Deutsches Zentrum für Musiktherapieforschung
(Viktor Dulger Institut) DZM e.V.

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

Dr. Heike Argstatter[1,2], Miriam Grapp[2], Prof. Dr. Hans-Volker Bolay[3]

[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

Background

Neuroscientific background

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

Psychological Background

- According to the "sensitization model" (Zenner 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 misdirected "filter functions" of thalamic and limbic areas

Auditory Stimulation

- Auditory stimulation therapies are common in tinnitus (e.g. TRT, Neurmonics, TMNMT)
- Musically based interventions have proven to be effective in chronic tinnitus - possibly by correcting tinnitus evoking neuronal mechanisms

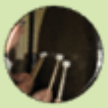
Neuro-Music Therapy

Counselling

Tinnitus-Estimation

Tinnitus-Reconditioning

Receptive Music Therapy



Resonance Training

Neuroauditive Cortex-Training

Active Music Therapy

- 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"

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), d' = 1.73

2005/2006
Effectiveness (different treatment options) (n = 53 „weekly therapy" vs. n = 66 „compact therapy")
→ both treatment options are effective (85% responder), d' = 1.39

2006/2007
Brain imaging (functional and structural MRI) in tonal tinnitus (n = 40)
→ "reorganization" of tinnitus related neuronal network

2008
Adaptation on noisiform tinnitus (n = 34) including brain imaging (MRI and fMRI)
→ Substantiation of results from „tonal" tinnitus (90% responder and reorganization of brain network), d' = 1.23

2009
Which parts of the therapy are helpful? (n = 9)
→ no module is helpful in isolation, only the combination leads to the overall effect (trial had to be terminated early due to the low success rate)

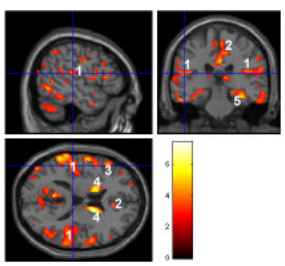
2006-2010
Controlled clinical trial (n = 146 music therapy, n = 144 counselling)
→ both interventions are helpful, but music therapy outperformed counselling (66% vs. 33% responder), d' = 1.39

2011
Follow-up survey on long-term outcome (n = 189)
→ about 75% of the patients report long term reliable reduction (responder), d' = .89

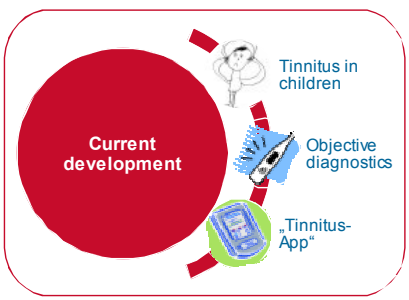
2012-2014
Expansion to recent onset tinnitus including brain imaging (MRI and fMRI) (n = 21 treatment, n = 20 waiting list control)
→ effective prevention of tinnitus becoming a chronic condition (55% responder), d' = 1.61

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.



1 = primary auditory cortex, 2 = cingulate cortex, 3 = prefrontale cortex, 4 = caudate nucleus, 5 = hippocampus formation



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