Comparative study of millennials’ (age 20-34 years) grip and lateral pinch with the norms

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Abstract

Study Design: Cross-sectional research design.

Introduction: Clinical practice continues to use normative data for grip and pinch measurements that were established in 1985. There is no updated norms despite different hand usage patterns in today’s society. Purpose of the Study: Measuring and comparing grip and pinch strengths with normative data is a valid method to determine hand function. This research was implemented to compare the grip and pinch measurements obtained from healthy millennials to the established norms and to describe hand usage patterns for millennials.

Methods: Grip and lateral pinch measurements were obtained from a sample of 237 healthy millennials (ages 20-34 years).

Results: Strength scores were statistically lower that older normative data in all millennial grip strengths, with the exception of the women in the age group of 30-34 years. Specifically, this statistically significant trend was observed in all male grip strengths, as well as in women in the age group of 20-24 years (bilateral grip) and 25-29 years (right grip). However, the lateral pinch data reflected was similar to the older norms with variances of 0.5-1 kg.

Conclusion: Current data reflect statistically significant differences from the norms for all male grip measurements, as well as for women in the age group of 20-24 years (bilateral grip) and 25-29 years (right grip). No statistical significance was observed in the independent-sample t tests for the lateral pinch in men of all age groups. Statistical significance was noted for lateral pinch for female age groups for the left hand (20-24 years) and for bilateral lateral pinches (30-34 years).

Level of evidence: IV.

Introduction

Grip and pinch strength measurements are routinely assessed to evaluate upper extremity impairments, strength changes, and work capacity or demands. Grip strength testing provides information on hand function and can be used as a predictor for treating hand injuries and related conditions, as well as determining illness and disability risk factors. Strength measurements are quick assessments that yield pertinent clinical data to be used in the rehabilitative remediation process. These data have acceptable reliability and validity, which is valuable for clinical reasoning in the determination of functional impairments and functional progress. Due to the fact that the norms for grip and pinch were established in 1985 and have not been updated despite changes in work demands and technological advancements, it is relevant to investigate whether older normative data for the current young generation (ie, millennial generation). The millennial population includes individuals born after 1980 who have a high frequency of technology use in everyday work, play, and leisure activities. Therefore, it is important to focus on this population when re-evaluating the grip and pinch norms to determine whether current societal and work changes and increased technology use may have affected grip and pinch strength values.

To ensure norm validity, it is recommended that the norms be updated every 10-20 years according to Stringer and Naldone. Several articles on pinch and grip strength suggest that therapists require an updated set of norms for assessments to be accurate. In the health care field, there is an evidence-practice gap where evidence formulated from research has not been up to date with the needs of current health care practice. The study by Muller-patan et al indicated that the United States uses the most...
outdated normative data from 1985 in comparison to normative data used in the regions of Switzerland, Taiwan, Australia, and Iran that have all been established or reestablished since 2006. Due to the lack of more current normative data, some health care professionals are using nonstandardized assessments to interpret grip and pinch strengths. Because these assessments are not evidence based, this does not reflect the vision toward which the occupational therapy profession is moving.\footnote{Outdated 1985 data used worldwide.} As a result, research studies such as the proposed grip and pinch study are important to provide data for evidence-based practice. Therapists need current evidence in practice to be able to obtain accurate assessments and provide appropriate interventions for their clients.

Grip and pinch norms should also be updated due to changes in societal trends potentially rendering the previous norms obsolete. One trend is the shift away from physical labor toward more sedentary jobs. It has been reported that from 1910 to 2000, there were major changes in the American workforce. The top areas to decline were in manufacturing and agriculture, whereas areas to increase dealt with technology-related jobs.\footnote{Decline in manufacturing and agriculture.} This trend is particularly important due to its potential effect on grip strength, as research has supported that grip strength varies depending on the physical and strenuous nature of the activities a person engages in daily.\footnote{Daily strenuous activities.} Along with this decrease in daily strenuous activities, there has been an increase in technology use in work and everyday activities, with three-fourths of adults using a laptop/personal computer and most American adults using a smartphone in their work and leisure tasks.\footnote{Increased technology use.} Therefore, these shifts in societal and work demands could affect current pinch and grip strength norms.

