# A Comparison Between Subjective and Objective Methods for Evaluating the Vocal Accuracy of a Popular Song

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## AIMS

Vocal accuracy of a sung performance can be evaluated by two methods:
acoustic analyses and subjective judgements.
Both are still used but the objective methods have been presented as a more reliable solution.[1]
Even if it is true, the criteria to observe objectively the singing voice accuracy must be clearly defined.

**➔ Are subjective and objective methods congruent?**
**➔ What has to be observed in objective methods?**

## METHODS

**Material**

166 sung performances of « Happy Birthday »

by occasional singers

http://sldr.org/sldr000774/en

### Subjective judgements

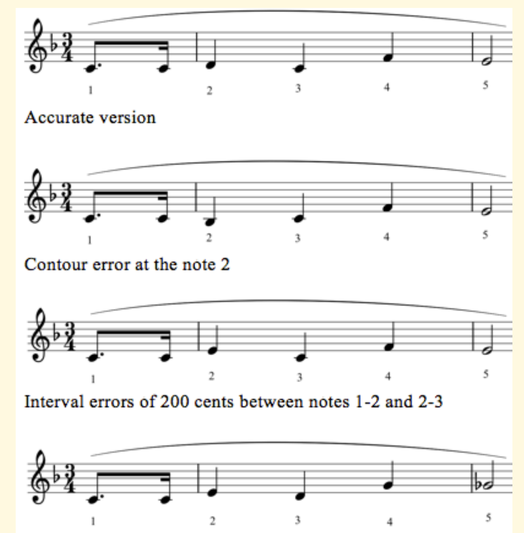
Expert judges
- 4 music students
- 5 professional musicians
- 5 professional singers
- 4 speech therapists

Evaluation of the global pitch accuracy
9 points scale

1----2----3----4----5----6----7----8----9
very inaccurate very accurate

### Acoustic analyses[2]

Estimation of the f0
- for the 21 notes of the tune
- Short Time Fourier Transformation analysis
- AudioSulpt and OpenMusic softwares (IRCAM, Paris, France)



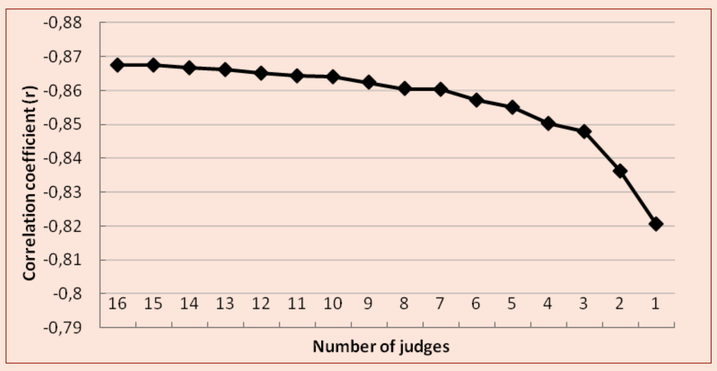

3 criteria
- Number of contour errors
- Pitch interval deviation
- Number of tonality modulations

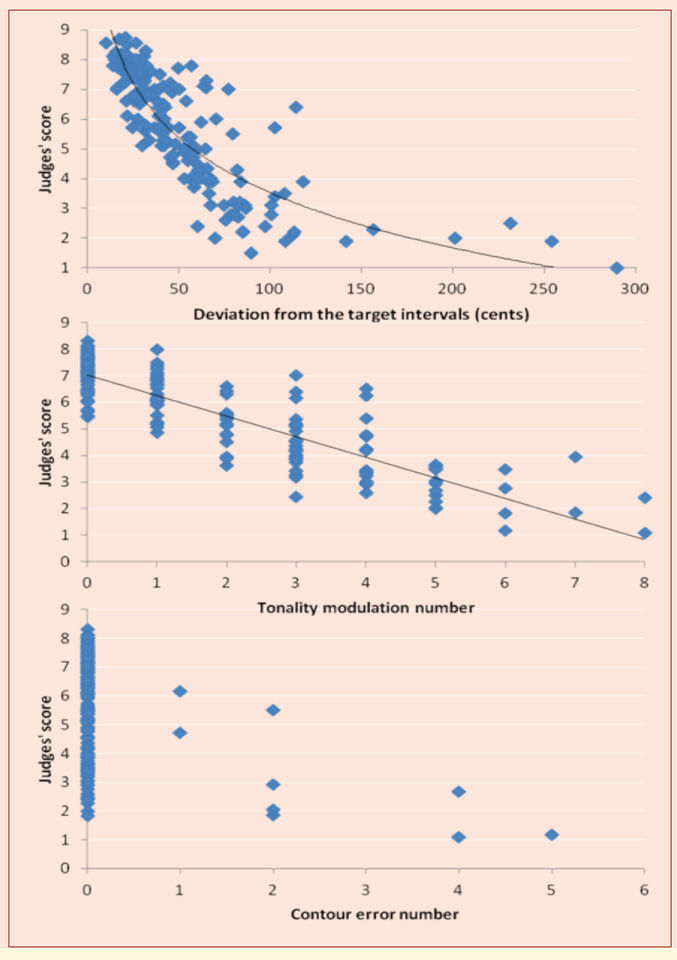
## RESULTS

➔ Correlation between the raters:
$r = .77$, $p < .01$

➔ Correlation between the interval deviation criterion and the judge rating:
$r = .87$, $p < .001$

Even with a downsampling to 3 judges




➔ The total model of acoustic analyses explains 81% of the variance of the judges.

➔ The multiple regression analysis indicates that two variables predict the score of vocal accuracy given by the judges.

- Pitch interval deviation
  $\beta = 0.51$; $t = -6.61$; $p < .001$
- Number of tonality modulations
  $\beta = 0.45$; $t = -6.33$; $p < .001$
- Number of contour errors
  $\beta = 0.08$; $t = -6.61$; $p = .06$

## DISCUSSION

- **Congruence between objective and subjective measurements of vocal accuracy while the assessment is done by music or singing voice experts.**
- **The vocal accuracy can be measured by an analytical objective method through acoustic measurements.**
- **The relevance of the pitch interval deviation criterion in vocal accuracy assessment is clearly confirmed.**
- **Furthermore, the number of tonality modulations is a salient criterion in perceptive rating and should be taken into account for the objective vocal accuracy assessment.**

**References :**
1. Dalla Bella, S., Berkowska, M., Sowinski, J. (2011). Disorders of pitch production in tone deafness. Frontiers in Psychology, 2, 1-11.
2. Larrouy-Maestri, P., Morsomme, D. (in press). Criteria and tools for objectively analysing the vocal accuracy of a popular song. *Logopedics Phoniatrics Vocology*.

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