Repetitive Upper Limb Tasks

Dr Lanre Okunribido: HSL Ergonomist

Introductions

Sessions

1. Why repetitive upper limb tasks?
2. Common Upper Limb Disorders (ULD) and injuries?
3. ULD Risk Factors
4. Introduction to the ART tool
5. Guided Case Study Assessment
6. Practice Assessment Case Studies (ART tool)
7. ULD intervention measures
8. ART at work
9. Big finish!!
Session 1

Why Repetitive Upper Limb tasks?

Aims: To describe the tasks and available evidence

Repetitive UL Tasks
1. Widely performed in industrial workplaces

Repetitive UL Tasks
2. Are made up of repeated cycles

- Main characteristic features:
  - Involve a sequence of actions of the upper limbs
  - Actions repeat every few minutes or even more frequently
  - Performed for at least 1 – 2 hours per day or shift
Repetitive Task
1. Open cardboard sleeve
2. Reach for gingerbread
3. Place into sleeve
4. Place product on table

Packaging Gingerbread

Task Elements

Task Cycle

PROCESS WORKER
Boxing Packages

1. Reach for cardboard box
2. Assemble box on bench
3. Fill case with 24 packs
4. Tape box lid
5. Lift box onto pallet

Repetitive UL Tasks

The LFS: main work activities causing or making upper limb disorders worse (2009/10-2011/12 average) were:
• Manual handling (pulling/pushing and lifting) - 80,000 cases;
• Keyboard work or repetitive actions - 56,000 cases; and
• Awkward and tiring arm positions - 28,000 cases.

The THOR-GP main causes of the ULD’s seen by the GP (2013-2015):
• Manual handling (heavy lifting);
• Holding or guiding tools for periods of time;
• Pulling, shove and carrying materials;
• Excessive keyboard work;

3. Associated with the development of ULDs
• 40% of all MSD in GB involve the upper limbs and neck
• 1 in every 10 days lost is due to ULD pain
• Average time off per person 13 days

• ULD prevalence was significantly lower in 2013/14 than 2001/02
• The incidence rate of ULDs in 2013/14 was comparable with that of 2001/02


ULD - LFS Self-Reported Cases

Total number of cases (prevalence) 2001-2014
ULD - LFS New Cases

Estimated new cases in the last 12 months, (2010/11 vs 2001/02)

ULD - Costs of Injuries

- sickness costs
- management time
- retirement costs
- temporary injury benefit
- permanent injury benefit
- adverse publicity
- loss of experience
- replacement costs
- litigation
- recruitment
- legal costs
- training costs
- continuity
- human costs

Session 2

What Are Upper Limb Disorders?

Aims: To define the disorders
Disorders in the tissues of the upper limbs

- **Effects of tissue change:** stiffness, weakness, pain, swelling, etc.
- **Tissues:** soft tissues, muscles, ligaments, and tendons
- **Upper Limbs:** fingers, hand, arm, shoulder, and neck

Also known as:

- WRULDs
- RSI
- CTDs
- OOS
- MSDs
- WRUEDs

“Upper Limb Disorders” (ULDs)

ULD – Most Common Types

- **Non-specific arm pain** is upper limb pain not due to any other condition. There has been much debate over the name and it may also be referred to as repetitive strain injury (RSI). 1 in 4 adults with an upper limb disorder has non-specific arm pain.

- **Carpal tunnel syndrome (CTS)** causes pins and needles over the thumb, index, middle, and ring fingers and results from pressure on the median nerve at the wrist. 1 in 20 adults gets carpal tunnel syndrome.

- **Tenosynovitis** is redness, swelling, stiffness, and pain over the wrist tendons. 1 in 100 men and 1 in 50 women get tenosynovitis.

- **Lateral epicondylosis (Tennis elbow)** gives pain on the outer side of the elbow. This condition worsens with a lot of lifting or twisting at the wrist e.g. using a screwdriver. 1 in 75 men and 1 in 50 women get tennis elbow.

(source Royal College of Physicians)
ULD – Range of recognised diagnosis

ULD – The Case for Early Intervention

The psychology and behaviour of a person with upper limb pain has a strong influence on their chance of recovery

Session 3

ULD Risk Factors

Aims: To understand each of the key, work relevant, risk factors
### ULD Risk Factors

Key risk factors can be thought of as relating to the:

<table>
<thead>
<tr>
<th>Task</th>
<th>Individual Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>• repetition</td>
<td>• working environment</td>
</tr>
<tr>
<td>• force</td>
<td>• psychosocial factors</td>
</tr>
<tr>
<td>• working posture</td>
<td>• individual differences</td>
</tr>
<tr>
<td>• duration of exposure</td>
<td></td>
</tr>
</tbody>
</table>

### ULD Risk Factors (repetition)

- using same muscle groups over and over again or performing frequent movements for prolonged periods.

#### Repetition:
- shoulder movements > 2.5 per minute
- elbow bends > 10 per minute
- wrist bends > 10 per minute

*Kilbom 1994*
Tolerance diminishes as fatigue increases.

