School of Health Professions
Institute of Occupational Therapy

Physical ergonomics at computer workplaces:
Findings from ergonomic workplace assessments and interviews

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Overview

1. Background
2. Objectives
3. Methods
4. Results
5. Recommendations
6. Discussion/Questions

1. Background I

- Physical work environment factors (e.g. design of desks, office chairs, computer keyboards, mice, ...) as well as context factors, (e.g. ambient noise, draft, lighting, temperature, etc.) can influence the performance of the people working at computers.

- These factors can also represent risk factors for health problems.

- Translators spend long hours sitting at computer workstations, keying in text, scrolling through electronic documents, and searching for information on the web and databanks.

- Entering text and using input devices such as touchpads or mice are activities which involve the whole body, and not just the hands and lower arms; constant repetition of movement can cause an overload of muscles of the upper extremities and back.
1. Background II

- Studies show that **hand and wrist tendonitis**, Carpal Tunnel Syndrome, Cubital Tunnel Syndrome, and epicondylitis are diseases typically associated with translation work. (de Léon 2007; Lavault-Olléon 2011)

- Explanations for those are: arrangement of letters and other keys on keyboards is **not based on ergonomic considerations** and non-physiological movements are needed to type. (Pineau 2011)

- **Eyestrain** due to long hours peering at a computer monitor can cause vision problems, known as Computer Vision Syndrome, which can present as headaches, ocular discomfort, dry eye, diplopia, and blurring. (Rosenfield 2011)

2. The Project

Study about physical ergonomics is part of a larger project comprising:

- **Workplace observations** (n=36)
- Usability lab observations (Pro=18; MA=12)
- Online survey (n=1,850)
- **In-depth interviews** (n = 7)
2. Study Objectives

Investigating:

- Which health complaints do language professionals working with computers report?
- Which health complaints are related to physical ergonomic factors?
- Are there differences in physical ergonomics between the employment situations?

... in order to make recommendations for more ergonomic workplaces.

3. Methods

- **36 workplace visits** to language professionals working as:
  - freelancers
  - staff in a commercial enterprise (e.g. LSP)
  - staff in an institution
- Assessment of workplaces regarding ergonomics
- Screen recordings and video recordings of translation activities
- **Interruptions and disturbances** were noted (RIHA/VERA)
- A **short interview** concerning socio-economic data and **health issues** possibly related to physical ergonomics
- **In-depth interviews** with 7 participants at the end of the study
3. Characteristics of sample and workplaces

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Sub-groupings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>female (n=25)</td>
</tr>
<tr>
<td>Age</td>
<td>18-45 (n=16)</td>
</tr>
<tr>
<td>Employment</td>
<td>freelancer (n=10)</td>
</tr>
<tr>
<td>Cat tool use</td>
<td>High (n=20)</td>
</tr>
<tr>
<td>Office type</td>
<td>Private (n=21)</td>
</tr>
</tbody>
</table>

4. Results of workplace observations: assessments

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Ergonomic</th>
<th>Problematic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient noise</td>
<td>up to 65 dB (n=27)</td>
<td>over 65 dB (n=9)</td>
</tr>
<tr>
<td>Temperature</td>
<td>up to 23° C (n=8)</td>
<td>over 23° C (n=28)</td>
</tr>
<tr>
<td>Lighting</td>
<td>adjustable (n=17)</td>
<td>non-adjustable (n=19)</td>
</tr>
<tr>
<td>Desk height</td>
<td>appropriate for user (n=17)</td>
<td>too high or low (n=19)</td>
</tr>
<tr>
<td>Chair height</td>
<td>adjusted correctly for user (n=17)</td>
<td>not adjusted correctly (n=19)</td>
</tr>
<tr>
<td>Chair back</td>
<td>movable (n=19)</td>
<td>static (n=16)</td>
</tr>
<tr>
<td>Feet</td>
<td>can touch ground (n=22)</td>
<td>cannot touch ground (n=14)</td>
</tr>
<tr>
<td>Screen height</td>
<td>5-10 cm under eye level (n=8)</td>
<td>too high (n=28)</td>
</tr>
<tr>
<td>Screen distance</td>
<td>60-80 cm away (n=25)</td>
<td>too far (n=11)</td>
</tr>
<tr>
<td>Keyboard</td>
<td>10-15 cm from desk edge (n=14)</td>
<td>too close or far away (n=22)</td>
</tr>
<tr>
<td>Documents</td>
<td>between keyboard + screen (n=13)</td>
<td>not in front of person (n=18)</td>
</tr>
</tbody>
</table>
4. Results of workplace observations: Interviews

