



# Motor System

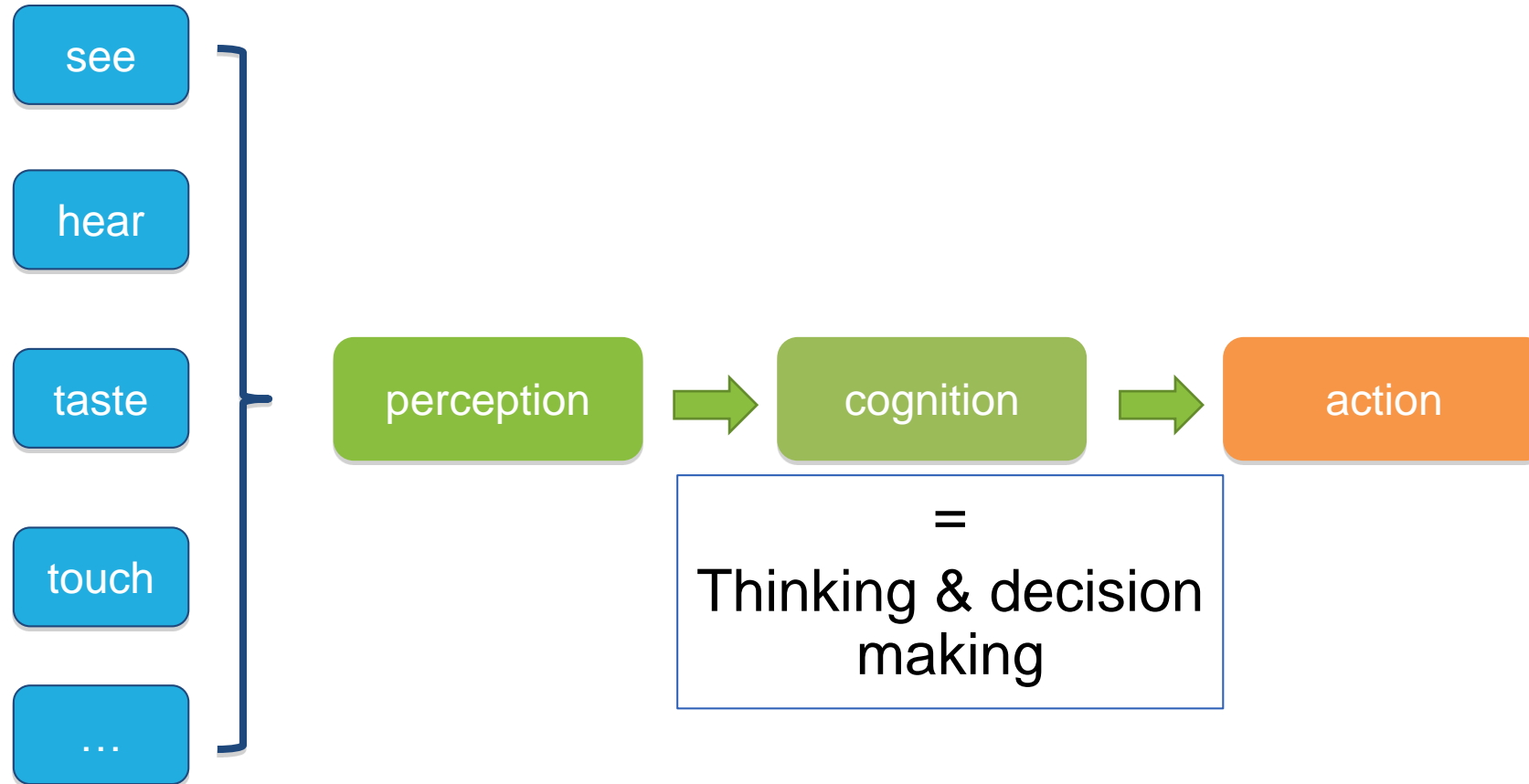
Image Source <https://pxhere.com/de/photo/1584193> by Muddu36



