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Current Normative Data for Grip, Pinch, and Fine Motor Control for Pediatrics and Adults

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Background:
Fine motor control can be measured with the Functional Dexterity Test (FDT) and the 9 Hole Peg Test (Aaron & Jansen, 2003; Oxford Grice et al., 2003). Grip and pinch strength are measured with a dynamometer and pinch gauge respectively, which are tools that measure strength in both pounds and kilograms (McQuiddy, Scheerer, Lavalley, McGrath, & Lin, 2015). The normative data for these tools from the mid-1980s is still being used in practice today and that needs to change.

1 Ask: Research Question

Is there a difference in current fine motor control, grip, and pinch normative data compared to normative data from the mid 1980s in both pediatrics and adults?

2a Acquire: Search Terms

Databases: PubMed & ProQuest

Search Terms: normative data, norms, pediatrics, adults, grip and pinch, fine motor control, occupational therapy

2b & 3a Acquire and Appraise: Selected Articles and Study Quality

Oxford Grice et al. (2003): Level IV. Established new norms and evaluated the interrater and test-retest reliability for the 9 Hole Peg Test. *Reliability study:* n=25; participants were OT student volunteers; *Normative study:* n=703; participants age 21-71+ divided up by sex and age. Limitations: possible practice effect, performed one trial.

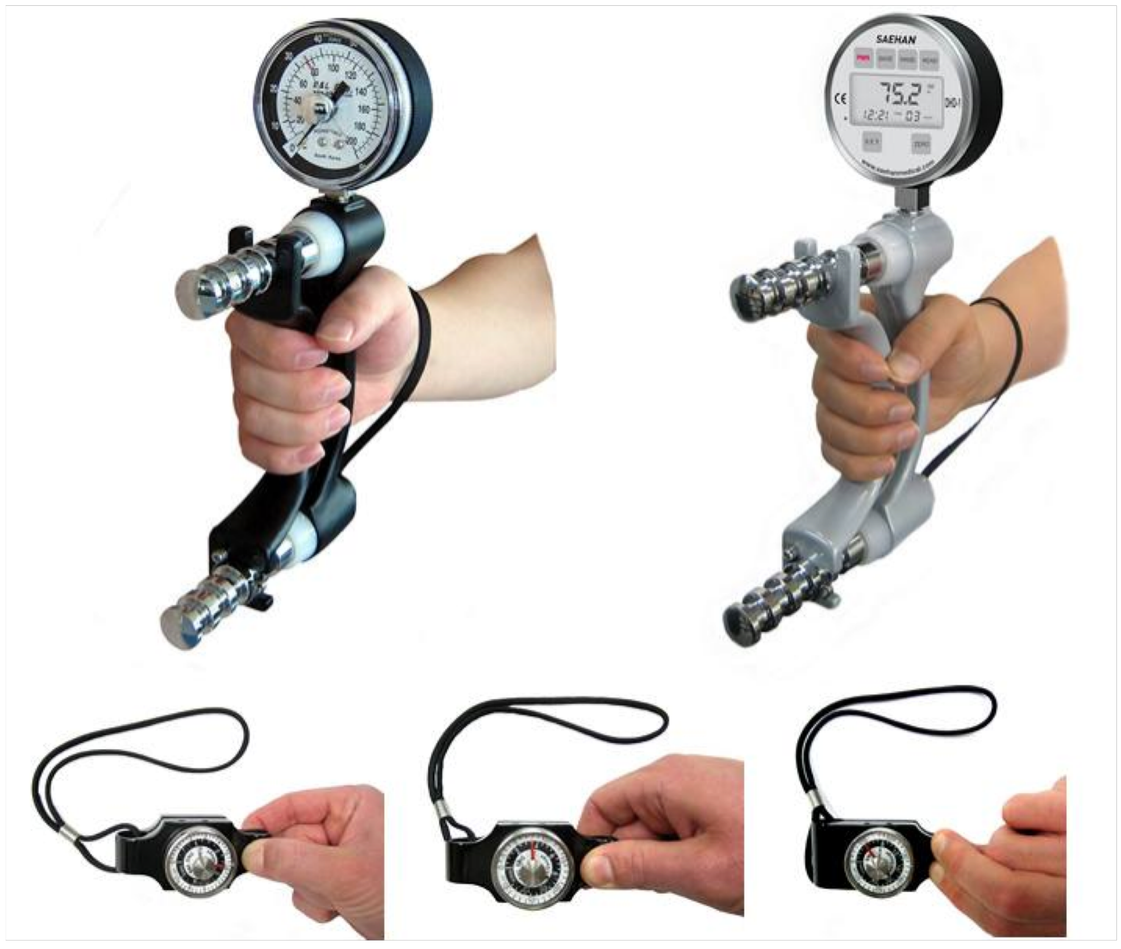
Tremblay et al. (2017): Level IV. n=271. Cross-sectional design. Collected normative data in typically developing children aged 3-5 years in the Greater Montreal area and evaluated the intrarater and interrater reliabilities of the FDT. Limitations: non-standardized use of the FDT for the pediatric population, differing environment between daycares.

Phillips et al. (2013): Level IV. n=179. Created a current norm reference of grip and pinch strength using a Jamar dynamometer for Michigan adults age 20-62 years. Participants were all employees at car plants in Southeast Michigan or hospital sites in West Michigan. Limitations: small sample size, especially in the group of 50-60 years old.

McQuiddy et al. (2015): Level IV. n=1508. Cross-sectional design. Provide current normative data for grip and pinch strength for the pediatric population of ages 6-19 and to examine the effect of age, sex, and hand dominance on grip and pinch strength. Participants came from 5 schools in the Cincinnati metropolitan area. Limitations: each participant's demographic information was not collected.

3b Appraise: Study Results

Oxford Grice et al. (2003): *Reliability study:* IRR of the 9 Hole Peg Test for the right and left hands very high (r=0.984 and r=0.993). Test-retest reliability coefficient was low to moderate for the right and left hands (r=0.459 and r=0.442). *Normative study:* Males 21-25 years old had the highest performance and males 71+ years old had the lowest performance. Variability in scores increased with age. T-test results indicate no significant differences in average scores between this study and the previous study upon which it was based.



(B&L Engineering., 2016)

Tremblay et al. (2017): There were statistically significant differences in FDT scores across all ages ($p<.01$). Total time decreased with increasing age. No significant differences were found between sexes ($p>.9$). Excellent IRR (ICC=.89-.98). Overall, test times using the dominant hand were faster than the non-dominant hand ($p<.01$).

Phillips et al. (2013): Hand dominance did not have a significant effect on hand strength. Sex and age had an effect on grip and pinch strength for both hands, as males were stronger than females and hand strength decreased with age in the adult population.

McQuiddy et al. (2015): Hand strength increased with age in the pediatric population. Hand dominance did not have a significant effect on hand strength ($p>.05$). Hand strength was significantly lower in 62% of measurements. Lateral pinch strength measurements increased or were similar to the 1986 norms for 86% of the measurements. Overall, results indicate that sex and age affected grip and all three types of pinch strength measurements for both hands ($p<.0001$).

4 Apply: Conclusions for Practice

FDT scores for children were higher and the majority of grip and pinch strength was lower for children compared to old normative data. Adult grip and pinch strength had varied significant differences and 9 Hole Peg Test scores were about the same compared to previous normative data. Over the past 30 years, there has been increased hand use for technology related activities and decreased use for manual tasks. There is a need for current normative data given the changes in hand related tasks for functional performance.

References available upon request

There is a difference in current normative data compared to previous norms with regards to each category, except for adult fine motor control using the 9 Hole Peg Test.