

Establishment of Normative Values for Measurements of the Hand in the Pediatric Population

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INTRODUCTION: Limb differences most commonly affect the distal part of the extremity. While many of these conditions can be quite obvious, at times the presence of an anomaly of the hand may be difficult to diagnose. Early intervention for some conditions, such as macrodactyly and brachydactyly, may be beneficial for the child. The purpose of this study was to establish normal measurement values of the hand in the pediatric and adolescent populations.

METHODS: A total of 308 hands were measured from 179 unique participants (101 male, 78 female; 0-18 years) recruited from a population of pediatric orthopaedic patients and their siblings. Measurements were taken of each hand of each patient, unless the child presented with a history of an injury to a particular limb and/or had a known congenital hand/digit condition, history of upper extremity surgery, brachial plexus birth palsy, or neurodevelopmental disorder. The measurements included the length of the volar flexion crease at the metacarpophalangeal (MCP) joint, length of hand from tip of long finger to wrist flexion crease, the palm width at the level of the distal palmar crease, and length of the wrist flexion crease. Simple statistical means and Pearson's R-squared values were determined.

RESULTS: Mean values of the hand measurements were established for each year of age from 2 to 15 years (mean age: 8.18 years; SD: 4.13), with ages 0, 1, and 16 through 18 having too few participants to establish a mean value. The determination of each of the hand measurements were found to be dependent on age with similar mean values found for both male and female hands of the same age. Pearson's R values exhibited a strong linear relationship between age and the following parameters: longitudinal distance from tip of the long finger to the distal wrist flexion crease ($R= 0.97$), the radioulnar width of the volar aspect of the palm at the level of the distal volar crease ($R= 0.98$), and the length of the volar flexion crease at the metacarpophalangeal (MCP) joint ($R= 0.97$). Longitudinal hand size ranged from 10cm to 22.5cm. Palm width ranged from 4.5cm to 10.5cm.

DISCUSSION AND CONCLUSION: Longitudinal and radioulnar hand size measurements increase proportionally with increasing age. The normative values defined in this study can be utilized clinically to aid the physician when diagnosing limb differences that may be subtle in nature.