# Learning Goals

- Motor cortex
- Physical ergonomics
- Ergonomic design guidelines

# Human information processing



# What we've learnt

## Somatosensory System

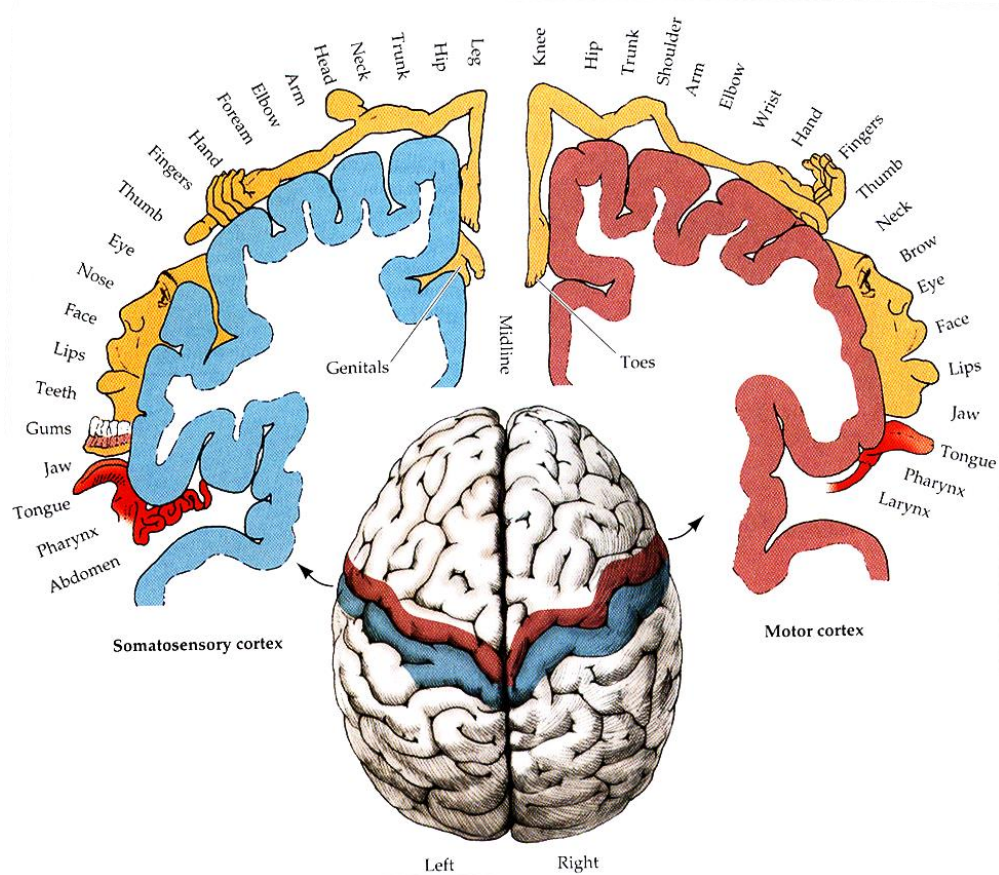


Image adapted from <https://www.flickr.com/photos/46006858@N05/8641421501> by Gary Kirwan & [https://en.wikipedia.org/wiki/Cortical\\_homunculus#/media/File:Front\\_of\\_Sensory\\_Homunculus.gif](https://en.wikipedia.org/wiki/Cortical_homunculus#/media/File:Front_of_Sensory_Homunculus.gif) by Mpj29

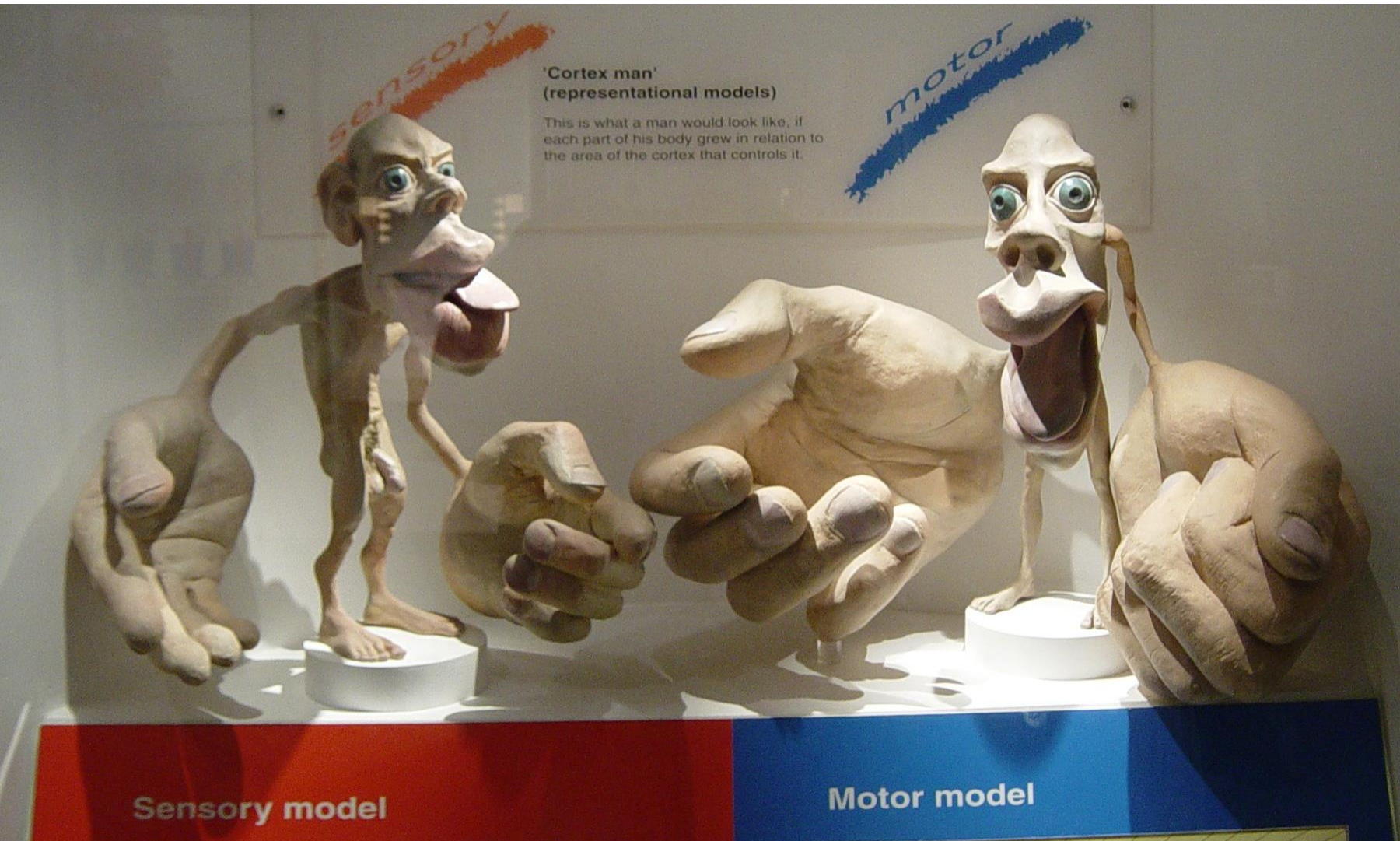
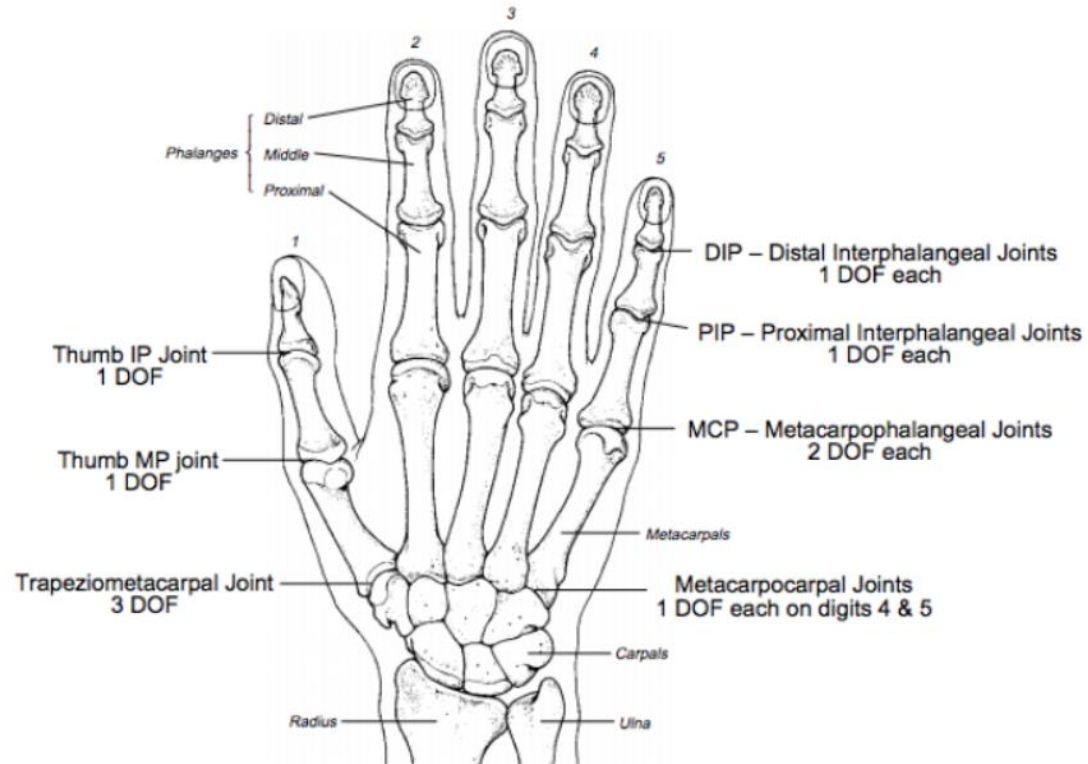


