CURRENT APPROACH TO PREVENTION OF MUSCULAR SKELETAL DISORDERS (ERGONOMICS)

PRESENTED BY N.W. PIETERSE
DEPARTMENT OF LABOUR ERGONOMICS WORKSHOP
19 FEBRUARY 2016
INTRODUCTION
INTRODUCTION
DILEMMA

The causes musculoskeletal disorders in the workplace (Do we understand these complex interactions)

DEVIAION FROM THE NORM

- Workplace Design
- Anthropometrical and Biometrical Demands
- Environmental Factors e.g. Illumination, Noise and Vibration
- Human and Organizational Behavioral Issues, Task Demands, Mental Demands

AWKWARD BODY POSTURES
THE CURRENT SITUATION REGARDING ERGONOMICS IN SOUTH AFRICA

• No account of ill health effects and injuries in industry related to ergonomics (Case Studies, management and assessments).

• Lack of regulation in terms of ergonomics in the workplace (Regulations on its way).

• No national standards in dealing with ergonomics in the workplace (Human Factors).

• Fragmentation in dealing with ergonomics and musculoskeletal disorders in the workplace.

• Although important the focus is more on “soft issues” like ergonomics in offices environments and computer workstations.

• Do not consider Environmental Factors, in the prevention of Musculoskeletal Disorders (Vibration, Illumination and Noise).
THE CURRENT SITUATION REGARDING ERGONOMICS IN SOUTH AFRICA (CONT)

• Lack of skilled ergonomists to deal with ergonomics in the workplace.

• No holistic, multi professional approach followed in dealing with ergonomics and musculoskeletal disorders in the workplace.

• All ergonomic issues are addressed with a tick sheet approach (Voodoo Ergonomists).

• Lack of standardised assessment tools, to assess musculoskeletal risks in the work place based on critical task observation principles.

• Occupational Hygiene Training Curricula at Tertiary Institution needs to focus more on Ergonomics.

• No proactive approach in dealing with musculoskeletal disorder in the workplace (Ad-Hoc).
DISCIPLINES (FIELDS) OF ERGONOMICS

• **Physical Ergonomics** is concerned with human anatomy, and some of the cases anthropometric, physiological and biomechanical characteristics as they relate to physical activity.

• **Environmental Ergonomics** is concerned with human interaction with the environment. The physical environment is characterized by: climate, noise, temperature, pressure, vibration, light and chemicals in the workplace air.

• **Cognitive Ergonomics** is concerned with mental processes, such as perception, memory, reasoning, and motor response, as they affect interactions among humans and other elements of a system.

• **Organisation Ergonomics** is concerned with the optimization of socio-technical systems, including their organizational structures, policies, and processes. (Relevant topics include communication, crew resource management, work design, design of working times, teamwork, participatory design, community ergonomics, cooperative work, new work programs, virtual organizations, telework, and quality management.)
PROFESSIONAL DISCIPLINES INVOLVED IN ERGONOMICS

**Occupational Hygienist** – Assessment (Prioritisation) of ill health effects and discomfort related to physical and environmental ergonomics.

**Ergonomist** - Designing work environments for maximizing safety and efficiency. Biometry and Anthropometrics are key words in describing the role of ergonomists.

**Occupational Health Practitioners** – Early detection, Diagnosing and treatment/rehabilitation of Muscoskeletal Disorders.

**Industrial Engineers** – Is a branch of engineering dealing with the optimization of complex processes or systems inclusive of humans as part of the system.

**Mechanical Engineers** – Is a branch of engineering responsible for the design of mechanical systems inclusive of ergonomical design.
THE IMPORTANCE OF THE OCCUPATIONAL HYGIENIST IN ERGONOMICS

• In most cases the first contact in dealing with ill health effects related to ergonomics in the workplace in preventing Musculoskeletal Disorders.

• Conduct assessments in identifying body postural and Musculoskeletal risks in the workplace by using scientific valid assessment tools e.g. REBA.

• Knowledgeable regarding measurement, assessment and control of environmental aspects of ergonomics (Noise, illumination, vibration etc.)

• More readily available than Professional Registered Ergonomists in dealing with ergonomical issues in the workplace.
• The Occupational Hygienist in most cases in a better position to interact with other role-players (engineering branches) in solving health effects related to ergonomics.

• Case Assessments and Case Studies.

