

## Vocal stereotypes

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### Abstract

German speakers receive different ratings in their perceived vocal attractiveness and personality characteristics. An experiment was conducted to evaluate the perceived personality attributions of 32 German listeners and find acoustic cues that correlate to these attributions. The attributed opposition pairs on which the speakers were judged were reduced by a cluster analysis to two factors: *dominance* (e.g. “confident”, “competent”) and *benevolence* (e.g. “sensitive”, “helpful”). The acoustic investigation of the voices of 4 male speakers revealed the impact of several acoustic parameters on the ratings. Among others, the harmonics-to-noise ratio (HNR) and breathy vocal onsets were most important for high ratings on benevolence. High ratings on dominance showed strong correlations to low mean F0 and strong glottal impulses.

Key words: vocal stereotypes, vocal attractiveness, personality attributions, dominance, benevolence

### Introduction

For more than 50 years, studies on the attribution of personality characteristics to voice quality descriptions have been conducted (Allport and Cantril 1934, Brown 1982, Zuckerman and Driver 1989, Sendlmeier and Siegmund 2005). While these attributions have been relatively consistent between listeners who had to judge different voices, the reason for this consistency has remained somewhat unclear.

Several of these studies found correlations between subjective evaluations of a voice (e.g. *shrillness*, *loudness*, *throatiness*) and perceived vocal attractiveness. However, the correlations to objective acoustical measures were rather low (Zuckerman and Miyake 1993) or contradictory (e.g. influence of F0 excursions on the factor competence by Brown (1982) and G elinas-Chebat (2003)). Judgements of several personality factors were matched with different voice parameters. A high speaking rate for example showed a positive effect on the factors competence, activity and attractiveness (Brown 1982, G elinas-Chebat 2003, Sendlmeier 2005) but a negative effect on benevolence (Sendlmeier 2005).

Thus, the aim of this study is to investigate “vocal stereotypes”, i.e. consistent personality attributions and vocal attractiveness ratings of several speakers by different listeners. In addition to that, we will discuss auditory and acoustic correlates to the subjective judgements of the raters.

## Method

We recorded 25 male native speakers of German reading a passage of “*The little Prince*” by Antoine de Saint-Exupéry. 32 male and female listeners rated each speaker on 15 attribute opposition pairs such as extroverted – introverted, competent – incompetent, honest – dishonest on a scale from 1-7. This method called “semantic differential” extends back to Osgood, Suci and Tannenbaum (1957). In total, 12.000 judgements were elicited (25 speakers x 15 attribute-pairs x 32 listeners).

A cluster analysis was performed on the rating data, reducing the dimensions on which speakers were judged (attribute opposition pairs) to two factors. Orientated on earlier literature we named the factors *dominance* (“confident”, “strong”, “competent”, etc.) and *benevolence* (“sensitive”, “helpful”, “warm”, etc.). This finding is consistent with results presented in recent studies (Sendlmeier and Siegmund 2005, Zuckerman and Driver 1989).

This study extends previous work by acoustically investigating the voices of 4 selected speakers that have received rather unambiguous ratings in order to find objective acoustic cues correlated to the consistent attributions of different listeners: The speakers were either high or low on both factor values, or high on one but low on the other.

Mean F0 and formants were measured but special attention has been given to previously rather neglected acoustic measures such as “harmonics-to-noise ratio” (HNR), “Relative Average Perturbation” (RAP) for jitter, and “Amplitude Perturbation Quality” (APQ) for shimmer. RAP describes micro-fluctuations in the mean F0 and reflects the difference between the calculated mean value of three neighboured oscillations and the actual value. Shimmer describes micro-fluctuations in the sound’s intensity. Other parameters (breathiness, sonority, harshness) were auditory judged based on acoustic evidence such as VOT, periodicity, harmonics, glottal impulses and vocal onsets (VRT).

## Results and discussion

The speakers were judged significantly different in their vocal attractiveness and personality attributions based on their voices. The high interrater reliabilities show the congruency of the ratings: Cronbach-alpha = 0.97 (*dominance*), 0.94 (*benevolence*) and 0.95 (attractive voice).

### The attractive voice

Our results confirm the findings of Zuckermann and Driver (1989) that listeners judge speakers to be different with regard to vocal attractiveness. In addition to that, the data shows, that the correlation between perceived vocal

attractiveness and the attributed personality factors *dominance* and *benevolence* differ in their strength: The association between attractive voice to *dominance* was stronger than to *benevolence*, cp.  $r = 0.82$  vs.  $r = 0.68$  (Pearson correlation,  $p < .01$ , two-sided)

### The personality factors *benevolence* and *dominance*

High jitter values correlate with low ratings of *benevolence*, whereas high shimmer values which are associated with breathiness have a positive effect to *benevolence* scores. Further, soft and breathy vocal onsets and high values for HNR showed a strongly positive effect to the judgement of *benevolence*.

Disturbed periodicity and harshness affect both factors negatively, corresponding to results from Teshigawara (2003) and Laver (1994). The correlation of high ratings on *dominance* and low mean F0 and laryngealisation could also be confirmed (Laver, 1994, Zuckerman and Miyake, 1993). Furthermore, correlations between the attribution of dominance and the existence of numerous harmonics, strong glottal impulses and several intense formants were found. These observations could refer to the connection of spectral tilt of a voice to the attribution of dominance.

Table 1 shows the impact of spectral parameters on the ratings of 4 speakers. Measured mean values from Yumoto, Gould and Baer (1982) for HNR (11.9 dB), from Walton and Orlikoff (1994) for RAP (0.28 %) and from Davis (1979) for APQ5 (5.97 %) can be used as reference.

Table 1. Measurements of Jitter, Shimmer, HNR and mean F0 of 4 speakers scoring high or low on *dominance/benevolence* and a combination thereof.

speaker	dom.	ben.	HNR (dB)	RAP (%)	APQ5 (%)	mean F0 (Hz)
1	high	low	8.30	0.94	4.22	99.28
2	low	low	6.95	1.34	5.24	129.30
3	low	high	10.80	0.37	6.88	133.00
4	high	high	11.60	0.34	5.75	89.40

Several acoustic patterns of the voice could be linked positively or negatively to both factors of personality. Especially features of laryngeal settings and here above all breathiness seem to have the greatest influence to positive attributions in regard to the factor *benevolence*. High scores in the factor *dominance* were more closely related to low mean F0 with laryngeal voice, glottal and pharyngeal laxness and a high sonority reflected through the existence of numerous harmonics and strong glottal impulses. Laryngeal and supra laryngeal settings but also the speaking style played a role.

## Conclusion

The study confirmed the existence of vocal stereotypes for male speakers of German and explored various spectral parameters associated with the raters' conforming judgements regarding perceived personality factors and voice attractiveness. Additionally, a difference in the judgements of the listeners depending on gender was found: Female listeners rated the male voices significantly more positive than their male colleagues. That could be interpreted in terms of competition within gender and should be investigated more intensely in further research. These results, identifying the acoustic resources employed in the performance of dominance and possibly gender in general, are of great interest to sociolinguists and sociophoneticians.

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