



# Ergonomic Evaluation of the PadsONMouse Product Concept

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# PadsONMouse Ergonomic Evaluation

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## 1.0 Overview

An expert ergonomic analysis has been completed of the PadsONMouse product. The device is a combination of pliable countered pads that may be placed on the mouse buttons or in the palm area (see images below). The evaluation was conducted by a Certified Professional Ergonomist with over 20 years of product testing and evaluation experience.

The ergonomic principles of the design are to improve mousing biomechanics by reducing the torque on the joints of the index and middle fingers, translating to additional relief at the wrist. In addition, the soft contoured pads allow customization of a traditional mouse to improve user fit and comfort.



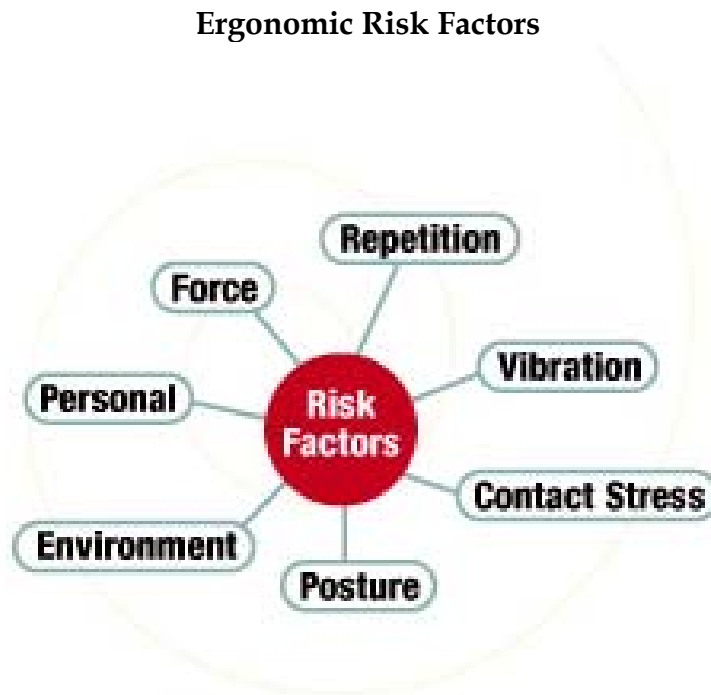
Illustration of PadsONMouse button pads (prototype form)



Illustration of hand gripping the mouse with finger and palm pads in place

## 2.0 Ergonomic Factors

The objective of any good ergonomic design is to minimize the ergonomic risk factors that may contribute to injury, compromise fit, or negatively affect user comfort. An illustration of the major ergonomic risk factors are presented below:



The task of mousing inherently possesses several of these risk factors including:

Contact stress - the physical contact between the mouse and the hand and fingers

Posture - of the wrist and fingers

Repetition - duration of use, number of clicks

Force - Applied button forces translate to forces in the fingers, hand and wrist.

Personal- including hand size, shape and user technique

## 2.1 Hand/Wrist Anatomy

The forces applied with the hand and fingers are generated by muscle contractions in the forearm, which in turn pull on tendons attached to the bones (finger phalanges) resulting in a movement of the hand and fingers. The tendons pass through the carpal tunnel of the wrist. By reducing the tension on the tendon fibers, the risks of irritation is reduced.



Illustration of the carpal tunnel

## 2.2 Biomechanics

The PadsONMouse product offers enhancements to mousing biomechanics as follows:

- The contoured finger pads change the orientation of the fingers on the buttons which reduce the moment arm (perpendicular distance between the point of force application and center of rotation), hence reducing joint torque and tendon tension.
- The palm pad provides an additional support structure for the palm and aides in distributing and absorbing contact forces. Depending on its placement and user hand size, it may also aide in supporting the natural wrist extension.

## 2.3 Anthropometry

The devices offers accommodation to the range of hand sizes. An analysis of global hand anthropometry indicates a 75mm (3") variation in hand length (see table below).

Global Range of Hand Sizes

Region	5 <sup>th</sup> percentile	95 <sup>th</sup> percentile
North America	160	205
Latin America	150	195
European	155	195
Northern Europe	160	205
France	160	210
Portugal/Spain	155	215
South India	145	200
South China	150	195
South East Asia	155	185
Austrailia	160	205
Japan	140	200

## 2.4 Contact Stress

The soft texture of the pads can be used to improve the distribution of pressure between the hand and the mouse. Contact pressure levels as low as 1 psi can affect user perceptions of comfort. By proper placement of the pads, user comfort may be enhanced.

### **3.0 Conclusion**

The PadONMouse product concept offers ergonomic improvements in mousing biomechanics, user fit and comfort. By shifting the angle of button force application the torque on the joints of the index and middle fingers may be reduced, translating to additional relief at the wrist. In addition, the soft contoured pads allow customization of a traditional mouse to accommodate the variation in user hand size.

It is anticipated that the product can produce measurable reductions in ergonomic stress. However addition testing would be required to quantify the ergonomic advantages.