Image Source [https://en.wikipedia.org/wiki/Cortical\\_homunculus#/media/File:Sensory\\_and\\_motor\\_homunculi.jpg](https://en.wikipedia.org/wiki/Cortical_homunculus#/media/File:Sensory_and_motor_homunculi.jpg) by Dr. Joe Kiff

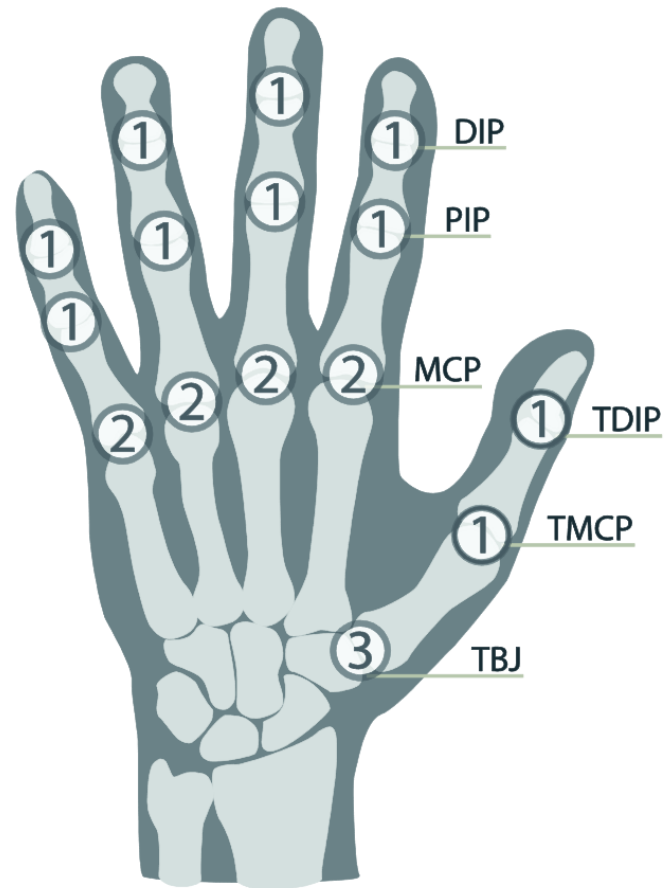
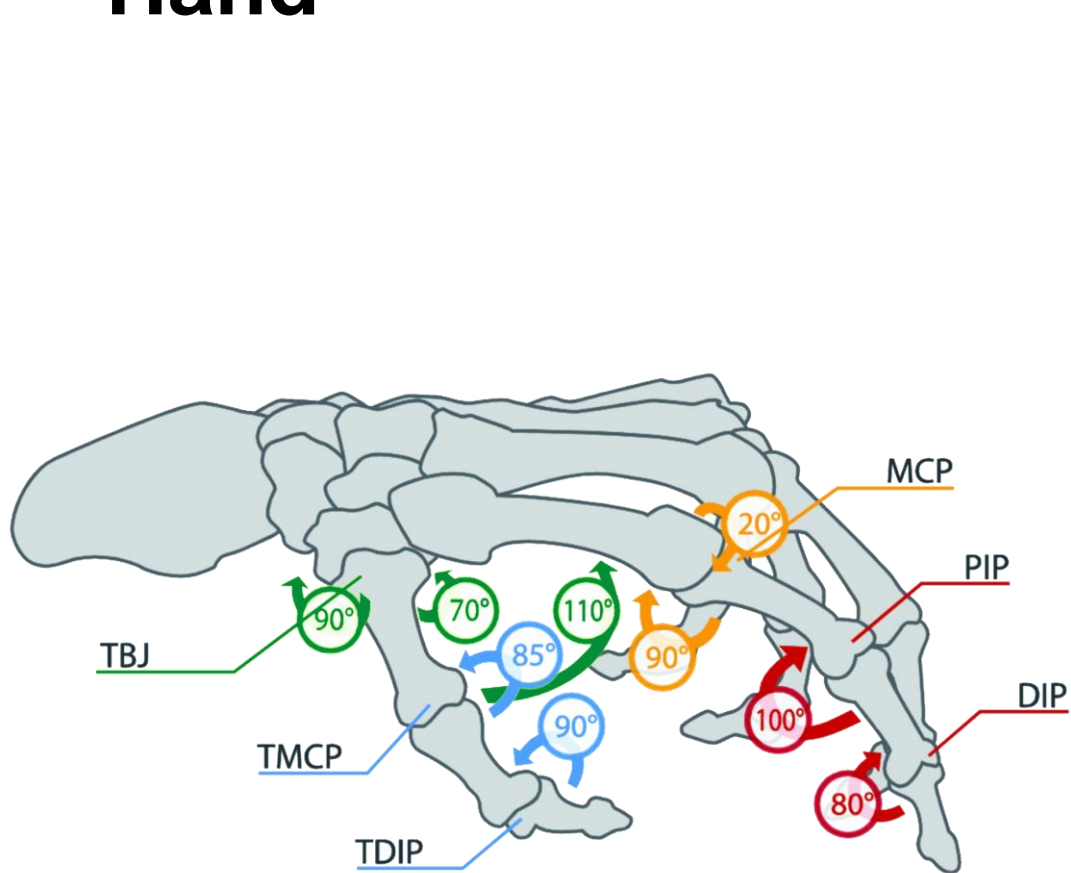
# Hand



DOF = Degree of Freedom

Image Source Various hand motions: Sturman, D. J. (1992), Whole-hand Input, PhD thesis, Massachusetts Institute of Technology.

# Hand



③ 3 DOF = Degree of Freedom

Image Source Katrin Wolf, Markus Schneider, John Mercurius and Christopher-Eyk Hrabia: Biomechanics of Front- and Back-of-Tablet Pointing with Grasping Hands. International Journal of Mobile Human Computer Interaction

