The Relationship Between Pitch and Persuasiveness

Honors thesis
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It's a damn shame we have this immediate ticking off in the mind about how people sound. On the other hand, how many people really want to be operated upon by a surgeon who talks broad cockney?

--Aileen Aitkins (British actress of the 1930s)
What’s in a voice?

- Social status
  - Avery & Lis, 1996

- Height + weight
  - Krauss, Freyberg, and Morsella, 2002

- Attractiveness
  - Collins and Missing, 2003

- Personality
  - Apple, Krauss, and Streeter, 1979

- Sexual orientation
  - Pierrehumbert and Bent, 2004

- Sexual behavior
  - Hughes et al., 2004
What makes the voice so revealing?

Two sources of information:

**Verbal channel**
content of speech

**Vocal channel**
speech minus content
Vocal channel

- Rate
- Loudness
- Pitch

\{ 
\text{Appraisal} \\
\text{Decision-making} 
\}

\textbf{Pitch}

How high or low someone talks

\textit{Fundamental frequency (FØ)}

- Physical property
- Perceptual correlate of pitch
- Measured in Hertz (Hz)

- Previous studies…
How do we produce speech?

Vocal cords

Frequency of air puffs → F0

Breathing – vocal cords separated
Vocal cords

Men vs. Women
Average F0 120 Hz 220 Hz

High pitch vs. low pitch
“Listen Up”

500 Hz

0.56 secs

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“Listen Up”

500 Hz

0.56 secs

+ 20 Hz

- 20 Hz

***speech rate not altered**
Past experiments…

**Apple, Krauss and Streeter (1979)**

- Effect of FØ manipulations on ratings of speaker’s personality
- Used only male speakers
  - Raised FØ…
    - Less truthful
    - Less persuasive
    - Weaker
    - More nervous

**Gardner (2003 Honors thesis)**

- Effect of FØ manipulations on persuasiveness of an argument
- Male and female speakers
- Bipolar Argument Task
Bipolar Argument Task

- **10 Fictional Scenarios**
  - Decision between 2 options (A or B)

- **4 Participants**
  - 2 male, 2 female
  - Made A and B arguments for each scenario

Pitch preferences

Scenario 1: A high, B low or A low, B high, etc.

- Male raters
  - Female speakers in high pitch
  - Male speakers in low pitch
  - Female speakers in low pitch

- Female raters
  - Male speakers in high pitch

***Results not significant***
Methods

1. **Speech sample collection**
   - Bipolar Argument Task
   - 6 speakers (3 male, 3 female)

2. **Speech re-synthesis**
   - FØ manipulations with Praat

3. **Data collection**
   - Listener ratings

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• **Tug-of-war vs. Croquet in the Olympics**

   *In the early part of the 20th century, tug-of-war and croquet were official Olympic sporting events. They have since been retired and are now listed as “past Olympic sports” on the official website of the Olympic games. Today, enthusiasts of these sports would like to see them reintroduced into the Olympic games. Here is some information about each sport’s suitability for being reintroduced as an official Olympic sporting event.*

• …followed by information about each sport

• **Question:** Which sport is more suitable for being reintroduced as an official Olympic sporting event?
Tug-of-war vs. Croquet

Re-synthesis with Praat

1. Measured average F0 for each argument
2. Raised and lowered F0 by…

Female speakers
- +/- 20 Hz

Male speakers
- +/- 15 Hz
Listener ratings

1. Participants listened to arguments
2. Rated on 6 point scale
   1. How much they AGREE* w/ argument
   2. Argument’s CONVINCINGNESS*
   3. Argument’s COHERENCE*

* Correlated

*** Results not significant

Preference for Low Argument

Average Log H Difference

Males prefer males in low pitch
Females prefer opposite
Males prefer females in high pitch

Rater Sex

FM Raters

M Raters

→ 10 talkers...
Meanwhile…

*Speaker personality?*

Arguments $\rightarrow$ Argument Ratings

Scaling study

- *Collecting adjectives*
  - Argument raters thought of adjectives

- *Paired similarity test*
  - 22 most commonly produced adjectives
  - Participants rated adjective similarity on scale of 1-6

- *Scaling Analysis*
  - Individual Differences Scaling (INDSCAL)
    $\Rightarrow$ Multidimensional Scaling Solution (MDS) $\Rightarrow$ 2D
Results for 10 talker study…
Unfortunately…

Summary

• **Wanted to accomplish?**
  - Understand relationship between FØ and persuasiveness for male and female speakers

• **Did accomplish?**
  - Identified trends in FØ preferences for male vs. female raters
  - Generated adjectives for a future personality attribution study

• **Next?**
  - Fine-tune 10 talker study (Larger FØ shifts?)
  - Run personality attribution study

***Stay tuned and 🔊***
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Counterbalancing stimuli presentation

There are four versions:

1. A high, B low; males 1-5, female 6-10
2. A low, B high; males 1-5, females 6-10
3. A high, B low; females 1-5, males 6-10
4. A low, B high; females 1-5, males 6-10
Number of raters

- Apple et al.: 
- Gardner: 22 (8 male, 14 female) 
- 6 talkers: 
- 10 talkers: 69 (28 male, 41 female) 

All native English-speakers with normal hearing

Summary

- Numbers of raters
- Whole design—counterbalancing