

# Quantitative Assessment of Dynamic Control of Fingertip Forces After Pollicization

Authors: Nina Lightdale-Miric, MD, Nicole Mueske, MS, Jamie Berggren, OT, Jennifer Loiselle, OT, Francisco Valero-Cuevas, PhD, Sudarshan Dayanidhi, PhD and Tishya Wren, PhD

## Objectives

- To use a novel **Strength-Dexterity (S-D) test** to quantify the dynamic control of finger tip forces after finger pollicization in children.

## Methods

- 8 participants, age 4-17 yrs
  - 10 pollicized hands, 5 non-pollicized hands
- Compress instrumented spring between new thumb and next most radial finger (Figure 1)
  - S-D score: max force compressing spring without buckling
- Traditional Functional Tests
  - Grip, lateral pinch, tripod pinch strength
  - Box and Blocks Test
  - 9-Hole Peg Board Test
- Anthropometric measures, medical history, Total Active Motion
- Pearson's correlation and Mann-Whitney rank sum statistical tests



Figure 1: S-D Test

## Results

- 6/10 pollicized hands and 5/5 non-pollicized hands had normal S-D scores (Figure 2)
- S-D scores correlated moderately with traditional functional tests ( $r=0.42-0.61$ )

- Poor S-D scores were more common in hands with radial absence ( $p=0.02$ )
  - 3/4 poor S-D had absent radius
  - 1/6 good S-D had absent radius
- Almost all pollicized hands scored below normal (poor outcome) on traditional functional tests (Figure 3)

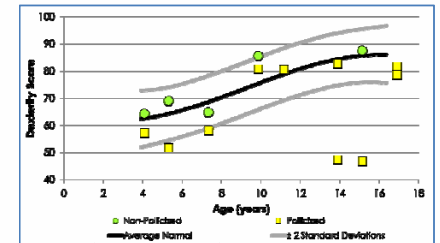


Figure 2: S-D scores as a function of age

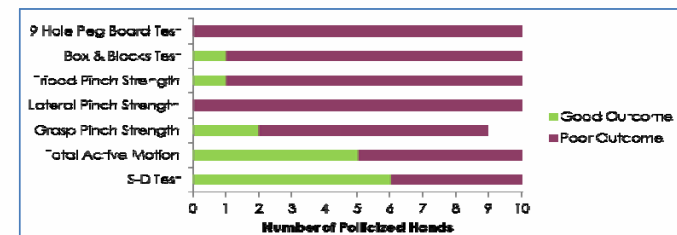


Figure 3: Good vs. Poor Outcome for S-D Test and Functional Tests

## Conclusions

- Most pollicized hands had normal S-D scores despite poor strength & performance on traditional functional tests.
- Neuromuscular plasticity allows children to achieve normal control over dynamic fingertip forces after pollicization, although strength and gross motor coordination are still lacking.
- Parents and children undergoing pollicization may be counseled that they will likely obtain precise control of fingertip forces and dexterity despite weakness in grip and pinch. Children with an absent radius may not achieve normal dexterity after pollicization.