Contours in music and speech
the effect of musical aptitude on speech prosody

Mateusz Jekiel and Kamil Malarski
Adam Mickiewicz University in Poznań, Poland
About the project

- musical hearing in the acquisition of EFL pronunciation
- 2015 – 2018
- Polish advanced learners of English

NATIONAL SCIENCE CENTRE
POLAND
Background

- music and language evolution (Brown 2001, Mithen 2005)
- music and neurolinguistics (Patel 2008, Fadiga et al. 2009)
- music and L1 acquisition (Carlton 2000, Strait et al. 2012)
- music and L2 acquisition (Pastuszek-Lipińska 2008)
- music in didactics and pedagogy (Franklin et al. 2008)
- popular science
Issues to address

- difficult to measure and define
- scarcity of empirical data for musical hearing
- scarcity of longitudinal studies
- general language proficiency vs specific aspects of pronunciation
- general musical aptitude vs specific aspects of musical hearing
Research questions

● To what extent are **pitch perception, melodic memory** and **rhythmic perception** correlated with the acquisition of EFL intonation?
● To what extent are EFL learners able to imitate their teachers’ pronunciation?
● Is EFL intonation learnable / teachable?
Participants

- 20 Polish advanced learners of English (all female)
- BA English studies programme
- 19-21 years old
- General British pronunciation model
- intensive two-year accent training
- one-year phonetics and phonology course
Recording sessions

● before and after accent training
● c. 50 minutes
● spontaneous speech *(warm-up)*
● reading passage *(Please Call Stella)*
● dialogues *(four dialogues eliciting intonation)*
● wordlist *(sets of words eliciting GB vowels)*
Musical hearing tests (Mandell 2009)

- pitch perception (Hz)
- melodic memory (%)
- rhythmic perception (%)
Online survey

- musical experience
  - music school
  - private music tutoring
  - playing a musical instrument
  - playing in a band
  - singing
The dialogue

A: What are you drinking?
B: Coffee.
A: Neat! Let me have some.
B: Hands off my drink!
A: I only want to taste it...
B: You’re broke again, aren’t you?
A: Don’t worry, I’ll have some money soon.
B: In that case, here you go.
Acoustic analysis (3 teachers & 1 native speaker)
Acoustic analysis

<table>
<thead>
<tr>
<th>Speaker</th>
<th>What are you drinking?</th>
<th>Coffee.</th>
<th>Neat!</th>
<th>Let me have some.</th>
<th>Hands off my drink!</th>
<th>I only want to taste it...</th>
<th>You're broke again, aren't you?</th>
<th>Don't worry, I'll have some money soon.</th>
<th>In that case, here you go.</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>fall</td>
<td>fall</td>
<td>rise-fall</td>
<td>fall</td>
<td>fall</td>
<td>rise</td>
<td>fall</td>
<td>rise</td>
<td>fall</td>
</tr>
<tr>
<td>T2</td>
<td>fall</td>
<td>fall</td>
<td>rise-fall</td>
<td>fall</td>
<td>fall</td>
<td>rise</td>
<td>fall</td>
<td>rise</td>
<td>fall</td>
</tr>
<tr>
<td>T3</td>
<td>fall</td>
<td>fall</td>
<td>rise-fall</td>
<td>fall</td>
<td>fall</td>
<td>rise</td>
<td>fall</td>
<td>fall-rise</td>
<td>fall</td>
</tr>
<tr>
<td>NS</td>
<td>fall</td>
<td>fall</td>
<td>rise-fall</td>
<td>fall</td>
<td>fall</td>
<td>rise</td>
<td>fall</td>
<td>fall-rise</td>
<td>fall</td>
</tr>
</tbody>
</table>
A: What are you drinking? (fall)
B: Coffee. (fall)
A: Neat! (rise-fall) Let me have some. (fall)
B: Hands off my drink! (fall)
A: I only want to taste it... (rise)
B: You’re broke again (fall), aren’t you? (fall)
A: Don’t worry (rise / fall-rise), I’ll have some money soon. (fall / fall-rise)
B: In that case (fall / rise), here you go. (fall)
Data analysis – musical hearing tests

Pitch perception (Avg. = 19.01 Hz)
Data analysis – musical hearing tests

Melodic memory (Avg. = 65.83 %)
Data analysis – musical hearing tests

Rhythmic perception (Avg. = 70.80 %)
Data analysis – intonation scores before & after training

F(1,38) = 9.57, p = 0.003
P028 (score 100%, pitch perception < 10 Hz)
P030 (score 33.3%, pitch perception > 50 Hz)
Results – intonation scores & pitch perception

![Graph showing the comparison of correct intonation patterns before and after training with trend lines for each condition. The x-axis represents pitch perception results (Hz), and the y-axis represents correct intonation patterns. The graph includes data points and trend lines indicating a decrease in correct intonation patterns from 100% to 0% as the pitch perception increases from 0 Hz to 60 Hz. The trend line for before training has an r^2 value of 0.03, and the trend line for after training has an r^2 value of 0.051.]
Results – intonation scores & melodic memory

![Graph showing correlation between melodic memory results and correct intonation patterns.](image-url)
Results – intonation scores & rhythmic perception

![Graph showing intonation scores and rhythmic perception results](image-url)
Data analysis – training & pitch perception

F(1,38) = 6.77, p = 0.01
Data analysis – training & melodic memory

$F(1,38) = 0.02, \ p = 0.87$
Data analysis – training & rhythmic perception

F(1,38) = 5.70, p = 0.02)
Data analysis – training & musical experience

\[ F(1,38) = 2.04, \ p = 0.17 \]
Conclusions

- An extensive two-year pronunciation course can significantly improve production of near-native intonation patterns.
- Good pitch perception and good musical rhythm can help in the acquisition of L2 intonation.
- Musical aptitude without formal pronunciation training is not enough.
- Musical aptitude can be more effective than musical experience.
Selected references


