



Working with computers

More than half of all jobs involve the use of computers. In addition to the normal problems associated with computer use, there are often multiple tasks with different physical needs that are hard to reconcile. In this leaflet we advise on:

- adopting good posture for display screen based work,
- setting up a workstation,
- combining different tasks without compromising comfort, and
- buying office equipment.

Assessment against the 1992 Display Screen Equipment Regulations is a legal requirement.

General principles

Here are some of the general principles of working at computers comfortably:

- Reduce repetition
- Vary the work done
- Do the same task in different ways
- Take regular breaks
- Stick to neutral postures (see below: Postures)
- Tailor the job to each person.

Posture

Wrist and hand

Common causes of wrist pain are keyboard and desk height, keyboard tilt, keyboard off-centre and mouse use. The main causes of hand pain are a poorly designed or maintained mouse, or a keyboard needing a heavy touch.

The wrist should not be bent to left or right (deviation) and there should be as little bend up or down at the wrist (extension and flexion) as possible.

Neck

Common causes of neck pain are screen to one side, screen too low or too high, two-finger typing, wearing bifocals.

The neck should be evenly supported over the top of the spine without flexion or over-extension, or twisting to right or left.

Back

Computer-related back pain can only be resolved by a complete reassessment of the workstation.

The back should be supported and reclining slightly or upright. When writing it is more common to lean forward.

Shoulder and arm

Common causes of arm and shoulder pain are mouse and keyboard position.

The shoulder should be relaxed; neither raised nor brought forward. The upper arm should be close to your upper body. The elbow should be flexed at about 90 degrees.

Setting up your workstation

The setting-up sequence is:
seat ▶ keyboard ▶ screen ▶ footrest
▶ backrest ▶ mouse.

Each new user of a workstation will need to go through the steps below.

They can only be undertaken after you have chosen your desk: see the back page.

▶ Seat

Seat height should be adjusted so that, with your upper arms beside your torso, your forearms are horizontal when your hands are on the keyboard. A seat with a higher lift may sometimes be needed – or a major review of desk height.

▶ Keyboard

Keyboards should be at the front edge of the desk unless you use the keyboard rarely. Wrist rests should not be needed when the keyboard is in this position, and their use is often the result of other problems in layout. Wrists can be perfectly well supported by the shoulders. Some exceptions are described later.

▶ Screen

The screen should be straight in front of you. On a curved desk this should

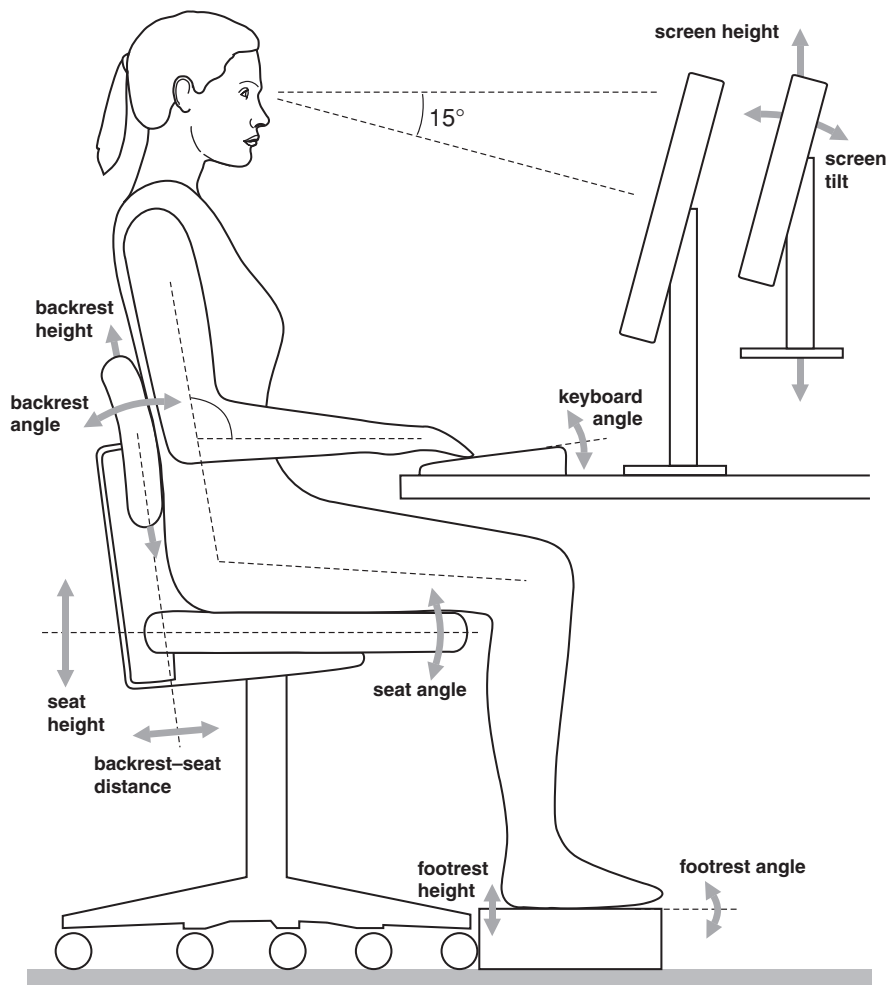


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be diagonally across the curve to give forearm support – see below.

