

Call Center – Rutgers Study

A Controlled Study of Responses to a Centrally Controlled Bar Mouse Compared to a
Standard Ambidextrous 2 Button Mouse

Methods/ Results / Summary

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Methods

Design

This experiment and study compared and measured reported upper-body extremity pain, perceived ease of operation, and resultant operator comfort levels of 2 different computer input devices. The experiment and study was administered in an active working environment; specifically the experiment was conducted among data entry personnel within a >1,000-seat call center at a major pharmaceutical company in the USA. Two groups of employees consented to participate in the exercise, and this study compares the results of the experiment. The length of the experiment was approximately 2 weeks. The overall length of the study was 3 weeks for an additional post-experiment data collection phase.

The experiment group of 20 employees was given the Contour® Design RollerMouse™ as a replacement for their previous input device. The RollerMouse places cursor and mouse-button control just below the spacebar of common computer keyboards, centrally-locating mouse controls and replacing traditional movement control with a rolling and sliding bar (a "bar mouse"). The experiment group was briefly trained on test device operation and good ergonomic practices. The other group (the control group) continued using their current 2-button mouse ("ambidextrous" mouse).

Of the twenty subjects in the experiment group, 19 completed the experiment phase, and 14 completed the post-experiment phase of the study. All control subjects completed all phases of the study.

Pre- and post-test data and responses were collected from both groups via paper/pencil survey, which included responses that were descriptive and judgments that were perceptual in nature. The surveys included Likert-type scales for the response variables of interest, scaled from one to seven with a higher score indicated a more positive response. Categorical responses were solicited for questions regarding pain, perceived source of pain, comfort, and smoothness, ease of use, accuracy, location and reactions to the devices.

Description of the sample

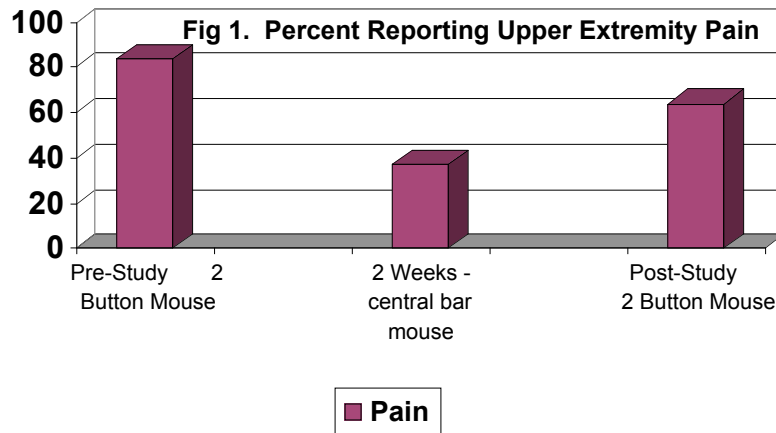
The bar mouse experiment group was composed of 18 females and 1 male. All subjects in the experiment group operated a 2-button mouse in their right hands prior to and after the experiment, although 1 subject is left hand-dominant. The experiment group subjects had worked an average of 12 months in their environment.

The control group, each using the 2-button mouse, was comprised of 15 right hand-dominant individuals and 5 left hand-dominant individuals, although all operate their mouse with their right hand. The control group subjects worked an average of 14 months in their environment.

Response to the Device

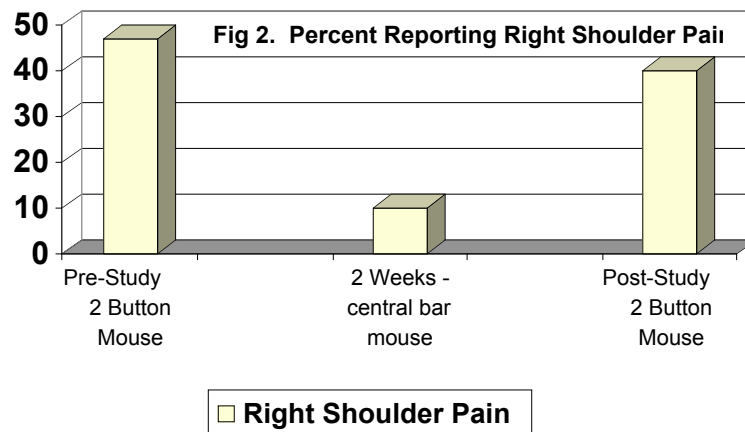
In general, the experiment group using the bar mouse reported a decrease in pain and rated the new device favorably. The control group (using a 2-button mouse) did not report a reduction in pain.

Test data analysis of 19 subjects in the experiment group indicates that the use of the bar mouse substantially reduced pain. Further, cessation of use of the bar mouse resulted in increases in pain near the levels experienced prior to use of the test device. The control groups reported pain similar to the levels reported by the pre-study test group.

