Computer Workstations (Design and Adjustment)

Course Overview

• This training module has been developed for workers at the University of Queensland, and forms part of the OH&S training program at UQ.

The aims of this course are to:

• Assist UQ staff and students to assess and control manual risks arising from computer use e.g. mousing, keying, reading the screen and phone use

• Identify strategies and UQ resources that will enable implementation of risk control measures e.g. ergonomically designed seating, keyboard and mouse; improved seating adjustment; telephone head set; voice activation software; task variation

• Monitor risk controls and make appropriate adjustments e.g. re-adjust seating, trial an alternative mouse

20 February 2013, v3
Introduction

Manual tasks at computer workstations can contribute to a number of musculoskeletal disorders including:

• Sprains and strains of muscles, nerves, ligaments and tendons in the hand, wrist, forearm, shoulders and neck

• Exacerbation of pre-existing lower back conditions (prolonged sitting)

• Eye strain and headaches are symptoms also reported by computer users.
Risk Factors

Manual task risk factors for computer workstations include:

- Repetitive hand, wrist and arm movements
- Awkward, static postures of the head, neck, mid and lower back and upper limbs
- Prolonged seated or standing posture
- Viewing the computer screen for prolonged periods

Controlling manual task risk factors reduces the risk of musculoskeletal disorders.

The control of manual task risk factors is the focus of this training program.
Risk Management Approach

• The optimal design and adjustment of computer workstations and work organization are risk controls that are effective in reducing the risk of musculoskeletal injury.

• This training program gives a step-by-step approach for the optimal design and adjustment of a computer workstation. It also reviews work organization options that should be considered in conjunction with the design and adjustment measures.

• Implementation of a combination of risk control measures will reduce the risk of musculoskeletal disorders. There is no single risk control measure that will be effective in reducing injury risk.
Risk Management (continued) ...

The Manual Tasks Code of Practice specifies the effective approach for manual task risk assessment and control.

The Code of Practice is found at:


-  Risk Management Database

•  A generic risk assessment for Ergonomics Computer Use has been completed on the University's Risk Management Database,

•  University Managers and Staff should refer to this when completing risk assessments for computer tasks in their work area.
Responsibilities

UQ managers and staff have obligations under the Workplace Health & Safety Act to ensure health and safety at computer workstations.

Specific responsibilities are as follows:

Staff

- Complete online injury, illness, incident reports
- Advise their supervisor of risk control requirements and implement them
- Monitor risk controls.
Specific responsibilities (continued) ...

Managers

- Ensure the lodgement of online injury, illness, incident report
- Ensure the implementation and documentation of appropriate risk control measures
- Allocate adequate resources.

Ergonomics & Rehabilitation Adviser

- Provides written advice to the manager and staff of the ergonomics requirements for computer workstations for staff with musculoskeletal disorders.
Optimal Design of computer workstations

The following photographs illustrate a range of optimally designed and adjusted computer workstations.

Seated at a workstation:
Optimal Design of computer workstations (continued) ...

A standing height workstation allows variation between standing and sitting postures with the use of a high gas-lift ergonomic chair.
## Workstation design and adjustment

The following pages outline optimal computer workstation design and adjustment.

**There are 14 Steps to consider:**

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Workstation design and adjustment (continued) ...

In addition to the 14 Steps, there are a number of other factors that also need to be considered:

- Work organisation
- Ergonomic software
- Touch typing
- Strains/Sprains, headaches, sore eyes
- Postural variation, stretching and movement
- Self assessment checklist
- Risk assessment for ergonomics computer use
- Selection and purchase of computer workstation furniture and equipment
Step 1: Seat height adjustment

- Sit in the chair, relax, and position your shoulders, elbows and wrist in a neutral position, i.e.
  - Shoulders and arms relaxed, with upper arms close to the body
  - Avoid reaching out to the side
  - Avoid forward/backward/upward reaching
  - Avoid elevated or hunched shoulders
  - Shoulders, elbows and hips in a straight line
  - 90 degree angle at the elbows
  - Wrists in a neutral posture (20 degrees extension)

- Adjust the seat height so that your elbow height is approximately the same height as the keyboard.
Step 1: Seat height adjustment (continued) ...

- It is important that your shoulders, elbows and wrists are kept in the relaxed neutral posture as you adjust your seat height. The aim is to avoid lifting your hands and arms upward because the desk is too high, or to lean forward because the desk is too low.