Occurrence of recent health complaints by sex

Occurrence of recent health complaints by age category
4. Results of workplace observations: Interviews

Occurrence of recent health complaints by employment position

<table>
<thead>
<tr>
<th>Employment Position</th>
<th>Freelance (n=10)</th>
<th>Commercial (n=9)</th>
<th>Institutional (n=17)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eyes</td>
<td>2.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head</td>
<td>1.2</td>
<td>1.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Neck</td>
<td>1.2</td>
<td>1.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Shoulders</td>
<td>1.1</td>
<td>1.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Upper Back</td>
<td>1.2</td>
<td>1.0</td>
<td>1.2</td>
</tr>
<tr>
<td>Lower Back</td>
<td>1.2</td>
<td>1.0</td>
<td>0.2</td>
</tr>
<tr>
<td>Stomach/Torso</td>
<td>1.2</td>
<td>0.4</td>
<td>0.2</td>
</tr>
<tr>
<td>Legs</td>
<td>1.0</td>
<td>0.2</td>
<td>0.2</td>
</tr>
<tr>
<td>Knees</td>
<td>0.9</td>
<td>0.6</td>
<td>0.1</td>
</tr>
<tr>
<td>Feet</td>
<td>0.9</td>
<td>0.9</td>
<td>0.1</td>
</tr>
<tr>
<td>Arms</td>
<td>1.6</td>
<td>1.0</td>
<td>0.8</td>
</tr>
<tr>
<td>Hands</td>
<td>1.6</td>
<td>1.0</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Intensity of pain or discomfort by employment position

<table>
<thead>
<tr>
<th>Employment Position</th>
<th>Freelance (n=10)</th>
<th>Commercial (n=9)</th>
<th>Institutional (n=17)</th>
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</thead>
<tbody>
<tr>
<td>Eyes</td>
<td>2.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Head</td>
<td>2.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neck</td>
<td>1.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoulders</td>
<td>2.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper Back</td>
<td>2.1</td>
<td></td>
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</tr>
<tr>
<td>Lower Back</td>
<td>2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stomach/Torso</td>
<td>1.4</td>
<td></td>
<td></td>
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<tr>
<td>Legs</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knees</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feet</td>
<td>1.0</td>
<td></td>
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</tr>
<tr>
<td>Arms</td>
<td>2.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hands</td>
<td>2.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Results of workplace observations: Interviews

How much affected in daily life by employment position

![Bar chart showing the impact of employment position on daily life](chart1.png)

Health complaints lately by full/part time employment

![Bar chart showing health complaints by employment status](chart2.png)
4. Results of workplace observations: Interviews

Health complaints lately by office type

![Bar chart showing health complaints by body part and office type.]

4. Results of workplace observations: Interviews & observations

Recent health complaints in comparison to ergonomics: Shoulders

![Bar chart showing health complaints in comparison to ergonomics.]
4. Results of workplace observations: Interviews & observations

Intensity of health complaints in comparison to ergonomics: **Shoulders**

Impact of health complaints in daily life in comparison to ergonomics:

- **Shoulders**
  - Intensity of health complaints:
    - Much ergonomics: 0% strong, 20% moderate, 40% slight, 60% very slight, 80% none
    - Little ergonomics: 100% strong
  - Impact in daily life:
    - Much ergonomics: 0% strong, 20% moderate, 40% slight, 60% very slight, 80% none
    - Little ergonomics: 100% strong

p = n.s.

p < 0.05.
### 4. Results of workplace observations: Interviews & observations

#### Recent health complaints in comparison to ergonomics: Knees

![Bar chart showing health complaints in comparison to ergonomics for knees.](image)

- **much ergonomics**
  - Often: [percentage]
  - Sometimes: [percentage]
  - Seldom: [percentage]
  - Never: [percentage]

- **little ergonomics**
  - Often: [percentage]
  - Sometimes: [percentage]
  - Seldom: [percentage]
  - Never: [percentage]

*P* < 0.0001

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#### Intensity of health complaints in comparison to ergonomics: Knees

![Bar chart showing intensity of health complaints in comparison to ergonomics for knees.](image)

- **much ergonomics**
  - Moderate: [percentage]
  - Slight: [percentage]
  - Very slight: [percentage]
  - None: [percentage]

- **little ergonomics**
  - Moderate: [percentage]
  - Slight: [percentage]
  - Very slight: [percentage]
  - None: [percentage]

*P* < 0.01
4. Results of workplace observations: Interviews & observations

Impact of health complaints in daily life in comparison to ergonomics: Knees

- Fewer health complaints/intensity/impact were mostly related to a more ergonomic workplace:
  - Eyes
  - Neck
  - Shoulders
  - Upper back
  - Torso
  - Legs
  - Hands

- But not for lower back, feet and head.