# Hand

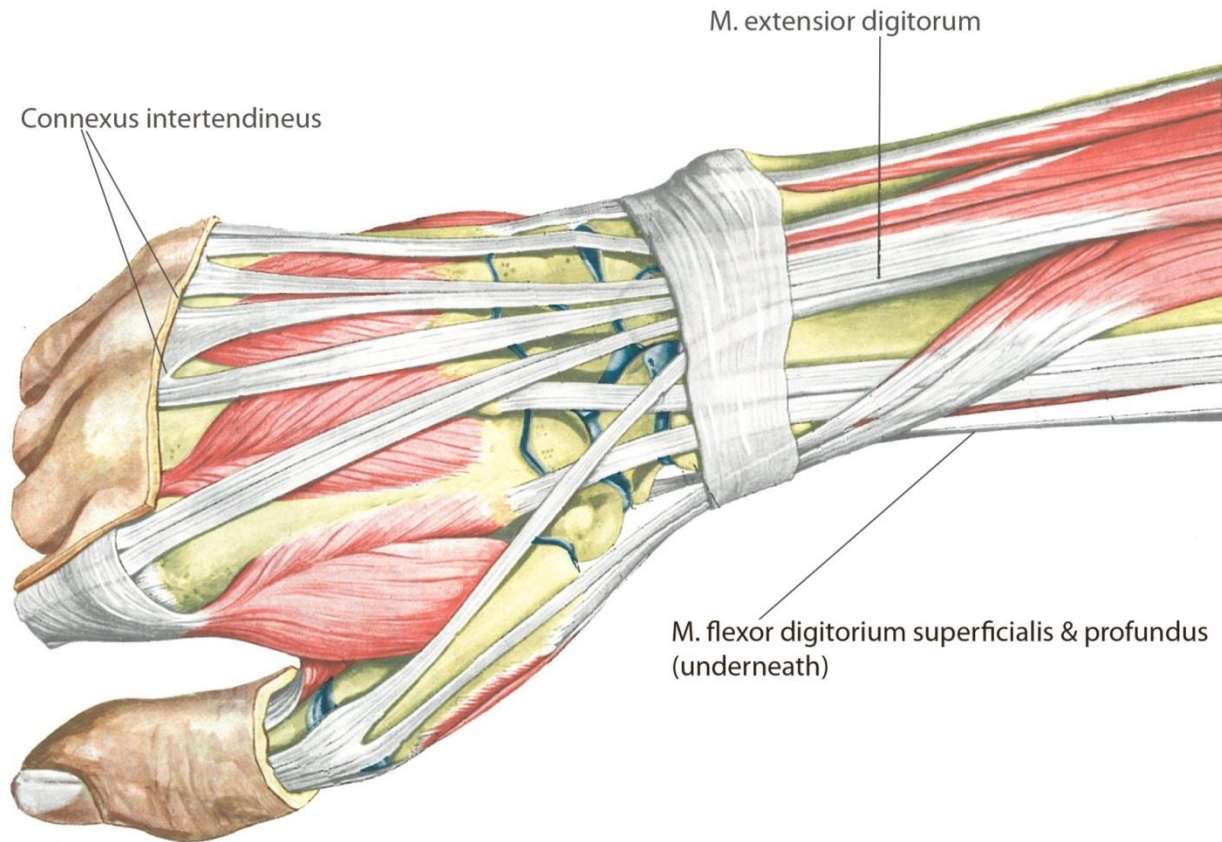


Image adapted from Spalteholz (1960): Hand-atlas of human anatomy.



# Manual Ergonomic Factors

- Size of objects we can grasp
- Weight of objects we can lift
- Force we can apply with fingers and hand
- Movements with fingers and hands we can do
- Areas we can reach with fingers and hands
- Time it takes to move a finger, e.g. to touch a button



Image Source [https://en.wikipedia.org/wiki/File:Trackman\\_marble\\_wheel.JPG](https://en.wikipedia.org/wiki/File:Trackman_marble_wheel.JPG) by Brad Kennedy

# Ergonomic Gesture Design

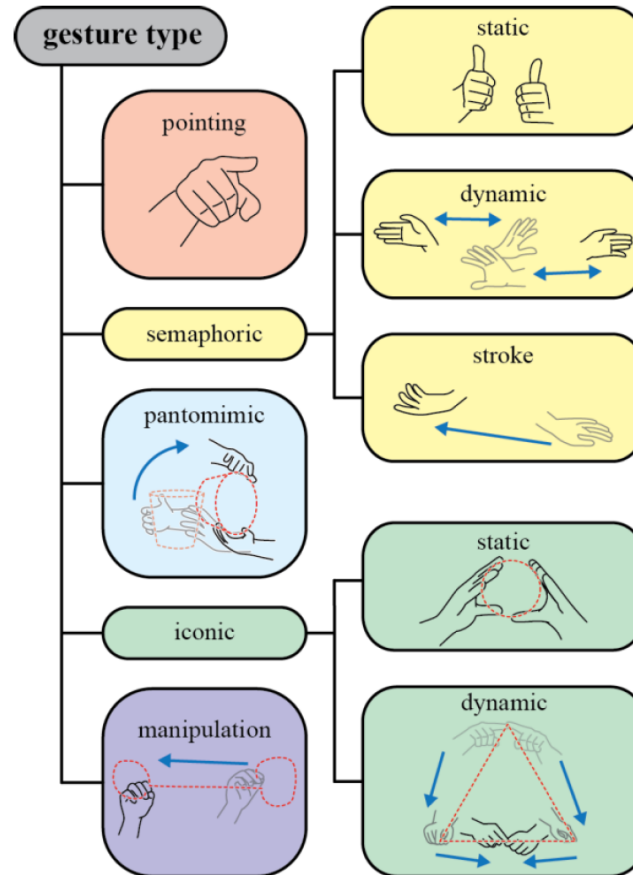
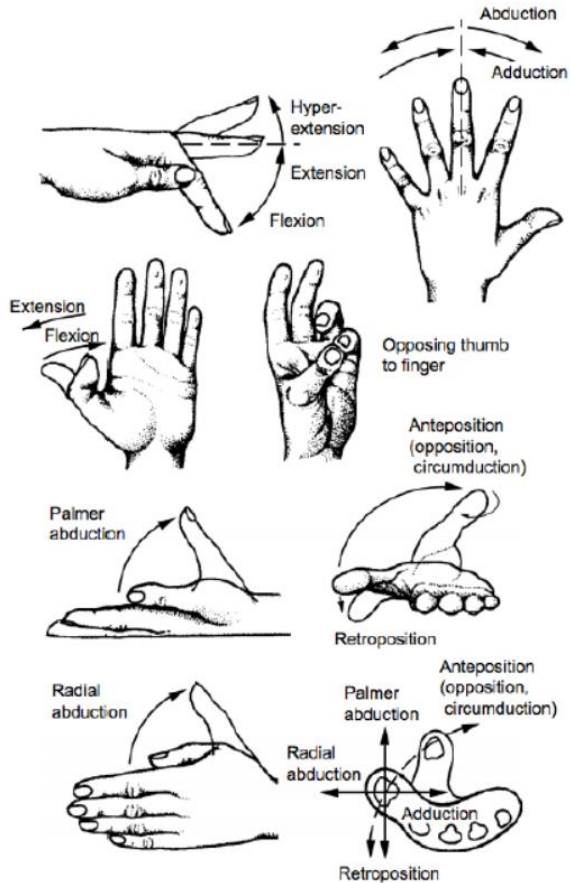


Image Source Various hand motions: Sturman, D. J. (1992), Whole-hand Input, PhD thesis, Massachusetts Institute of Technology. & Aigner et al. (2012) Understanding Mid-Air Hand Gestures: A Study of Human Preferences in Usage of Gesture Types for HCI.