- Your hands should rest comfortably on the keyboard, mouse or work surface without reaching upward or hunching your shoulders.
Step 2: Feet support

- Check if your feet are resting comfortably on the ground or whether they are dangling and in need of support. (This should be done after adjusting your seat height)

- If you experience pressure behind your thighs, or feel as though your legs and feet are not supported, you will require an adjustable footrest

- The footrest should be positioned to enable you to sit close to the desk surface
Step 3: Backrest angle adjustment

• Sit to the back of the seat so that your back rests against it without slouching.

• Adjust the back rest so that the angle at your hip or between your trunk and your legs is between 92-100 degrees. In other words, the backrest angle should be 92-100 degrees, relative to the horizontal seat.

• You should feel the backrest supporting your body.
Step 4: Backrest height adjustment

- Adjust the backrest height so that the lumbar support in the lower part of the backrest supports the lumbar curve of your back. This is also known as the ‘small’ of your back.
- These pictures demonstrate a seat backrest that has been correctly adjusted for both height and angle, promoting a supported, neutral, relaxed sitting posture.

- The backrest height is adjusted by moving the backrest to its highest point to disengage the ratchet, lowering the backrest to its lowest point and clicking it into the ratchet, and then moving it slowly and gradually upward until the lumbar curve supports the small of your back.
Step 5: Armrest adjustment

- Armrests are not recommended for use with corner workstations. In this case the desk should be used for forearm support instead of the armrests.
- If you prefer armrests and do not use a corner workstation, then height adjustable, recessed armrests must be used. (It is preferable to use the desk for forearm support - see Step 6)
- When adjusting armrest height the arms should be supported without pushing the elbow or shoulder upward. In other words, armrests should be adjusted to 0.5-1cm below the elbow when the shoulder is relaxed and the upper limb is in the posture illustrated in Step 1.
Step 6: Forearm support

- Move your chair close to the work surface so that your stomach is almost touching it.
- If the computer equipment is too close, move it further back on the desk.
- Sitting close to the work surface will allow your forearms to be supported by the desk whilst operating the keyboard/mouse/pen or when reading.
Supporting the forearms on the desk surface reduces static loads and tension in muscles.

You are encouraged to relax your arms and partly support them on the work surface.

Figure 3. Diagram of dynamic and static muscular effort.
Step 6: Forearm support (continued) ...

• A keyboard gel wrist rest encourages support of the forearm, can facilitate a neutral wrist posture, and reduces contact stress between the forearm and the desk edge.

• If your keyboard is low profile, the wrist is usually positioned in a neutral position and a gel wrist rest is not required. The use of a gel wrist rest with a low profile keyboard can cause awkward wrist position and should not be used.
Step 7: Computer screen adjustment

• Screen distance - sit close to the desk edge. This will enable you to comfortably support your forearms on the desk and support your back against the backrest.
• The computer screen should then be moved to a comfortable viewing distance on the desk. This viewing distance is between 500 - 700mm for most people.
• The computer screen should be placed directly in front of you and reference documents also be placed close to the screen - either beside it or between the keyboard and screen. (See step 10 for more information)
Step 7: Computer screen adjustment (continued) ...

Screen height
• Evidence shows that the optimum position for the computer screen is 15-50 degrees below the horizontal line of sight. (International Standards Organisation – ISO 1998).
• Some guidelines incorrectly recommend that the top of the screen be placed at eye level. This screen height often results in an upward tilt of the head and bending of the neck - both risk factors for neck strain and headaches.
• The recommended screen height of 15-50 degrees below eye level also facilitates a neutral head position of within 20 degrees from upright. The head should have a slight forward tilt and your neck should be relaxed.
• The monitor should be tilted back so that the top is slightly farther away from the eyes than the bottom.
Step 7: Computer screen adjustment (continued) ...

Screen size

- Use standard size computer screens whenever possible
- Avoid large tall screens which can result in tilting the head upward and bending the neck backward
- Small laptop screens can result in higher mouse movement and this is a risk factor for upper limb injury
Step 7: Computer Screen Adjustment (continued) ...

Two or more computer screens

- The high usage / primary screen should be placed directly in front of you. The lesser used screen should be placed adjacent to the primary screen in order to avoid repetitive neck twisting.
- In the case that screens are used equally, they should be placed closely to each other at the midline of vision. Slightly angling the screens places them within central vision and reduces neck twisting.
- The use of 3 or more screens at the same time is discouraged as it will increase the risk of neck strain. Where 3 or more screens are necessary you should apply the same principles for 2 screens, and have a long desk that enables you to move to the third screen to sit directly in front of it. This strategy will minimise neck twisting.
Step 7: Computer Screen Adjustment (continued) ...

