

# Moment-to-moment variability of the auditory phantom perception in chronic tinnitus

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With a prevalence of about 70%, the majority of patients that undergo cochlear implantation also report a perception of tinnitus prior to operation. Following implantation, some patients report an improvement of tinnitus while the tinnitus worsens in other cases. Subjective tinnitus, in general, is defined as an auditory perception in the absence of any physically identifiable source for it. The patients typically report a constant ringing, buzzing or hissing in the ear, which can lead to serious psychological distress including depression, insomnia and anxiety.

Several evidence exists, that the perception of tinnitus is not constant during the everyday life and rather fluctuations from one moment to the other and that the amount of fluctuation relates to the generally perceived tinnitus-related distress. For example, electrical stimulation of the cochlea can change this perceptual variability leading to longer and more episodes where the tinnitus is 'off'. In order to measure this moment-to-moment variability of tinnitus perception, we developed an experience sampling application running on smartphones that is able to track the individual tinnitus perception and distress during the day under real world conditions. The longitudinal data collected by the app might also be helpful for the adjustment of the CI settings.

Additionally, we assessed the moment-to-moment variability of brain activity in the auditory cortex using magnetoencephalography. Chronic tinnitus is usually associated with a decrease of the alpha frequency oscillatory power in temporal areas. Here we show, that also the moment-to-moment variability of the alpha activity is largely reduced in chronic tinnitus. Most importantly, it can be shown that this neuronal variability is associated with the tinnitus duration. Subjects with a longer history of tinnitus show less alpha variability in auditory regions. Whether these changes in neuronal variability relate to the perceptual variability remains to be seen.

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