O-6-2

DIRECT MEASURES FOR EXPOSURE ASSESSMENT OF MSD PHYSICAL RISK FACTORS FOR COMPUTER USERS

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INTRODUCTION

Prolong duration of computer use is the most consistent risk factor identified for computer-related musculoskeletal disorders; however, there is strong evidence supporting postural components. (Gerr et al., 2006). There is debate among researchers and practitioners whether simple static postures or the more dynamic repetitive motions are associated with MSD outcomes. For example, Serinia et al. (1999) measured in the laboratory setting that the velocities and accelerations of the wrists were similar to those observed in high risk industrial jobs. Unfortunately, little field data exists on the direct measures of dynamic components due to the complex nature of the direct measures. Therefore, our goal is describe a field system and present preliminary data combining our direct measures of posture with our direct measures of computer activities to estimate the dynamic components associated with computer users.

METHODS

We have developed a system that continuously and directly measures wrist posture, keyboard typing force, and mouse grip force. We utilize a portable data logger and electrogoniometers for wrist posture, a custom designed strain-gauged force plate to measure typing forces, and a modified MicroSoft mouse with embedded strain gauges to measure the forces of the thumb. In the laboratory we measured 30 subjects to determine the difference in wrist dynamics between keyboard and mouse intensive tasks. The wrist posture was recorded at 20 samples per second and were then filtered and digitally differentiated to determine wrist velocity and acceleration values.

In addition we have developed an integrative program that directly measures the duration and characteristics of each keystroke, mouse movement, and mouse button activation. In the field, we measured the mouse and keyboard usage patterns of 20 office workers for a half day (four hours). From the directly measured keyboard and mouse activities we determined the duration of mouse, keyboard and computer usage for these 20 office workers and then calculated a time-weighted average for the acceleration of the wrist during the observational period.

RESULTS & DISCUSSION

Wrist accelerations were significantly higher during keyboard activities (291 deg/s/s) compared to mouse activities (67 deg/s/s). See Dennerlein and Johnson (2006) for details. A range of mouse and keyboard use existed among the 20 field participants (Figure 1). The calculated time-weighted averages for wrist acceleration were not strictly co-linear with computer duration (Figure 2). These data suggest that the variability of computer duration and of the dynamic component can be considered potential independent factors in the epidemiology of computer risk factors, thus providing an opportunity to explore hypotheses related to static and dynamic postures and MSD outcomes.

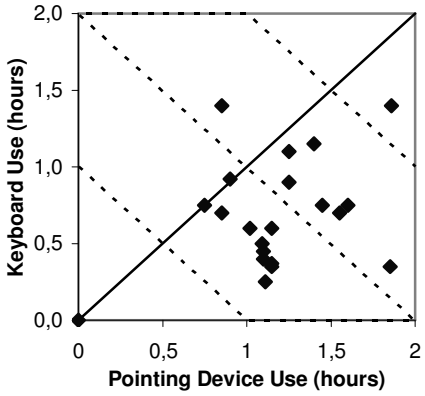

Figure 1: Usage duration patterns (N=20)

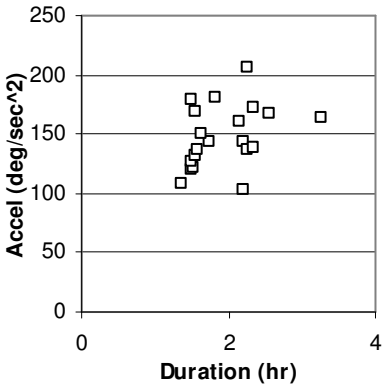

Figure 2: Wrist acceleration values (N=20)

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