Prescription glasses

• Progressive lenses with viewing for short distance set in the middle of the lens, will enable a neutral head and neck position. Alternatively, lenses with one focal length for viewing the computer screen or ‘reading glasses’ also enable optimal head and neck position.

• Looking through the lower part of the lense to view the screen, results in awkward head and neck posture and should be avoided. If you have neck pain and are using progressive lenses with short distance viewing set at the lower part of the lense, you should consider new prescription glasses.

Lighting, glare and reflection

• If you experience lighting, glare or reflectance issues, you should contact the OH&S Unit (ext 52365). You will be directed to the appropriate specialist staff for advice.
Step 8: Laptop Use

- Laptop use is often associated with musculoskeletal problems. This is commonly due to the fixed position of the screen, keyboard and mouse in relation to each other, and the awkward postures that result.
- Using the laptop with an external keyboard and mouse enables independent adjustment of the controls and computer screen. This facilitates optimal posture and reduces injury risk.
- The keyboard and mouse should be optimally designed.
- Where ever possible desk top computers should be used in UQ offices, as this allows adequate screen size.
- Small laptop screens require increased repetition of mouse movements in order to view documents and may be associated with visual acuity and eye strain issues.
Step 8: Laptop use (continued)

The laptop workstation should be adjusted using the key steps outlined in this document.

Laptops with the following design criteria should be selected:

• Lightweight
• Sharp definition of screen
• A lightweight carrying case with handle and shoulder straps
• The capacity to plug in an external keyboard and mouse

Transporting a laptop computer: eliminate unnecessary equipment/materials from the case; use a wheeled luggage bag whenever possible. Avoid forcefully pulling, pushing or jerking the bag.

Travelling with a laptop: use pillows to raise your seating height or support the back, and separate keyboards and mice can often be borrowed from the hotel.
Step 9: Keyboard and Mouse design and placement

• The keyboard, mouse and any other controls should be placed within a comfortable reach distance so that the upper limb and spine are in a neutral working posture.

• A comfortable reach distance is usually within 35-45 cm from the elbow to the fingertips.

• The keyboard and mouse should be placed far enough onto the desk to allow forearm support, and close enough so that the shoulder, elbow and wrist approximate the neutral posture, as specified in Step 1.
Step 9: Keyboard design (continued) ...

The use of a conventional keyboard with a right-sided mouse can cause awkward right shoulder posture (abduction and elevation) if you have a small shoulder span. The awkward posture may cause neck, shoulder and upper limb strain, especially if held for long periods.

**If you use the mouse with the right hand, you should consider these options:**

- An alphabetical keyboard without the number pad. The row of numbers above QWERTY can be used instead. (eg a QBoard or a recently designed Mac keyboard)
- An alphabetical keyboard with a separate numerical keypad placed on the left side. (eg Goldtouch numerical keypad)
- An alphabetical keyboard with a left side keypad. (eg Evoluent keyboard)

These options will enable neutral shoulder position during right hand mouse use, and should be considered if you have a small shoulder span.
Step 9: Keyboard design (continued) ...

Using the mouse with the left hand with a conventional keyboard enables neutral left shoulder posture, as there is no left side numerical keypad. Changing to left hand mouse use will also reduce overuse of the right hand if you are right handed.

Awkward shoulder posture using alphabetical only or opposite side numerical keypad (e.g. Evoluent Keyboard)

Neutral shoulder posture using numerical keypad on same side as mouse
Step 9: Keyboard design (continued) ...

Keyboard angle and height
The keyboard angle should be kept low. This will help to prevent upward bending of the wrists, which is a risk factor for wrist strain

- Where possible slim/low profile keyboards should be used to promote neutral wrist posture.
- Awkward upward bending of the wrist with angled keyboard
- Neutral wrist posture with gel wrist support during use of a high profile keyboard
Step 9: Keyboard design (continued) ...

Split keyboard e.g. Goldtouch Adjustable Keyboard

• Conventional keyboards can require sideways bending of the wrist when keying. You may use a conventional keyboard without experiencing any musculoskeletal symptoms. However, if you use a conventional keyboard and have hand, wrist or forearm pain you should consider the use of a ‘split keyboard’ that can facilitate an optimal hand, wrist and forearm position.

