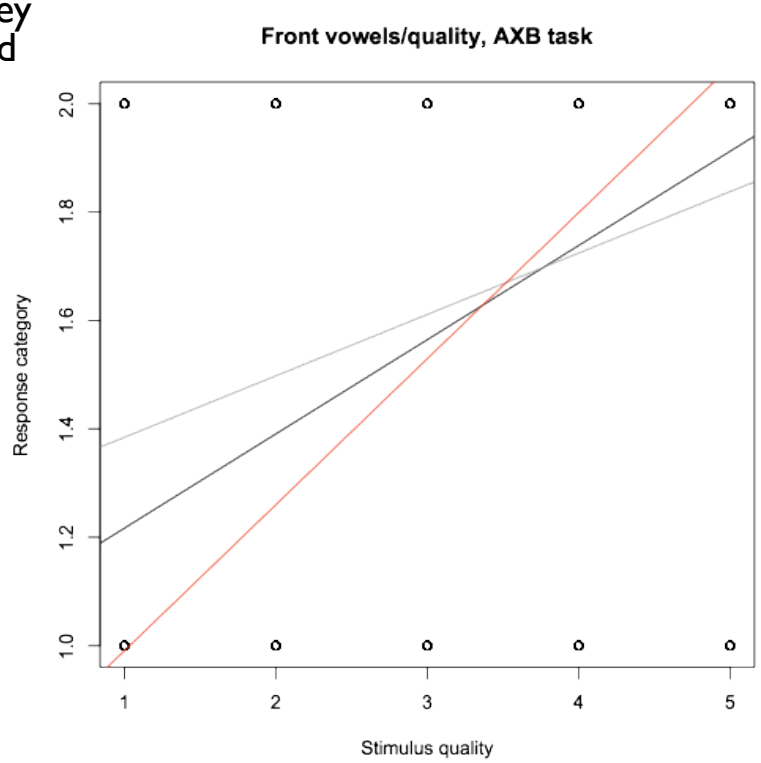
Front versus back vowels: quality/identification

