An upper extremity checklist by Keyserling

General description and development of the method

A checklist aimed for screening of jobs with potential hazard for upper limb disorders. Repetitiveness, local contact stresses, forceful manual exertions, awkward upper extremity posture, and hand tool usage are evaluated and each detected risk factor should be further evaluated.

The aim of the checklist is to determine the presence of ergonomic risk factors associated with the development of upper extremity cumulative trauma disorders. It was developed in conjunction with a 42-month longitudinal study undertaken in a large automotive corporation in US to evaluate the effectiveness of a joint union-management programme in reducing injuries and disorders caused by poor ergonomic conditions in the workplace. (Keyserling 1993)

Exposure descriptors

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Description of exposure</th>
<th>magnitude/amplitude</th>
<th>duration</th>
<th>frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>posture</td>
<td>Postures used for &gt;1/3 of the cycle time</td>
<td></td>
<td>x</td>
<td>.</td>
</tr>
<tr>
<td>movements</td>
<td></td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>(external) force</td>
<td>Manual handling of weights &gt;4.5kg; or &gt;2.7kg with one hand</td>
<td></td>
<td>x</td>
<td>.</td>
</tr>
<tr>
<td>vibration</td>
<td></td>
<td></td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>contact forces</td>
<td></td>
<td></td>
<td>.</td>
<td>.</td>
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</tbody>
</table>

Additional items: Cold exhaust air; unbalanced tool or object; use of gloves

Resource demands and usability

The checklist was designed as an ergonomic job evaluation tool to be used on the plant floor by representatives of management and labour

Equipment needed

Checklist described in publication (Keyserling 1993)

Stopwatch and force gauge / scales needed for measurement of time and weights /forces

Process of coding and analysis

Observed items are marked on the checklist. Total number of items indicating non-zero risk are summed up to give an overall score of upper extremity stresses.

Output type/level (risk assessment)

The response to each question result in a stress rating (zero = ergonomic exposures insignificant; check = moderate exposures; star = substantial exposures). Once the checklist is completed, the total number of checks and stars were summed, producing an overall score of upper extremity stresses.
Criteria to help the evaluator to make decision

Any job receiving one or more stars is considered to have high priority for additional investigation and analysis. Checklist users are instructed to interpret the overall score with caution, because the rated items are qualitative and not directly additive (Keyserling 1993).

Fields of the working life where the method has been used

Car manufacturing and warehouse jobs (Keyserling 1993)
Packing of icecream (Sannino 1996)
Ceramic industry (Arfaioli 1996)

Validity

Face validity / Contents validity

Does the method seem to be valid for the aimed purpose?

<table>
<thead>
<tr>
<th>(Keyserling 1993)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The contents of the method is such that a relevant assessment can be expected</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>2. Items to be observed have a sound basis</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>3. Sound operationalization of the items to be observed</td>
<td>x</td>
<td></td>
</tr>
</tbody>
</table>

Comments: Selection of cut-off values of categories (30 sec for time, 2.7 kg for weights) is somehow arbitrary, even though it is based on one epidemiological study.

<table>
<thead>
<tr>
<th>(Keyserling 1993)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Sound process to collect data</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>5. Sound process to get the output of the collected data</td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

Comments: An additive total score may be biased if similar weight is given for all items

<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6. Output can help in decision making</td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>

Concurrent validity

How well does the method correspond with more valid method/s?

Comparison of observations with "expert" evaluation* (Keyserling 1993)

* see p. 812-13: "Evaluation of the checklist as a screening tool"

- Question 1: Repetitiveness evaluated by review of work methods, standards, production rates
- Postures, mechanical contact, tool use: observations from video (Stetson 1991)
- Shoulder postures: computer aided observations from video (Keyserling 1986)

results p. 820-823, Tables 6 - 12

Comments:
- The criteria in references are different from that in the checklist

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Expert analysis were completed viewing a videotape; it is not known how well the video sample corresponded to the documentation of workplace.

"Predictive validity"

How well has the risk-estimation of the method been shown to be associated with or predicting musculoskeletal disorders (MSDs)?

- No formal studies

Intra-observer repeatability (within observers)

- No formal studies

Inter-observer repeatability (between observers)

Repeatability of postures (Burt 1999)

- A field study with 2 observers
- The repeatability was moderate to fair for pinch grip and shoulder elevation >45º, but poor for wrist deviations

Conclusions

Strengths of the method

- Quick, easy to use

Limitations in the use of the method

- Rating system is qualitative -> does not help much in decision making; does not consider the interaction of risk factors
- Definition of some items is arbitrary

To whom can this method be recommended?

Occupational safety/health practitioners for screening of potential risk factors in hand intensive work tasks

References


