OCRA checklist and EAWS risk assessment using sEMG
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1. Introduction
The study aim is to compare OCRA checklist (Colombini, 2004) and EAWS Ergonomic Assessment Worksheet (Caragnano, 2008) for upper limb risk assessment in a home appliance assembly line. The task investigated consisted in screwing a glass on the door and then embed it into the appliance body.

2. Material and methods
Three right handed skilled workers were enrolled in the study. We investigated the task in an assembly line of appliances. For each workers we did five acquisitions. The task investigated had a cycle time of 67 seconds. We used a 16 channel Wi-Fi surface electromyography system (FreeEMG, BTS SpA, Milan, Italy) for sEMG recordings. We investigated the following muscles on the right side of the body: first dorsal interosseous, flexor carpi radialis, deltoideus anterior and biceps brachii. Maximal voluntary isometric contractions from each muscle were performed according to SENIAM recommendations (Hermes, 2000). The mean activation and the peak values were computed for all muscles. Results obtained from sEMG were used to identify force level in the OCRA checklist and EAWS risk assessment worksheet.

3. Results
sEMG results showed that the most involved muscle was flexor carpi radialis that had a mean value of 11.6% and a peak value of 45.7%. Biceps brachii, deltoideus anterior and first dorsal interosseous were less involved. These last muscles had a mean activation values ranging from 5.3% to 6.1% and peak values ranging from 31.8% to 40.2%. The sEMG values suggested us to choose a third level force (30 N) in EAWS methodology and a level of 3 (moderate) of the Borg CR-10 scale (Borg, 1998) in OCRA checklist. Table 1 resume mean activations and the peak values.

<table>
<thead>
<tr>
<th>Muscles</th>
<th>Mean sEMG activity (%)</th>
<th>Peak sEMG activity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>First dorsal interosseous</td>
<td>5.3</td>
<td>31.8</td>
</tr>
<tr>
<td>Flexor carpi radialis</td>
<td>11.6</td>
<td>45.7</td>
</tr>
<tr>
<td>Biceps brachii</td>
<td>6.1</td>
<td>34.7</td>
</tr>
<tr>
<td>Deltoideus anterior</td>
<td>5.7</td>
<td>40.2</td>
</tr>
</tbody>
</table>

After the assessment of all the other risk factors (shift duration, postures and additional risk factors) we obtained a value of 19 (corresponding to a green risk level) for EAWS and a value of 17 (corresponding to a red moderate risk level) for OCRA checklist.

4. Discussion
Our results show that, for the task investigated, we obtained two different risk levels: a green one using EAWS and a moderated one applying OCRA checklist. The two main factors that contributed to this difference are stereotopy and the number of computed actions. Stereotopy is considered only in OCRA checklist. In the studied activity it was assigned the maximum value for this risk factor.

With respect to the number of technical actions OCRA counts it as “elementary actions” while EAWS takes into account “real actions” consisting in a lower frequency.

Our data shows a considerable disagreement between risk levels obtained comparing the two methods. The study suggests us that there isn’t a preferred method for upper limb risk assessment, but the
use of more than one method of evaluation could be helpful in order to better assess the various aspects of the investigated tasks.

References

Caragnano, G., Lavatelli, I. 2008. Manuale corso applicatore EAWS, versione 1.3.2b_ITA. AMI