• Expertise in assessing and evaluating the impact of Vibration and other environmental Risks related to musculoskeletal disorders.
**THE ERGONOMIC PROCESS**

- Identification of hazardous tasks for investigation
- Prioritise Hazardous Activities to be investigated
- Decide on the appropriate methodology and assessment tools
- Conduct assessment (Tools)
- Evaluate results and case assessments
- Conduct Specialised Ergonomic Assessments and decide and implement appropriate controls
- Regular review of process
- Decide on the appropriate methodology and assessment tools

**Ergonomist**

**Occupational Hygienist**
ASSESSMENT TOOLS FOR ASSESSING BODY POSTURAL ISSUES THAT CAN RESULT IN MUSCULOSKELETAL DISORDER
AVAILABLE TOOLS FOR ASSESSING BODY POSTURAL AND MUSCULOSKELETAL RISK RISKS IN THE WORKPLACE

• REBA – Rapid Upper Limb Assessment.
• REBA – Rapid Entire Body Assessment (Integrates lifting of heavy materials in risk matrix).
• WINOWAS – Free software solution for the assessment of body posture (integrate video footage).
• NIOSH lifting equations.
RAPID ENTIRE BODY ASSESSMENT TOOL WORKSHEET

### REBA Employee Assessment Worksheet

#### A. Neck, Trunk and Leg Analysis

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Locate Neck Position</td>
<td>1</td>
</tr>
<tr>
<td>2a</td>
<td>Adjust: if trunk is twisted</td>
<td>1</td>
</tr>
<tr>
<td>2b</td>
<td>Adjust: if trunk is side bending</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Adjust: if trunk is twisted</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Look-up Posture Score in Table A</td>
<td>9</td>
</tr>
<tr>
<td>5</td>
<td>Add Force/Load Score</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Score A, Find Row in Table C</td>
<td>10</td>
</tr>
</tbody>
</table>

#### SCORING:

- 1 = Negligible risk
- 2 or 3 = Low risk: change may be needed
- 4 to 7 = Medium risk: further investigation, change soon
- 8 to 10 = High risk: investigate & implement change
- 11+ = Very high risk: implement change

#### B. Arms and Wrist Analysis

<table>
<thead>
<tr>
<th>Step</th>
<th>Description</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Locate Upper Arm Position</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Locate Lower Arm Position</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>Locate Wrist Position</td>
<td>1</td>
</tr>
</tbody>
</table>

### Table A: Neck Posture Score

<table>
<thead>
<tr>
<th>Neck Score</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

### Table B: Lower Arm Score

<table>
<thead>
<tr>
<th>Lower Arm Score</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

### Table C: Score A (score form Table A + load/force score) + Score B (Table B value + coupling score)

<table>
<thead>
<tr>
<th>Score A</th>
<th>Score B + Coupling Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>4</td>
</tr>
</tbody>
</table>

### Table C: Score C Score + Activity Score

<table>
<thead>
<tr>
<th>Final REBA Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
</tr>
</tbody>
</table>

Permission granted by Dr. Lynn McAnatomy to convert the paper-based format to an Excel spreadsheet version.
RAPID ENTIRE BODY ASSESSMENT TOOL (SOFTWARE)
RAPID ENTIRE BODY ASSESSMENT TOOL (EXCEL VERSION)

**Instructions**

Only fill in the **BLACK** boxes in the REBA Assessment worksheet.

Fill in the details below:

- **Subject:**
- **Task:**
- **Assessor:**
- **Date:**

**Activity:**
- 1: 1 or more body parts static (held > 1min)
- 2: repeated > 4 per min in small range (not walking)
- 3: rapid large changes in posture or unstable base

**Coupling**

0: Good: Well-fitting handle & a mid range power grip
1: Fair: Hand hold acceptable but not ideal, or coupling is acceptable via another part of the body.
2: Poor: Hand hold not acceptable although possible
3: Unacceptable: Awkward, unsafe grip, no handles; coupling unacceptable using other parts of the body

**Load / Force**

- 0: < 5kg
- 1: 5 - 10kg
- 2: > 10kg

Add +1 for shock or rapid build up.
RAPID ENTIRE BODY ASSESSMENT TOOL (EXCEL VERSION)
RAPID ENTIRE BODY ASSESSMENT TOOL (EXCEL VERSION)

