

## The importance of forearm support and sources of mouse pain

It is important to relieve the load on shoulders and arm. This in view of the required effort to move a non supported arm for example when operating a computer mouse.  
Note, the weight of an arm is substantial.

We therefore advise to use either arm rests to support the forearm or to put the arm on the desk top, for example  $\frac{3}{4}$  on the desk top and  $\frac{1}{4}$  over the edge of the desk.  
The hand can then be comfortably supported by the body of the HandShoe Mouse.  
Minimal effort is then required to move the mouse by means of forearm and hand.



motion of forearm and hand



supported forearm, o.k.



reaching, not o.k.

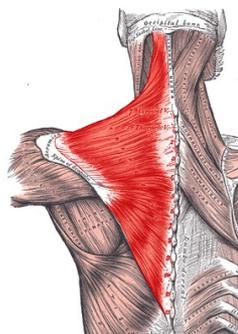
It is also important to sit in a comfortable fashion. The backrest of a chair should be at an angle of around  $110^{\circ}$  with respect to the seat of the chair, while the seat is at  $0^{\circ}$ .  
The latter to prevent sliding.

The following video tells all about it:

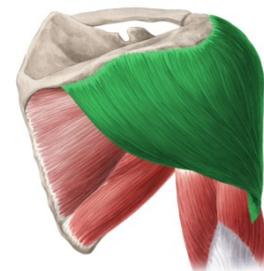
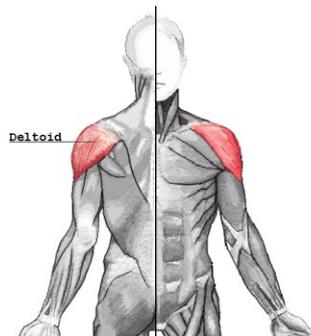
<http://handshoemouse.com/news/ergonomic-mouse-stop-reaching/>

### Activity of Trapezius and Deltoid Muscles

One should realize that arm and hand activities have an effect on the Trapezius muscle.  
However, there is only a partial influence on the Deltoid muscle for example when reaching.  
So to prevent unnecessary muscle loads one should support forearm, hand and fingers.



Trapezius muscle



Deltoid muscle

### Forearm position

Studies have shown that unnatural forearm positions, supination angles of over  $25^{\circ}$ , the so called neutral or handshake position, will introduce unnecessary loads. Restricting the supination angle by means of a supporting body for the hand of around  $25^{\circ}$  prevents this.

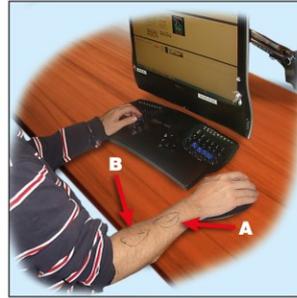
<http://handshoemouse.com/news/use-of-ergonomic-mouse/>

### Wrist action versus wrist snap

As addressed, minor movements from the wrist are OK but to “snap” the wrist sideways is detrimental. The following image of an arm with points indicated by A and B reflects muscle irritation due to excessively moving the hand sideways (wrist snap).



motion of forearm and hand, ok



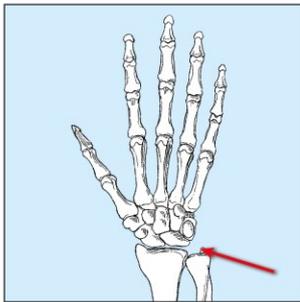
Extensor Digitorum muscle (A)

Extensor Carpi Ulnaris muscle (B)

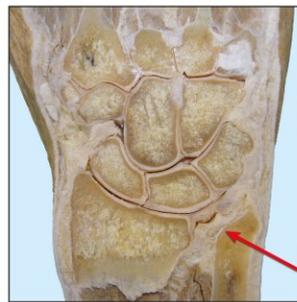
In line with the above it should be noted that wrist supports act counter productive for forearm motion will be restricted resulting in excessive wrist (snap) motion.

<http://handshoemouse.com/news/ergonomic-mouse-forget-wrist-support/>

The effect of aging in combination with wrist snap can be dislocation of the Articular Disc.



Position and status of Articular



Discdislocation of Articular Disc

Other sources of mouse pain are presented in the following video:

<http://handshoemouse.com/news/what-causes-mouse-pain/>

## References

<http://www.handshoemouse.com/dnld/Ergo-Expo-Webinar-slides-Paul-Helder-2014.pdf>

Publication by Bart Visser et al in *Clinical Biomechanics* 15Supplement No 1, 2000, S34-S38  
*"The effect of arm and wrist supports on the load of the upper extremity during VDU work."*

### Results

Lower levels of trapezius muscle activation were recorded with the use of arm supports. Wrist supports did not reduce activation.

### Conclusions

Reduction of muscle activation in the neck-shoulder region during standard visual display unit work can be achieved with arm supports. Wrist supports do not reduce the strain on the neck-shoulder region. Subjective ratings seem not of use in selecting ergonomic aids in low intensity tasks.

Visual display unit workers are at risk of developing complaints of the neck and upper extremity. Arm and wrist supports are introduced at the workplace to reduce the workload. If arm and wrist supports are effective in reducing the workload they might be of use as preventive measures to reduce the risk of neck-shoulder complaints.

Publication by professor Han-Ming Chen et al in *Clinical Biomechanics* 22, 2007, 518-523  
*"The effect on forearm and shoulder muscle activity in using different slanted computer mice"*

### Summary

Background information on how to work in a comfortable position is provided, for example the positive effects of a slanted mouse (palm supporting area at an angle of 25° or 30°).

Forearm and shoulder muscle activity will reduce in this position.

Increasing the slanted angle will result in a larger wrist extension and thus higher muscle activity.

Working with hand and forearm at a suitable slanted angle provides a more neutral hand position, so forearm and shoulder muscle activity will be reduced.

Publication by Onyebeke LC, et al. *Applied Ergonomics* 2013 Sep 18

*"Effects of forearm and palm supports on the upper extremity during computer mouse use."*

### Summary

The use of forearm support compared to the no support condition was significantly associated with less shoulder muscle activity and torque, and the raised palm support was associated with less wrist extension.

Participants reported less musculoskeletal discomfort when using a support.

It should be noted that some aspects addressed in this paper must also be looked at from the perspective of findings by other researchers presented in this overview of publications.

Publication by Bjarne Laursen et al in Int J Occup Saf Ergon. 2001;7(2):179-93.  
*"Shoulder muscle activity in young and older people during a computer mouse task."*

### **Conclusions**

Shoulder muscle activity during computer work is affected by age, but only to a minor extent by the type of computer mouse task. The deltoid and the trapezius muscle activities are low during computer mouse use when there is efficient forearm support by the table.

Publication by Danuta Roman-Liu et al in Clinical Biomechanics 2000;15 Suppl 1:S30-3.  
*"Assessment of the musculoskeletal load of the trapezius and deltoid muscles during hand activity."*

### **Abstract**

The purpose of the study was to analyse the influence of the precision of a task on tension and fatigue of the trapezius and deltoid muscles. Ten young men took part in experiments. Different levels of force and different frequencies of pressing a button defined the precision of the task. Surface electromyography (EMG) was used.

Muscle tension and fatigue were reflected by 2 parameters of the EMG signal: the Root Mean Square amplitude related to the maximum value and changes in the Median Power Frequency.

The results showed that hand activities influence the descending part of the trapezius muscle and do not influence the deltoid muscle, and that the precision of work can influence the examined muscles of the arm and shoulder even during work in which only the hand is involved in a performed task.

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