# Ergonomic Gesture Design



Image Source Katrin Wolf, Anja Naumann, Michael Rohs and Jörg Müller: Taxonomy of microinteractions: defining microgestures based on ergonomic and scenario-dependent requirements. INTERACT 2011

# Ergonomic Gesture Design

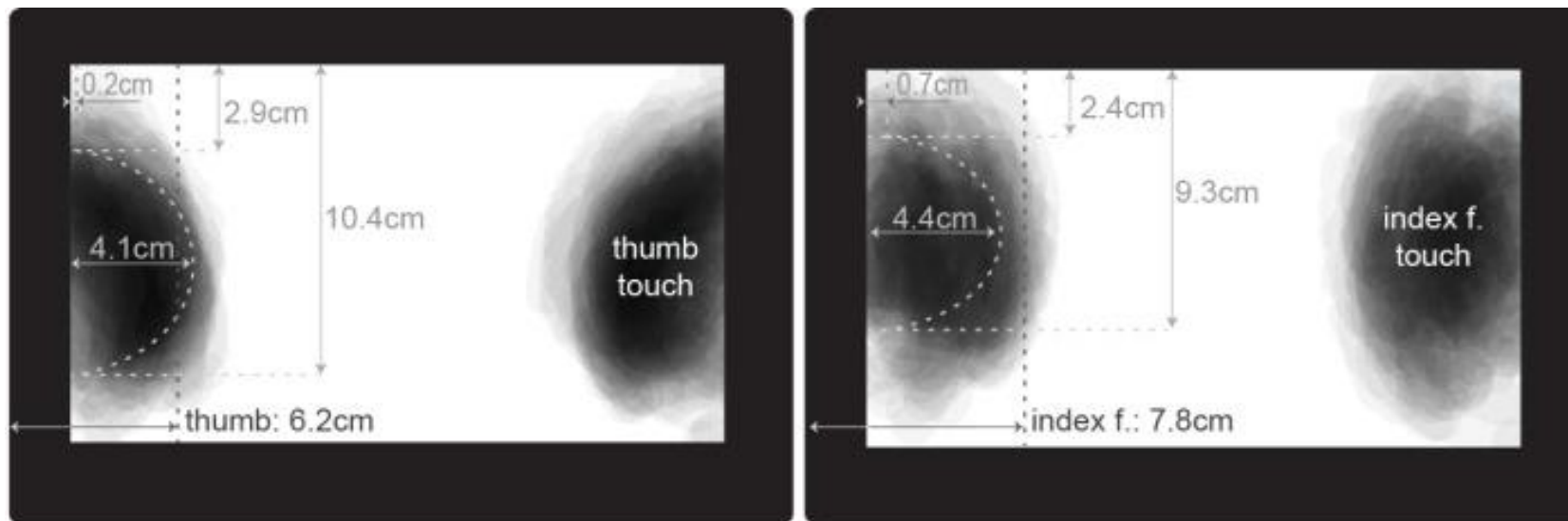


Image Source Katrin Wolf, Robert Schleicher and Michael Rohs: Touch Accessibility on the Front and the Back of held Tablet Devices. EuroHaptics 2014

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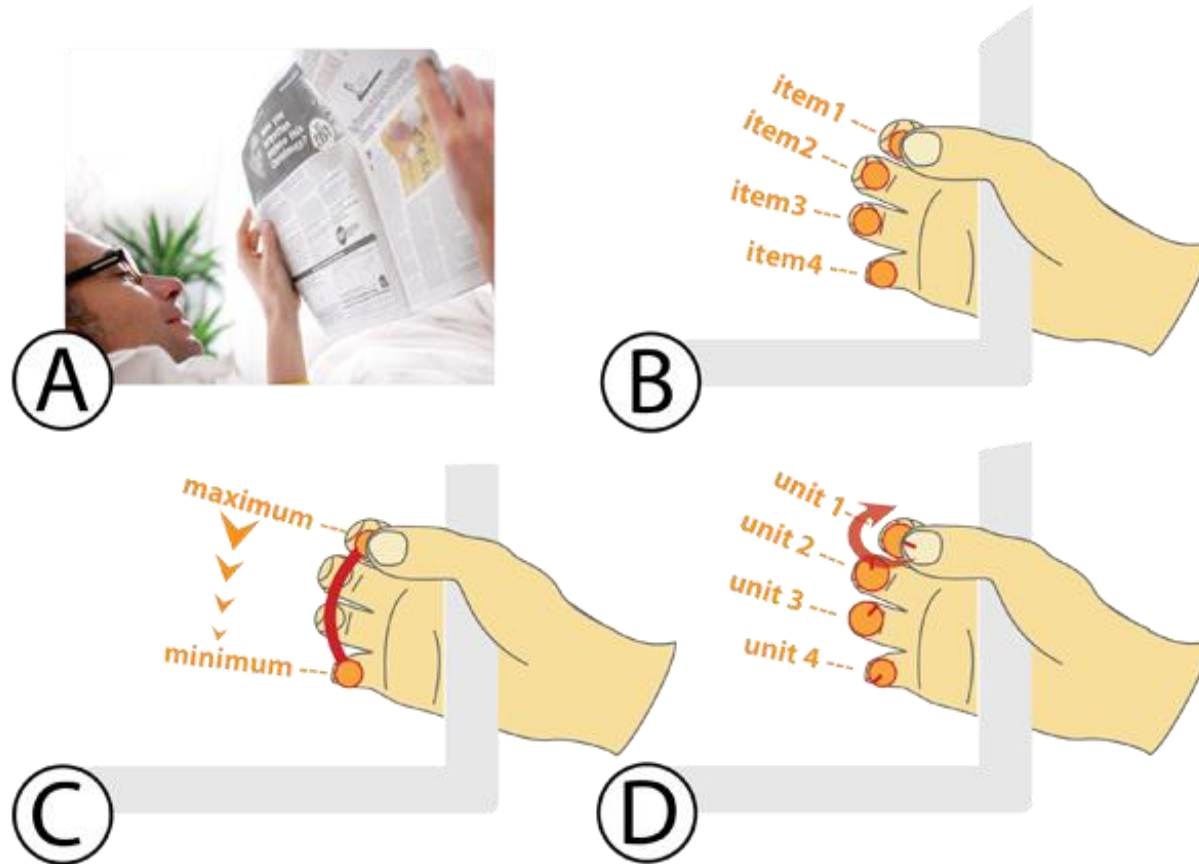


