Abstract

Background: The exponential rise in smartphone and handheld gaming device usage among young adults has introduced non-physiological biomechanical stress on the distal upper extremity. Repetitive thumb movements (tapping, swiping) cause microtrauma and muscle fatigue in the thenar eminence, potentially impacting functional hand performance.

Objective: To evaluate bilateral maximum hand grip strength (HGS) and quantify individual intrinsic thumb muscle metrics,specifically the abductor pollicis brevis (APB), flexor pollicis brevis (FPB), and adductor pollicis (ADP) to analyze their correlation in healthy young adult males.

Materials and Methods: A cross-sectional observational study was conducted on 98 healthy male participants (mean age: 21.92 \pm 1.05 years). Maximum HGS for both dominant (right) and non-dominant (left) hands was measured using a standard hydraulic hand dynamometer. Localized muscle metrics and pressure pain thresholds for the APB, FPB, and ADP were recorded using localized physiological assessment protocols. Data were analyzed using IBM SPSS Statistics 27 using Paired Samples t-tests and Pearson's Correlation Coefficient (r).

Result: The Paired Samples t-test demonstrated a highly significant bilateral difference in grip strength ($t = 7.42$, $df = 97$, $p < 0.001$), with the right dominant hand showing higher maximum HGS (41.31 \pm 3.19 kg) compared to the left hand (39.06 \pm 3.14 kg). Pearson's correlation matrix revealed significant positive correlations between individual thumb muscle metrics and overall HGS. The adductor pollicis showed the strongest association with right HGS ($r = 0.554$, $p < 0.01$), followed by the abductor pollicis brevis ($r = 0.468$, $p < 0.01$) and flexor pollicis brevis ($r = 0.419$, $p < 0.01$)

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