

Are Jitter and Shimmer comparable to perceptual voice analysis in healthy voices?

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Abstract

Introduction: Objective and perceptual acoustic voice assessments are recommended as complimentary parts for clinical voice examinations [1]. However, in hoarse voices there have been contradictory descriptions of the correlation between perceptual and objective acoustic analysis [2, 3]. One reason might be the low reliability of objective acoustic measurements in irregular voice signals, which is better in normal voices [4]. In comparison perceptual assessment protocols show high validity and reliability in irregular and also in normal voices [4, 5]. Therefore, this study investigates if Jitter and Shimmer correlate to perceived „irregularity“ in healthy voices using a new ranking tool to assess subtle differences between normal voices.

Methods: 40 vocally healthy adults (20f, 20m) between 20 and 40 years provided 80 recordings of the prolonged vowel /a/. Of these 2 subsets with 10 female and 2 subsets with 10 male voices each were compiled. 6 independent trained speech pathologists ranked all 10 recordings in each subset according to perceived “irregularity” twice in a 1 week interval. Furthermore, rank orders according to Jitter % and Shimmer % using PRAAT were determined. The kappa statistic was used to assess the agreement between perceptual and objective acoustic rankings and intra- and interrater agreement. The statistical significance was investigated with the students-t-test.

Results: Poor agreement was found for the perceptual analysis rankings with jitter (mean 0.18, SD 0.10; Figure 1) and shimmer (mean 0.07, SD 0.15). However, considering all raters together, a statistically significant relationship between perceived irregularity and jitter was found (t-test, $p=0.02$). Whereas all raters had a good intrarater agreement (mean 0.77, SD 0.11; $p < 0.05$) agreement between raters was low (mean 0.25, SD 0.16).

Discussion:

The poor agreement between perceptual and objective acoustic voice rankings suggests that Jitter and Shimmer do not correlate to perceived „irregularity“ in normal voices (Figure 1). Even though there was a significant relationship between Jitter and perceptual „irregularity“ for the consensus of all raters, the low interrater agreement shows that a significant correlation can not be automatically assumed for every examiner. Therefore, we conclude that objective acoustic and perceptual assessments describe different vocal characteristics. This has to be clarified in further research.

Literature:

1. Dejonckere, P.H., et al., *A basic protocol for functional assessment of voice pathology, especially for investigating the efficacy of (phonosurgical) treatments and evaluating new assessment techniques*. European Archives of Otorhinolaryngology, 2001. **258**: p. 77-82.
2. Dejonckere, P., et al., *Differentiated perceptual evaluation of pathological voice quality: reliability and correlations with acoustic measurements*. Revue de laryngologie, d'otologie et de rhinologie, 1996. **117**(3): p. 219-224.
3. Ma, E. and E. Yiu, *Multiparametric evaluation of dysphonic severity*. Journal of Voice, 2006. **20**(3): p. 380-90.
4. Carding, P.N., et al., *Measuring voice outcomes: state of the science review*. The Journal of Laryngology and Otology, 2009. **123**(8): p. 823-9.
5. Bele, I.V., *Reliability in perceptual analysis of voice quality*. Journal of Voice, 2005. **19**(4): p. 555-73.

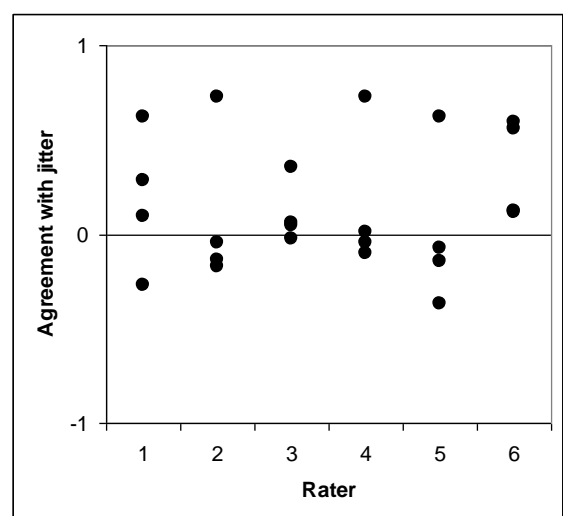


Figure 1: Agreement of perceptual voice irregularity with jitter for four subsamples of ten voices as determined by the kappa statistic. Each rater's agreement is shown separately.