Assessing Attitudes Toward Use of Hearing Protection Devices and Effects of an Intervention Based on Results of Fit Testing

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Topics Include:

FAES Defined
FAES Field Research
Research Take-Aways
FAES: Field Attenuation Estimation System

- FAES is a quantitative method for individual fit-testing HPDs
- A recognized “best practice” in hearing conservation
  - OSHA/NHCA/NIOSH Alliance issued Best Practice document in 2008
  - Safe in Sound award winners use FAES
  - NIOSH won the Bullard-Sherwood Research-to-Practice (r2p) Award in 5/2013 for development of a FAES technology (HPD Well-Fit)
- Language is being included in hearing protection use standards and guidance documents (Australia, Canada, EU, India, US)
FAES Field Research
Research Objectives

1. For individuals at risk, did training improve their Personal Attenuation Rating (PAR\(_{50}\))?
2. Is self-efficacy (one’s perception of how well one can use hearing protection devices HPDs) a good predictor of PAR\(_{50}\)?
3. Do PAR\(_{50}\) values and attitudes and beliefs regarding HPDs change over time?
Define: What is PAR$_{50}$???

PAR$_{50}$ represents the mean binaural value calculated by the FAES software similar to the Noise Reduction Statistic (NRS$_{50}$) in ANSI S12.68-2007(R2012).
Define: What is Self-Efficacy?

Theoretical Framework

- Health Promotion Theory

  - Nola Pender (2011) – “Perceived competence or self-efficacy to execute a given behavior increases the likelihood of commitment to action and actual performance of the behavior”

Simple Definition: One’s belief in one’s ability to accomplish a skill, task, goal.

  “I can do this!”
Research Process Schematic

Initial Visit

- Pre-Survey
- Baseline PARs $n = 327$
- FAIL
- Post-Survey
- Post-Intervention PARs $n = 91$

Follow-up Visit

- Follow-up PARs $n = 70$
- Post-Survey
Research Tools

1. FAES – F-MIRE System
2. Electronic Survey
Online Survey Questionnaire

- Tool previously validated by research done by Lusk, et. al
- Electronic Tablet

Please indicate your level of agreement with the following statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Moderately disagree</th>
<th>Slightly disagree</th>
<th>Slightly agree</th>
<th>Moderately agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am sure I can use my hearing protection properly.</td>
<td></td>
<td></td>
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<tr>
<td>I am sure I can tell if my hearing protection is working properly.</td>
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<tr>
<td>I do not always use my hearing protection the way it should be used.</td>
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<tr>
<td>I do everything possible to make my hearing protection work effectively.</td>
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<tr>
<td>I know how to use my hearing protection so that it works effectively.</td>
<td></td>
<td></td>
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<tr>
<td>I am not sure that I can use my hearing protection correctly.</td>
<td></td>
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</tbody>
</table>

Questionnaire included...

Online Consent Form
Basic Demographic Information
Hearing Protector Preferences & Usage
Hearing Protector Beliefs
  ◦ Barriers
  ◦ Benefits
  ◦ Self-Efficacy
The Study Results
Study Population

- Silgan Containers – large metal can & lids co.
- 4 locations in the US – 327 naïve employees
Baseline Outcome Distribution

- Pass: No Additional Training (70%)
- Retraining Only (17%)
- New Style/Size (11%)
- Earmuff (1%)
- Cerumen (1%)

Pass = PAR > Target Minimum with the absence of low frequency leakage or R/L PAR discrepancy
Paired T-test Results

Overall Study Population:

- **PAR50**
  - Baseline to Post-Intervention
  - Baseline to Follow-up
  - Post-Intervention to Follow-up

- **Attitudes**
  - High Self Efficacy Scores
  - High Perceived Benefit Scores
  - Low Perceived Barrier Scores

