The development of the Situated Phoneme (SiP) test
A Swedish test of phonemic discrimination in noise for adult people with hearing loss

av

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Akademisk avhandling

Avhandling för medicine doktorsexamen i handikappvetenskap, som kommer att försvaras offentligt fredagen den 19 februari 2021 kl. 09.00, Hörsal L2, Örebro universitet

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Abstract


In the current thesis, a Swedish phoneme-level speech-audiometric test in natural background noise was developed. The test is called the Situated Phoneme (SiP) test. In the first study, different types of word metrics thought to influence lexical access were developed and calculated for more than 800,000 phonetically transcribed Swedish words, which were then assembled in a database called the AFC-list. In the second study, groups of monosyllabic AFC-list words with minimal phonemic contrast were selected as linguistic stimuli for the SiP-test, using a method by which the influence of word frequency, neighborhood density, phonotactic probability and orthographic transparency was controlled. All test words were recorded to sound files, of which the accuracy was validated in a listening experiment with 28 normal-hearing adult native speakers of Swedish. In the third study, a method was developed by which realistic masker sounds, spectrally matched to each set of test phonemes in the SiP-test material, were generated for the SiP-test based on a database of urban outdoor sound events. In the fourth study, the validity of six statistical methods for significance testing of observed score differences applicable to the SiP-test were investigated. Analyses were based both on computer simulated test sessions and on SiP-test sessions with human participants. In the latter, the SiP-test speech material was presented against the urban outdoor masker sounds at different difficulty levels to 74 people with normal hearing to severe hearing loss in a listening experiment using a multiple-alternative forced choice paradigm. Based on the results, a computational prediction model for the SiP-test was developed, by which the underlying success probability of specific SiP-test trials could be estimated. In turn, this enabled the use of significance-test methods based on the Poisson’s binomial distribution, resulting in improved significance-test validity. In addition, the human SiP-test results were analyzed in terms of test-retest reliability, learning effects, content-, construct- and criterion validity within the remains of the thesis.

Keywords: hearing impairment, speech audiometry, phonemic discrimination, realistic masking noise, critical differences, Swedish

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