Interventions to prevent occupational noise induced hearing loss

NVvA 22 april 2009
Interventions to prevent occupational noise induced hearing loss: 
A Cochrane Systematic Review 
- final draft -

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Jos Verbeek, Finnish Institute of Occupational Health, 
Cochrane Occupational Health Field

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Outline

1. Cochrane Systematic Review

2. Noise Review
   - Protocol
   - Search & Selection
   - Quality assessment & Data Extraction
   - (Meta) analysis

3. Authors’ conclusions
   - Implications for practise
   - Implications for research
Cochrane Systematic Review

- Systematic Review on the effectiveness of medical treatment
- Structured process according to a written protocol
- Always in co-operation with co-reviewers and relevant Collaborative Review Group
- According to handbook Cochrane Collaboration

- To enable people to make well-informed decisions about healthcare
Noise Review

Cochrane Systematic Review
Cochrane Occupational Health Field

Objectives
To assess the effectiveness of non-pharmaceutical interventions for preventing occupational noise exposure or occupational hearing loss.
Review Team Noise Review

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- Dr. Jos Verbeek, Finish Institute of Occupational Health, Cochrane Occupational Health Field
- Dr. Thai Morata, Niosh
- Prof. dr. W.A Dreschler, Dep Audiology, Academic Medical Centre
- Dr. Bas Sorgdrager, Academic Medical Centre, Arbo Unie
Cochrane noise Review
Protocol (1)

Interventions to prevent occupational noise induced hearing loss (Protocol)
Kawana Z, Verbeek J, Mount T, Cochrane D, Droese W, Sorgelosser B

- Background and Relevance of review
- Criteria for considering studies
- Search methods
- Methods of the Review
  . Study selection
  . Quality assessment
  . Data extraction
  . Data analysis
Cochrane Noise Review
Protocol (2)

Criteria for considering studies

- Participants: Workers exposed to noise
- Intervention: Industrial hierarchy of controls & Hearing Loss Prevention Programs
- Comparison: Alternative interventions and no interventions
- Outcome: Noise Exposure / Hearing Loss

- Study design: Randomized, Controlled before-after, ITS
Cochrane Noise Review
Protocol (3)

Search Strategy

- #1 noise AND (reduction OR abatement OR diminishment OR elimination OR "engineering controls" OR "administrative controls")
- #2 "hearing loss prevention" OR "hearing conservation" (425) OR "hearing surveillance"
- #3 "ear protective device" OR "ear protective devices" OR "hearing protective device" OR "hearing protective devices" OR "hearing protector" OR "hearing protectors" OR "hearing protection" OR "ear muffs" OR "ear plugs" OR "ear defenders"
- #4 (noise, occupational[mesh] AND "protective equipment") OR ("noise reduction" AND "protective equipment")
- #5 #1 OR #2 OR #3 OR 4
- #7 #5 AND #6
- #8 NOT animal[mh]
- #9 #7 AND #8
Cochrane Noise Review
Search & Selection (1)

Results

- Search Pubmed, Embase, CINAHL, Cisdoc, Niostic, Central, Biosis Previews, Web of science: 1626 titles & abstracts
- Scanning abstracts: 104 full articles
- Reading full articles: 21 included studies
## Cochrane Noise Review

### Search & selection (2)

### Included studies

<table>
<thead>
<tr>
<th>Publication</th>
<th>Intervention</th>
<th>Comparison</th>
<th>Outcome</th>
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<tbody>
<tr>
<td>Adera 1993</td>
<td>HLPP</td>
<td>Study population versus reference population</td>
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<td>Good program versus Bad program</td>
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<td>ANR-muff versus Regular Muff</td>
<td>Hearing Level - TTS</td>
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<td>Joy 2007</td>
<td>Legislation</td>
<td>Before after change in legislation</td>
<td>Noise Levels</td>
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<td>HLPP</td>
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<td>HLPP</td>
<td>Yes or not follow-up audiometric examinations</td>
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<td>Muhr 2006</td>
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<td>Hearing Protectors</td>
<td>4 versus 4 types of devices</td>
<td>Attenuation - REAT</td>
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<td>Park 1991b</td>
<td>Hearing Protectors</td>
<td>2 types of training</td>
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<td>HLPP</td>
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<td>Hearing Level - TTS</td>
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<td>Good program versus -Bad program</td>
<td>Hearing Loss</td>
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</table>
Cochrane Noise Review
Search & Selection (3)

