Washington State Ergonomic checklist

**General description and development of the method**

The method is aimed for identification of risk for musculoskeletal disorders at workplaces. The items to be evaluated are awkward postures, highly repetitive motions, high hand force, repeated impacts, lifting, and hand-arm vibration. Two checklists are used: 1) Caution Zone Checklist with 14 items is used as a screening tool. If no positive findings are met, the job is regarded to be safety; otherwise a moderate risk is indicated and the job should be evaluated with 2) the Hazard Zone Checklist. Positive findings with it indicate immediate actions to reduce the risk. The lifting analysis is based on the NIOSH lifting equation but has higher values for the acceptable weight of the load (Keyserling 1989). (Washington-State-Dept._of_Labor_and_Industries 2003)

The checklists were developed as part of a regulatory effort to control exposure to musculoskeletal hazards in workplaces in Washington State at late 90tees and beginning of 2000. (Silverstein 2007). Epidemiological and other scientific studies were the basement for the selection of items in the checklists (Washington-State-Dept._of_Labor_and_Industries 2003)

**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>Awkward postures</td>
<td>× .</td>
<td>× .</td>
<td>× .</td>
</tr>
<tr>
<td>movements</td>
<td>Highly repetitive</td>
<td>× .</td>
<td>× .</td>
<td>× .</td>
</tr>
<tr>
<td>(external) force</td>
<td>High hand force; Lifting</td>
<td>× .</td>
<td>× .</td>
<td>× .</td>
</tr>
<tr>
<td>vibration</td>
<td></td>
<td>× .</td>
<td>x .</td>
<td>□ .</td>
</tr>
<tr>
<td>contact forces</td>
<td>Repeated impact</td>
<td>× .</td>
<td>x .</td>
<td>□ .</td>
</tr>
</tbody>
</table>

The items are assessed on dichotomous level (‘yes / no’). The duration of risk factors is estimated as total duration of day ("more than [2 -- 7] hours total per day"). For lifting a simplified version of NIOSH lifting equation is modified.

**Resource demands and usability**

**Equipment needed**


If the weights of the objects are not known they should be weighted.

**Process of coding and analysis**

First, jobs are evaluated by employers to determine whether any risk factor is present at a “moderate” level, defined as being in the “Caution Zone”. Jobs that are found to meet the criteria at a moderate level of risk are assessed to determine if they meet the criteria at a “high” level of risk.

**Output type/level (risk assessment)**

Checklist items indicated with "yes / no" for risk

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Criteria to help the evaluator to make decision

If only Caution boxes are checked, the risk is present but immediate action (further analysis or interventions) are not recommended. It is worthwhile to continue to monitor Caution level jobs for changes that might increase the risk and for injuries or symptoms that may occur. If one or more Hazard boxes are checked, a work-related musculoskeletal disorder (WMSD) hazard exists, and further action is recommended.

Fields of the working life where the method has been used

Wide variety of sectors in working life (Silverstein 2007)

Validity

Face validity / Contents validity

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

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Evaluation</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>
</tr>
<tr>
<td>Comments: Includes the general risk factors for MSDs</td>
<td></td>
</tr>
<tr>
<td>2. Items to be observed have a sound basis</td>
<td>x</td>
</tr>
<tr>
<td>Comments: Based on thorough review of literature</td>
<td></td>
</tr>
<tr>
<td>3. Sound operationalization of the items to be observed</td>
<td>x</td>
</tr>
<tr>
<td>4. Sound process to collect data</td>
<td>x</td>
</tr>
<tr>
<td>5. Sound process to get the output of the collected data</td>
<td>x</td>
</tr>
<tr>
<td>6. Output can help in decision making</td>
<td>x</td>
</tr>
<tr>
<td>Comments: Straight forward decisions for the needs of interventions</td>
<td></td>
</tr>
</tbody>
</table>

Lifting part is based on the simplified application of the NIOSH Lifting equation (Keyserling 1989). The recommended weight limits are higher than in the NIOSH LE

Concurrent validity

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

Comparison of NIOSH, ACGIH TLV, Snook tables, 3DSSPP and WA L&I lifting assessment instruments (Russell 2007)

- "The NIOSH, ACGIH TLV and Snook methods were similar in their results. ... the WA L&I and 3DSSPP predicted substantially lower exposures."

"Predictive validity"

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

Observation of 14 multitask jobs of a solid waste management company and comparison the results with data on occurrence of musculoskeletal diseases/injuries (Eppes 2004)

- "the WSET caution zone criteria were more effective at predicting which jobs were likely to increase the risk of WMSDs than was the hazard zone checklist. The caution zone had high
sensitivity and low specificity. The hazard zone criteria reflect a low sensitivity and a low specificity

**Intra-observer repeatability (within observers)**

Caution zone checklist used as questionnaire for workers and supervisors (Winnemuller 2004).

Note! No observations but the checklist filled in as a questionnaire.

- "Intrarater reliability between the two questionnaires administered several weeks apart revealed Kappa values for most of the risk factors in the good to excellent reproducibility range (Kappa > .4)"

**Inter-observer repeatability (between observers)**

Two ergonomists simultaneously performed separate, synchronized work sampling (Winnemuller 2004)

- "Comparison of 3 hours of work sampling, or 180 samples per ergonomist, resulted in 11 of 12 risk factor Kappas with a good (.> .4) reproducibility rating and all 12 risk factors above 92% agreement."

**Conclusions**

**Strengths of the method**

- Simple, quick, takes into account duration and frequency. Straight forward decision rules.

**Limitations in the use of the method**

- Limited to screening of risks

**To whom can this method be recommended?**

Occupational safety/health practitioners; trained representatives of the workplace

**References**