Image Source Katrin Wolf, Christian Müller-Tomfelde, Kelvin Chen and Ina Wechsung: PinchPad: performance of touch-based gestures while grasping devices. TEI 2012

# Ergonomic Gesture Design

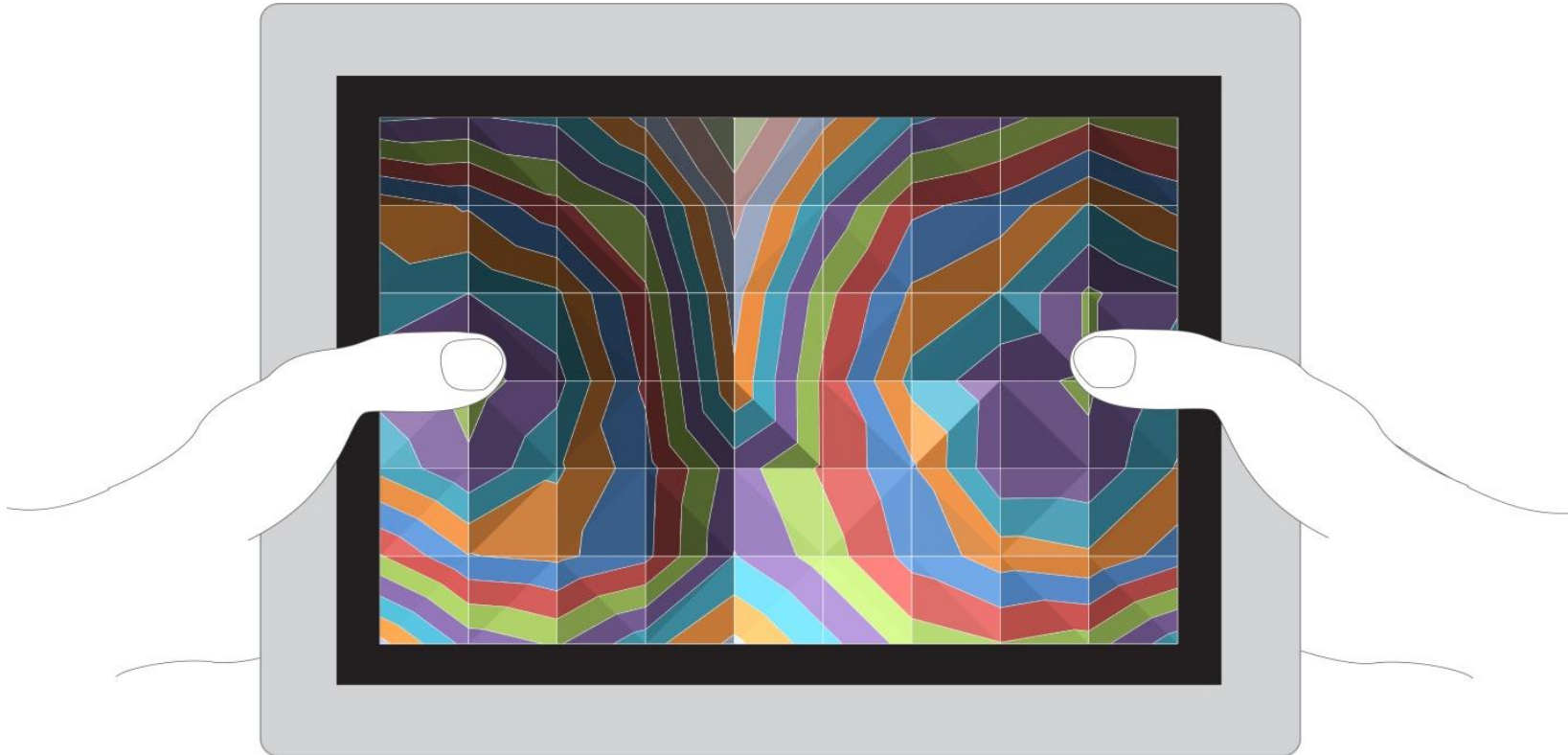
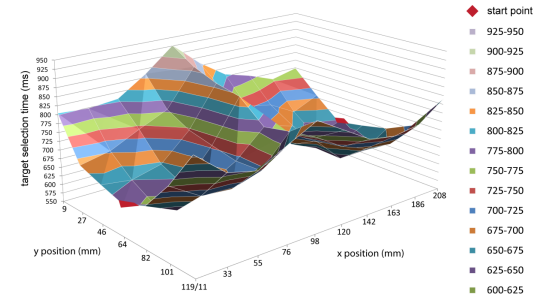


