



February 2004, Vol. 6 Issue 1

| [Volume 6 Issue 1](#) | [Past Issues](#) | [A-Z List](#) |

Usability News is a free web newsletter that is produced by the Software Usability Research Laboratory (SURL) at Wichita State University. The SURL team specializes in software/website user interface design, usability testing, and research in human-computer interaction.

[Barbara S. Chaparro](#), Editor

Evaluating the CombiMouse™: A New Input Device for Personal Computers

[Jeremy Slocum](#), [Shelby Thompson](#), [Barbara Chaparro](#), and [Michael Bohan](#)

Summary: The CombiMouse™ is a new input device for personal computers that combines the functionality of a keyboard and a mouse into one device. Preliminary results of first-time usage indicate the device to be very promising. CombiMouse performance was shown to be just as efficient as the traditional mouse and significantly more efficient than the track ball and another novel input device. Typing performance was not as fast as the traditional keyboard, though users reported they would improve with practice.

INTRODUCTION

Intensive mouse and keyboarding use has been associated with increased risk of upper extremity musculoskeletal disorders (see Fagarasanu & Kumar, 2003 for a review). As a result, input devices (e.g. ergonomic keyboards, trackball or joystick) are often recommended as a therapeutic intervention. However, use of these alternative devices may result in a trade-off between comfort and performance.

The [CombiMouse™](#) is an alternative input device¹ that combines the functionality of a keyboard and a mouse into one device. The CombiMouse consists of two units, much like a split-keyboard, in which the left hand unit (LHU) is a stationary device with keys that are typically used by the left hand, while the right hand unit (RHU) contains keys typically used by the right hand but also is mobile and serves as a mouse. To change the RHU to mouse mode, the user grips the RHU touching a proximity circuit that detects finger contact. This cancels out the keyboard functions and allows it to act as a mouse.



The purpose of the current pilot study was to evaluate the CombiMouse as a pointing device and as a typing device. User performance with the CombiMouse was compared to a traditional mouse and

two other alternative pointing devices (trackball and RollerMouse™) (Slocum, Bohan, & Chaparro, 2003). User performance was also compared to the traditional keyboard.

METHOD

Seven right-handed, touch-typists were used in this study. First, participants were asked to perform a point-and-click task that represents the type of action typically performed using pointing devices. The task required the participant to click the left button on the device to bring up a target on the screen. Once the target appeared, the participant moved the cursor into the target as quickly and accurately as possible, and clicked inside the target to end the trial. When the trial was completed the participant was required to click again to bring up the next target. Targets were presented at distances of 12.5mm, 50mm, and 200 mm, sizes of 3mm and 6mm, and angles of 0°, 60°, 90°, and 120°. Participants completed 2 trials for each combination of conditions for practice and 10 trials for the data collection.

In the second phase of the experiment, participants were given two text passages (2 paragraphs in length) to introduce them with the functionality of the CombiMouse. This was followed by five two-minute typing trials with each device, the CombiMouse and traditional keyboard.