Microsoft Natural Keyboard

• This moulded keyboard has a right side numerical keypad and this may require shoulder abduction for right side mouse use in smaller users. In the case that you have right side neck and shoulder symptoms, this split keyboard should only be used with a left side mouse. Left side mouse use enables neutral left shoulder posture due to the absence of a left side numerical keypad.
**Step 9: Keyboard design (continued) ...**

**Where to buy?**

- Although specific suppliers are not particularly recommended, suitable products were available from the following online stores at the time this module was developed:
  
Step 9: Keyboard design (continued) ...

Right hand use and overuse

- Right dominant people may have very high use of their right hand and arm, and this is considered to be an injury risk factor.
- The right hand is often used for alphabetical & numerical keying, mousing, writing and phone operation. If you are right hand dominant and have had a right hand, wrist, arm or shoulder strain or right side neck strain you should consider increasing your left hand use for mouse work.
- Changing between right and left hand mouse work is encouraged. Mice positioned at each of the side of the keyboard will enable this to occur. The right and left clicks on the mouse can be reversed by adjusting computer system preferences.
- Reducing use of the right hand and arm can prevent injury and reduce symptoms.
- Using the mouse with the left hand with a conventional keyboard enables neutral left shoulder posture, as there is no left side numerical keypad. Changing mouse to left hand will also reduce overuse of the right hand if you are right-handed.
Step 10: Mouse design and placement

Use of a well-designed mouse can help to reduce injury risk. Mouse design should be coupled with task variation, use of keyboard shortcuts instead of mouse use, and use of the non-dominant hand for mousing.

Regular / Ordinary mouse

• The regular mouse can require awkward posture and movement of the wrist and forearm: palm facing downward, sideways wrist movement, and wrist upward bending beyond 20 degrees. The awkward posture can increase injury risk.
• Use of a low profile regular mouse can minimise the upward bending of the wrist.
Step 10: Mouse design and placement (continued) ...

Vertical mouse (e.g. Evoluent or Minicute)

- The use of a vertical mouse can provide optimal forearm, wrist and hand posture and can be effective in reducing injury risk.
- The mouse is re-oriented so that the forearm is in the mid-position, and the hand uses a comfortable gross grasp.
- Sideways bending of the wrist can also be reduced for most people using the vertical mouse.
- Forward and backward bending of the wrist should be avoided and instead, relaxed whole arm movements should be used to move the mouse.
Step 10: Mouse design and placement (continued) ...

Vertical Mouse – small hands

- People with small hands may experience sideways bending of the wrist owing to the height of the standard sized Evoluent vertical mouse.
- In this case the Minicute mouse may be preferred: it is lower profile, suited to smaller hands and enables neutral wrist position.

Wrist rests

- A gel mousing platform can also be used, provided the wrist moves across the gel rest and whole arm movements are used rather than isolated wrist movements.
Step 10: Mouse design and placement (continued) ...

Where to buy?

- Although specific suppliers are not particularly recommended, suitable products were available from the following online stores at the time this module was developed:
Step 11: Document Placement

- Reading hard copy documents placed flat on the desk top requires forward bending of the neck and upper back. This is a risk factor for neck strain.
- Hard copy documents should be elevated and placed close to the midline of vision to enable neutral neck and head position. An angled reading surface / document holder can be placed close to the midline of vision, either between the keyboard and the computer screen or adjacent to the computer screen. Where there is limited desk depth, placement of the reading surface between the screen and keyboard may prevent forearm support so in this case the angled reading surface should be placed adjacent to the computer screen.
Step 12: Voice Recognition Software

- Voice Activation Software such as Dragon Naturally Speaking (Professional), is an effective means of reducing the use of the keyboard and mouse, and can reduce the risk of soft tissue injury associated with computer use.
- Use of voice activation software is strongly recommended for staff who have persistent musculoskeletal symptoms despite implementation of all other ergonomics modifications. Voice activation software is an effective injury prevention measure for staff who have very high computer usage during the course of their work at UQ.
- The software can be used with the full suite of Microsoft Office products.
- E.g. Dragon Naturally Speaking software,
Step 13: Touch Typing

- Touch typing can increase the efficiency of hand and wrist movements and will minimise the requirement for excessive neck flexion that is required to view the keys.
- There is a range of touch typing teaching software available for PCs and Macs.
Step 14: Telephone use

- Telephone headsets should be used by staff who frequently use the telephone and computer simultaneously. A telephone headset enables neutral posture of the neck and upper limb during phone and computer use, and is strongly recommended for frequent telephone users.
- When a conventional phone handset is used during computer operation, awkward head and neck postures result from cradling the handset between the head and shoulder. This is a significant risk factor for neck and shoulder strain.
Step 14: Telephone use (continued) ...

