What Is Feeling of Operators about Physical And Psychosocial Ergonomic Risks?

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Ergonomics is one of a key approach to survive in competitive industrial worlds.
RISK EXPOSURE ASSESSMENT

Various methods for assessing the physical workloads:

- **Observational methods**
- **Direct measurement methods** (inclinometer, goniometry, acceleration, EMG)
- **Self-report method** (Nordic and ergonomic questionnaires)

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**IN-DEPTH REVIEW**

Ergonomic methods for assessing exposure to risk factors for work-related musculoskeletal disorders

G. C. David
Main objectives …

The comparison of three methods

1. SCANIA Ergonomic Standard (SES)
   ✓ Observational method (*ergonomist*)

2. Questionnaires
   ✓ Operators Feelings & Opinions

3. The Biomechanical Methods
   ✓ Real measurement (Precision & Accuracy)
Verifying the SCANIA method
Operators Opinions
Common representation of work
Asking participants about their feelings, opinions, beliefs and so on

What is the questionnaire (self reported methods)?
QUESTIONNAIRES USED

1. Self-reported Questionnaire

- Physical workloads
  - Physical risk factors (repetitiveness, postures, handlings, force, etc.)

- Mental workloads
  - Model Karasek

- Musculoskeletal Symptoms
  - Current intensity of symptoms on a visual scale
### Borg scale Interview: perceived exertion force (Borg Scale)

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
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<tbody>
<tr>
<td>Maximum</td>
<td>20</td>
</tr>
<tr>
<td>Very, very hard</td>
<td>19</td>
</tr>
<tr>
<td>Very hard</td>
<td>18</td>
</tr>
<tr>
<td>Hard</td>
<td>17</td>
</tr>
<tr>
<td>Somewhat hard</td>
<td>16</td>
</tr>
<tr>
<td>Fairly light</td>
<td>15</td>
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<td>Very light</td>
<td>14</td>
</tr>
<tr>
<td>Very, very light</td>
<td>13</td>
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<tr>
<td>Maximum</td>
<td>12</td>
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<td>11</td>
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<tr>
<td>Very light</td>
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<tr>
<td>Very light</td>
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<tr>
<td>Maximum</td>
<td>7</td>
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<tr>
<td>Very, very light</td>
<td>6</td>
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</table>

- Quantitative feeling of fatigue
Cycle time 11’ (July 2013) (15 operators)
Mean Age 42
Cycle 8’ in March 2014 (21 operators)
Mean Age 39

$t$-test $\ \ p$-value 0.27
Questionnaires Development & Validity

- Used by large French epidemiological surveys (SUMER, ESTEV etc) or International (NIOSH, Music, etc)
- Modified for SCANIA situations
- Consulting with Expert in LEEST and in ARCEAU (Conseils Techniques et Psychologie du Travail)

Check with SCANIA staff

Self reported questionnaires

Interview questionnaires
Results of Physical Workloads
Comparison of two cycle times

The better organization the less problems
Comparison of SCANIA with other automotive industries in Pays de la Loire
Which risks should be considered?

- Half of the SCANIA operators reported *shoulder risk factors* > pays de la Loire industries (20%)
  - SHOULDERS
- About 60% reported *wrist and elbow risk factors* = pays de la loire industries
  - WRIST & ELBOW
- Back flexion was high in both (75%)
  - BACK
- Push pull was higher in SCANIA than pays de la loire industries
  - FORCE
Psychological demands (9 items)

- Work hard
- Excessive amount of work
- Work very quickly
- Work very rushed
- Need to wait for others
- Contradictory orders
- Intense concentration
- Tasks interruption
- Excessive tasks

Decision latitude (9 items)

- Decision-making autonomy
- Influence workflow
- Free to decide how to do its job
- Use of skills
- Creative at work
- Learning new things
- Develop various activities
- Perform creative activities
- Seek a high qualification level
- Not perform repetitive work
- Use of skills

Social support (7 items)

- Concerned about welfare of subordinates
- Help for carrying out the tasks
- Pay attention to what subordinates say
- Collaboration with subordinates
- Friendly
- Show interest
- Professionally competent

Responsible colleagues
high psychological demands + low latitude decision = risk for health

(Job Strain)
Psychosocial Factors (Job strain)...

- Repeated more frequently same tasks
- More concentration for learning new products in combination with production mixing
Psychological

Karasek job strain model

Demands

Low

High

Low

High

LOW STRAIN

ACTIVE

PASSIVE

HIGH STRAIN

Final score = Weighted Average

Psychosocial Factors (Iso-strain)…

- Good relation in team (RC, TL, TM, Eng.)
- Working Group
- Helping each other
Improvement in the ISO-strain because of *good quality* of social support
Musculoskeletal (MSDs) Symptoms in P42

Reduction of MSDs symptoms in new TAKT
Conclusion

Questionnaire: complementary tool

Help to have better representation of risk factors (operator opinion)

The feelings for the new takt time were better

Organizational changes, technical improvement and product changing

The differences of risk factors between SCANIA and Pays de la Loire were few

Upper limbs and low back risk factors were high in both

We can reduce Psychosocial risk factors

Good quality of social support significantly reduce Iso-strain

MSDs symptoms reduced in the new takt time

However, MSDs symptoms in upper limbs & lower back were relatively high
What is next

Interview and restitution

Objective: help operators to develop ideas for ergonomic improvements

we will show to operators the film of their work and we will talk about their opinions regarding identified risk factors by ergonomist and Direct methods (gestures, risks, etc.)
Direct measurement methods results

Percentage position non neutre: 35.255663% | Flexion > 45: 2.7937968%, Flexion 20-45: 32.459886%)

ROUGE ! 11 secondes > 45°.
Right mudguard station