<table>
<thead>
<tr>
<th>REBA Score</th>
<th>Risk Level</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Negligible</td>
<td>None necessary</td>
</tr>
<tr>
<td>2 - 3</td>
<td>Low</td>
<td>May be necessary</td>
</tr>
<tr>
<td>4 - 7</td>
<td>Medium</td>
<td>Necessary</td>
</tr>
<tr>
<td>8 - 10</td>
<td>High</td>
<td>Necessary soon</td>
</tr>
<tr>
<td>11 - 15</td>
<td>Very High</td>
<td>Necessary now</td>
</tr>
</tbody>
</table>

**Legs**
- Adjust: 30-60°
- Add +1
- Add +2

**REBA Score 10**

**Wrist**
- Score 2
EVALUATION OF REBA

Pro’s

• Freely available for download on the internet in several formats e.g. excel and software
• Renders relative quick results.
• Consider and integrate coupling, muscle use, force and load in the calculation of the final risk score.
• May require the use video recording equipment to record activities while conducting assessments.
• Express and reflect as a risk rating, prioritise risks and recommend actions.
• Consider load (lifting of heavy materials).

Con’s

• Need to cover a lot of activities (per person) to render representative assessment result.
• Requires an intermediate knowledge and understanding of Biomechanics.
• Needs more than one assessor to validate the result.
• Calculation of risk using the paper version could be a daunting task.
• Requires extensive time for visual confirmation and assessment.
• Only provide a snapshot of risk related to certain activities (Non TWA)
• Not sensitive in assessing body posture issues related to wrists (RULA more adequate).
• Steep learning curve if using the software version. Requires some expertise in Ergonomics).
WINOWAS (WINDOWS SOFTWARE)
EVALUATION OF WINOWAS

Pro’s

• Available for download on the internet.
• Used widely by researchers and ergonomic specialists internationally.
• Time Weighting Averaging Function.
• Can display results in Graph Format.
• Can conduct extensive statistical analysis on results obtained.
• Use and integrate video recording equipment in user interface.
• Easy risk classification system and Risk Bands.
• Consider load (Heavy Material Handling) in assessment.

Con’s

• Requires Windows XP - Will not work on PC’s with Windows Vista or Windows 7.
• Requires extensive time for visual confirmation and assessment.
• Steep learning curve, requires extensive expertise in Ergonomics.
• Not sensitive in assessing body posture issues related to wrists and the neck (REBA more adequate).
• Cannot use tool without video support.
CONSIDERATIONS IN THE ASSESSMENT OR RISKS AND PREVENTION OF MSD’S

- Vibration Assessment Data and Control Criteria
- Body Posture Assessment Data and Control Criteria
  \( \text{REBA WINOWAS} \)
- Material Handling Assessment Data and Control Criteria
  \( \text{REBA WINOWAS} \)
- Illumination Assessment Data and Control Criteria
- Noise Assessment Data and Control Criteria
- Anthropometrical and Biometrical Data and Control Criteria
  \( \text{OPERATORS REQUIREMENTS} \)

Adaptation of working environment to fit the human being

Assessment and Evaluation of Risk
ENVIRONMENTAL FACTORS
- NOISE
- ILLUMINATION
- VIBRATION

WORKPLACE DESIGN

HUMAN BEHAVIOUR

ANTHROPOMETRICS AND BIOMETRY

MUSCULOSKELETAL DISORDER RISK

ERGONOMICAL INTERVENTION

Occ Hygiene
Environmental Factors

Engineering
Mechanical Systems

Ergonomist
Human Systems
Workplace Design

Industrial Engineering
Organizational Systems and Processes
Work Demand
WAY FORWARD IN DEALING WITH MUSCULOSKELETAL DISORDERS (ERGONOMICS)

- Emphasize Ergonomics at the Design Stage of Work Processes and Workplaces.
- Follow a preventative approach in dealing with Musculoskeletal disorders in the workplace.
- Development of assessment tools in assessing Musculoskeletal Risks in the workplace (Ergonomists and Occupational Hygienists). Compile Standard (First).
- Fill the skills gap in dealing (curricula) with ergonomics and musculoskeletal disorders in the workplace South Africa.
- Create standards in South Africa in dealing with Ergonomics and Musculoskeletal disorders in support of legislation.
- Adopt a multi-professional approach in dealing with ergonomics and musculoskeletal disorders in the workplace.
- Boundary management between Occupational Hygiene and other professional disciplines involved in Ergonomics.
QUESTIONS