The Effect of Mouse Location on Seated Posture

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To understand the effect that mouse location has upon seated posture, twenty subjects performed a mousing task. The position of the torso and upper extremities were monitored during the task for three separate locations of the mouse. The upper arm angle of the subjects was found to be related to mouse location, and torso angle was found to be independent of mouse location.

1. Introduction

Knowledge workers who spend a lot of time using the computer, often assume a seated posture similar to that of driving an automobile. The physiological benefits of reclining while sitting include reduced back muscle activity, and reduced lumbar disc pressure (Andersson et.al. 1974).

Minimizing upper arm elevation is also important when working in a seated posture. In Sweden, regulations assert that arm elevation below 30° over a working day is not considered to be harmful. Even when arm elevation remains below 30° during the main portion of the working day, neck and shoulder disorders don’t decrease over time (Fernstrom and Ericson 1996).

Achieving a reclined seated posture and minimizing upper arm elevation is often difficult when performing intensive mousing tasks. Observation has shown long periods of strenuous working postures for ‘mouse’ operators compared to ‘non-mouse’ operators (Karlvqvist, Hagberg and Selin 1994).

The hypothesis that a mousing location close to the torso will result in less reaching and more reclining was examined in this study.

2. Methods

Ten female and ten male subjects performed a predominately mousing task for 25 minutes at each of three locations of the mouse. All subjects were right
handed. The reach and recline components of posture were determined by orthogonal photography, taken at one minute intervals.

The subjects mean age was 30.0 years (SD = 10.3), their mean stature was 174.7 cm (SD = 8.6), and their mean weight was 74.2 kg (SD = 16.4).

The subjects were marked at surface points relating to joint center locations of the hip, (slightly anterior to the tip of the femoral trocantor); elbow; wrist; glenohumerus; and the C1 spine; The torso link was defined as hip-to-C1. The upper arm link was defined as glenohumerus to elbow, and the forearm link as elbow to wrist (see figure 1).

![Figure 1](image)

One 35mm camera was positioned parallel to the sagittal plane to the right of the subject. The center of the lens of the camera was 102cm from the floor, and 3.05m from the subject. The camera was positioned behind a one way mirror.

The task was to find specific information within a computer on-line service, cut the information from the service, and paste it into a word processing software.

The mouse pad was 20.3cm square. The left/front corner of the mouse pad was located 25.4cm to the right of the centerline of the computer screen. The first location of the mouse pad aligned the edge of the pad closest to the user with the front of the monitor screen. The screen was located 33.0cm from the front edge of the work surface. The second mouse location was 25.4cm in front of the first, and the third location the same distance in front of the second (see figure 2). The order that the subjects worked at each location was counter balanced.
The work station included a height adjustable work surface, a height adjustable monitor stand (if requested), and a highly adjustable task chair. All subjects were trained to use the equipment, and encouraged to adjust the work station to fit them.

The Nordic questionnaire (Kuorinka et. al. 1987) for analysis of musculoskeletal symptoms was administered before each subject's work session, and immediately after the session for each location of the mouse.

3. Results

A 3(mouse location) x 24(time) repeated measures analysis of variance (ANOVA) indicated that mouse location had a significant effect on the subjects reach angle [$F(2,20) = 32.5$, p<.001]. The reach component, as defined by upper arm angle was shown to approach vertical as the mouse location moved toward the torso. The relationship is shown in figure 3.

The recline component, as defined by hip-to-C1, was statistically independent of mouse location.

There was no significant discomfort associated with any of the mouse locations.
3.1 Discussion

Observing the subjects during testing suggested that their preferred torso postures were predominant over mouse location. Those who preferred to recline, found a way to do so, and those who sit upright, also. The correlation between mouse location and upper arm angle was strongest within subjects, as recliners held their upper arm more horizontal than upright sitters.

References


