Aimee Helliwell
Audiologist, Royal Liverpool University Hospital

A Music Technology Approach To Tinnitus Management
Music Technology and tinnitus

BSc Music Technology

First Year Exams

Pulsatile tinnitus??

Principles of acoustics, Environmental acoustics, Psychoacoustics and Anatomy of the ear
Aims and Objectives:

- To gain an understanding of tinnitus and how it is currently treated
- To understand what masking is and its use in tinnitus therapy
- To create an audio masking cd
- To devise a delivery system
The ear and the Hearing process...

Source: http://www.tinnitus.asn.au/tinnitus.htm
Masking…

“The amount, or the process, by which the threshold of audibility for one sound is increased by the presence of another (masking) sound”

*Everest. 2001.*
Masking...

Masking averages

- Frequency in Hz: 1000hz, 3000hz, 300hz
- Masking averages: 0.00, 5.00, 10.00, 15.00, 20.00, 25.00, 30.00

Db scales for 1000hz, 3000hz, and 300hz are depicted.
Tinnitus Retraining Therapy...

- Counselling
- Acoustic therapy

The work of Heller and Bergman in 1953 triggered the work of Pawel Jastreboff.
The Jastreboff model...
The conditioned response…

A negative evaluation of tinnitus!
Sound Therapy…

White Noise?

Music Therapy?

http://www.upenn.edu/almanac/v42/n5/octcal.html
Music as a healer?

- In the bible
- Greek History
- Confucius
- Hospitals in the 1800s
- World War II

2003. Music therapy: Loud noise or soothing notes? *International Pediatrics* 18, 4
Sound enrichment...

- Acoustic weaponry
  - High intensity sound can saturate inner ear inducing disorientation
  - High power low frequency oscillator (VLF) causing physical discomfort and bone vibration

http://globalsecurity.org/military/systems/munitions/accousti.htm
Sound enrichment..

- Any sound should be easier to ignore than the tinnitus

More pleasant?
Sound enrichment..

- Music processed through RAS and temporal lobe

- All Jassim study; Do patients prefer music?

Image Source: http://www.rnceus.com/uncon/ununcon.html
Sound enrichment CD..

- Recorded on location
- Synthesised
- Sampled

All sounds produced, mixed and mastered in Cubase SX.
TRT User Guide DVD...

- DVD aims to supplement the TRT counselling sessions

- Supported by Attention Diversion studies in Tinnitus therapy by Teichmann et al (2004)

Made using Adobe Encore, Adobe Photoshop, Macromedia Flash and Cool Edit pro.
Conclusion…

- Sound has a significant use in any tinnitus management system.
- Long term studies have proven that TRT is an effective tinnitus treatment.
- Principles of the hearing system must be understood.
- My knowledge of the ear stopped at the cochlea!
Current Research...

● German researchers create Notched music

- [http://www.pnas.org/content/107/3/1207.abstract?sid=7f9aa380-60a4-412d-a4f1-ecf24ecded48](http://www.pnas.org/content/107/3/1207.abstract?sid=7f9aa380-60a4-412d-a4f1-ecf24ecded48)
- [http://www.nytimes.com/2010/01/05/science/05obhear.html](http://www.nytimes.com/2010/01/05/science/05obhear.html)
References

- Kumar, A. Chiu, P. 2003. ‘Music therapy: Loud noise or soothing notes?’ International paediatrics. 18 (4).

Any Questions?