Investigating Total Exposure to WMSD Risks: The Roles of Occupational and Non-occupational Factors

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Models of WMSDs

- **Ecological models**
  - view WMSDs as consequence of interaction between physical demands and work-organization demands (Sauter & Swanson, 1996; Amick III et al., 1999)

Models of WMSDs

• Total Exposure model
  – views MSDs as consequence of work and non-work demands on the body

\[
WMSD = f(WMSD \text{ risks} + \text{non-occupational MSD risks})
\]

Research Study

- **Subjects** – 403 full-time office workers (195 women; 208 men) at NJOIT

- **Workstations** – all workers at workstations equipped with:
  - Negative-slope keyboard tray with 2-tier mouse platform
  - Ergonomic chair
  - Anti-glare filter, document holder, footrest

- **Workers** – all trained with 3 hours ergonomics course

Procedure

• One year after ergonomic intervention, all completed and extensive self-report survey on:
  • MSDs
  • Work activities
  • Non-work activities:
    – home computer use
    – domestic activities (gardening, home maintenance)
    – hobbies (knitting, crocheting, needlepoint)
    – sports (volleyball, tennis, golf, racquetball)
Results

• 31.7% of sample (126 people) participated in at least 1 of the 11 non-work activities
  – 52 participated in single activities
  – 38 in 2 activities
  – 21 in 3 activities
  – 12 in 4 activities
  – 3 in 5 activities
Non-work Activities

<table>
<thead>
<tr>
<th>Activity</th>
<th>N</th>
<th>Weekly Mean hrs.</th>
<th>Weekly Max. Hrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home computing</td>
<td>78</td>
<td>5.7</td>
<td>35</td>
</tr>
<tr>
<td>Gardening</td>
<td>34</td>
<td>4.4</td>
<td>24</td>
</tr>
<tr>
<td>Home repair</td>
<td>30</td>
<td>5.4</td>
<td>22</td>
</tr>
<tr>
<td>Golf</td>
<td>17</td>
<td>3.9</td>
<td>23</td>
</tr>
<tr>
<td>Needlepoint</td>
<td>13</td>
<td>2.8</td>
<td>9</td>
</tr>
<tr>
<td>Tennis</td>
<td>10</td>
<td>0.9</td>
<td>4.5</td>
</tr>
<tr>
<td>Crocheting</td>
<td>9</td>
<td>0.9</td>
<td>7</td>
</tr>
<tr>
<td>Knitting</td>
<td>8</td>
<td>0.9</td>
<td>7</td>
</tr>
<tr>
<td>Racquetball</td>
<td>8</td>
<td>0.3</td>
<td>2</td>
</tr>
<tr>
<td>Volleyball</td>
<td>8</td>
<td>0.2</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Frequency Distribution for WMSDs pre and post ergonomic intervention

Results

- All respondents categorized into those who do participate (RA) and those who do not participate (NRA) in potentially risky non-work activities.
- Overall difference in WMSDs:
  - RA = 4.4 symptoms
  - NRA = 2.7 symptoms
  - (63% risk increase; p=0.001)

Results

• After ergonomic intervention overall WMSDs not correlated with:
  – Days per week of computer use
  – Hours per day of computer use
  – Use of keyboard, mouse or both
  – Wearing corrective lens (glasses, contact lens)
  – # times getting out of chair
### Non-occupational MSD Risks

<table>
<thead>
<tr>
<th>Activity</th>
<th>N</th>
<th>NRA</th>
<th>RA</th>
<th>% increase</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home computer use</td>
<td>78</td>
<td>2.9</td>
<td>4.4</td>
<td>51.7%</td>
<td>0.009</td>
</tr>
<tr>
<td>Gardening</td>
<td>55</td>
<td>2.9</td>
<td>5.2</td>
<td>79.3%</td>
<td>0.004</td>
</tr>
<tr>
<td>Crocheting</td>
<td>5</td>
<td>3.1</td>
<td>9.6</td>
<td>209.6%</td>
<td>0.001</td>
</tr>
<tr>
<td>Needlepoint</td>
<td>6</td>
<td>3.2</td>
<td>5</td>
<td>56.3%</td>
<td>0.03</td>
</tr>
</tbody>
</table>
## Activities Not Associated with WMSDs

<table>
<thead>
<tr>
<th>Activity</th>
<th>N</th>
<th>NRA</th>
<th>RA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knitting</td>
<td>3</td>
<td>3.1</td>
<td>5</td>
</tr>
<tr>
<td>Golf</td>
<td>19</td>
<td>3.2</td>
<td>4.5</td>
</tr>
<tr>
<td>Tennis</td>
<td>2</td>
<td>3.2</td>
<td>1.8</td>
</tr>
<tr>
<td>Racquetball</td>
<td>2</td>
<td>3.2</td>
<td>2</td>
</tr>
<tr>
<td>Volleyball</td>
<td>3</td>
<td>3.2</td>
<td>1</td>
</tr>
</tbody>
</table>

WMSDs, Duration of Working without a Rest Break

Conclusions

• Non-work activities can contribute to WMSDs
• After an ergonomic intervention residual WMSDs may be amplified by non-work activities
• Home computer use and gardening may significantly elevate MSD risks
• Participation in certain sports may reduce MSD risks
• Models of WMSDs should incorporate certain non-work activities in estimating risks
• Results are suggestive not definitive, and further work is warranted.

Acknowledgements

• Thanks to Laurie Golding of NJOIT for assistance in data coding and verification