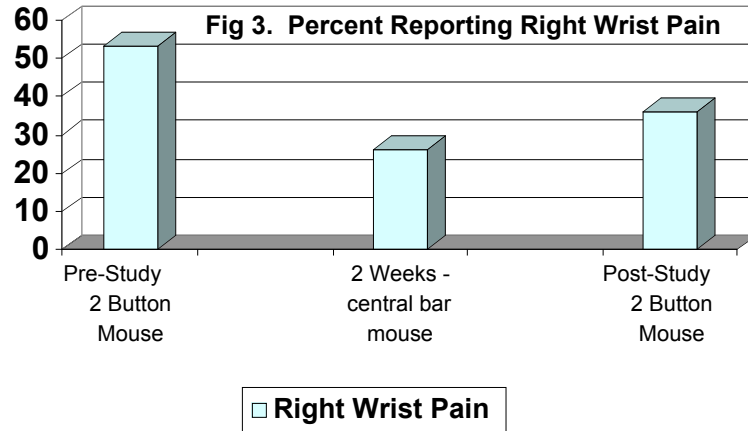


The bar mouse reduced the upper-body extremity pain reported by 19 subjects in a controlled study. (See Fig 1) After two weeks of using the bar mouse, reports of upper-body extremity pain was reduced 47% [the chance that this reduction is unrelated to the change in input device is less than 3 in 1000; $p < .003$]

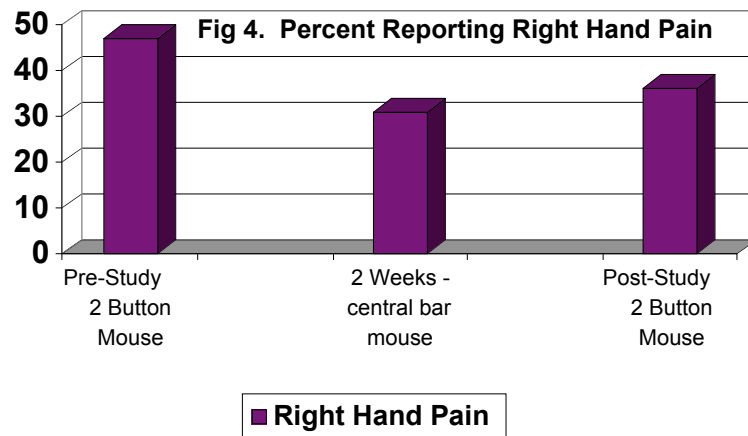
Moreover when the subjects resumed using the standard 2 button mouse for 1 week, the upper-body extremity pain increased by 27% , again an increase most likely associated with the discontinued use of the bar mouse [$p < .09$].

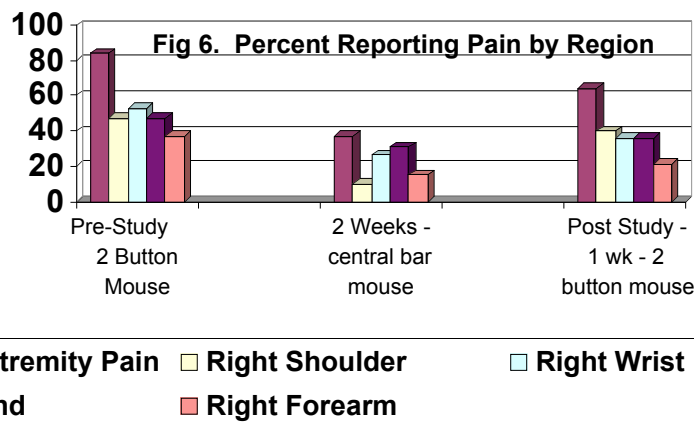
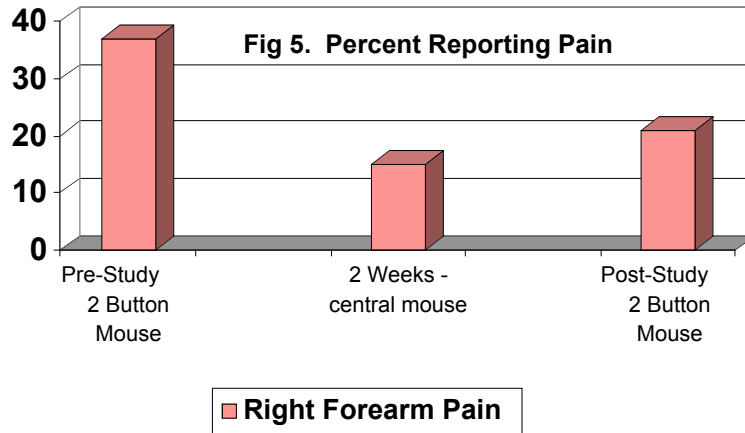


Right shoulder pain was reduced by 37% ($p < .006$) . (See Fig 2) After using the bar mouse for 2 weeks, only 2 out of 19 workers reported pain; with the two button mouse, 9 people from this group of 19 had reported right shoulder pain. When surveyed after 1 week using the 2 button standard mouse, these participants reported an increase of 30% in reported right shoulder pain, again an increase most likely associated with the discontinued use of the bar mouse [$p = .09$].