- Most observed differences were below statistical significance.

P < 0.001
4. Results of in-depth interviews: Interventions at the workplace

- In the validation phase of the project, a subset of each group of translators was asked to participate in an in-depth interview.
- They were chosen based on the workplace profiles that emerged from the analyses as being particularly relevant to issues of cognitive and physical ergonomics.
- Participants were asked about the ergonomic interventions, whether they had changed their workplace after the intervention, and whether it had had any impact on their general well-being.

<table>
<thead>
<tr>
<th>Interviewee</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
<th>V</th>
<th>VI</th>
<th>VII</th>
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<tbody>
<tr>
<td>Chair</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Chair height adjusted</td>
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</tr>
<tr>
<td>Back rest adjusted</td>
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<td>X</td>
<td>X</td>
<td>X X</td>
<td></td>
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<td>Armrests adjusted</td>
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<tr>
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<tr>
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<tr>
<td>Height adjusted</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
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</tr>
<tr>
<td>Keyboard</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Put flat on desk</td>
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<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Pull closer to the body</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Air quality</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air is too dry use humidifier</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Breaks</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Increase frequency of beaks</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Posture</td>
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<td></td>
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<td></td>
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<tr>
<td>Change sitting position more often</td>
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<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4. Results of in-depth interviews: Interventions at the workplace

- After the intervention, most translators kept their workplace the way the occupational therapist had set it up.
- In some cases, small optimisations had been made (e.g. addition of hand rest, stability ball, etc.).
- One freelancer entirely reorganised her workplace based on the recommendations of the OT.
- After the workplace observations, one participating organisation purchased ergonomic chairs for all of their employees.

- Most participants stated that they were much more aware of ergonomics now.
- They took small breaks more often and were more aware of their posture.
- Some interviewed participants stated that they were taking more responsibility for their health and changing their posture during work more often, or doing more sports, etc.
- Some stated that this was affecting their health in a positive way.
4. Results of in-depth interviews: Interventions at the workplace

Exp VI 00:03:05 : Aber ja, ich merke schon, wenn ich mir Mühe gebe, aufrecht zu sitzen, dass ich dann weniger verspannt bin, auf jeden Fall. Ich schaue jetzt eigentlich schon mehr darauf, dass eben der Tisch zum Beispiel genug tief eingestellt ist.

But yes, I notice when I make the effort to sit upright, that I’m less tense, for sure. I pay more attention, for example, to making sure that the [desk] surface is set low enough.

4. Other findings

- **Standard for ergonomics** at the workplaces in the companies and institutions in this study was **high**.

- Ergonomics at freelancers workplaces was often **sub-optimal**.

- Participants often said they had had **health complaints in the past** (e.g. back pain) that decreased or ceased after changing aspects of their workplace to be more ergonomic (e.g. ergonomic chair).

- Ergonomic features existed at many workplaces; however, they were **not adjusted for the person using them**.
4. Challenges of current study: Limitations

- **Recruitment was difficult**: some companies were resistant to having their employees take part in the study. The targeted 50 workplace observations could not be achieved (n=36).
- Observed participants generally had **few health complaints** and generally quite ergonomic workplaces.
- Participants often had **more than one position** (e.g. freelancer and part-time staff translator at a company or government), so they had **more than one workplace**.
- Statements of **cause and effect** are **not possible** with this data/study design (e.g. part-time workers had more complaints).

5. Recommendations

- As problems were more often observed among freelancers and younger professionals, we recommend that:
  - basic **ergonomic knowledge** be integrated into **BA and MA programmes**.
  - ergonomic training be provided to practitioners in further education.
  - information about ergonomics be disseminated through professional associations and similar channels.
  - change position from time to time and take frequent short breaks.
- An **individual workplace consultation** is recommended before any health problems emerge.
Literature


Thank you for your attention!
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