EVALUATING THE EFFICIENCY OF EXPOSURE ASSESSMENT METHODS: COST, FEASIBILITY, AND OVERCOMING CHALLENGES IN THE FIELD

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**Background**

- When choosing ergonomic assessment methods for the low back, researchers need to consider not only the exposures of interest, but also the efficiency and feasibility of available methods in varied and complex worksites.

**Study Objectives**

- To describe the data collection success rates and costs for 5 low-back risk factor exposure assessment methods.

**Research Setting**

- Large field study assessing risk factors for low back injury in five heavy industries:
  - Construction
  - Forestry
  - Transportation
  - Warehousing
  - Wood products


For each worker, all methods were implemented on the same day and performed for the whole work shift.

**Direct Measurement Methods**

- **EMG**
  - RMS Measurements made over the left and right erector spinae muscles at L4 level with a portable EMG (Mega Electronics ME3000)

- **Vibration Measures**
  - Seat pad accelerometer placed on the seat of any vehicle driven by the worker (Larson Davis)

- **Inclinometer**
  - Measured flexion/extension and lateral bending with a VC Inclinometer (Microstrain Inc) fixed to the trunk

**Post-shift Interview**

- Self–reported tasks, posture, mmh, and vehicle factors for that day’s shift

**Results**

- Success rate of exposure assessment methods in heavy industry

  - Vibration: 99.6%
  - EMG: 97.8%
  - VC: 99.6%
  - Interview: 99.2%
  - Observation: 89.2%

- Costs for exposure assessment methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Cost per attempted measure</th>
<th>Cost per successful measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observation</td>
<td>$215.21</td>
<td>$215.21</td>
</tr>
<tr>
<td>VC Inclinometer</td>
<td>$214.45</td>
<td>$214.45</td>
</tr>
<tr>
<td>EMG</td>
<td>$21.70</td>
<td>$21.70</td>
</tr>
<tr>
<td>Vibration</td>
<td>$21.70</td>
<td>$21.70</td>
</tr>
<tr>
<td>Total</td>
<td>$212.56</td>
<td>$212.56</td>
</tr>
</tbody>
</table>

**Conclusions**

- Industrial environments are demanding on electronic equipment.
- Challenges included:
  - Cold, hot, dusty, wet, explosive environments
  - Rough handling/vibration
  - Scaffold, confined spaces
  - Tight spaces, working postures, safety equipment

- Observation and interview methods were the most cost-effective and more reliable than direct methods due to:
  - Greater adaptability to challenging workplace conditions and no malfunction
  - Substantially lower equipment investment

- Of the direct measurement methods, the inclinometer had the best combination of high success rate and low cost.

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