

Quantitative Investigation of Hand Grasp Functionality: Hand Joint Motion Correlation, Independence and Grasping Behavior

(Electronic supplementary material)

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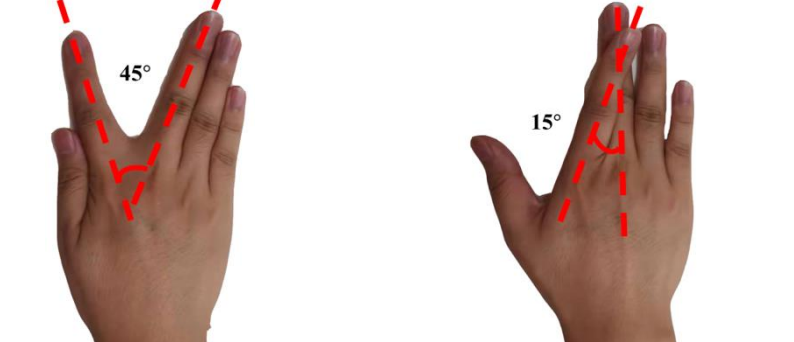
This document includes:

- Supplementary explanation to extreme joint angles induced by extreme gestures
- Supplementary figure

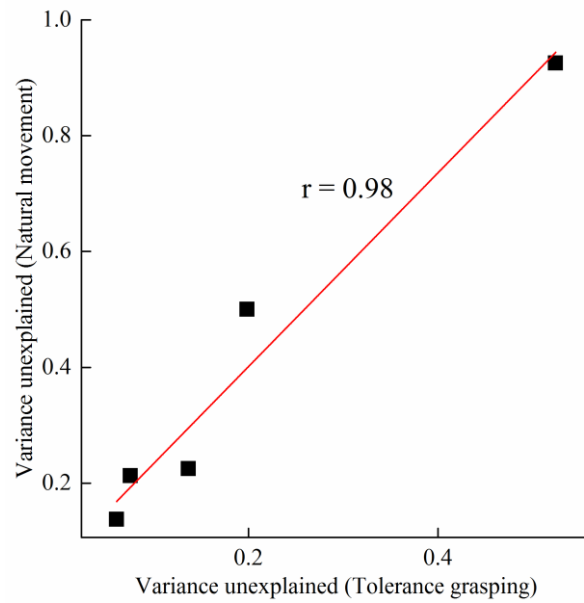
Supplementary explanation to extreme joint angles induced by extreme gestures

Compared with the recent range investigation study [Ref 1] and natural grasp [Ref 2], most of joints in tolerance grasping are generally larger, especially for thumb Rot and MCP, ABD between fingers. Therefore, the author performed some extreme postures to reflect the extreme joint angles contain thumb Rot and MCP, and the abduction-adduction between adjacent fingers, as shown in S_Table1.

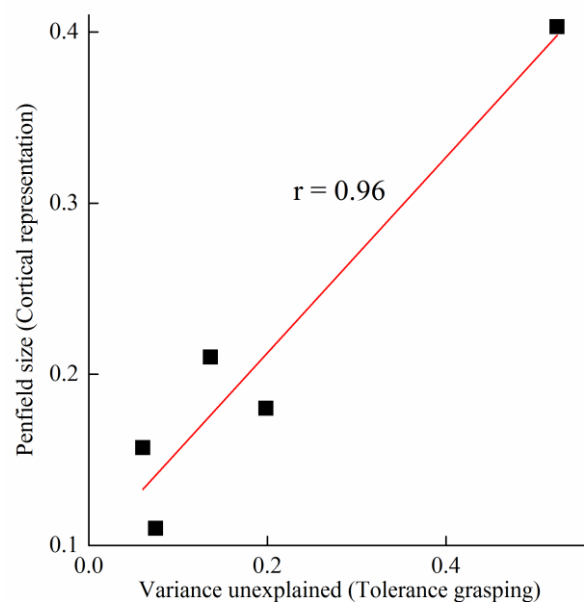
S_Table1 The extreme joint angles contain thumb Rot and MCP, and the abduction-adduction between adjacent fingers

Thumb Rot	
Thumb MCP	
Abduction-adduction between adjacent fingers	

Supplementary figures



S1_Fig. The correlation analysis of the finger independence analysis results between hand natural movement [Ref 2] and tolerance grasping.



S2_Fig. The correlation analysis of the finger independence analysis results of tolerance grasping and cortical representation size of finger movement [Ref 3].

Supplementary references

[Ref 1] Gracia-Ibáñez V, Vergara M, Sancho-Bru J L, et al. Functional range of motion of the hand joints in activities of the International Classification of Functioning, Disability and Health[J]. *Journal of Hand Therapy*, 2017, 30(3): 337-347.

[Ref 2] J. N. Ingram, K. P. Körding, I. S. Howard, and D. M. J. E. b. r. Wolpert. The statistics of natural hand movements. *Experimental brain research*, vol. 188, no. 2, pp. 223-236, 2008.

[Ref 3] W. Penfield and E. J. B. Boldrey, "Somatic motor and sensory representation in the cerebral cortex of man as studied by electrical stimulation," *Brain*, vol. 60, no. 4, pp. 389-443, 1937.