Screen height should now be adjusted so that the top of the screen is at about eye level. The aim is to place the whole of the screen within the comfortable viewing range for the eye, i.e. from horizontal to an angle about 30 degrees down.

Some screens have height adjustment built in, but often the correct height can only be achieved by raising the screen to suit your own needs. Screen raisers should be purchased to allow this. A monitor placed on top of a processor is the right height for almost nobody.

Eye-to-screen distance should be adjusted so that screen image is comfortable to look at (with glasses, if worn): 600–650 mm is a good starting point. Screen tilt should now be adjusted. Software should allow

adjustment of the character size on the screen.

► Footrest

With the new seat and screen position, some workers need a footrest. This should be close to the chair base. It may need to fit over a chair 'leg'. Foot pedals for audiotypists will need to be placed on top of the footrest. Adjustable height is likely to be essential. A few chairs have a built-in footrest that is adjustable in height.

► Backrest

The backrest should now be adjusted in height, tilt and (if possible) shape, so that the pit of the back is supported. Long 'comfortable' seat backs may not adjust into this position. A

new chair with a more suitable – and often shorter – back may be needed. Backrests must be adjustable – no single position is good for everyone or for long periods of work.

► Mouse

The best position for the mouse is next to the keyboard. Forearm support with minimal movement of the upper arm away from the torso can be provided by a forearm support (purchased as an add-on) or by a curved desk. These design requirements must be met if the work involves a lot of precise click-and-drag operations. Occasional mouse work is less of a problem.

Combining tasks

Many of the problems experienced by desk-bound workers arise because computer use is combined with other activities, such as:

- speaking to clients,
- writing, examining patients, or
- using the telephone.

Where significant problems still remain, work rates and job variety should be adapted. There are solutions to most of the combinations. Here are some thoughts.

Computing and consulting

Arms on your chair are useful when you are speaking directly to a client, customer or patient, but will get in the way when you use the keyboard as described; consider whether they are necessary or a different shape of arm would be better. Achieving the same eye level as the person you are speaking to means lowering the seat below the best height for keyboard work; either change the seat height as you move from one activity to the other, or consider other keyboard positions.

Computers and glasses

The eyes' ability to focus on different distances deteriorates gradually. This loss of accommodation is most evident above the age of about 50. If you have reached the point where you have to wear glasses for reading, or need different prescriptions for reading and other work, computer-based work makes additional demands.

The principle of bi-, tri- or varifocals, or half-glasses, is of course that you look down to read or write, and look up for distance work – such as looking at, examining or treating a patient. When you add computers into the situation, a new problem arises: you have to look through the lower part of the glasses (by tilting the head back, with a risk of over-extending the neck) to be able to read a computer screen. To look at the keyboard, or at reference material on the desktop, you must then move your head down. This repeated nodding of the head is a recognised cause of neck strain. Lowering the screen so that it is below the ideal height provides only a partial solution.

You can avoid this specific problem if you get a special pair of single-prescription glasses for computer work. (Measure the actual distances from your eye to the screen, from your eye to the keyboard, and from your eye to the reference material, and give this information to your optometrist.) Glasses with this prescription may or may not also be satisfactory for reading and writing. However, other tasks that are part of medical or other kinds of work involve longer viewing distances, and therefore no single pair of glasses can suit all the various activities if your accommodation is limited.

Glasses obtained specifically for computer work should be paid for by the employer.

One solution is to place the keyboard and mouse on a tray that slides out from under the desk; this would be at a suitable height for use without readjustment. Trays can be added to desks, but they may get in the way when not in use.

The area beneath the desktop should be free from obstructions so that you can swivel round when moving from keyboard or writing to talking/examining. Old desks do not allow this and are unsuitable for combining keyboard work and talking to people face to face.

Computing and writing

The best seat height for writing is 2–3 inches (50–75 mm) lower than for computing. Most people lean forward and do not use the backrest

when writing. A sloping writing surface suits some people but may get in the way of other activities.

The ability to touch-type is always helpful, and can easily be acquired with the help of cheap or even free software.

Counter work

Many jobs involve standing at a counter, looking at a client, customer or patient and at a computer screen. Counter height should be high enough (or the screen raised high enough) to stand without stooping (be careful to avoid lighting reflections from the screen). The keyboard should be placed on a surface high enough to maintain relaxed wrist, arm and shoulder positions as described earlier.

