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Input Device Research for Digital Pathology. An Ergonomic Outlook

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Introduction/ Background

Digital Pathology represents a technological innovation that introduces changes in the traditional work of pathologists. In this regard, an important issue that has not been enough emphasized is the image handling from an ergonomic point of view to avoid work-related musculoskeletal disorders (MSD).

Aims

The aim of this study was to investigate a proper input device for digital pathology.

Methods

Research was conducted in two phases: 1. Comparative study to find an optimal external controller. Eight medical students analyzed 11 input devices: keyboard (HP), conventional mouse (HP), vertical mouse (CLS), touchpad (Logitech), 3 trackballs (Logitech, Kensington Expert and Ulove), Rollermouse (Contour), Ergopointer (Märzhäuser Sensotech), gamepad (Logitech) and a touchless device (Leap-Motion), using them with the Image Viewer software (Ventana). The web-based Fitts' law test (UC Berkeley) was used to objectify the accuracy of each device, randomly. 12 items were included in the questionnaire: comfort, technical aspects (cursor movement and objective achievement), prospects, overall satisfaction, prior experience, and others. 2. Evaluation by two experienced pathologists (MPR and ANO, 55 and 50 year-old, respectively) the best rated input device and comparison with a voice recognition system (Invox Medical Dictation) using a headset microphone (Plantronics), rating perceived workload using NASA Task Load Index with 28 whole slide images. Digital Image Hub (Leica) with a 4 MegaPixel display (Barco) was used. Data were processed with SPSS 21.0.





Results

Correlation between technical aspects of the evaluated devices and accuracy (Fitts' law test), and comfort with overall satisfaction existed ($p < 0.05$). The assessment concluded that vertical mouse was the best rated input device. However, it has a slightly higher perceived workload in comparison with the voice recognition system, which was the proper controller for digital pathology in this study.

Conclusion: We describe a methodology that can study and compare input devices for future workstations in digital pathology. Pathologists should be involved in this process trying to find ergonomic devices that prevent MSD. Voice recognition can function as a good handsfree device for digital pathology and could be considered in physical disability situations. Further studies using electromyography, accelerometry and 3D reconstruction analysis could provide additional ergonomic information.