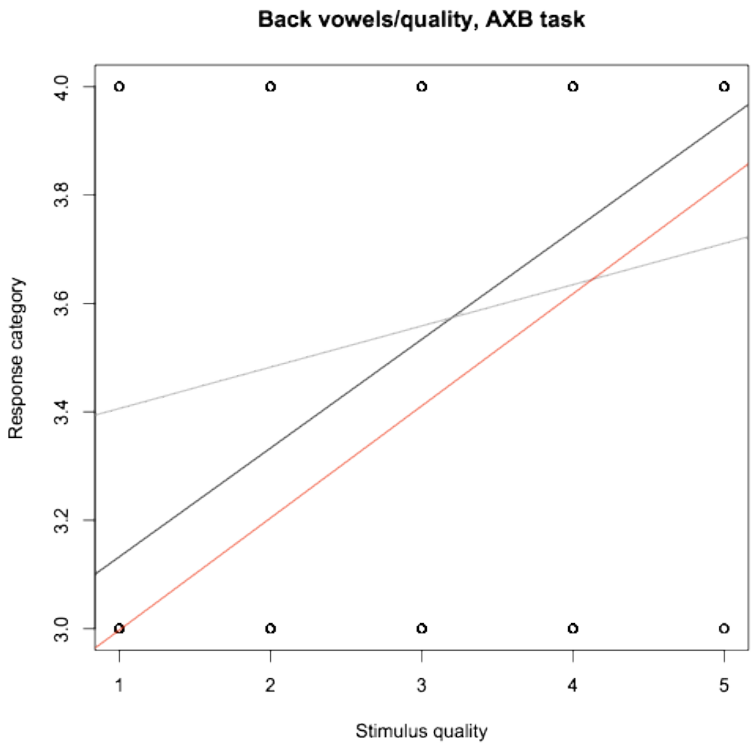
Pol: black
Cro: grey
Eng:red



Front vowels vs back vowels, quality/AXB

Pol: black
Cro: grey
Eng:red

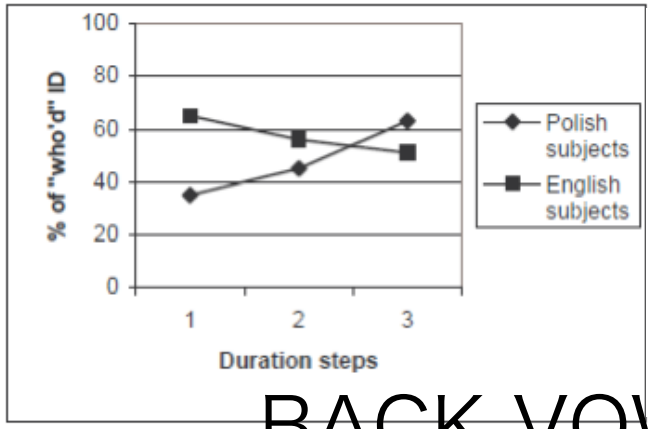


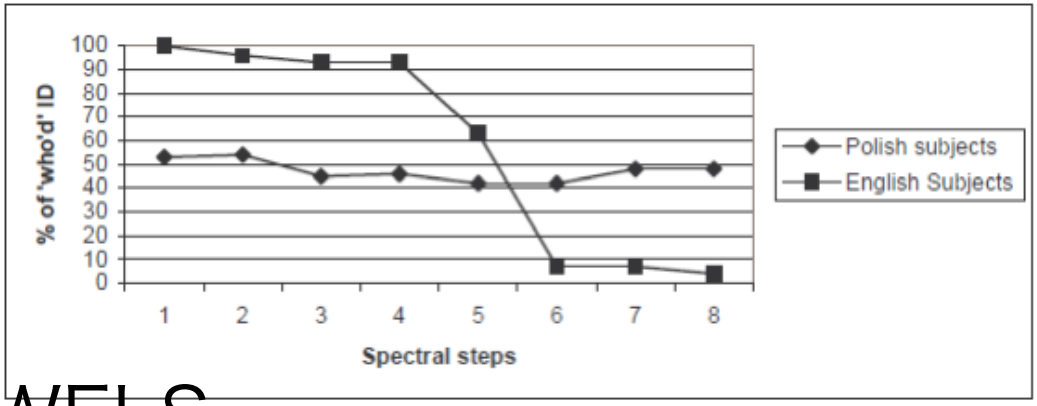


Discussion

- Croatian results are not surprising; they conform both with universal approach and transfer approach.
- Polish results in back vowels are surprising: the relative high reliance on quality and relative low reliance on duration as a cue cannot be accounted for by neither transfer nor universal interlanguage features.
- Particularly surprising are results of AXB test where the reliance on durational cue was weaker for back vowels than for front vowels.

Earlier study: Bogacka (2004)





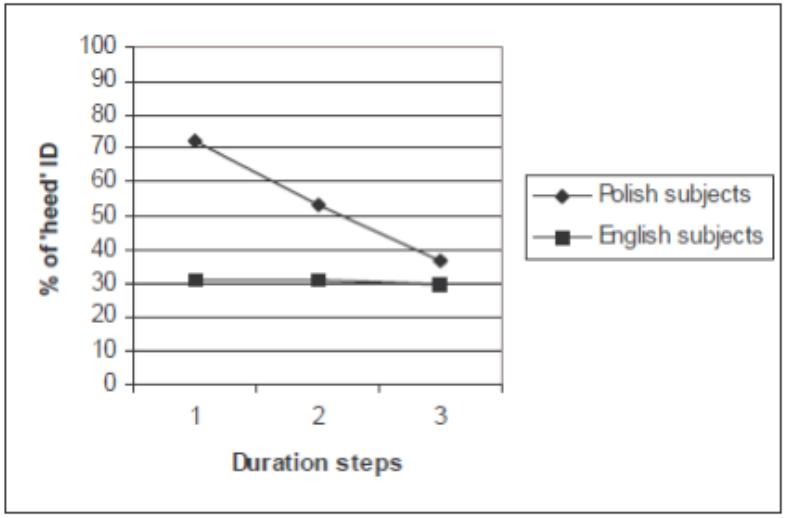
BACK VOWELS

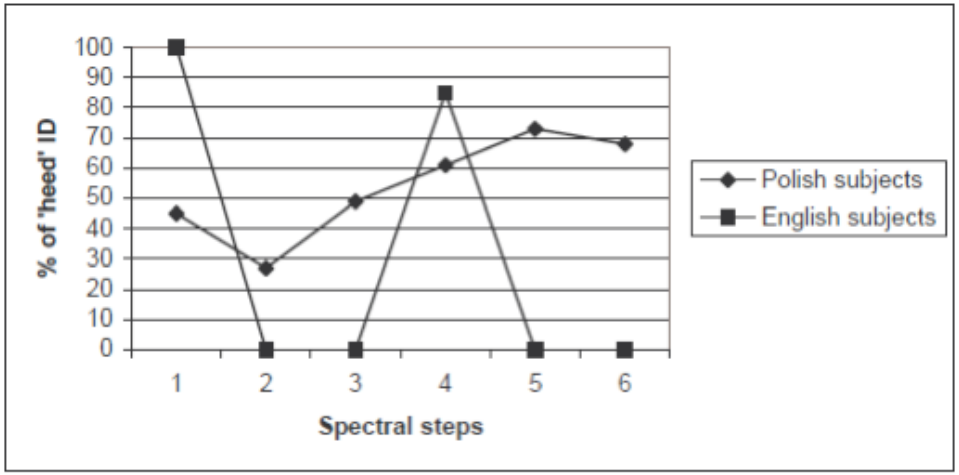
- Durational cues are crucial for Polish learners of English.
- English speakers relied predominantly on spectral cues, while Polish learners of English exhibited very weak reliance

Discussion (cont.)

