Is Tip Pinch Strength Accurately Measured?

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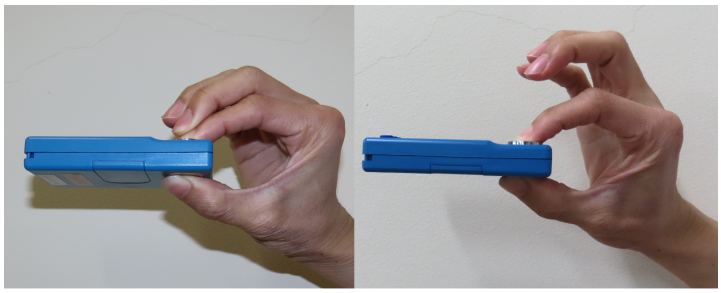
INTRODUCTION: You may wonder about the reproducibility of data when collecting pinch strength data. There are several types of "pinch," such as tip and side pinch. Hand therapists use various measurement methods of measurement[(1)]. In carpal and cubital tunnel syndromes, which are major causes of upper-extremity entrapment neuropathies, accurate and reproducible pinch strength measurements are important for measuring the recovery of the intrinsic muscles of the hand. However, few textbooks describe in detail how to measure pinch strength. Pinch strength is measured by grasping only the thumb and index finger. The measurement value may change if the middle finger is used to support the index finger. However, the influence of the dominant hand remains unclear. We hypothesized that supporting the index finger with the middle finger would change the measured value, and the pinch strength would be stronger in the dominant hand (DH).

METHODS: Forty-four healthy volunteers (31 men and 13 women; mean age 35.7 years) participated. The exclusion criteria were upper limb strangulation neuropathy, trauma to the upper limb, history of neuromuscular disease, and unclear DH.
Tip pinch strength was measured in the sitting position, shoulder abduction 0º, elbow flexion 90º, forearm in 90º pronation, and wrist in mild dorsiflexion by grasping the pinch meter with the thumb and index finger. The participants were placed in two positions: tip-supported (TS), with the middle finger supporting the index finger, and tip non-supported (TN), without the middle finger supporting the index finger. (Fig. 1)
Three measurements were obtained with the DH and non-dominant hand (NDH), and the average values were TS-DH, TS-NDH, TN-DH, and TN-NDH. The TS vs. TN and DH vs. NDH values were compared to determine whether there were differences in the values. The Wilcoxon signed rank sum test was used to compare the means, and $p<0.05$ was considered a significant difference.



Tip supported (TS): with the middle finger supporting the index finger.

Tip non-supported (TN): without the middle finger supporting the index finger.

Fig. 1: TS and TN

RESULTS: One participant with cubital tunnel syndrome, one with scaphoid fracture, and two with a change in DH were excluded because of preexisting conditions. Forty participants (27 men and 13 women; mean age 34.8 years) were examined. Mean values were TS-DH = 6.4±1.9, TS-NDH = 6.1±2.0, TN-DH = 4.0±1.0, and TN-NDH = 3.8±1.1. (Fig. 2) TS was significantly higher than TN (P = DH, 0.0000000502; NDH, 0.0000000678), and DH was significantly higher than NDH (P = TS, 0.03757; TN 0.0376). (Fig. 2)
The ratios were as follows: TS-DH/TN-DH = 1.61, TS-NDH/TN-NDH = 1.65, TS-DH/TS-NDH = 1.07, and TN-DH/TN-NDH = 1.06.

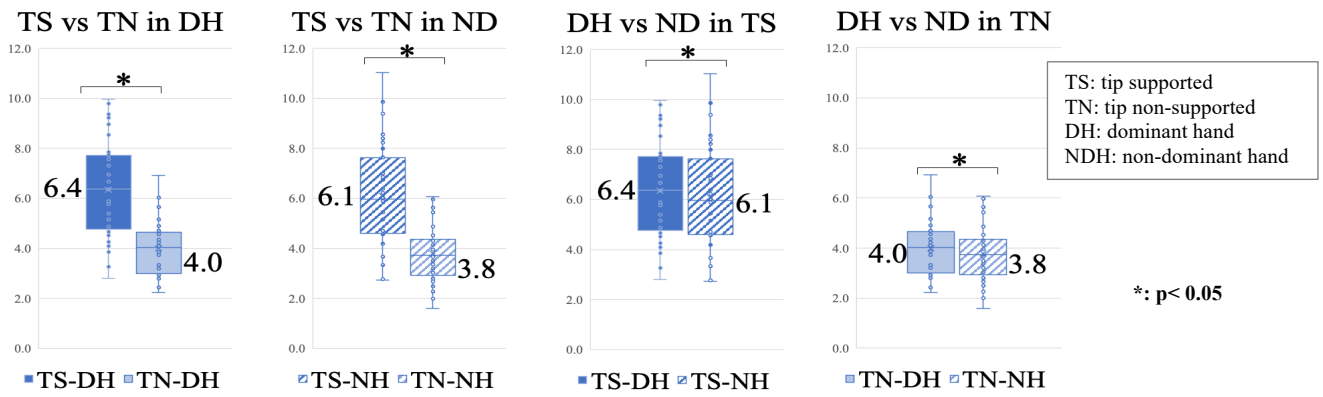


Fig.2 Comparison of the mean values of tip pinch strength with and without middle finger support and by dominant and non-dominant hand

DISCUSSION: In healthy participants, the tip pinch strength was approximately 1.6 times greater if the index finger was supported by the middle finger and approximately 1.06 times greater in the DH than in the NDH. It was expected that there would be differences in the measured values because of the method of grasping and the influence of the DH; however, no reports have verified this. A highly reproducible and accurate measurement method is necessary to evaluate the clinical data in carpal and cubital tunnel syndromes. Therefore, the index and middle fingers should be independent for accurate measurement of tip pinch strength.

CLINICAL RELEVANCE: To accurately measure tip-pinch strength, the index and middle fingers should be independent. In a normal participant, the tip pinch strength was approximately 1.6 times stronger when the index finger was supported by the middle finger, whereas the tip pinch strength of the dominant hand was approximately 1.06 times stronger than that of the non-dominant hand.

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