Developing a Digital Training System for Acquired Dysarthria: the *ISi-Speech* Project

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- Speaking is a key factor for successful communication and participation in society
- Speech motor impairments, such as dysarthria, have a significant impact on everyday communication due to reduced speech intelligibility
- Neurologic diseases, e.g. stroke or Parkinson’s disease, are often associated with dysarthria
- Health insurance often covers only a limited set of treatment units for speech therapy, e.g. two sessions a week
- Sustainable effects for treatment of dysarthria have primarily been shown using intensive treatment approaches like LSVT LOUD® (e.g. Fox, Ebersbach, Ramig, & Sapir, 2012)
- Increase of frequency often fails due to a lack in human resources or cost coverage
- This is where technology comes into play
  - in the interaction with a speech pathologist
  - as a supplement tool for autonomous training
- In autonomous speech training, feedback on correct execution is of utmost importance
- Objective and motivating feedback may nowadays be based on automatic speech recognition, helping to boost awareness of intelligibility limitations and optimizing speech performance

**Challenge**

Joining efforts to develop a digital training system for people with dysarthria in an interdisciplinary team of engineers for speech signal processing and informatics, media designers and researchers from the fields of speech pathology and psychology

- The *ISi-Speech* training system covers evidence-based and best clinical practice exercises for treatment of articulation, prosody and pitch range, speech rate, vocal volume, and resonance:
  - Articulation: repetition and reading tasks, clear and exaggerated articulation (e.g. Park, Theodoros, Finch, & Cardell, 2016) of words, phrases, sentences and texts
  - Prosody: metrically controlled sentences, poems or lyrics, rhythmic entrainment exercises (cf. Späth et al., 2016), utterances with specific emphatic stress patterns
  - Speech rate: virtual metronome, pacing board
  - augmented vocal volume & vocal vigilance
- Treatment options with *ISi-Speech* are numerous, but each patient shall focus on only one to two variables at a time to maximize outcome (Atkinson-Clement, Sadat, & Pinto, 2015).

**References**


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**Fig. 1.** *ISi-Speech* is designed as a training system to be worked on with personal computer, laptop, tablet or smartphone.

**Fig. 2-4.** Exemplary *ISi-Speech* exercises on speech rate, vocal volume and prosody.

**Fig. 5-7.** *ISi-Speech* exercises on intelligibility in a participative dialog.