

Monitor Placement

The question of where to place a computer monitor is critical to users of Video Display Terminals (VDTs), especially those who use their machines for long continuous periods. There are two primary areas to consider when deciding where to place the computer monitor: visual comfort and head/neck/shoulder musculoskeletal comfort.

Visual Comfort

Most ergonomists estimate that upwards of 75% of computer users suffer from visual discomfort. Importantly, Dr. James Sheedy has stated that visual discomforts are also related to significant losses in productivity (Leavitt, 1995).

There are several visual comfort issues associated with monitor placement. However, two primary concerns are distance from the user's eyes to the monitor and the height of the user's eyes in relation to the height of the monitor.

Viewing Distance

The current ANSI HFS-100 standard (1988) requires a minimum distance of 12". The Occupational Safety and Health Administration (OSHA) guidebook recommends a viewing distance of 18-24", and the Canadian ergonomic standard promotes 13-28". However, there is really not a great amount of research literature in support of these recommendations.

Grandjean et. al. (1983) has reported that there is a user preferred eye-to-screen distance of 30" for VDT work. Most research on the resting point of eyes' accommodation finds the resting point to be slightly greater than 30". Also, many researchers believe that continuously holding a focus of less distance than the resting point of accommodation may contribute to feelings of eye strain.

It is, therefore, important to allow the user adjustability of viewing distance to the monitor by allowing appropriate space to move the monitor further away without causing the arms to extend forward to use necessary input devices.



Viewing Angle

Grandjean (1987) suggests that viewing tasks should be within a 30 degree vertical cone around the normal line of sight for comfortable eye movements. The normal line of sight is approximately 10 to 15 degrees below the horizontal plane. This would mean that the entire viewing surface of the VDT monitor should fall within the range of 30 degrees below the horizontal to 5 degrees above the horizontal. Grandjean states that anything outside of this range involves using the head's tilting mechanism.

However, this recommendation must be coupled with seated persons' preference for a 13-15 degree forward head tilt. Thus, the VDT screen should fall in the approximate range of 10-45 degrees below horizontal. It is important to note that this recommendation includes the bottom line of the screen.

Additionally, it should be noted that Bergqvist, Knave and Wibom (1994) have recently reported that VDTs placed as high as eye level were associated with various symptoms of eyestrain.

Musculoskeletal Comfort

It has been reported that extreme forward tilt of the head causes cervical spine compression to increase (Chaffin, 1973). Importantly, it has also been reported that only 4 degrees of neck extension (bending the neck back to look up) has been associated with increased muscle activity and muscle discomfort (Kumar, 1994). Finally, maintaining a sustained static posture of the head can cause discomfort (Grieco, 1986).

Therefore, the most sensible recommendation is to have the monitor placed below eye level, but not so far below eye level as to cause the user to bend the neck forward more than 15 degrees to see even the bottom line of the screen. Further, it is very important to allow (and, in fact, encourage) the user to assume a variety of seated postures while viewing their monitor. Such postures include the backward reclined posture recommended by ergonomists for maintaining the lumbar curve of the spine.

Recommendations for Monitor Placement: Practical Considerations

Given these eye comfort and head/neck comfort considerations, the monitor should be positioned so that the top line of readable print is at least approximately 10 degrees below horizontal eye level. This allows for both users' preferred forward head/neck tilt positions and the range of comfortable eye movements.





However, the monitor should not be so low that the bottom area of the screen is below 45 degrees below horizontal eye level, since this may cause an awkward, downward neck angle and/or the user's back and shoulders to be rounded forward.

There are also practical considerations for monitor placement. First, the height of the monitor should be easily adjustable by the user to that, if the user changes their posture throughout the day, they can make some minor height and tilt adjustments to remain comfortable. Users should be encouraged to change postures frequently and not hold their head in a fixed position.

The depth of the monitor support surface should also allow the user to adjust viewing distance without putting the arms in an extended position.

There must also be sufficient space in the area of the monitor for paper documents that must also be viewed. The failure to provide an adequate holder and space for documents can also result in poor neck postures or eyestrain.

The support surface for the monitor should not obstruct leg room. The user must be able to fully extend his/her legs under the workstation.

The monitor should be tiltable so that the user can adjust the screen for glare reduction. Research has demonstrated that users prefer positive tilt (i.e., a tilt **away** from the user's face), but at the same time the more positive the tilt, the greater the likelihood of reflections on the screen. Screens that are close to horizontal are very likely to result in reflections on the screen.

Glass or plastic surfaces between the user and the monitor screen (e.g., for glare control) should be avoided since, in fact, they may cause light to bounce between the surface of the screen and the secondary glass/plastic source.

References

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This paper was written for The Ergonomics Consortium by Dr. Carla Springer. Dr. Springer is a Board Certified Professional Ergonomist with M.A. and Ph.D. degrees in cognitive psychology and statistics from the University of Colorado. She has been an active participant on both national and international forums on VDT ergonomics, and is a member of the ANSI committee responsible for revising the HFES 100 standard for the VDT. Dr. Springer has been a member of The Ergonomics Consortium since its inception.

