Toward a Characterization of Western Operatic Singing Voices

Pauline Larrouy-Maestri*, David Magis*, Marion Nowak*, & Dominique Morsomme*
*Unit «Logopédie de la Voix», Department of Psychology: Cognition and Behaviour, University of Liège, Belgium
°Department of Education, University of Liège, Belgium

AIMS

Western operatic singing performances
- Easily recognizable
- Several acoustical parameters identified

However
- The number of parameters could be extended
- Effect of melody on these parameters remains unclear

→ Effects of melody and technique on acoustical and musical parameters

→ Characterizing the Western operatic singing style

METHODS

Participants
- 50 professional singers (38 women and 12 men)
- Age from 19 to 66 years (M = 36.94)
- Classical training started between 6 and 49 years of age (M = 20.18)
- Singing experience from 5 to 51 years (M = 19.86)
- Practice 13.68 h/week on average

Material
- Two contrasting melodies
  - popular song (Happy Birthday)
  - romantic melody
- With two vocal techniques
  - with operatic singing technique
  - without particular technique

200 performances

Database: http://sldr.org/sldr000792/en

RESULTS

ACOUSTICAL PARAMETERS
- Energy distribution (ED)
- Vibrato rate (VR)
- Vibrato extent (VE)

MUSICAL PARAMETERS
- F0 of the starting note (F0)
- Average tempo (Tempo)
- Sound pressure level in dB (SL)

PERTURBATION PARAMETERS
- Standard Deviation of F0 (SDF0)
- Signal-to-noise ratio (SNR)
- Jitter % (Jitter)
- Shimmer % (Shimmer)

PARAMETERS

Effect of melody

Effect of technique

Theoretical model

200 performances

→ z-scores for significant and non significant effects of melody (left) and technique (right) on the 10 parameters observed.

Positive z-scores for melody indicate a positive effect of the covariate on the romantic melody.
Positive z-scores for technique indicate a positive effect of the covariate on the operatic technique.
Dashed horizontal lines refer to the 5% significance levels for z-scores.

CONCLUSION

- Vocal technique affects most of the parameters examined
- The effect of melody is limited
- Preliminary theoretical model
  - A particular vocal profile appears depending on the vocal technique employed
  - Perturbation parameters don’t seem to take part in the characterization of operatic singing voices
  - Vibrato rate, sound level, energy distribution, fundamental frequency of the starting note and tempo are relevant in describing the Western operatic singing technique.