- Telephone Services (IT Services at UQ), should be contacted in relation to the selection and purchase of appropriate telephone headsets,

Additional information

Ergonomics Software

• Computer users often don't realise how long they've been sitting and working at the computer.
• Prolonged sitting at the computer and operation of the keyboard and mouse are risk factors for musculoskeletal injury.
• Ergonomic software can be used to monitor your keyboard and mouse use, and prompt you to vary your posture, tasks and to stretch regularly.
• However, care should be taken to move away from the chair and stand and walk during regular postural breaks.
• Alternatively, desktop calendars may be set to remind you to get up from the workstation regularly.
Additional information (continued) ...

Work organisation

• Job design to enable postural variation and movement. For example, position description could include computer tasks and reception counter tasks at separate workstations, or schedule tasks to balance computer based tasks with meetings or deliveries
• Ideally, vary tasks to enable changes between seated and standing and walking
• Design the tasks to enable postural variation and movement e.g. walking to meetings, discussions at a central meeting room instead of emails, using video conferencing software with a headset
• Anticipate peak workloads to ensure extra staffing or assistance.
Postural variation, stretching and movement

Working at a computer workstation for prolonged periods is considered to be a risk factor for musculoskeletal injury. It is important that workstation design and adjustment is coupled with regular movement of the body in order to offset the static loading effect on musculature and compressive forces on the spine.

The overall strategy for prevention of musculoskeletal injury should include the following additional measures to complement workstation design and adjustment:

• Relaxed posture
• Task variation
• Regular movement
• Dynamic backrest
• Workload management and prioritisation
• Stress management to reduce muscle tension and anxiety / psychological factors
• Constructive and harmonious working relationships
Regular Postural Variation

- Regular postural variation (e.g. changing between sitting, standing and walking for a few minutes every 30 minutes) is preferable to taking longer breaks less frequently (e.g. 10 minutes every hour).

- Regular variation between sitting, standing and walking is vital for back injury management and prevention.

- Gentle and regular mobilisation of the head, neck, shoulders, arms, hands and upper trunk is also a key injury prevention and management strategy.
Specialist Advice

In the case that an individual has special needs, the OH&S Division can be contacted for further guidance. Examples of special needs include tall or short stature, injury or a specific disability.

Strain injury

In the case that an injury persists despite implementation of appropriate risk controls, the Faculty/School OHS Manager should be contacted in the first instance. Where there is not a Faculty/School OHS Manager, the OHS Division should be contacted for further guidance.

Vision

Staff who experience problems with vision or headaches that may be associated with visual acuity problems are encouraged to attend an appointment with their treating doctor or optometrist in the first instance.
Ergonomics & Rehabilitation Officer

Ms Jolene Cooper
Bachelor of Kinesiology

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Self-Assessment Checklist

• A comprehensive guideline and a self-assessment checklist are available for use by UQ Safety Coordinators, staff and students.

• The documents can be downloaded from the UQ OH&S Unit website:
  – Computer Workstations: Design and Adjustment Guideline
  – Computer Workstations: Self-Assessment Checklist
Selection and purchase of computer workstation furniture and equipment

- The UQ Guideline for the “Selection and Purchase of Seating and Furniture” provides detailed information for the responsibilities, procedures and resources for the purchase of compliant workstation seating and furniture.


- All Schools purchasing new computer workstation furniture and equipment must follow this guideline.
Compliant seating and furniture

A range of compliant seating and furniture can be viewed on the P&F website, and tested at the associated Furniture Showroom by contacting P&F.

**P&F Furniture Section:**
Phone: 3365 9127
Email: furniture@pf.uq.edu.au

- The Ergonomics & Rehabilitation Adviser can also be contacted for further information about this topic.
Assessment

• You have now completed the University of Queensland Computer Workstations: Design and Adjustment training module.

• If you would like to revise any of the topics covered before you begin the assessment, please use the quick find index to navigate to a particular topic.

• You will be asked a set of randomly selected questions. The pass mark is 80%. You may repeat the test as many times as you require. Each time you attempt the assessment, you will be presented with a different set of questions.

Assessment location

• Please close this module and return to the OH&S courses main page. Select the relevant assessment to complete your test.