Dr. Pim van Dijk

“Abnormal Central Sound Processing in Tinnitus”

Abstract:
Tinnitus is a multifactorial symptom that may involve mechanisms in the peripheral hearing organ, the auditory brain and non-auditory portions of the brain. Functional magnetic resonance imaging is a method to study the brain mechanisms involved in tinnitus. In particular, it offers the opportunity to test in humans, hypotheses that were developed from experiment in animals. Animal experiments show clear evidence of reorganization of the cortical map with hearing loss, which is possibly associated with tinnitus. In contrast, fMRI experiments show that tinnitus may occur without evidence of cortical remapping. In a study of gaze-modulated tinnitus, the gaze was associated with a decrease in thalamic activity and an increase in cortical activity. In two other studies, subjects with and without tinnitus were compared with respect to the brain’s response to sound. In the first study, subjects had normal to near-normal audiogram. In the second study, the subjects had a moderate sensorineural hearing loss. Functional MRI suggested a reduced functional connectivity between the brainstem and the cortex in tinnitus patients, which signifies abnormal auditory processing. Together, these results are consistent with an abnormal role of the thalamus in tinnitus. Future studies must further define this abnormality and may point towards targeted treatments for tinnitus.