

ABSTRACT

An Ergonomic Evaluation of the Design and Performance
of Four Keyboard Models and Their Relevance to
Carpal Tunnel Syndrome. (December 1993)

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This study examines the effects of four keyboard designs, including a horizontally split keyboard (Kinesis), a vertically oriented keyboard (Comfort), a keyboard with a contoured wrist rest (Wave), and a traditional IBM keyboard, on various carpal tunnel syndrome (CTS) physiologic measures, performance, posture, and discomfort. In addition, users' subjective evaluations of the keyboards are evaluated.

Twenty female touch typists with CTS and sixteen normal touch typists participated in the study. Physiologic measures of nerve conduction velocity, vibrotactile sensitivity, digit tip temperature, hand strength, and hand volume were taken before and after each typing session. Posture was evaluated based on video recordings. Post-use discomfort and keyboard evaluation surveys were administered for subjective assessments. The material typed with each keyboard was assessed for speed and accuracy performance.

Results of this study found no significant differences among the keyboards in terms of the physiologic measurements.

Significant postural and comfort differences were found among the keyboards, with the alternative design keyboards reducing wrist deviation. The Kinesis keyboard best approximated the desired neutral wrist posture and received the highest comfort ratings.

No significant differences among the four keyboards were found in performance, although accommodation occurred in a shorter period with the Comfort keyboard which retained much of the traditional keyboard layout.

Subjective evaluations found users prefer the traditional keyboards, even though these keyboards are rated as less comfortable. Familiarity was cited as the most important reason for the keyboard preferences.

Significant changes in digit tip temperature over time were found, with a decreasing trend in both groups. This decreasing temperature resembles the vibration related occupational Raynaud's syndrome. It appears that the repeated tissue vibration created at the end point of the keystroke stresses the nerve and causes vasospasm. This phenomenon may be contributing to the development of CTS. Any redesign of a keyboard must address the mechanical characteristics of the keystroke as well as posture.