If you have an existing musculoskeletal disorder

You could approach occupational health advisers in your GP practice for advice on equipment that would help you find comfortable solutions. A typical solution for someone with a chronic back problem in an office job is a sitting/standing desk with a foot control (less suitable for consulting).

Lighting

A common cause of awkward computer working positions is the need to avoid glare from windows or lights. The position of the computer on the desk can be modified, but try to keep the screen directly in front of you when using the keyboard. Natural lighting from windows should come from your left or right. Windows behind you or behind the screen will cause glare unless they have blinds in front of them.

There should be a reasonable match in brightness between background lighting and computer screen, with local task lighting available for reading hard copy. Lighting levels required for comfortable reading increase several fold with age.

What is a computer workstation?

The term 'workstation' covers all the various combinations of computer equipment that end-users directly interface with, and the working environment around them. A workstation includes a display monitor, a keyboard and usually a pointer manipulation device such as a mouse. A laptop computer also counts as a workstation. The terms 'VDT' (video display terminal) and 'VDU' (video display unit) are associated with older generations of computer equipment and are now avoided.

Choosing equipment

Desks

Desks should be roughly 700 mm high. Many standard desktops are higher than this, and not all chairs can be adjusted high enough to suit them.

Built-in desk surfaces are a potentially disastrous compromise designed to accommodate filing cabinets beneath them. The effect is to raise the desk height so high that special chairs and footrests with an additional three inches (75 mm) of height adjustment are needed. It's not worth it. Some built-in desks/worktops are too shallow from front to back to place the screen and keyboard in the right positions and will give no support to your forearm when using a mouse.

Under-desk drawers above the knees will also prevent you from reaching the correct working height. Avoid 'computer desks' unless they meet all your requirements.

Chairs

Office chairs should be fully adjustable for seat height, seat angle, back height and back angle. Shorter backs or backrests with inflatable pads provide more useful support than long backs. If keyboard work is only a small proportion of work done, then a larger back may give better support when speaking to patients, clients or colleagues – but it will not provide back support when typing or writing.

Arm rests on chairs almost always get in the way of the optimal keyboard positions described earlier, because they prevent the seat being placed close to the desk. Users then often sit forward and get back or neck pain as a result.

Footrests

Footrests should be horizontal, and adjustable to accommodate staff of different heights. All workers under

168 cm tall are likely to need a foot rest. Common sloping footrests encourage sitting forward without back support. **They don't work.** Audio-typists need a footrest on which the foot control can be placed.

Screen type

LCD ('flat screen') monitors generally give clearer images, and, being less bulky, allow more flexibility in desk layout. The ability to tilt the screen back by at least 15 degrees is desirable. Larger screens are advantageous if the pixels are simply larger: if they have higher resolution, i.e. more pixels, they bring no benefit unless the software allows the character size to be increased.

Screen raisers

The illustration (on page 2) shows LCD monitors of the smallest and largest sizes typically found. To achieve a satisfactory viewing position, the largest monitors sometimes need screen raisers, and smaller monitors almost invariably do. Screen raisers should provide easy height adjustment in steps of of half an inch to an inch (12–25 mm). If a workstation is used by staff differing in height, then an adjustable arm should be considered.

Mice and related devices

There are many variations on this theme. Mice are still preferred by most people. Staff must be able to choose one that feels comfortable and fits inside their hand without over-extension at the wrist and without requiring an excessively tight grip. Forearm support is important if your work involves a lot of mouse use and you do not have a curved desk. Simple, cheap, bracketed supports that fit on the front of the desk do the job.

With some software, especially 'draw' and 'paint' programs, a graphics tablet and pen may give a more relaxed hand position than a mouse. Some users even prefer this combination to a mouse for all computer work.

Keyboard

Standard keyboard designs are fine for most people. Splayed keyboards with the right and left keys angled so that the wrists are not ulnar-deviated (bent out away from the body) help people with existing wrist pain. Keyboards should have a low profile, i.e. with the 'home row' (ASDF...) no more than 30 mm above the desktop, and have adjustable tilt to suit individual users.

The best profile for keyboards is the 'sculpted' or 'dished'* profile. The 'stepped' profile of traditional typewriters is also good. Worst is the flat profile seen on laptops and now on many desktop computers too.

Laptops

If regularly used at work, these should have a detachable keyboard and a laptop rest. A separate mouse is often preferred to the built-in touchpad. Most laptops also accept an external keyboard, for better ergonomics.

Useful information

Additional information on various health aspects of computer workstations can be found via the Work and Health Information Gateway (www.whig.org.uk). For information on employers' duties under the Display Screen Equipment Regulations 1992, visit WHIG and search for **Display Screen Equipment**.

* This description applies to the overall layout of the rows of the keyboard. Concave ('dished') keytops are normal on all keys.