Overall, the literature review suggests that grip and pinch strength norms need to be updated due to changes in societal trends potentially affecting pinch and grip strength. Updating the grip and pinch norms will ensure health care professionals can accurately assess their clients’ hand function.

Purpose

The purpose of this study was to determine whether there are differences in grip and pinch strengths comparing a sample of healthy millennials (ages 20–34 years) with the Mathowietz (1985) age- and sex-matched norms.

Methods

Design and setting

A nonexperimental cross-sectional research design with data collected over 1 semester was used in this quantitative study because the recruitment of participants included a convenience sample that was not randomized, controlled, or manipulated.\footnote{Societal normative data used worldwide.}

Participants were full-time students aged 20–34 years (millennials’ age group), totaling 237 participants with 154 being women and 83 being men. Participants were recruited at university settings in North Carolina. All participants received instructions and provided consent before initiation of the study. Participants completed a questionnaire to provide demographic information; however, no further information was obtained due to participants reporting being full-time students with assumed similar roles/daily activities. Questions relating to any history of upper extremity pathology/injury or recurrent pain were also included before the participants’ inclusion in the study. If prior upper extremity pain or injury that indicated potential residual impairments or pathology was disclosed, these individuals were excluded from the data collection sample. The Finkielstein test was also administered to exclude participants with possible thumb conditions or injuries affecting pinch strength, which is especially significant in this population due to the increased prevalence of repetitive stress activities such as texting. It was not determined to be necessary to evaluate more specifically for other types of tendonitis as these participants were excluded from the study to prevent potential influences on the data being compared to the 1985 Mathowietz normative data.

Procedures

The Jamar hydraulic hand dynamometer was obtained from Sammons Preston, Boling Brook, Illinois and used to assess hand-grip strength, and the B&L Engineering pinch gauge was used to assess lateral pinch strength. Instruments were calibrated before initiation of the study. Calibrations were conducted by a master service technician per manufacturer guidelines using force gauges and adjustment of readings as indicated. Testing with both instruments was conducted according to the American Society of Occupational Therapy.
Hand Therapists (ASHT) protocol and the study by Mathiowetz et al. These measurements were obtained with the client sitting with the shoulder adducted, the elbow flexed at 90°, the forearm in a neutral position, and the wrist between 0° and 30° dorsiflexion when assessing grip and pinch strengths with the dynamometer or the pinch gauge as indicated in the ASHT protocol. The researchers held the dynamometer with the strap around their pants and the dynamometer handle was set at the second handle position for all participants to collect demographic information for the participants’ gender, age, hours and method of smartphone usage, and history of any upper extremity pain or injury. The grip and pinch strength data were then collected using the dynamometer and pinch gauge instruments for both the right and left upper extremity per ASHT protocol.

**Results**

This study population included a sample of 237 healthy millennials (ages 20–34 years). Data analysis was conducted using SPSS to determine the mean, standard deviation controlling for sex, age, and each hand grip and lateral pinch to obtain comparable data points as the study by Mathiowetz et al. Data analysis controlling for these variables was done using the independent-samples t test in Excel. Additional analysis of the pinch and grip strengths controlling for each age range was calculated and compared with the normative data from the study conducted by Mathiowetz et al. For women of age 20–24 years, the average right grip strength was lower by 5.2 kg (11.4 lb) and the average left upper extremity grip strength was lower by 2.7 kg (6 lb). The average right upper extremity pinch strength was higher by 0.4 kg (0.8 lb), whereas the average left upper extremity pinch strength was higher by 0.5 kg (1.2 lb). For women of age 25–29 years, the average right upper extremity pinch strength was lower by 3 kg (6.7 lb) and the average left upper extremity pinch strength was lower by 0.6 kg (1.3 lb) and the average left upper extremity pinch strength was higher by 0.7 kg (1.5 lb) and the average left upper extremity pinch strength was higher by 4.3 kg (9.4 lb). The average right upper extremity pinch strength was higher by 1.6 kg (3.6 lb), whereas the average left upper extremity pinch strength was higher by 2.1 kg (4.6 lb) as noted in Figures 1 and 2.

