

## CPH News and Views

*A semi-monthly column on emerging topics related to healthy workplaces*

### **Issue # 42: Alternative computer input devices: Implications for musculoskeletal symptoms**

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Using ordinary computer keyboard and mice input devices may cause musculoskeletal symptoms [1]. Various new devices, which are marketed with the claim that they will reduce or prevent musculoskeletal pain, have become available. Are these alternative devices effective?

Many alternative computer keyboards and mice have been evaluated for effects on the musculoskeletal system [2]. One common alternative to a conventional computer keyboard is the split geometry keyboard, which consists of two halves that can be separated and inclined to different angle (Figure 1)[3]. Common alternatives to conventional computer mice include a trackball, a vertical mouse, a touchpad, a pen, a trackpoint, and a roller bar mouse, which each have different body designs (Figure 2, 3)[4]. Other types of alternative computer keyboard and mouse devices are also available on the market, but these have not been evaluated for their effects on the musculoskeletal system in research studies.



**Figure 1** A split geometry keyboard[3].



**Figure 2** A vertical mouse[4].



**Figure 3** Keyboard with a roller bar mouse[4].

Split geometry keyboards have been beneficial for preventing musculoskeletal symptoms. Split keyboards permit typing with more neutral forearm posture and lower muscle activation, which may help to prevent musculoskeletal symptoms and disorders. Workers using split keyboards had less upper extremity pain and developed fewer new symptoms than those using traditional keyboards in previous studies as reviewed by Rempel et al.[5]. However, users should note that the split geometry is beneficial only to a point; extreme changes in keyboard separation or inclination can adversely affect posture, muscle activation, and productivity [6].

There have been few studies investigating the relationship between any alternative mouse design and musculoskeletal symptoms, and results have been inconclusive among the research completed so far. The trackball and vertical mice were associated with fewer musculoskeletal symptoms in previous studies [7,8]. There is mixed evidence as to whether or not beneficial changes in posture and muscle activation occur with use of alternatives to the standard computer mouse, with the roller bar mouse being the most consistently associated with improved postures and reduced muscle activation [2,9].

In addition to alternative computer keyboard and mouse input devices, “gestural interfaces,” including multi-touch gesturing, have recently been developed. Multi-touch gesturing allows users to interact with computers via motions of their fingers or hands such as pinching, tapping, or scrolling [10]. There have been few studies of the effects of gestural interfaces on musculoskeletal symptoms, postures, or muscle activation. Some research suggests that this

technology may lead to fatigue due to higher muscle activation and non-neutral posture requirements and therefore the technology may be unsuitable for general replacement of other input devices[11].

Many factors other than keyboard and mice devices can affect musculoskeletal symptoms among computer workers. For example, psychosocial factors such as job demands and time pressure are also associated with musculoskeletal problems in computer users [12]. Therefore, changing only the devices may not be as effective for improving musculoskeletal health as a comprehensive intervention addressing work organization.

### Conclusions

- Split geometry keyboards can be beneficial for preventing musculoskeletal symptoms.
- Alternative mouse devices, especially the rollerbar mouse, might reduce users' musculoskeletal symptoms, but more research must be done to assess their effectiveness.
- Designers of gestural interface technology should consider its musculoskeletal implications for future iterations.
- Changes to computer input devices should be considered as part of comprehensive ergonomic interventions aimed towards improving musculoskeletal health.

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