The impact of levodopa on acoustic parameters of prominence marking and tongue body movements in patients with Parkinson’s disease

Tabea Thies1,2, Doris Mücke1, Richard Dano2, Michael T. Barbe2

Background

Parkinson’s disease (PD)
• neurodegenerative disorder
• affects motor and non-motor functions

Gross motor symptoms
• smaller, slower, less extended movements
• tremor, rigidity

Speech symptoms (hypokinetic dysarthria) [1,2]
• quiet, monotone, slurred speech
• reduced vowel space, slower articulation rate

Dopaminergic medication (levodopa)
• effective treatment for gross motor symptoms
• but unclear how it affects speech

Methods

Motor Assessment
• rating motor symptoms in med-OFF and med-ON condition using standard motor test (UPDRS III) [3]: the higher the score, the higher the impairment

Speech recordings (med-OFF/med-ON)
• 3D Electromagnetic Articulograph (AG 501) to track tongue dorsum movements during vowel production
• Acoustic measures: Tonal height (FO) of rising pitch accents, intensity, syllable duration (articulation rate)

Patients Characteristics

Speech Material

Target Words
li:na, mi:la
la:ni, ma:li

Question-Answer-Scenario
• Elicitation of focus structure: background (unaccented) < broad focus (accented) < contrastive focus (accented)

Articulation

Acoustics

Levodopa influences speech

PD patients ability to speak improves in med-ON:
• faster articulation rates, louder, higher pitch range & longer, faster, larger tongue body movements

PD patients can mark prominence with and without medication – but different strategies are used:
• phonetic modulations are more efficient in med-ON: hyperarticulation of all phonetic parameters to express prominence
• in med-OFF PD patients use a mixture of hyper- and hyparticulation: no modulation of intensity, but modulation of FO and durations