

Acoustical and perceptual analysis of speech disorders in progressive supranuclear palsy and multiple system atrophy

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Objectives: Speech disorders represent an early and prominent clinical manifestation of progressive supranuclear palsy (PSP) and multiple system atrophy (MSA). Unlike Parkinson's disease, characterized by a predominant hypokinetic dysarthria, speech disorders in atypical Parkinsonism usually evolve into a condition of "mixed" dysarthria, expression of corticobulbar and cerebellar involvement. The aim of this study was to characterize speech impairment in PSP and MSA with a standardized approach, in order to detect specific speech parameters which might discriminate these conditions.

Materials and Methods:

✦ 15 PSP patients, 15 MSA patients and 15 healthy controls (HC) were enrolled.

✦ Tasks performed:

- read a short story and a list of words
- 1 minute of spontaneous speech
- sustained phonation of the vowel "a"
- fast syllable repetition (pa/ta/ka).

✦ ANOVA and logistic regression were performed



Acoustic analysis: performed using PRAAT software (Figure 1); 24 parameters evaluated by the speech and language therapists, correlated to hypokinetic, ataxic and spastic dysarthria.



Perceptual assessment: 24 different speech dimensions grouped into 3 category: articulation, phonation and prosody. Global intelligibility was calculated according to the percentage of the 50 words correctly transcribed by examiners.



Neurological Evaluation: disease severity and progression was assessed by Hoehn and Yahr staging and NNIPPS scale.

Results:

✓ PSP and MSA vs HC: greater alteration of global perceptual quality of spontaneous speech and abnormally slow syllable articulation rate.

✓ PSP vs HC: perceptual global intelligibility and single words intelligibility resulted significant impaired in PSP compared to HC.

✓ **PSP vs MSA:** mean speech intensity of spontaneous speech was statistically lower in PSP compared to both HC and MSA patients (HC: $70,7 \pm 4,6$ dB, PSP: $57,3 \pm 7,0$, MSA: $63,7 \pm 6,5$) (figure 2).

Univariate and multivariate logistic regression analyses confirmed the role of speech intensity in differentiate PSP from MSA (OR= 1.5, p=0.02).

