Efficacy of a Noise-Induced Hearing Loss Prevention Education Programme in Group Exercise Instructors

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Background: Sound Recommendations

- Music not conventionally thought as noise source
- But noise in NIHL is **not** limited to unwanted sounds
- NIHL is irreversible but preventable
- Recommendations on sound limits by Singapore’s Workplace Safety and Health (Noise) Regulation 2011:

  85 dBA for 8 hours
  3-dB exchange rate
Background: Group Exercise

- Music is prevalent – sets the rhythm, enhances enjoyment, motivates participants, decreases sense of exertion, improves performance and endurance

<table>
<thead>
<tr>
<th>Study</th>
<th>Country</th>
<th>Average Sound levels (dBA)</th>
</tr>
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<tr>
<td>Beach &amp; Nie, 2014 (2009 – 2011)</td>
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Aims

To measure knowledge, attitudes and behaviour of GXIs

To measure sound levels of GX classes conducted in Singapore

Determine the effectiveness of a NIHL prevention education programme on GXIs
Dangerous Decibels

- Established evidence-based intervention program
  - Proven effective for changing knowledge, attitudes and behaviour regarding sound exposure and appropriate use of hearing protective strategies among children and adults
    - (Martin et al. 2013; Reddy et al. 2013)
  - Modified for one-to-one presentation to GXIs
    - Examples unique to GX classes
    - Individual GXI’s class sound levels (baseline measures) used in educational presentation
Study Participants

- 21 participants
  - Intervention group: 10 GXIs
  - No-intervention group: 11 GXIs
- Participants taught pre-choreographed music-based GX classes of the following types
  - cardio workouts
  - weights-based workouts
  - dance workouts
  - stationary bike workouts
Outcome Measures

- Measure changes in **knowledge, attitudes, intended behaviour and self-reported behaviour**
  - Questionnaire-based evaluation tool
  - 18 knowledge questions, 4 attitude questions, 2 intended behavioural questions, 7 behavioural questions

- Measure **objective behavioural** changes
  - Dosimetry measurements to determine average sound levels during the classes ($L_{avg}$) in dBA
  - Microphone of dosimeter placed near/on stage at the front of GX studio
## Outcome Measures

<table>
<thead>
<tr>
<th>Intervention</th>
<th>0</th>
<th>1</th>
<th>3</th>
<th>10</th>
<th>11</th>
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</thead>
<tbody>
<tr>
<td><strong>Intervention</strong></td>
<td>Baseline Dosimetry Measurements</td>
<td>1. Baseline Questionnaire</td>
<td>1. Follow-up Dosimetry Measurements</td>
<td>2. Follow-up Questionnaire</td>
<td></td>
</tr>
</tbody>
</table>

- Timeline for participants were staggered
Baseline Measures

- No significant difference between both groups
- Knowledge – certain deficits
  - All did not know the physiology of NIHL
  - Majority did not know that sound exposure of $\geq 85$ dBA for 8 hours can cause NIHL
  - Deficits in recognizing some sources of sounds that are typically able to damage the ears
- Attitudes
  - Class participants’ preferences most important
Baseline Measures

Median Scores

- Attitudes
- Intended Behaviour
- Behaviour
## Baseline Sound Levels

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<td><strong>Current study</strong></td>
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<td><strong>96.3</strong></td>
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Results

- Intervention group: compare baseline measurements with
  - Post-intervention (immediate improvements from DD)
  - 7-week follow-up (sustained improvements from DD)

- No-intervention group: compare baseline measurements with
  - 7-week follow-up (changes not resulting from DD)
Results: Knowledge

- **Intervention Group**
- **No-intervention Group**

- Baseline
- Post-intervention
- Follow-up

Number of correct responses vs. time:

- Green line (Intervention Group)
- Blue line (No-intervention Group)

Significance levels indicated by asterisks: **p < 0.01**
Results: Attitudes

- **Intervention Group**
- **No-intervention Group**

<table>
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<th>Median Responses</th>
<th>Baseline</th>
<th>Post-intervention</th>
<th>Follow-up</th>
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</thead>
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<tr>
<td></td>
<td>10</td>
<td>9</td>
<td>8</td>
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<tr>
<td></td>
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<td>9</td>
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</tbody>
</table>
Results: Attitude A2

Median Score

- Intervention Group
- No-intervention Group

Baseline | Post-intervention | Follow-up

0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

**
Results: Intended Behaviour

Median Responses

Baseline  | Post-intervention  | Follow-up

Intervention Group

No-intervention Group

* Indicates significant difference
Results: Behaviour

Median Responses

- **Intervention Group**
- **No-intervention Group**

Baseline | Follow-up
Results: Sound Levels

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<th>Post-intervention</th>
<th>Follow-up</th>
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- **Intervention Group**
- **No-intervention Group**
Results: Sound Levels

- **Sound Levels (dBA)**
  - Baseline
  - Post-intervention
  - Follow-up

- **Groups**
  - Responders \( n=4 \)
  - Non-responders \( n=5 \)
  - No-intervention Group \( n=11 \)

The diagram illustrates the change in sound levels across different intervention stages for each group.
Discussion

- Dangerous Decibels effective at improving knowledge
- Some improvements on attitudes and intended behaviour
- Limited effect on behaviour
  - Why? Socially accepted to use high intensity music in GX classes, perceived preferences of class participants, pressure from class participants to increase sound levels, lack of support from management
- But some effect in a subgroup
  - Both responders and non-responders showed similar improvements in attitudes and intended behaviour
  - Further studies to differentiate responders and non-responders
Cummulative Sound Exposure

- Full-time GXIs
  - 95.9 dBA for 19.5 hours per week
  - Equivalent annual exposure that is 805% of recommended exposure
  - > 8 years of exposure in 1 year

- Part-time GXIs
  - 97.0 dBA for 5.1 hours per week
  - Equivalent annual exposure that is 189% of recommended exposure
  - Nearly 2 years of exposure in 1 year

- A need for action to reduce sound levels used in GX classes
What’s next

- Random, controlled study
- Longer interval for follow-up measurements
- Booster programmes
- Intervention on GXIs, class participants, managers of fitness institutions
  - GXIs’ selection of music based on perceived preferences of GX class participants
- Setup of GX studio and studio acoustics
- Evidence-based selection of music
References

time for questions