Longitudinal Study of the Effects of an Adjustable Ergonomic Keyboard on Upper Body Musculoskeletal Symptoms

Alan Hedge et al.
Cornell University, Dept. Design & Environmental Analysis, Ithaca, NY 14853.
Research Team

- Mark Goldstein, Goldtouch technologies Inc.
- Lawrence Hettinger, Northrop Grumman Information Technology
- Cari Varner, Cornell University
- Don Silva, Blue Cross Blue Shield
- Jean Malafonte, Blue Cross Blue Shield
- Chuck Goodyear, Goodyear Statistics

Keyboard Design Issues

- Conventional keyboards – keypad is linear and can encourage ulnar deviation

Keyboard Design Issues

- Splayed keyboards – keypad is halved and each half laterally rotated to minimize ulnar deviation

Keyboard Design Issues

- Tented keyboards – keypad halves are angled to an apex to minimize wrist pronation

Keyboard Design Issues

- Fixed designs – splay and tent angles are fixed
- Adjustable designs – splay and tent angles are adjustable
Alternative Keyboards Field Studies

- Tittiranonda et al. (1999)
  - Tested 4 keyboards with 80 users for 6 months (20 per kbd)
  - Results most positive for kbd2 (adjustable), but 9 dropouts from sample – unreliable results
  - Kbd1 & 3 showed some improvements in pain compared with control
  - Users may experience decreased hand pain after several months of using alternative geometry keyboard

Research Issues

- Does the use of an adjustable keyboard over an extended period of time result in an effect on symptoms of upper body musculoskeletal disorders (MSDs)?

Research Study

- Site – large, urban insurance office
- Subjects – 80 subjects selected and allocated into 2 groups based on results from a wellness survey. Subjects matched for age, gender and initial MSD reports.
  Complete data for 73 subjects:
  - Test group – 37 subjects
  - Control group – 34 subjects

Research Design

- Baseline survey – all subjects completed an initial survey of computer use and MSDs.
- All subjects received instruction and guidance on setting up their office workspace (chair use, desk surface height, etc.)
- Control group – no other intervention
- Test group – subjects provided with an adjustable keyboard and given some instruction on how to adjust and use this keyboard.

Adjustable Keyboard

Test keyboard with adjustable splay and tent angles
Adjustable Keyboard

- Test keyboard with adjustable splay and tent angles

Research Measures

- Baseline survey results
- Weekly “keyboard evaluation survey” results gathered for both groups for a 6 months period
- Terminal Interviews - Test subjects were interviewed at the end of the study

Results

- Data from a total of 1,442 surveys were analyzed.
- Subjects in both groups were full-time keyboard users (median weekly keyboard use = 30 hours).
- Over the course of the study MSDs were reported by all users:
  - 50% lower back pain
  - 43% neck pain
  - 40% shoulder/forearm/wrist pain

Mean Keyboard Comfort Ratings

- No significant difference in comfort ratings at the 0.5 level after 6 months

Effects on MSDs

- 6 month MSD ratings were compared with those at baseline
- No significant changes in MSDs were found for the control group
- Several significant changes were found for the test group

Test Group MSD changes (P<0.05)
(1=great discomfort…..7=great comfort)

Terminal Interviews and Post-study Behavior

- Over 80% of test groups subjects were enthusiastic about their use of the adjustable keyboard by the end of the study.

- 36 of the 37 subjects were continuing their use of the adjustable keyboard at 6 months after the end of the study.

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Conclusions

- Upper limb musculoskeletal discomfort ratings showed some significant improvements with the use of the adjustable keyboard by the end of the study.
- Keyboard comfort ratings were not substantially higher for the adjustable keyboard than the conventional keyboard.
- Results agree with those of Tittiranonda et al. (1999) that beneficial effects of some alternative keyboard designs may appear after longer-term field use.