Cross-linguistic analysis of pitch range and its influence on perceived speech friendliness

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Outline

- Background
- Preliminary analysis
- The study
- Conclusions and plans for future research
Paralinguistic uses of pitch

- all languages use gradient variations in pitch properties to signal different degrees of a certain set of meanings
  - attitude
  - confidence
  - friendliness
  - surprise
Paralinguistic uses of pitch

- biological conditions that cause pitch variation across and within speakers
  - Frequency Code (Ohala 1983)
    - smaller larynxes produce higher-pitched sounds
  - Effort Code (Gussenhoven 2002)
    - change in the amount of energy is reflected in the speech signal
  - Production Code (Gussenhoven 2002)
    - supply of energy is available in breathing phases
The Frequency Code

- higher pitch
  - feminine
  - submissive
  - friendly
  - polite
  - vulnerable
  - uncertain

- lower pitch
  - masculine
  - dominant
  - confident
  - protective
  - aggressive
  - certain
Pitch range variation

- pitch range: span and register (Cruttenden 1997)
  - pitch span: distance between the highs and the lows
    - the wider span, the higher register (Ladd 1996)
  - pitch register: mean pitch value of the pitch contour
    - increases and decreases of high and low pitches (Rietveld and Vermillion 2003)
Is paralinguistic intonational meaning universal?

- cross-linguistic variations
  - listeners with different language background rely on similar intonational cues, but differ in sensitivity to them (Scherer 2000, Makarova 2000)
Language specific effects of pitch range on perception of universal intonational meaning

- Chen, Rietveld, and Gussenhoven (2001)
  - lexically equivalent stimuli varied in pitch range and contour
  - perceived confidence decreased and perceived friendliness increased as pitch range was raised
  - British English more friendly than Dutch at identical pitch ranges
Language specific effects of pitch range on perception of universal intonational meaning

![Graphs showing the relationship between pitch register or span and perception of friendly and confident](image-url)
Language specific effects of pitch range on perception of universal intonational meaning
The study

- English speakers

Speaker 1
(31 years old)

Speaker 2
(52 years old)
The study

- Dutch speakers

**Speaker 1**
(28 years old)

**Speaker 2**
(50 years old)
The study

- Polish speakers

Speaker 1
(25 years old)

Speaker 2
(53 years old)
Stimulus

● **English**
  ○ *By the way, I didn’t catch your name.*
  ○ *You can do it on Tuesday afternoon or on Wednesday morning.*

● **Dutch**
  ○ *Trouwens ik heb je naam gemist.*
  ○ *Je kan dat op dinsdagmiddag of woensdagochtend doen.*

● **Polish**
  ○ *Tak w ogóle to nie dosłyszałem Twojego imienia.*
  ○ *Możesz to zrobić we wtorek po południu albo w środę rano.*
Data

- 36 recordings
  - 12 unmodified recordings
  - 12 recordings with equalized pitch register
  - 12 recordings with flat intonation
Method
Method

Pitch manip
Pitch from pulses

- 300.0 Hz
- 134.0 Hz
- 25.0 Hz
Online survey

http://goo.gl/NHgEZ2
Online survey

(if you have problems playing the audio, click here)

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Respondents

- English respondents
  - 17 people (9 M, 8 F) | age = 33.8

- Dutch respondents
  - 14 people (6 M, 8 F) | age = 40.9

- Polish respondents
  - 20 people (9 M, 11 F) | age = 26.7
Hypotheses

- English should be perceived as the most friendly due to its wide pitch span

- modified recordings should score the same
  - speakers with lowered pitch register should score worse in friendliness than with standard pitch register
  - speakers with raised pitch register should score better in friendliness than with standard pitch register

- recordings with flat intonation should score the same

- speakers regarded as less friendly should score better in self-confidence
Mean values / all languages
Mean values / individual languages
Mean values / speaker’s age

- Friendliness / Young
- Friendliness / Old
- Self-confidence / Young
- Self-confidence / Old

- Unmodified
- Modified
- Flat
Conclusions

- speakers with lowered pitch register were perceived less friendly than originally
- speakers with raised pitch register were perceived more friendly than originally
- large differences in pitch are noticeable as expected by Polish and English listeners
- even small differences in pitch are noticeable as expected by all listeners in Dutch
- Polish respondents find flat intonation less striking than Dutch or English speakers due to lower pitch span of their native language
Future research

- perform more tests for pitch span
- find more respondents
- include cross-dialectal differences
Selected references


