

# 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

Recruited random sample of workers with workers' compensation claim for back injury in 2001, and their co-workers

## 5 Exposure Assessment Methods

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

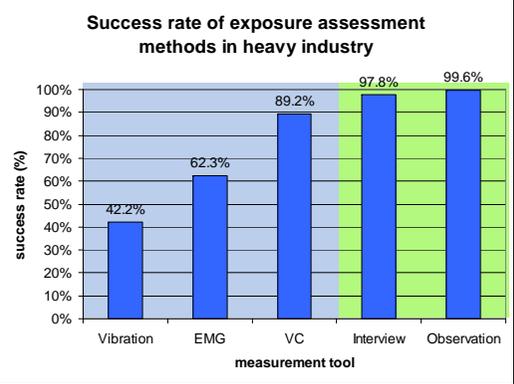


**Observation**  
Followed workers & took notes on tasks, posture, mmh, vehicle factors every minute ~300-500 snapshot-observations per shift



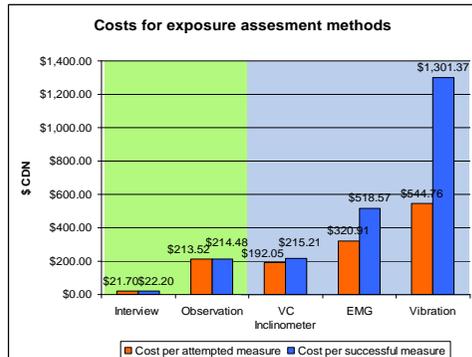
**Post-shift Interview**  
Self-reported tasks, posture, mmh, and vehicle factors for that day's shift

## Results



Success rate is the proportion of attempted measures which yielded useable data. The chart above shows that the success rates for direct measurement lagged behind observation and interview, although the VC inclinometer was very close.

The chart of costs-per measurement shows vibration were the most expensive, although this is in part due to the lower number of workers with vibration exposure.



## Conclusions

Industrial environments are demanding on electronic equipment.  
Challenges included:

- Cold, hot, dusty, wet, explosive environments
- Rough handling/vibration
- Scaffolding, confined spaces snagged/damaged equipment
- Tight spaces, working postures, safety equipment could make equipment uncomfortable

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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