- The differences in the results between Bogacka and our study might be due to:
  - (1) differences in methodology
    - Bogacka tested 3 duration steps (150, 200 and 250ms; all of them typical of long vowels), we tested 5 steps (85, 100, 110, 130 and 150ms), covering the range from typical lax to tense vowels in American English.
    - Bogacka had many more spectral (6 or 8) than durational steps (3), we had equal number of durational and spectral steps.
  - (2) differences in the make up of the test group (exposure to British rather than American accented speech).

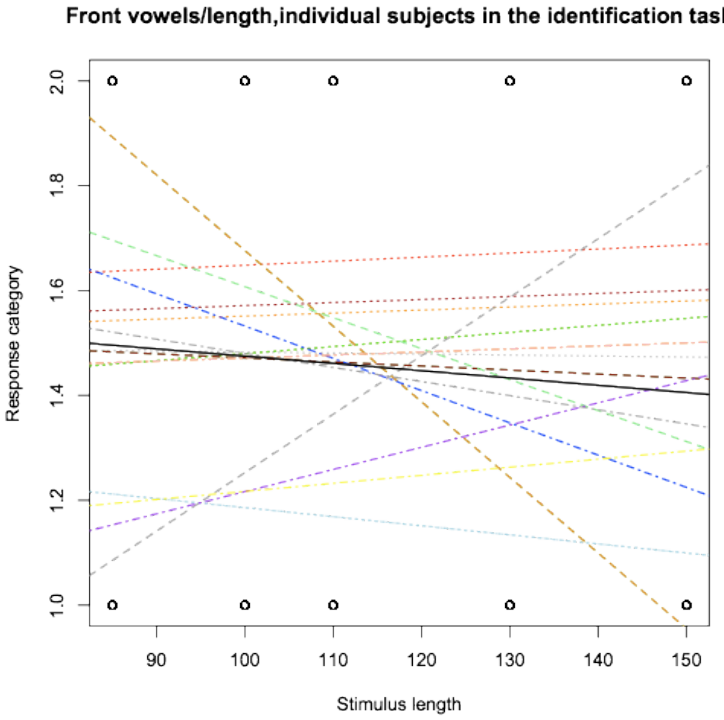
Bogacka (2004): front vowels

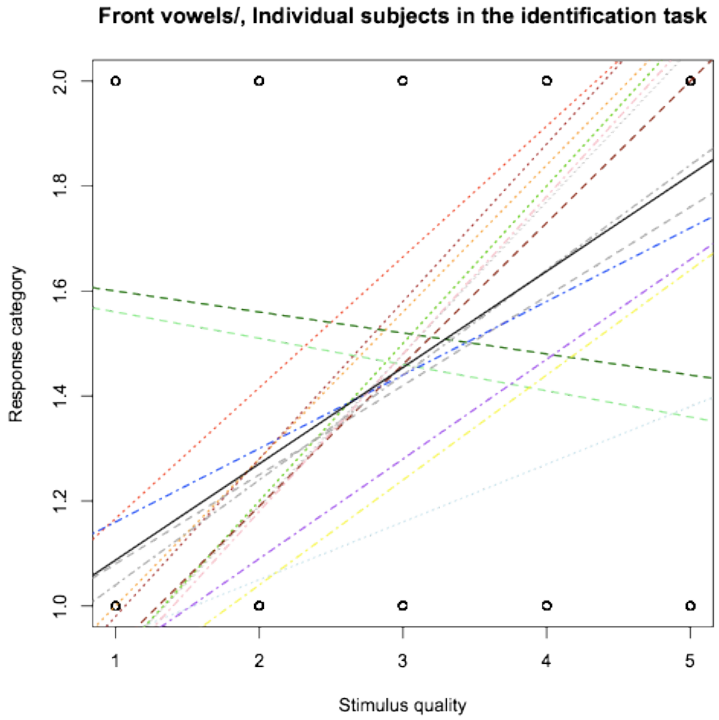




Also for front vowels, Bogacka's study shows unexpectedly high reliance on length in Polish subjects (indicating the influence of the methodology on the results).

Individual differences in Polish participants





The strategies in the use of cues might differ between individual participants.

Conclusions

- When L1 has a native spectral - but no durational - distinction --> duration as a cue statistically irrelevant (in both identification and AXB tests).
- When L1 has a spectral distinction somewhere else in the inventory and no length distinction --> the spectral strategy is to some extent generalized to a new contrast (in AXB test length was insignificant for Polish subjects)
- When L1 has length but no quality distinction --> quality is in identification either irrelevant (back vowels) or less relevant (front vowels).

General conclusions

- Cue weighting seems generalizable, i.e. even if in L1 there is no corresponding contrast in the same perceptual space, the strategy may be used that is favored in L1 for other phonemic oppositions.

Acknowledgements

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