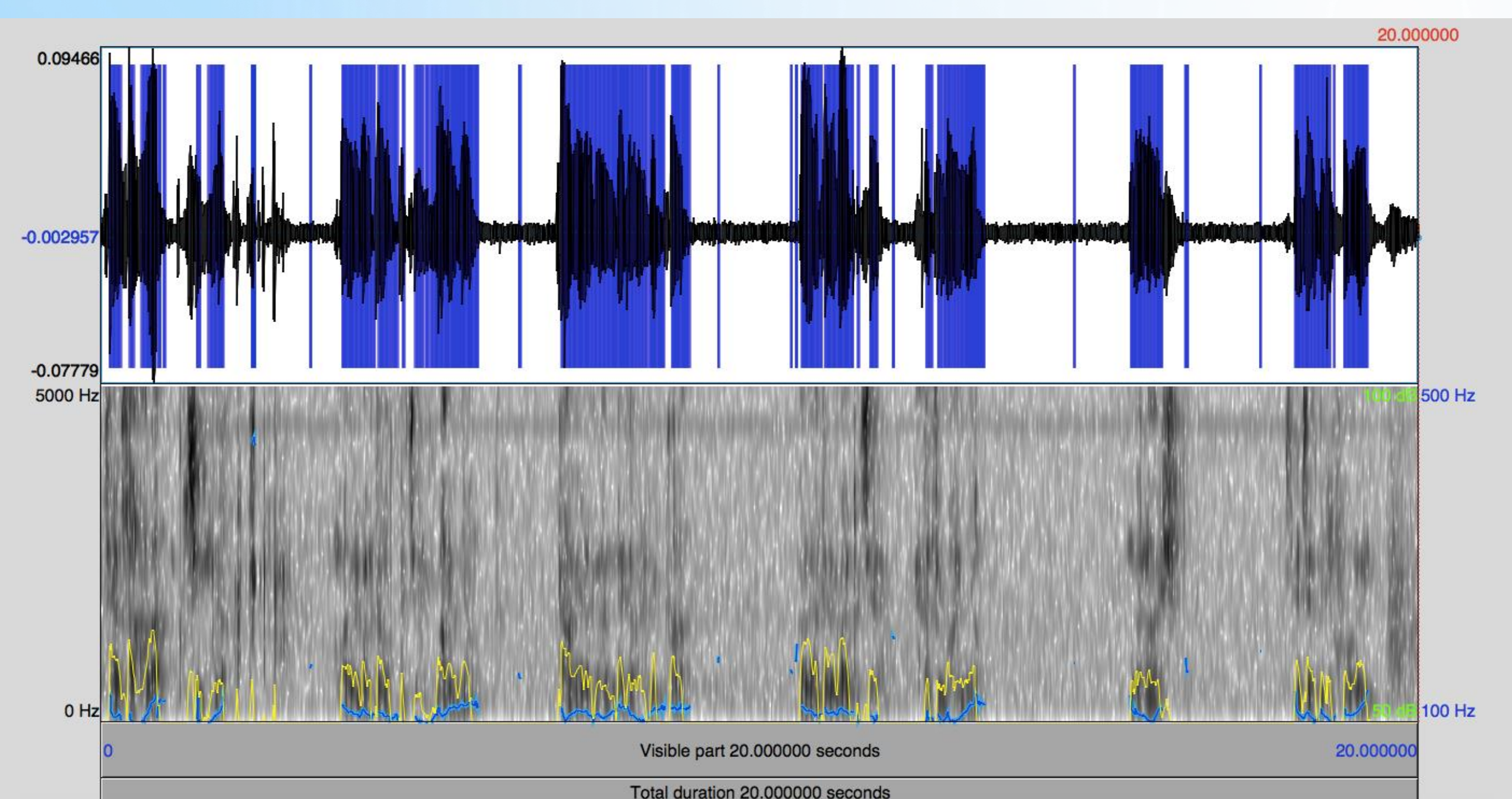


Figure 1: example of acoustic analysis performed using PRAAT (spontaneous speech in a PSP patient).

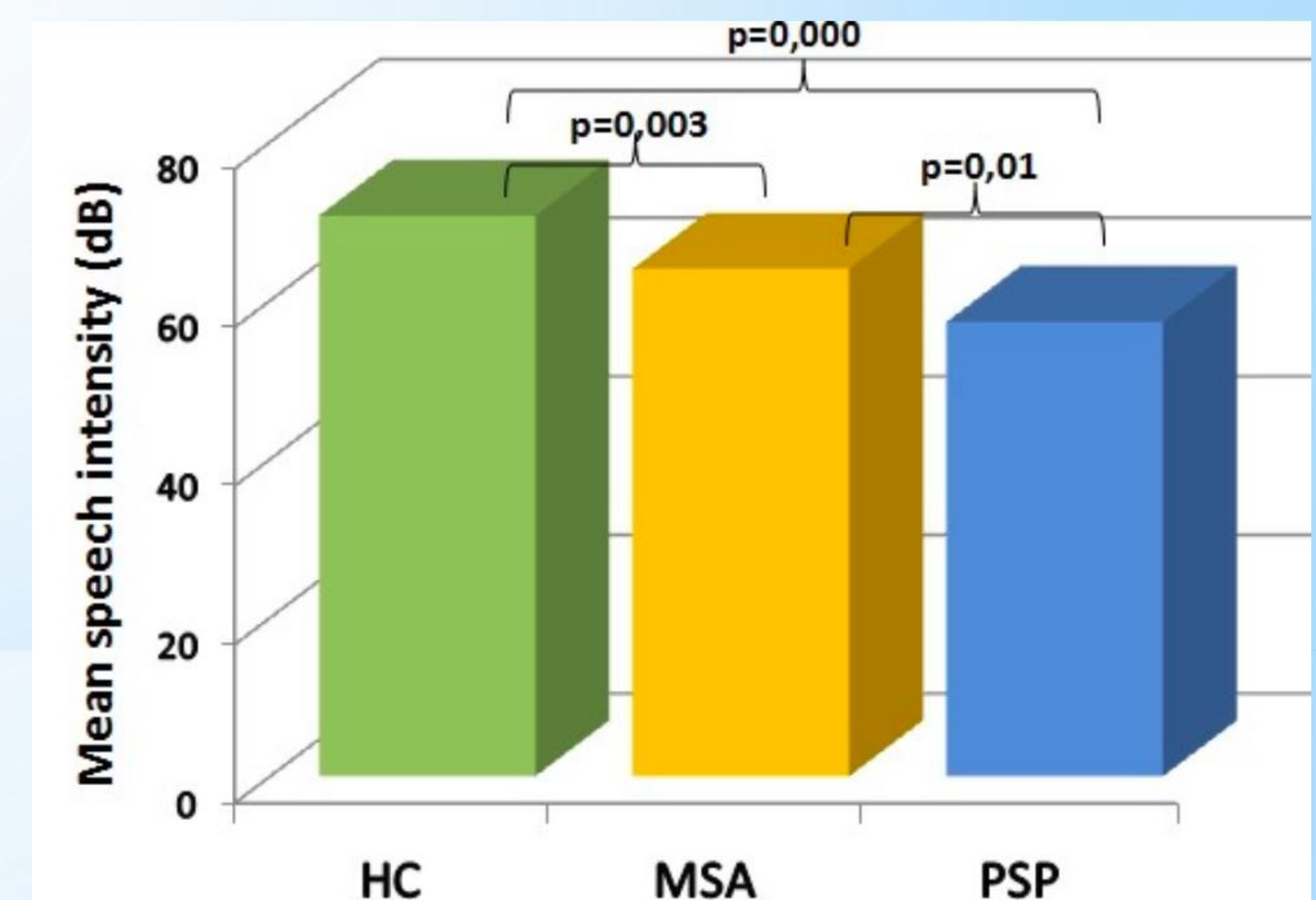


Figure 2

Conclusions: Our data suggest that respect to MSA, PSP patients show a greater global deterioration of speech in particular as regards the intelligibility of words and spontaneous speech. Furthermore, we found that mean speech intensity of spontaneous speech is able to differentiate PSP from MSA. This finding may be related to the different neurodegenerative involvement of basal ganglia and midbrain structures in PSP respect to MSA.

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