Image Source Katrin Wolf, Markus Schneider, John Mercouris and Christopher-Eyk Hrabia: Biomechanics of Front- and Back-of-Tablet Pointing with Grasping Hands. International Journal of Mobile Human Computer Interaction

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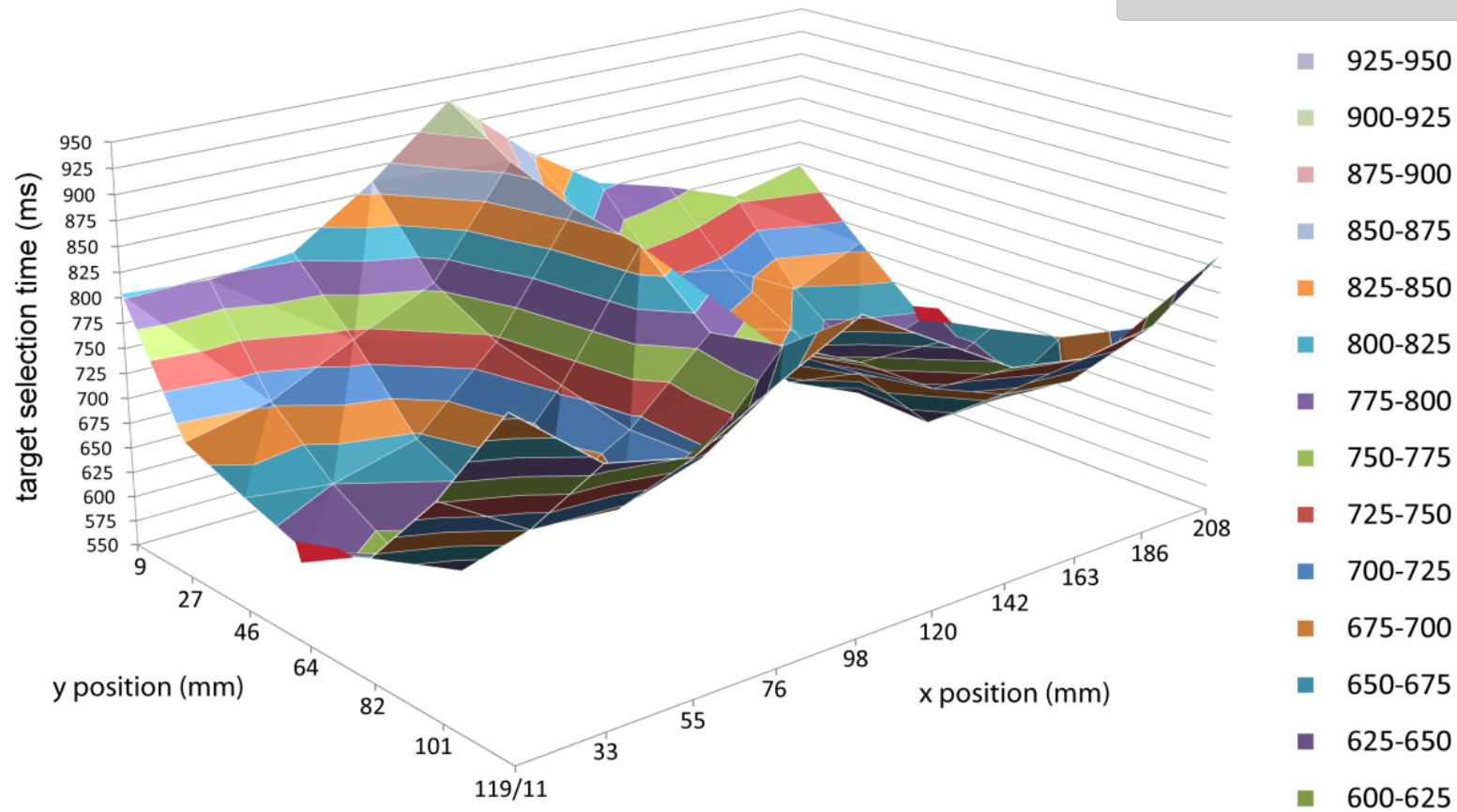
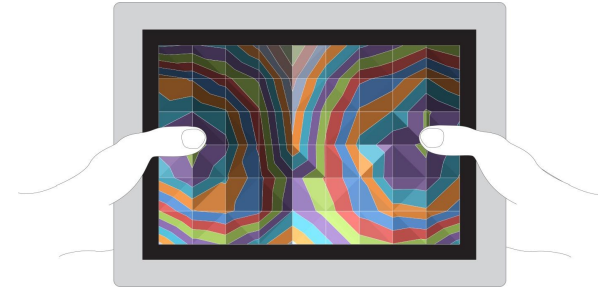


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