**Data collection**

Data collection was conducted in areas highly accessed by millennials, where permission was obtained to conduct research. A researcher invited individuals to take part in the study and provided a summary of the purpose of the study and expectations for participation. If the individual expressed interest in participating, a consent form was then provided to prevent liability of the researchers and university for any injuries, as well as to ensure participant confidentiality. A questionnaire was also given to all participants to collect demographic information for the participants’ gender, age, hours and method of smartphone usage, and history of any upper extremity pain or injury. The grip and pinch strength data were then collected using the dynamometer and pinch gauge instruments for both the right and left upper extremity per ASHT protocol.

**Table 1**

<table>
<thead>
<tr>
<th>Age</th>
<th>Side</th>
<th>Male</th>
<th>Group 1</th>
<th>Group 2</th>
<th>P value</th>
<th>Female</th>
<th>Group 1</th>
<th>Group 2</th>
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Statistically significant values for P value <.05.

SD = standard deviation.
For men in the age group of 20-24 years, the average right upper extremity grip strength was lower by 9.1 kg and the average left upper extremity grip strength was lower by 2.6 kg (5.8 lb). The average right upper extremity pinch strength was lower by 0.3 kg (0.6 lb) and the average left upper extremity pinch strength was lower by 0.3 kg (0.6 lb). For men in the age group of 25-29 years, the average right upper extremity grip strength was lower by 11.7 kg (25.8 lb) and the average left upper extremity grip strength was lower by 10.5 kg (23.1 lb) and the average right upper extremity pinch strength was lower by 0.8 kg (1.7 lb), whereas the average left upper extremity pinch strength was lower by 0.5 kg (1.1 lb). For men in the age group of 30-34 years, the average right upper extremity grip strength was lower by 10.5 kg (23.1 lb) and the average left upper extremity grip strength was lower by 4.4 kg (9.7 lb). The average right upper extremity pinch strength was lower by 0.8 kg (1.7 lb), whereas the average left upper extremity pinch strength was lower by 0.5 kg (1.1 lb) as noted in Figure 2. Therefore, it is apparent that overall in most age groups, there was a lower grip strength, as well as a higher or comparable pinch strength noted in women and a slight rise or similar pinch strength was observed in women age and gender for norms (Mathiowetz study, group 1) and (present study, group 2) and independent-samples t test with P value.

<table>
<thead>
<tr>
<th>Age</th>
<th>Side</th>
<th>Group 1</th>
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Table 2: Average lateral pinch strength (kg) for both hands stratified by age and gender for norms (Mathiowetz study, group 1) and (present study, group 2) and independent-samples t test with P value

Statistically significant values for P value < .05.

SD – standard deviation.

Acknowledgments

The authors greatly appreciate Anne Blosser, Cody Hamrick, Elizabeth Davis, and Anthony Dixon for their contributions to this study.


Record your answers on the Return Answer Form found on the tear-out coupon at the back of this issue or to complete online and use a credit card, go to JHTReadforCredit.com. There is only one best answer for each question.

#1. The study design is
   a. RCTs
   b. case series
   c. prospective cohort
   d. cross sectional research

#2. The study sought to compare
   a. grip to pinch in a population of Millennials
   b. lateral pinch to three jaw chuck pinch in Millennials
   c. established norms to a population of Millennials
   d. grip and pinch in senior citizens to Millennials

#3. The test population typically performed more __________ than the established group
   a. technology use
   b. work from home tasks
   c. intellectually challenging work
   d. bilateral tasks at work

#4. The authors cite Stringer when suggesting norms be up-dated every
   a. 5-10 years
   b. 10-20 years
   c. 30 years
   d. 50 years

#5. The findings confirmed that both male and females had almost identical differences in comparing the established groups to the test groups
   a. true
   b. false

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