Muscular activity during staircase cleaning while using an easily adjustable and a non-adjustable mop stick

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Introduction

- Cleaning is removal of undesired dirt, dust, marks, stains and other extraneous materials.
- The most common occupation worldwide
- 3 million cleaners in EU
- 78,800 cleaners in Sweden of which 15,500 are males and 63,300 are females
- Cleaning tasks involve heavy manual work and is physically demanding.
Many factors of work and environmental conditions are affecting professional cleaners’ health. Among them are:

- inappropriate and poor working postures
- lack of task variation
- poor ergonomic design of the work places
- poor design of cleaning tools.
Introduction
Existing problem

- While using non-adjustable mop sticks during staircase cleaning, cleaners usually abduct the arm which holds the upper part of the mop stick.
The aim of this paper was to study:

- whether there were any differences in muscular load, perceived exertion, and comfort rating during staircase cleaning with a non-adjustable mop stick compared to an easily adjustable mop stick.
Method

• Thirteen professional cleaners volunteered for the study.
• Their average professional experience was 17 years.
• Average age of the cleaners was 48 years.
• All cleaners reported experiences with the use of the easily adjustable mop stick as well as with the non-adjustable mop stick.
• Cleaners performed a staircase cleaning task about 5 minutes for each test and the selection of mop stick for each test was randomized.
• Surface EMG (sEMG) data were recorded during each test using telemetric ME6000 EMG analysis system equipment.
• sEMG activity was recorded bilaterally from the following muscles:
  – upper trapezius
  – middle deltoids
  – wrist extensors
Method

- Location of the electrode positions were based on the recommendations by Cram et al., (1998).
- sEMG surface electrodes were placed on the skin in pairs with 3.5 cm apart (DeLagi et al., 2004).
- The cleaners relaxed for 30s to set sEMG baseline before and after the registration with each mop stick.
- MVC:s were performed for each muscle at the beginning of the recording. Cleaners were given about 5 min rest before each test.
- The cleaners rated perceived exertion on a Borg Scale (0-10) for the upper body just after the completing the cleaning task with each mop stick.
- Cleaners rated comfort level on 1 to 5 scales (1 = most uncomfortable; 5 = most comfortable)
Data analysis

• Muscle activities were analyzed in terms of %MVC.
• Results were expressed as means and standard deviations.
• Paired t-test was used to determine significant differences between the %MVC:s for each mop stick.
• P<0.05 was set as the level of statistical significance.
**Results**

Mean %MVC for the easily adjustable mop stick and the non-adjustable mop stick (n = 13)

<table>
<thead>
<tr>
<th>Muscle group</th>
<th>Easily adjustable mop stick</th>
<th>Non-adjustable mop stick</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Right wrist extensors</td>
<td>29</td>
<td>11</td>
<td>26</td>
</tr>
<tr>
<td>Right middle deltoid</td>
<td>7</td>
<td>5</td>
<td>11</td>
</tr>
<tr>
<td>Right upper trapezius</td>
<td>15</td>
<td>11</td>
<td>23</td>
</tr>
<tr>
<td>Left wrist extensors</td>
<td>18</td>
<td>10</td>
<td>21</td>
</tr>
<tr>
<td>Left middle deltoid</td>
<td>5</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Left upper trapezius</td>
<td>8</td>
<td>3</td>
<td>9</td>
</tr>
</tbody>
</table>

* Significant at p<0.05

- The cleaners rated less perceived exertion on the upper body while using the easily adjustable mop stick compared to the non-adjustable mop stick.

- The mean comfort rate while using the easily adjustable mop stick was almost 5 while the non-adjustable mop stick showed a mean of a little more than 1.
Conclusions

• It can be concluded that easily adjustable mop stick can be recommended as a general means of reducing muscular load on the shoulder muscles group.

• The easily adjustable mop stick facilitates cleaners to keep their arm close to the body which results in more comfortable working posture.
QUESTIONS?