**ULD Risk Factors**

- Repetition
- Force
- Working posture
- Duration of exposure

**Tendon**

- Example: Tendon damage in the wrist

**Muscle**

- Example: Bursitis in the shoulder

© Crown Copyright Health & Safety Laboratory.
Force can effect various structures of the musculoskeletal system:

- repetition
- force
- working posture
- duration of exposure

Effects Muscles:
- tendon/muscle tears
- post exercise soreness
Effects Tendons:
• fraying of tendon
• shearing synovium
• swelling due to friction

Effects Nerves:
• friction
• stretching
• squashing

Kilbom 1994
**Force:** What is a high hand force?

It depends on…
- the object
- how force is applied
- the strength of the person
- other risk factors

What is a high hand force?
- pinching an object weighing about 1 kg or more per hand
- gripping an object weighing about 4 kg or more per hand

… or applying an equivalent amount of gripping force
What is a high hand force?
You really need to ask people doing the work.

Shock forces
- hammering or striking objects with a tool

Compression forces
- work pieces or tools digging into the anatomical structures
- continuous gripping onto tools (e.g., knives)
- using the hand as a tool

Increased risk of injury when posture is awkward and/or fixed.
**Task**

- Repetition
- Force
- Working posture
- Duration of exposure

**Working Posture:**

- Increased risk of injury when posture is *awkward* and/or *fixed*. *part of the body is used beyond its neutral position*

**Joints at the mid-range of motion**
**ULD Risk Factors**

- **Task**
  - repetition
  - force
  - working posture
  - duration of exposure

**Working Posture:**
- increased risk of injury when posture is awkward and/or **fixed**.

“part of body held in a particular position for extended periods of time”.

**Working Posture:** **fixed posture**
- restricts blood flow to muscles
- build up of metabolic waste
- muscle fatigues quickly
What’s the best posture?

ULD Risk Factors

Task

・ repetition
・ force
・ working posture
・ duration of exposure

Working Posture: postural ideal

The best posture is .............

The best posture is generally .............the next posture !

Rest Breaks:

“short frequent breaks are generally better than long spread out breaks”
Rest Breaks:
The opportunity for recovery can occur within the:
• work shift
• job
• task

Exposure:
Work time : Rest time ratio
(for particular joints/muscles)

Ratio of 5 : 1 optimal
Avoidance of muscle fatigue

\[
\text{fatigue} = \downarrow \text{reaction time} + \downarrow \text{strength} + \uparrow \text{recovery time} = \uparrow \text{risk of injury}
\]

**ULD Risk Factors**

- **Task**
  - repetition
  - force
  - working posture
  - duration of exposure

- **Environment**
  - working environment
  - psychosocial factors

- **Individual**
  - individual differences

**Vibration:**
- alters sensation leading to “over gripping”
- increases muscle activity
- increase in carpal tunnel syndrome

**Cold:**
- reduced blood flow to upper limbs
- reduced grip
- increases muscle activity

**Lighting:**
- stooping to see = compromised posture
- accommodating for glare

© Crown Copyright Health & Safety Laboratory.
Vibration: - alters sensation leading to “over gripping” - increases muscle activity - increase in carpal tunnel syndrome

Physiological

Cold: - reduced blood flow to upper limbs - increases muscle activity

Lighting: - stooping to see = compromised posture - accommodating for glare

• working environment
• psychosocial factors

ULD Risk Factors

Machine Paced Work:
- lack of control of pace
- lack of participation in task design

Social Environment at Work:
- group pressure
- negative social interaction
- poor task feedback

Work Schedules and Overtime:
- shift work
- overtime fatigue
- work demands

etc.

• working environment
• psychosocial factors

ULD Risk Factors

psychosocial factors

• working environment
• psychosocial factors

(Aptel and Cnockaert 2002)
### ULD Risk Factors

- new employees
- competence skill level
- body size/tolerance
- vulnerable groups
- health status and disability
- individual attitudes/compliance
- age
- genetics

### Individual Differences

- Individual
- Individual Differences

### Task

- repetition
- force
- working posture
- duration of exposure

### Environment

- working environment
- psychosocial factors

### Individual

- Individual
- Individual Differences

---

All risk factors work together to create an overall effect on people.
And as a general rule

Risk Factors = ULDs

Risk Factors = ULDs

HSG60(rev)

- Further reading
- Lots of information for duty holders
- Risk filter → risk assessment (7 pages)

Management Framework

- Understand the issues and commit to action
- Create the right organisational environment
- Assess the risk of ULDs in the workplace
- Reduce the risk of ULDs
- Educate and train the workforce
- Manage any episodes of ULDs
- Carry out regular checks on effectiveness
Management Framework

- Understand the issues and commit to action
- Create the right organisational environment
- Assess the risk of ULDs in the workplace
- Reduce the risk of ULDs
- Educate and train the workforce
- Manage any episodes of ULDs
- Carry out regular checks on effectiveness

Understand the issues and commit to action

Create the right organisational environment

Assess the risk of ULDs in the workplace

Reduce the risk of ULDs

Educate and train the workforce

Manage any episodes of ULDs

Carry out regular checks on effectiveness