

# COMPUTER-ASSISTED ASSESSMENT AND TREATMENT OF ARTICULATION, PROSODY AND SPEECH INTELLIGIBILITY OF DUTCH PATHOLOGICAL SPEAKERS

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Current advances in information and communication technology offer great opportunities to society. In health care, these technologies have stimulated the development of e-health tools that complement or supplement current practices. In this workshop, we will demonstrate ASISTO [1] and the Prosodietrainer [2], two examples of e-health tools for training and assessment of pathological speakers which employ speech technology to provide speech-related information.

ASISTO is a web-based platform to help Dutch-speaking adults having various conditions such as dysarthria or total-laryngectomy. The tool can be used under supervision of the therapist as well as independently at home. It offers automatic feedback on intelligibility [3], articulation (e.g. vowel space) and voice quality. The tool can be used with a variety of text material (words, read speech, monologues) which can be personalized towards the patient's needs and capabilities. The automated intelligibility measurements were recently validated on 50 total-laryngectomy patients. This experiment demonstrated a very strong correlation (0.87) between the computed scores and the responses of experienced listeners in case monosyllabic words were used, and strong correlations (0.77-0.79) in case of read speech.

The Prosodietrainer is a Windows computer program for the assessment and treatment of the prosodic skills of Dutch-speaking adults with light to moderate dysarthria. The tool offers automatic feedback on two aspects of prosodic expressiveness: speech rate and sentence final intonation patterns that signal the difference between statements and declarative questions. It contains a hierarchical therapy program and a standardized prosody test to measure progress. A pilot experiment demonstrated the first evidence of the short-term efficacy of the tool [3]. 11 patients with hypokinetic dysarthria secondary to Parkinson's disease who practiced intensively with the tool during 3 weeks – under supervision of a SLP – succeeded in lowering their speech rate and in enhancing their prosodic contrast between statements and questions. Speech intelligibility was significantly improved with a large effect size.

We are currently merging the functionality of ASISTO and the Prosodietrainer in a new software tool in which we focus on usability. This tool will offer new types of automatic analysis such as the automatic measurement of contrastive stress (e.g. "The TEACHER arrived late" versus "The teacher arrived LATE") and speech sound discrimination using minimal pairs (e.g. "neck" versus "net"). We plan to extend this tool to other languages such as English and French, and plan to adapt our algorithms to analyze pathological speech in children.

[1] <https://asisto.elis.ugent.be/>

[2] <http://catris.etrovub.be/prosodietrainer.html>

[3] Middag et al. (2014). "Robust automatic intelligibility assessment techniques evaluated on speakers treated for head and neck cancer." *Computer Speech and Language*, 28(2):467-482.

[4] Martens et al. (2015). "The effect of intensive speech rate and intonation therapy on intelligibility in Parkinson's disease." *Journal of communication disorders*, 58:91-105.