RESULTS

Mousing

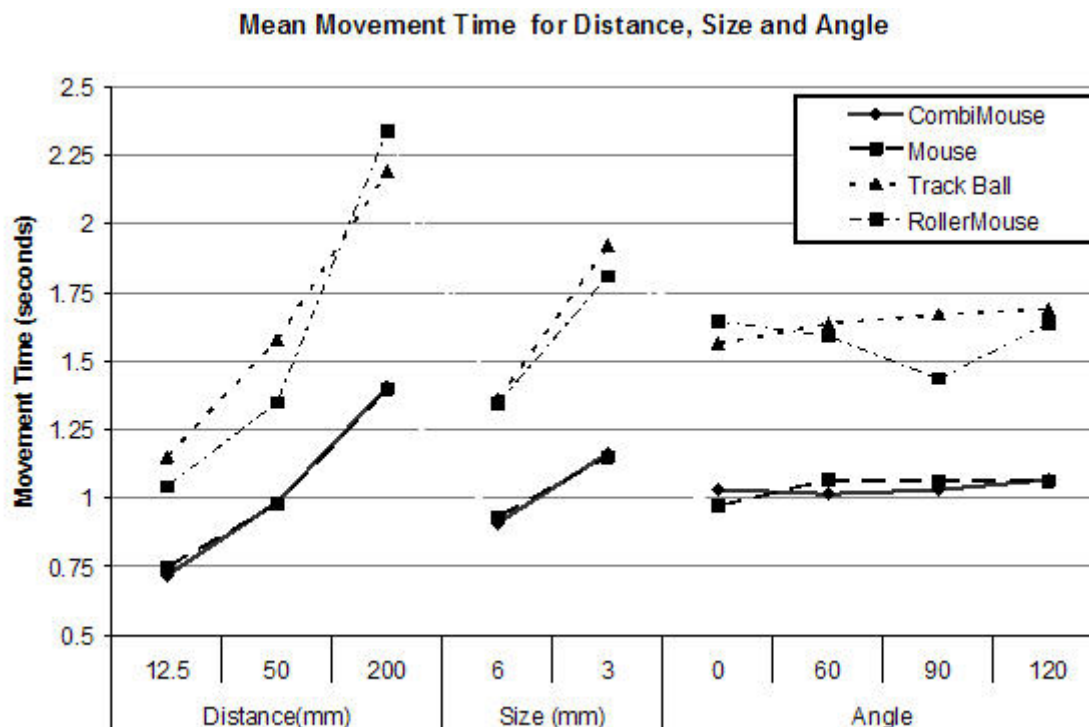


Figure 1 shows a plot of mean performance for each device separated by distance, target size, and angle. A one-way ANOVA comparing the CombiMouse data to previous data collected on input devices found a significant main effect for device. A post-hoc pairwise comparison indicated that the CombiMouse was significantly faster than both the RollerMouse and the trackball. There was no significant difference between the CombiMouse and the traditional mouse.

Typing

A paired samples t-test was completed comparing net words per minute (gross WPM x percentage of errors) of the traditional keyboard to the CombiMouse. The traditional keyboard was found to be significantly faster than the CombiMouse. However, as shown in Table 1, the mean difference between the devices was only 14.45 net WPM. The typing program used for the evaluation provided feedback on keys that were problematic for the users (i.e., resulted in error rates higher than 25%). While no specific keys were problematic across all users, 36% of the problem keys identified were capital letters, most likely resulting from a faulty Right Shift key on the test prototype.

Device	Trials					Mean
	1	2	3	4	5	
CombiMouse	27.86	31.71	31.86	32.14	33.00	31.31
Keyboard	40.71	47.43	44.43	49.71	46.57	45.77
MD						14.46

DISCUSSION

As a pointing device the CombiMouse performed very well when compared to other input devices. It performed just as efficient as the traditional mouse and significantly more efficient than the track ball and the RollerMouse. As a keyboard, the CombiMouse performed well, but results showed that the participants were significantly faster typing with the traditional keyboard. This is not surprising given the fact that users had little practice with the new device.

In general, subjects enjoyed using the CombiMouse and made comments such as, "This could be very useful," or "I like that it takes up so little space." All subjects stated that they believed the device performed well as a keyboard and as a mouse, and they believed that their typing performance would improve with practice.

Results of this study are limited because of the small sample size and the small amount of practice users had with the CombiMouse. Further research investigating keyboard performance after extended training as well as varying levels of typing ability is ongoing to determine any interaction between skill level and CombiMouse typing performance.

¹ The CombiMouse is an alternative input device in the prototype stage. It is not yet available for commercial use. Design modifications have been made since this report to enhance typing performance. See <http://www.combimouse.com> for more details on this device.

Note: For additional information, please see the proceedings of the Human Factors and Ergonomics Society's 47th (2003) Annual Meeting.

REFERENCES

- Fagarasanu, M. & Kumar, S. (2003). Carpal tunnel syndrome due to keyboarding and mouse tasks: a review. *International Journal of Industrial Ergonomics*, 31, 119-136.
- Slocum, J., Bohan, M. & Chaparro, B. (2003). First time user performance of the RollerMouse. 8th Annual International Conference on Industrial Engineering Theory, Applications and Practice.

SUBSCRIBE to *Usability News*!