Included studies: study design

- Randomized design (2)
- Quasi randomized design (1)
- Controlled before-after (18)
- Interrupted Time-series (1)
Cochrane Noise Review
Search & Selection (4)

Included studies: participants

workers within:
- automobile industry (1)
- shipyards (2)
- chemical industries (2)
- military (5)
- steel industry (1)
- lumber mill industry (1)
- coal mining (1)
- unknown (3)
- various industries (5)
Cochrane Noise Review
Search & Selection (5)

Included studies: type of interventions

- HLPP (14)
- HPD’s (6)
- Legislation (1)
Cochrane Noise Review
Search & Selection (6)

Included studies: type of outcomes

- Hearing loss (12)
- Hearing levels (6)
- Noise levels (3)
Cochrane Noise Review
Search & selection (7)

Great number of excluded studies:
- Cross sectional studies on hearing status;
- Studies on noise exposure survey’s;
- Experimental studies
- Studies with volunteers
- Case studies on noise reduction

Nearly all studies stress the importance of reducing noise exposure!
Cochrane Noise Review
Analysis (1)

Classification for analysis

- Noise reduction studies
- Immediate effect HPD studies
- Long term HLPP evaluation studies
Cochrane Noise Review
Analysis (2)

Noise reduction studies

After change in legislation in mining industry
- Faster decrease in noise exposure
- Significant for underground job titles
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Analysis (3)

Immediate effect HPD studies

- Instruction increases noise reduction plugs
- EAR plug outperforms muffs after instruction
- No significant difference between muffs for peak exposure
- ANR increases noise reduction HPD’s
- All HPD’s performed worse than official attenuation
Cochrane Noise Review
Analysis (4.1)

Long term HLPP evaluation studies

*Exposed in program equals non-exposed?*

- One year follow up
  - OR of sustaining STS significant higher for exposed
  - Well implemented HLPP lower risk, but not significant
Cochrane Noise Review
Forrest Plot Muhr (4.1)

<table>
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<th>Study or Intervention</th>
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<th>Foresta Exposed</th>
<th>Total Weight</th>
<th>Foresta Non-exposed</th>
<th>Foresta Exposed</th>
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<th>Foresta Exposed</th>
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<td></td>
<td>2</td>
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<td></td>
<td></td>
<td></td>
<td>3</td>
<td>97.1</td>
<td></td>
<td></td>
<td>3</td>
<td>97.1</td>
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</tbody>
</table>

Test for overall effect Z = 0.44 (P = 0.65)

For total effect, there is no significant difference between the non-exposed and exposed groups.

Subgroup analysis:
- Subgroup 1: No significant difference
- Subgroup 2: No significant difference

Overall, the results indicate no significant difference in noise exposure between the non-exposed and exposed groups.
Cochrane Noise Review
Analysis (4.2)

Long term HLPP evaluation studies
Exposed in program equals non-exposed?

- Five year follow up
  - Meta-analysis:
    - with 4 studies mean change in HL at 4Khz reveals slight difference with non-exposed
    - with 3 studies mean change in HL at 4Khz reveals no difference with exposure to 85dB(A)
  - Meta-analysis: well implemented lower risk, but low quality
  - OR time tot STS exposed compared to non-exposed significant higher, with dose response relationship.
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Forrest plots GHL and Davies (4.2)
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Authors’ conclusions

Implications for practice

- No controlled evaluation studies on technical measures to reduce noise exposure
- Low quality evidence legislation can reduce occupational noise exposure at branch level
- Effectiveness of hearing protection less than stated by supplier and highly depend on proper instruction
- Contradictory evidence that HLPP are effective in the long term
Cochrane Noise Review
Authors’ conclusion

Implications for research

- Better evaluations of technical measures are needed
- Better use of available audiometric data is needed

- *Discussion on the need for controlled studies in the case of considerable changes in for example, noise exposure*
For now

- Questions & Discussion ?!?!?!

- Thank you for your attention

- We will sent you the full review, if you leave me your business card