

UCL

Current Themes in Hyperacusis

Josephine Marriage PhD
j.marriage@ucl.ac.uk
 research / clinical interest

UCL

Hyperacusis:

- Unusual sensitivity to noise, not perceived as aversive by others
- Normal acoustic signal perceived as extremely loud or uncomfortable
- Intolerance for ordinary sound levels (in absence of peripheral auditory pathology)

UCL

Use of terms for loudness sensitivity

- Abnormal auditory aversions to daily sounds "allodynia"
- Hyperacute hearing thresholds (hyperacusis)
- Lower uncomfortable sound levels "odynacusis" (ULLs typical 86-98dB HL)
- Fear potentiated aversion (phonophobia)

Suggest: Need for common terms across disciplines (paediatrics, psychology, audiology, psychiatry etc)

UCL

Descriptions given by patients

- Pain in ears
- Difficult to listen/
- Annoyance/ irritation with specific sounds
- Fight or flight reaction
- Gradual or sudden onset
- Almost always bilateral

Possibly associated with head/neck injury/ trauma/ reaction to medication

UCL

Does hyperacusis exist? As a condition? As a symptom?

Question: Is it an auditory symptom or anxiety, heightened responsivity?

Current Answer: Not hyperacute thresholds (refs)

Question: are there measurable lower discomfort levels?

Current Answer: not consistently so

UCL

Peripheral auditory conditions with decreased loudness tolerance

Conductive:

- Loss of Acoustic Reflex, Bells palsy (VII CN), stapedectomy (stapedius muscle)
- Decreased hearing with OME, over-stim from high noise levels

Cochlear: Recruitment

- Abnormal loudness growth with hearing loss

Neural:

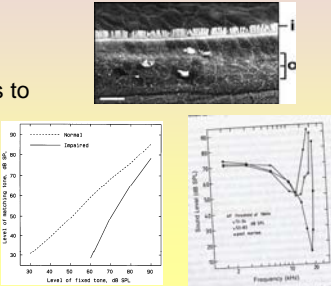
- Lyme disease, MS, efferent auditory system

UCL

Potential causes of loudness intolerance

Cochlea

- Recruitment relates to frequency of HL
- Acoustic shock (Don McFerran)



The top image shows a cross-section of a cochlea. The bottom left graph plots 'Levels of recruitment tone, dB SPL' (30-90) against 'Levels of loudness tone, dB SPL' (30-90), showing a normal linear relationship (dotted line) and a steeper, non-linear relationship (solid line) for 'impaired' hearing. The bottom right graph plots 'Sound Level (dB SPL)' (20-120) against 'Frequency (kHz)' (0.1-10), showing a normal curve (dotted line) and a curve with a sharp peak at high frequencies (solid line) for 'impaired' hearing.

UCL

Decreased sound tolerance in Normal Hearing: no peripheral auditory pathology

- Over sensitivity to specific sounds in environment
- Worsened by anxiety and fear (limbic system)
- Overlap with ME, depression, PTSD
- This is typical presentation for "hyperacusis patient" "Central hyperexcitability"

No generally accepted method of assessment

UCL

Objective methods of assessment for subjective symptom?

Audiological parameters

- ART
- OAE
- ABR
- CERA
- ULL
- Loudness scaling
- ABLB not unilat
- Tensor tympani syndrome with tympanometry
- Efferent suppression (Collet effect)
- Thornton ABR results for LDLs
- Neville auditory system less refractory
- Goldstein and Shulman (1996) but not consistent eg Jastrebov 2004, Anari et al (1999), Nelting and Reinhoff, (2003)
- Interaction with reference LSGC Goebel (2003) Khalfa, 1991 > 50 dB, single frequency, not consistent.

UCL

Subjective Assessments

- Occurs for all frequencies or frequency-specific?
- Is there Reflex reaction eg physiological startle
- Phonophobia- increased by anxiety- measures of subjective distress. In WS from birth, not learned.
- Associated with tinnitus in 40% (Anderson 2002),
- Jastrebov (1999) "Pre-tinnitus state increased central gain in auditory pathways".
- Hyperacusis associated with Tinnitus 30% (anderson, 2002) 86% (Anari 1999)

Common mechanisms for causation?

UCL

Hyperacusis prevalence (Criteria and Assessment method)

- General population 15.2% (Fabijanska 1999)
- 8.6% (Anderson, 2002)
- Subjective symptom needs subjective report: self-rating questionnaires discussed by Hashir

Include: Questionnaire on hypersensitivity to sound: Nelting and Finlayson (2004)

Structured Tinnitus Interview: Goebel and Hiller (2001) includes hyperacusis section

Khalifa questionnaire: Khalfa et al (2002)

UCL

Current Treatment Options

Avoid use of ear protection like ear plugs, muffs

Tinnitus Hyperacusis re-training (TRT)

Directive counselling, noise generators,

No randomised trials for hyperacusis

Cognitive behaviour therapy (CBT) to counter anxiety and stress, relaxation therapy

3 component model of Biological, Psychological and Social factors

Research areas for Hyperacusis

- Plasticity in auditory system (eg Formby, 2003)
Kevin Munro presentation
- Use of acoustic enhancement (Arnaud Norena) and today
- Role of pharmacology and neurotransmitters
- Generation of Tinnitus and fMRI Alf Linney
- Autistic spectrum disorders

Purpose of Course

- Review basic/applied research in both areas
- Sub-groups of the symptom profile
- Methods of treatment derived from evidence from basic research
- Evaluate outcomes from interventions
- Development of service models by clinicians
- Feedback to research colleagues

References

All given in pre-course reading references:

Hyperacusis:

www.audiology.org/Documents/AN2009Handouts/FS607_baguley.pdf

Tinnitus:

<http://jrsm.rsmjournals.com/cgi/content/full/96/12/582>