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# Eye Control Hints and Tips

by

the Network of Excellence on  
Communication by Gaze Interaction

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# Environmental and ergonomic issues

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DART, Sweden 2007

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The content of this presentation is translated from, or inspired by the book *“Be active using a computer – possibilities for people with physical disabilities”* (Lidström and Zachrisson 2005)

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# Seating and positioning

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The use of computer in a good ergonomic way, requires a good seating and working position (ref. Lidström, H. Aktiv med dator).

# Functional sitting position



There are 3 core elements to good positioning:

- Stability
- Mobility
- Comfort

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For a good ergonomic position by people who are using a mouse and keyboard to control the computer, the key issues are stability, mobility and comfort :

- For good balance with a broad support a stable base is required. The seat and backrest of the chair should provide comfortable postural support, allowing occasional variations in the seating position. The seat back should provide a comfortable position with ample support for the lower back.
- The height of the seat should allow the user to comfortably place the entire sole of the foot flat on the floor or flat on a footrest.
- Armrests should be at a suitable height to provide a comfortable position that enables the shoulders and arms to relax.
- The mouse and keyboard should be positioned as centrally as possible.
- The screen should be positioned at a suitable distance (about 75 cm) and the top of the screen should be level with (or perhaps slightly lower than), the user's eyes.
- For comfort during extended periods of use, the seating needs to be flexible. The user should be able to change position whenever he/she wants.

# Ergonomics



For people with physical disabilities, follow the same ergonomic principles as for anyone else.

Apply the same basic principles of seating and positioning but adapt them to meet individual needs



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For a person with motor disorder, the principles are essentially the same, just modified in relation to the needs and abilities of the individual.

It must be remembered that the purpose of sitting at a computer is to achieve dynamic positioning and that is what we must try to enable people with physical disabilities to achieve too. When sitting, we should try to adopt a position that demands as little energy as possible. We should prioritise comfort and try to avoid pain or discomfort. A person with motor disability might not be able to move themselves and be forced to sit in the same position all the time. What kind of consequences might that have?

- Contractures and deformities
- Pain
- Reduced ability to be active and reduced ability to work for an extended period of time
- Increased fatigue and reduced comfort
- Increased risk of infections



An example of a bad ergonomic seating!

- The screen is too high
- The mouse is too far away
- No stable seating in the chair
- The feet are not positioned on the floor – giving you bad posture and poor balance



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This an example an example of a bad ergonomic seating.

The screen is too high and might cause neck pain. Also, the eyes might be irritated and the user will soon become tired.

The mouse is placed too far away, which might cause pain in the arm and shoulder.

There is no stabile seating in the chair, not enough support for the back and for the feet. The balance is bad, and it will be tiring after a short while. This could cause pain in the back and neck.



This is an example of a person who has the screen too high.  
Having to look up can make the eyes tense and tired.  
It can also cause pain in the neck.



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## Interesting findings with eye gaze ....



However...

when using an eye gaze system we have found that some users may benefit from having the computer screen a bit higher than is generally advisable

This may be because the user opens his/her eyes more when looking up, allowing the eye gaze system to recognise where the user is looking more easily...

... It is therefore important to be attentive to the user's neck to avoid pain.

**Use a good neck rest!**

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All new methods of computer access should be linked to an assessment of seating and positioning

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A new method of computer access often requires a reassessment of seating and positioning

When using an eye gaze system, compared with many other access methods, the user does not necessarily need to have as much controlled mobility and muscle function (strength, endurance and muscle tone) but, nonetheless, a good seating and working position is essential. From the experience of DART so far, a user who is hypertonic, for example, with a great deal of involuntary movement and perhaps unwanted reflex actions, often seems to be more relaxed when using an eye gaze system compared with other methods. However, if the eye gaze system does not work satisfactory and the user has problems with making the right choices, he or she may become more tense. This is why the use of appropriate software, personalised if necessary to meet individual needs and abilities, is so important.



An electric wheelchair can allow the possibility for seating to be easily changed



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Electric wheelchairs often provide good opportunities for easy adjustments of positioning and users are often able to change the seating by themselves. Thus, an electric wheelchair may often offer good ergonomic possibilities.

# Adjustable screen



- Giving more choice for comfortable positioning



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The stress on the spine is higher when sitting compared to when standing. To sit too long in the same position can be very demanding on the body. It is essential to be able to change position. The computer screen therefore needs to be adjustable for different sitting positions, including the user leaning backwards whether in an electric wheelchair or even lying in bed. This is particularly relevant when using an eye gaze system, as it often allows for a wider range of working positions.

## There are a wide variety of mounts



Examples of different kinds of mounting systems

# Light



- Consider the positioning of the screen
- Avoid reflections and direct sunlight



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Think carefully about where you use your eye control system!

Consider the positioning of the screen. It is best if there is daylight coming in from a window at the side rather than directly in front. Therefore, avoid positioning the computer so that the user is directly facing a window. The user will have too much light coming into his/her eyes and, because the eyes must change in order to compensate for this, the system might not be able to interpret their eye movement as easily. Also, avoid having a window behind the user, as the light will reflect from the screen.

Using an eye gaze system outside in direct sunlight, coming directly onto the screen or into the user's eyes, might also cause problems. Eye gaze systems that are using infrared lighting will be effected by light that contains infrared (IR). Sunlight contains infrared, as well as direct light from some light bulbs, especially if the light comes directly into the user's face or into the system's camera. It is better if the light is indirect and/or comes from the side.

# Summary



- Use your knowledge of ergonomic issues whether or not the user has disabilities
- Use some kind of protocol or check list
- A good sitting position is essential for making special access methods successful
- Consider the benefits of having a good chair, an adjustable height table, appropriate lighting and the ability to reposition the computer screen
- Inform and educate the user and others in the environment
- Use video and photos to help you to evaluate your success
- Continuously follow up the effectiveness

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## References:

- Lidström, H. and G. Zachrisson, Eds. (2005). [Aktiv med dator - möjligheter för personer med rörelsehinder.](#) Stockholm, Hjälpmedelsinstitutet.
- <http://www.osha.gov/SLTC/etools/computerworkstations/index.html>



# For more information...



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For more information about eye control, see [www.cogain.org](http://www.cogain.org)

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