

Grip and Pinch Strength: Normative Data for Adults

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ABSTRACT. Mathiowetz V, Kashman N, Volland G, Weber K, Dowe M, Rogers S: Grip and pinch strength: normative data for adults. *Arch Phys Med Rehabil* 66:69-72, 1985.

• The primary purpose of this study was to establish clinical norms for adults aged 20 to 75+ years on four tests of hand strength. A dynamometer was used to measure grip strength and a pinch gauge to measure tip, key, and palmar pinch. A sample of 310 male and 328 female adults, ages 20 to 94, from the seven-county Milwaukee area were tested using standardized positioning and instructions. Right hand and left hand data were stratified into 12 age groups for both sexes. This stratification provides a means of comparing the score of individual patients to that of normal subjects of the same age and sex. The highest grip strength scores occurred in the 25 to 39 age groups. For tip, key, and palmar pinch the average scores were relatively stable from 20 to 59 years, with a gradual decline from 60 to 79 years. A high correlation was seen between grip strength and age, but a low to moderate correlation between pinch strength and age. The newer pinch gauge used in this study appears to read higher than that used in a previous normative study. Comparison of the average hand strength of right-handed and left-handed subjects showed only minimal differences.

KEY WORDS: Exercise test; Exertion; Occupational therapy; Physical therapy

Reliable and valid evaluation of hand strength is of paramount importance in determining the effectiveness of various surgical or treatment procedures. In addition, normative data are needed to interpret evaluation data; to set realistic treatment goals; and to assess a patient's ability to return to employment.

The most common norms for grip and pinch strength used in therapy clinics were compiled by Kellor's group,⁷ which sampled 250 individuals in three large age groups. Regression analysis was performed to predict the amount of right hand (RH) or left hand (LH) strength an individual of a given sex and particular age would demonstrate. Since few left-handed subjects were tested, their scores were combined with those of right-handed subjects. No standardized positioning or instructions were followed. Test-retest and interrater reliability data were not reported. The Osco pinch meter used in their study is no longer commercially available and there is some question whether data from use of the newer pinch meters can be validly compared to their norms.¹⁷

Another study¹⁶ established clinical norms for grip strength, employing the Martin Vigrometer, which has a soft handle and has been used clinically with arthritic patients. However, the Jamar dynamometer^a has been found^{8,12} to give the most accurate measure of grip strength.

Schmidt and Toews¹⁴ used the Jamar dynamometer to test grip strength in a large sample, 1128 males (M), 80 females (F), of employee applicants at a manufacturing plant. Although the instructions and positioning were reported to be standardized, description was not sufficient for replication. Unfortunately, as the handles of the dynamometer were coated with a sand-paint mixture and the data were collected in the competitive situation of a pre-job placement interview, generalization from these results is questionable.

Recently, the American Society of Hand Therapists, suggesting a standardized arm positioning for hand strength tests, concluded that the position of the upper extremity (UE) might influence measurements, and recommended that the patient should be seated with his shoulder adducted and neutrally rotated, elbow flexed at 90° and the forearm and wrist in neutral position.³

Table 1: Characteristics of Subjects: Age, Sex, and Hand Dominance

Age	Men				Women			
	N	Age (\bar{x})	Dominance		N	Age (\bar{x})	Dominance	
			R	L			R	L
20-24	29	21.7	26	3	26	22.4	26	0
25-29	27	27.4	21	6	27	26.6	25	2
30-34	27	32.1	24	3	26	32.1	23	3
35-39	25	37.3	24	1	25	36.4	17	8
40-44	26	41.5	22	4	31	42.3	30	1
45-49	28	47.1	28	0	25	47.1	25	0
50-54	25	51.9	25	0	25	51.9	22	3
55-59	21	57.1	21	0	25	56.5	25	0
60-64	24	62.1	22	2	25	62.4	24	1
65-69	27	66.7	27	0	28	67.3	25	3
70-74	26	72.0	23	3	29	71.8	28	1
75+	25	78.9	25	0	26	78.8	25	1
Total	310		288	22	318		295	23

In testing the variable of wrist position, Pryce¹³ found no significant difference in grip strength with test positions at 0° and 15° ulnar deviation, 0° and 15° dorsiflexion, or any combination of these. Kraft and Detels¹⁰ found no significant difference with test positions at 0°, 15°, and 30° dorsiflexion (0° ulnar deviation) in measuring grip strength. Both studies^{10,13} found grip strength to be significantly less at 15° of volarflexion.

Mathiowetz and associates¹² used standardized procedures (subject position and instructions) to assess the reliability and validity of grip strength and pinch evaluations. The highest test-retest reliability for each test was achieved when the mean of three trials was utilized. The Jamar dynamometer and the B&L pinch gauge^b had the highest calibration accuracy of the instruments tested.¹² No normative data based on these standardized procedures have previously been reported.

The primary purpose of this study was to establish clinical

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