After using the Rollermouse for two weeks, right wrist pain was reduced by 27% [$p < .05$]. (see Fig 3), right hand pain was reduced by 16 % [$p < .16$](see Fig 4), and right forearm pain was reduced by 22% [$p < .07$].(see Fig 5).

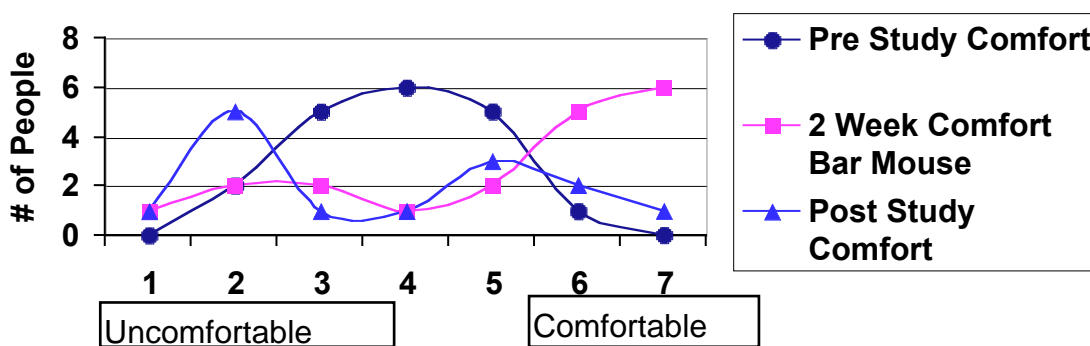




Analysis of the reduction in pain from other sources with the same subjects after 2 weeks of use of the bar mouse and analysis of the increased pain with the discontinued use of the bar mouse resulted in similar conclusions. (see Figure 6)

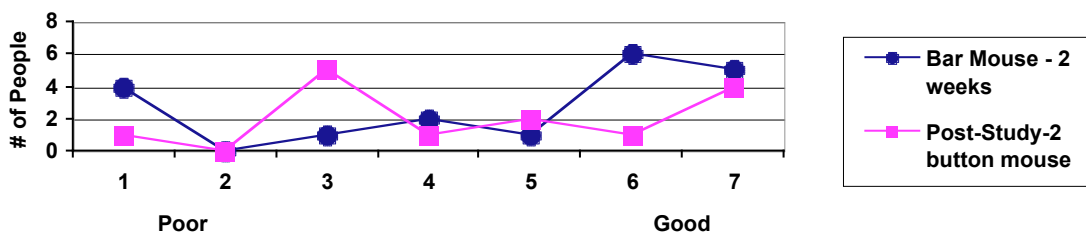
For the group testing the bar mouse, there was a significant reduction in the overall amount of pain reported from the pre-study levels to the 2 weeks after initiating the study test group levels [$P < .003$] Reports of pain increased to pre-study levels when participants returned to their original input device for the final reporting period: This increase was not significant at $p < .09$.

Fig 7. Comfort Ratings



The comfort ratings for the bar mouse test group were higher than the pre-study and post-study group. More subjects reported high levels of comfort and fewer reported low levels of comfort, as shown in Figure 7.

Fig 8. Location of Central Bar Mouse



On the above Likert-type scales, we can see the impact of using a bar mouse that is centrally located. After 2 weeks of using the central bar mouse, people rated the placement of the mouse much higher than the post-study group did with the 2 button mouse positioned to the right side of the keyboard.

Further Study

This exploratory study used a small sample size appropriate for a pilot study. A larger sample would better support widespread inference to the larger employee populations.

The results do, however, indicate the value that could be gained from more in-depth study involving a condensed instrument, a larger sample size, and more thorough review of the number of instruments collected and response for completeness prior to submission

Summary

This exploratory study measured subject responses to the use of 2 alternative input devices in terms of comfort level of posture, accuracy, smoothness of operation, general effort required, overall ease of operation pain reported by anatomical region, and pain associated with each of the devices.

The group using the bar mouse reported the most positive responses and claimed significant reduction in pain in the shoulder, wrist, hand and forearm regions.

The results of this study do illustrate that the use of this centrally controller bar mouse (Rollermouse™) is beneficial to computer mouse users as it reduces pain associated with using a standard 2-button mouse. Participants reported less pain after using the bar mouse device for just 2 weeks. Many found it was easier to use compared to the standard mouse.

These findings do suggest that further studies may be valuable to support extrapolation of these resulting findings to larger employee populations.

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