<table>
<thead>
<tr>
<th>Variable</th>
<th>Test</th>
<th>p</th>
<th>95% CI</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PAR50</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline - Post Intervention</td>
<td>&lt;0.001***</td>
<td>-13.4 dB, -10.3 dB</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>Baseline-Follow-Up</td>
<td>&lt;0.001***</td>
<td>-11.2 dB, -6.3 dB</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Post-Intervention-Follow-Up</td>
<td>0.001***</td>
<td>1.3 dB, 4.9 dB</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td><strong>Self-Efficacy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline - Post Intervention</td>
<td>0.006**</td>
<td>0.32, 1.86</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>Baseline-Follow-Up</td>
<td>0.521</td>
<td>-0.72, 1.40</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Post-Intervention-Follow-Up</td>
<td>0.120</td>
<td>-1.85, 0.22</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td><strong>Barriers</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline - Post Intervention</td>
<td>0.557</td>
<td>-1.15, 0.63</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>Baseline-Follow-Up</td>
<td>1.00</td>
<td>-1.14, 1.14</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Post-Intervention-Follow-Up</td>
<td>0.682</td>
<td>-0.77, 1.17</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td><strong>Benefits</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baseline - Post Intervention</td>
<td>0.051*</td>
<td>-1.17, 0.003</td>
<td>91</td>
<td></td>
</tr>
<tr>
<td>Baseline-Follow-Up</td>
<td>0.095*</td>
<td>-1.56, 0.13</td>
<td>70</td>
<td></td>
</tr>
<tr>
<td>Post-Intervention-Follow-Up</td>
<td>0.489</td>
<td>-1.26, 0.59</td>
<td>70</td>
<td></td>
</tr>
</tbody>
</table>

Note:
* p < .1, two-tailed
** p < .05, two-tailed
*** p < .001, two-tailed

Table 2: Comparisons of intervention group scores at baseline, post-intervention, and follow-up.
Baseline vs. Post-Intervention PAR_{50}

- Statistically significant
  - \( p < 0.001 \)
- Average Mean Difference
  - \( 95\% \, CI = -13.4 \, dB, -10.3 \, dB \)
Baseline vs. Follow-up PAR$_{50}$

- Statistically significant
  - ($p < 0.001$)
- Average difference
  - (95% CI = -11.2 dB, -6.3 dB)
Post-Intervention vs. Follow-up PAR_{50}

- Statistically significant
  - ($p = 0.001$)
- Average difference
  - (95% CI = 1.3 dB, 4.9 dB)
Using Regression, we found that Self Efficacy Scores were not a significant predictor of Baseline PAR$_{50}$ ($R^2=0.04\%$).
Clues to Deterioration of PAR

- Limited or NO access to newly assigned hearing protection devices
- Comfort is a High Priority
  - Fit-test time may not be long enough to assess comfort
- Change is Difficult for Some
The Research

1. 28% of workers were not able to achieve adequate attenuation when using the earplug of their choice without added intervention.

2. Fit testing and an educational intervention were effective in improving attenuation as (PAR\textsubscript{50} values) significantly increased post-intervention, and at 6-month follow-up.

3. FAES’s can
   a) help identify workers who are at high risk (low PAR\textsubscript{50})
   b) teach the proper fit and use of HPDs
   c) assist in hearing protector selection
The Research

4. Attitudes regarding the use of HPD (Self-efficacy/Perceived Benefits/Barriers) did NOT predict effective use in this population.

5. Workers identified as high risk for hearing loss may benefit from frequent follow-up and warrants further study.

6. Don’t assume the assigned HPD is what the employees will wear.

7. NEVER underestimate COMFORT.
“Tell me and I forget. Teach me and I may remember. Involve me and I learn.”  

B. Franklin
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Acknowledgments

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- Barbara Monaco, MS, 3M Company
- Sally L. Lusk, PhD, RN, FAAN, FAAOHN, *University of Michigan School of Nursing Professor Emerita*

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*Big thank you to Silgan Containers*
Questions?

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