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Listening Effort and Speech Intelligibility

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Hearing impaired people often report that it is difficult to understand speech in situations with high background noise levels. Difficulty often means that hearing impaired people are able to understand everything but they need to concentrate to the speaker very much or in other words, they need a lot of listening effort (LE). In this study we evaluated whether listening effort can be measured by a simple scaling procedure. Another question was whether LE and speech intelligibility (SI) are different factors that both describe the perception of speech in noise or if they influence each other so that the measure of one would be sufficient.

10 normal hearing subjects (group 1), 10 subjects with a mild hearing loss (group 2) and 10 subjects with moderate hearing loss (group 3) participated in this study. SI measure was performed using the adaptive Oldenburg sentence test to get the SRT and the slope of the psychometric curve [1]. An effort scaling using a 60 point scale from “extreme easy” to “extreme difficult” was used to evaluate the subjectively perceived LE at 11 different Signal to noise ratios (SNRs). So, SI and LE could be compared over a wide range of SNRs. Both measurements were performed with two different background noises: the “olnoise” and a “cafeteria noise”.

Subjects from all three groups showed better speech reception thresholds with the “olnoise” compared to the “cafeteria noise” over a wide range of SNRs. However, the effort was rated to be less with the “cafeteria noise”. This indicates that LE and SI are two different factors that both describe the perception of speech in noisy conditions. This might explain why e.g. Marzinzik and Kollmeier found no effect on SI when using noise suppression algorithms but an effect in LE [2].

Literatur:

1. Brand, T. and B. Kollmeier, Efficient adaptive procedures for threshold and concurrent slope estimates for psychophysics and speech intelligibility tests. J Acoust Soc Am, 2002. 111(6): p. 2801-10.
2. Marzinzik, M. and B. Kollmeier, Development and Evaluation of Single-Microphone Noise Reduction Algorithms for Digital Hearing Aids, in Psychophysics, Physiology and Models of Hearing, T. Dau, V. Hohmann, and B. Kollmeier, Editors. 1999, World Scientific: Singapore. p. 279-282.

