One decade of the "Heidelberg Model of Neuro-Music Therapy" in tinnitus

Dr. Heike Argstatter¹, Miriam Grapp², Prof. Dr. Hans-Volker Bolay³

¹ Deutsches Zentrum für Musiktherapieforschung (German Center for Music Therapy Research), DZM e.V. Heidelberg
² Tinnitus outpatient department at the DZM e.V., Heidelberg
³ Psychotherapy and music therapy practice, Hertlingshausen, Germany

**Results**

- Music therapy aims at correcting the underlying neurophysiological brain mechanisms rather than at only managing the psychological symptoms.
- In the last decade about N = 1000 patients have been treated by Neuro-Music Therapy both in clinical trials and regular health care provision.
- Music therapy is effective in changing the tinnitus pitch (predominantly downward slope).
- Music therapy is an effective option in preventing acute tinnitus from becoming a chronic condition.

**Sources of funding:** Klaus Teltow Stiftung Heidelberg; SRH Stiftung Heidelberg; Landesstiftung Baden-Württemberg; private sponsors

**Research cooperations:** ENT (H. Heidelberg), U. Heidelberg, HU für Diagnostische und Interventionelle Neuroradiologie der Universität Hamburg (Hosted by); Tinnitus outpatient department of the German Center for Music Therapy Research; SRH University of Applied Sciences Heidelberg

**Timeline: one decade**

- **2004-2005**: Development of the Neuro-Music Therapy for chronic tonal tinnitus (n = 10 music therapy vs. n = 10 counselling)
  - 80% of patients with reliable improvement of symptoms (responder), d² = 1.73

- **2005/2006**: Effectiveness (different treatment options)
  - (n = 53; "weekly therapy" vs. n = 66; "compact therapy")
  - Both treatment options are effective (85% responder), d² = 1.39

- **2006/2007**: Brain imaging (functional and structural MRI) in tinnitus (n = 40)
  - "Reorganization" of tinnitus related neuronal network

- **2008**: Adaptation on noise tolerant tinnitus (n = 34) including brain imaging (MRI and fMRI)
  - Substantiation of results from "tonal" tinnitus (90% responder and reorganization of brain network), d² = 1.23

**Auditory Stimulation**

- According to the "sensitization model" (Zener 2006), tinnitus originates from a specific non-associative learning process and can be altered by counteracting learning procedures.
- A deliberate regulation of emotional responses towards the tinnitus sounds might enhance gate control mechanisms and restore maladjusted "filter functions" of thalamic and limbic areas.
- Auditory stimulation therapies are common in tinnitus (e.g. TRT, Neumonics, TMNMT).
- Musically based interventions have proven to be effective in chronic tinnitus - possibly by correcting tinnitus evoking neuronal mechanisms.

**Neuroscientific background**

- Erroneous "noise cancellation system" (Rauschecker et al., 2010) → strong connections between auditory cortex, limbic system and hypothalamic structures.
- Neuroanatomic localization of tinnitus and brain areas involved in music perception and music making overlap.

**Background**

- Sources of funding: Klaus Teltow Stiftung Heidelberg; SRH Stiftung Heidelberg; Landesstiftung Baden-Württemberg; private sponsors

**Psychological Background**

- "According to the "sensitization model" (Zener 2006), tinnitus originates from a specific non-associative learning process and can be altered by counteracting learning procedures."

**Neuro-Music Therapy**

- Counselling
  - Duration: 5 days with 9 sessions (50 min) of individual therapy
  - Standardized treatment outline with specific modules
  - Aim: exert active influence on the sounds → exposition to the tinnitus sound instead of passive sounding.

- Tinnitus-Estimation
  - Reseptive Music Therapy
  - 1 = primary auditory cortex, 2 = cingulate cortex, 3 = prefrontal cortex, 4 = caudate nucleus, 5 = hippocampal formation

- Tinnitus-Reconditioning
  - Active Music Therapy

- Resonance Training
  - Neuroauditive Cortex-Training

**Image**

- Current development
- Objective diagnostics
- "Tinnitus-App"