Effect of Participatory Ergonomics Training on Non-ergonomist Ratings of Ergonomic Exposures

A Healthier Workforce Center for Excellence Pilot Study

Nate Fethke (PI)
Fred Gerr (Co-I)
Linda Merlino (Study Coordinator)
Cassidy Branch (RA)
Steven Hanson (RA)
Participatory ergonomics (PE) often suggested as an effective intervention strategy to control musculoskeletal disorders (MSDs)

**Elements of participatory ergonomics programs**

- Joint employee-management team
- Diverse personnel experience and perspectives
- External ergonomist
- Training in ergonomics process
- Support meetings with ergonomist
PE Interventions: Reported Benefits

- **Reductions in work-related musculoskeletal symptoms**
  - e.g.: Vink & Kompier, 1997; Evanoff et al., 1999; Bohr 2000; Bohr 2002

- **Reductions in MSD claims rates and costs**
  - e.g.: Lanoie & Tavenas, 1996; Moore & Garg, 1998; Evanoff et al., 1999; Carrivick et al., 2002; Joseph 2003; Moreau, 2003; Butler, 2003

- **Reduced exposure to physical risk factors**
  - e.g.: Vink & Kompier, 1997; St. Vincent et al., 1998; Laing et al., 2005

- **Other reported benefits:**
  - Reduced work stress, sick leave and absenteeism, improved productivity and product quality

- **Review of PE and health outcomes was equivocal**
Limited description of change theories used to implement PE interventions
- Wijk and Mathiassen, 2011

Infrequent use of process evaluation
- Dale et al., 2012

When reporting effect of PE on exposures:
- Inconsistent or unspecified exposure assessment methods
- Role of external ergonomist unclear
PE Interventions: Exposure Assessment

- Ability of non-ergonomist to independently perform exposure assessments is unclear
  - Saleem et al., 2003; a lab study with university students
- Diversity of PE committee members
  - Intimately familiar with industrial processes
  - Inherent baseline understanding of ergonomics
Study Objective

- Provide quantitative information about a nascent PE committee’s collective understanding of ergonomics exposures
  - Compare pre- and post- training
Specific Aims

Specific Aim 1
Establish and train a participatory ergonomics committee at nearby manufacturing facility

Specific Aim 2
Examine effect of training on measures of agreement between expert and non-expert ratings of ergonomic exposures
Methods: Aim 1

Ergonomics process training content
  Musculoskeletal disorders; anatomy and risk factors
  Exposure assessment
  Video analyses of actual tasks
  Design and implementation of controls

Support meetings
  Facilitate discussion
  Assist with prioritization and control design
Facility Description

- Global manufacturer with >20,000 employees
- Facility produces vinyl-framed windows
- Approximately 350 employees on-site
- Multiple assembly lines, organized by area and then tasks

Ergonomics Committee Members (n=9)

- Production manager
- HR manager
- Quality/reliability representatives (3) (responsible for safety)
- Maintenance representative
- Employee representatives (3)
Methods: Aim 2

- Pre- and post-training ergonomic hazard level agreement
- Video of 30 randomly selected tasks in facility
- Visual analogue scales (VAS; 0-10 cm) of hazard level
  - Each committee member assigned ratings individually
  - Research team used a consensus approach
- Low back, neck/shoulder, elbow, and hand/wrist
- Correlations
  - Ergonomic Committee vs. Research Team (Pearson, Concordance)
  - Among the Ergonomic Committee members (ICC; 2-way random)
Results: Examples

Elbow
Pre-training: $r = 0.44; \text{ CCC} = 0.29$
Results: Examples

Elbow
Pre-training: \( r = 0.44; \) CCC = 0.29
Post-training: \( r = 0.48; \) CCC = 0.64
Results: Examples

Low Back
Pre-training: $r = 0.89;\text{ CCC } = 0.50$
Results: Examples

**Low Back**

Pre-training: \( r = 0.89; \) CCC = 0.50

Post-training: \( r = 0.71; \) CCC = 0.64
Results: Concordance Correlation

Concordance correlation of Ergonomics Committee score and UI Research Team score

<table>
<thead>
<tr>
<th>Body Region</th>
<th>Pre-training</th>
<th>Post-training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Back</td>
<td>0.49</td>
<td>0.63</td>
</tr>
<tr>
<td>Neck/Shoulder</td>
<td>0.08</td>
<td>0.36</td>
</tr>
<tr>
<td>Elbow</td>
<td>0.29</td>
<td>0.64</td>
</tr>
<tr>
<td>Hand/Wrist</td>
<td>0.47</td>
<td>0.58</td>
</tr>
</tbody>
</table>
Results: Intraclass Correlation

ICC of scores among the Ergonomics Committee members

- Low Back: Pre-training 0.17, Post-training 0.36
- Neck/Shoulder: Pre-training 0.19, Post-training 0.28
- Elbow: Pre-training -0.03, Post-training 0.32
- Hand/Wrist: Pre-training 0.11, Post-training 0.50
Summary

Training improved the Ergonomics Committee’s ability
  Higher concordance correlation for all body regions

Training helped “normalize” Ergonomics Committee members
  Higher inter-rater agreement for all body regions

Work continues with the Ergonomics Committee
  More complex exposure assessment techniques (e.g., REBA)
  Ongoing 5-year randomized trial within the HWCE

Limitations
  Focus on exposure assessment to evaluate training effectiveness
  Effectiveness of training or effectiveness of trainer?
References