ITKids: does computer use reduce postural variation in children?

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New ICT (Information and Communication Technology)
Old ICT
Non ICT
Background

- MSDs have been associated with New ICT use among adults.
- Daily exposure to New ICT for many children for school and leisure tasks.
- Health effects of New ICT use on children is largely unknown.
Development of MSDs likely to have a multi-factorial aetiology.

Variation in exposure may impact on risk.

Variation been investigated in adults but not in children.
Study Aims

- Quantify variation in upper body postures of schoolchildren over a 12-h duration.

- Determine if there is postural diversity between Old, New and Non ICT tasks.
Method

- Descriptive field study combining direct observation and direct monitoring.
- 5 boys and 4 girls
  - Mean [sd] age 9.1 [0.3] years
  - Height 135.1 [4.3] cm
  - Weight 28.4 [1.9] kg
- Access to and use of New ICT at school, home or community.
- Exclusion criteria: history of musculoskeletal disorders.
Method

- School children were observed continuously for up to 12-h.
- Tasks and ICT use were measured by observations in their natural environments.
- Postures were measured using continuous direct monitoring.
Inclinometer readings:
sampled at 10Hz.

- Head flexion/extension & lateral bend
- Trunk flexion/extension & lateral bend
- Arm flexion/extension/ & abduction/adduction were reduced to arm elevation using spherical geometry
Other measurements

- Surface EMG from right and left upper trapezius and right wrist extensors.

- Discomfort measures: 0-10 scale and body map. Obtained during natural breaks throughout the day.
Data Processing

- Mean [sd] for posture.
- APDF
  - APDF (90-10) range.
- Exposure variation analysis (EVA).
  - SD of the cell values of the matrix (EVA (sd)).
Data Sample

- Mean = 7.1
- APDF range = 3.9
- EVA(sd) = 11.8

- Mean = 6.3
- APDF range = 29.5
- EVA(sd) = 3.6
Statistical Analysis

- One-way RANOVA
  - IV (ICT type)
  - DV (mean, $\text{APDF}_{\text{90-10}}$ range and $\text{EVA}_{\text{sd}}$ ) of each posture variable.
  - Differences between ICT types identified using planned pairwise contrasts.
## Mean postures

<table>
<thead>
<tr>
<th></th>
<th>OLD</th>
<th>NEW</th>
<th>NON</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arm elevation</td>
<td>35</td>
<td>32</td>
<td>25</td>
</tr>
<tr>
<td>Head flexion</td>
<td>17</td>
<td>-2</td>
<td>0</td>
</tr>
<tr>
<td>Trunk flexion</td>
<td>13</td>
<td>8</td>
<td>11</td>
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</tbody>
</table>
## Range of posture - APDF (90-10)

<table>
<thead>
<tr>
<th></th>
<th>OLD</th>
<th>NEW</th>
<th>NON</th>
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</thead>
<tbody>
<tr>
<td>Arm elevation</td>
<td>46</td>
<td>35</td>
<td>46</td>
</tr>
<tr>
<td>Head flexion</td>
<td>53</td>
<td>30</td>
<td>42</td>
</tr>
<tr>
<td>Trunk flexion</td>
<td>40</td>
<td>29</td>
<td>40</td>
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</table>
## EVA $(_{sd})$

<table>
<thead>
<tr>
<th></th>
<th>OLD</th>
<th>NEW</th>
<th>NON</th>
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</thead>
<tbody>
<tr>
<td>Arm elevation</td>
<td>1.7</td>
<td>2.2</td>
<td>2.2</td>
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<tr>
<td>Head flexion</td>
<td>2.0</td>
<td>3.0</td>
<td>2.4</td>
</tr>
<tr>
<td>Trunk flexion</td>
<td>2.1</td>
<td>2.0</td>
<td>2.6</td>
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</table>
Old ICT tasks had higher postural values but the greatest variability.
New ICT tasks were characterised by close to neutral postures, but low postural variability.
Non ICT tasks had high variability of postures compared to New ICT.
More questions to be answered...

- Is there postural diversity within New ICT use by children - between computer use and television viewing?

- Is there a difference in postural diversity between school and home locations?
More questions to be answered...

- Are the diversity of muscle activity patterns similar to the postural patterns observed?

- Is there a difference between adults and children’s postural and muscle activity variation?
Conclusions

- New ICT tasks including computer use, are characterised by:
  - neutral head and trunk postures, suggesting less risk
  - but with the least variability in posture patterns, suggesting greater risk
  - than Old ICT tasks and Non ICT tasks.
Implications

- Different ICT use by children results in different postural variation patterns.
- Need to further investigate the health effects related to these differences in variation.
- Guidelines should be developed for children’s safe ICT use based on postural diversity.
Acknowledgements

- National Health and Medical Research Council Public Health Scholarship
- James Lyra - data collection
- Paul Davey – data processing software development
Questions?
<table>
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<tr>
<th>Time period</th>
<th>0 - 9°</th>
<th>9 - 18°</th>
<th>18 - 27°</th>
<th>27 - 36°</th>
<th>36 - 45°</th>
<th>45 - 54°</th>
<th>54 - 63°</th>
<th>63 - 72°</th>
<th>72 - 81°</th>
<th>81 - 90°</th>
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<tbody>
<tr>
<td>Length (s)</td>
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