Sonderforschungsbereich/Transregio 31
"Das aktive Gehör"

E I N L A D U N G

zum Vortrag im Rahmen des Seminars des SFB/TRR 31

Freitag, 6. Dezember 2013, 14 Uhr c.t.

im Raum H28 / R 2.31 des Med. Campus Magdeburg
und Raum W2 1-143 der Universität Oldenburg,
(per Videoübertragung)

"How the Brainstem Modifies Sound Processing in the Cochlea - Insight from Psychophysical Studies"

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Evidence suggests that that top-down neural feedback from higher brain centres can modify the processing of sounds within the cochlea of the ear (Liberman et al., 1996). Of particular interest is the efferent neural pathway from the superior olivary complex (at the brainstem level), which via the olivocochlear bundle can modify the response of the basilar membrane (in the cochlea) in response to sounds. Time delays for the onset of this medial olivocochlear reflex (MOCR) are estimated to be about 25 ms (Backus and Guinan, 2006). It is important to understand the role of this efferent response on sound processing, as evidence suggests that in humans with efferent lesions, speech intelligibility (Giraud et al., 1997) and vowel discrimination in noise (Zeng et al., 2000) are both significantly reduced. This may also be the case with some cases of hearing impairment (Attias et al., 1996), where listening to speech in noise becomes particularly difficult.

We currently lack a detailed account of the effects of a hearing impairment on efferent sound processing, yet such a detailed understanding is crucial if we are to build accurate models of human hearing to improve our understanding of the effect of a hearing impairment on speech perception.

Psychoacoustical tasks such as signal detectability in the presence of a noise (often referred to as masking) can be used to obtain a measure of efferent processing in humans. Such methods can also be used to obtain a measure of the degree to which the efferent response modifies cochlear amplification (gain) and compression in response to a sound. A new psychoacoustical method called the Frequency-Duration Masking Curve method (FDMC; Yasin et al., 2013a,b,c) will be described. This method can be used to quantify the effect of efferent processing on human cochlear gain and compression without confounds that may be associated with other masking methods.

The initial findings from using the FDMC method with human listeners may have implications for the clinical assessment of individuals with a hearing impairment and also be of relevance to improving current hearing-aid processing strategies.

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Liberman M.C., Puria S., and Guinan J.J. Jr. (1996). “The ipsilaterally evoked olivocochlear reflex causes rapid adaptation of the 2f1-f2 distortion product otoacoustic emission,” J. Acoust. Soc. Am. 99, 3572-3584.
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Zeng, F-G., Martino, K. M., Linthicum, F. H., Soli, S. D. (2000) “Auditory perception in vestibular neurectomy subjects”, Hear Res. 142, 102-112.