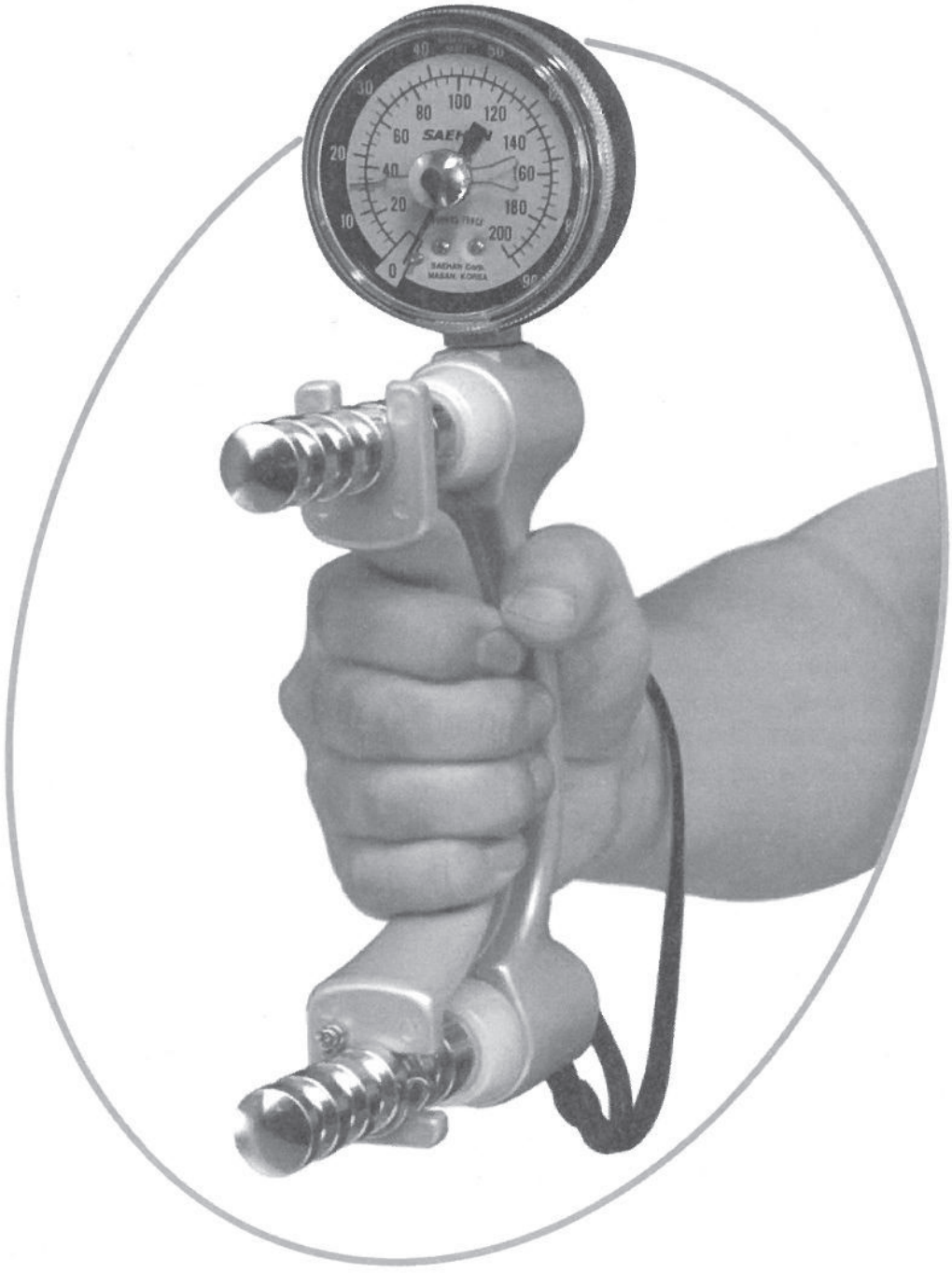
Hydraulic Hand Dynamometer



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Introduction

The Hydraulic Hand Dynamometer gives accurate grip strength readings without the subject being able to "feel" the handle move.
The adjustable handle has 5 positions to be able to accommodate to any hand size.
The indicator remains at the subject's maximum reading until it is reset.
This hand dynamometer has a scale in kilograms.

Features

The Hydraulic Hand Dynamometer offers numerous features for standard screening work, as well as for assessing hand trauma and disease;

Dual-Scale Readout Displays grip force in pounds and kilograms.
Maximum reading is 200 pounds or 90 kilograms.

Peak-Hold Needle For convenience and ease of recording, it automatically retains the highest reading on the peak-hold needle.
That needle will remain on the gauge until it is reset.

Accurate & Reproducible It is isometric in use with almost no perceptible motion on the handles, regardless of grip strength.
This ensures accurate, reproducible results.

Adjustable Handle To accommodate various hand sizes, the handle can be adjusted to 5 positions from 3,5cm to 8,5cm in 1cm increments.

Since grip strength may also vary in an individual patient, this feature allows therapists to quantify grip strength for different size objects.

Benefits

Some patients may be reluctant to exert maximum effort in grip force evaluation.
Repeated tests after short rest periods will determine if a patient is exerting maximum effort.

(1) Test grip in the usual manner taking readings with the hand grip in each position of the hand dynamometer

(2) Test the normal hand, followed by the injured hand.
Allow the patient to see the readings.

(3) After about five minutes you can repeat the test.

Usually, if the patient has carried out the test with full effort, there will be less than 10% variation in results for various grip positions.
However, if the patient has not exerted maximum effort, there will be a larger, inconsistent, variation between the tests.

The Hydraulic Hand Dynamometer is a precision instrument and its accuracy can be impaired by abuse. Have the patient use the wrist safety strap to minimize the chance of dropping the instrument accidentally.

To use the hand dynamometer:

(1) Set the adjustable handle to the desired spacing. Make sure the handle clip is located at the lower (furthest) post fro the gauge before moving the handle from one position to another.
If you do not replace the handle in the correct position, inaccurate readings will result.

(2) Rotate the peak-hold needle counter clockwise to 0.

(3) Let the patient arrange the instrument so that it fits in the hand comfortably.
Request that the patient squeeze with maximum strength.
The peak-hold needle will automatically record the highest force exerted.

(4) After the patient has used the instrument, record the reading.

(5) Reset the peak-hold needle to zero before recording new readings.

Suggested Standard Procedures (1):

(1) Sit or stand comfortably
(2) Keep shoulder adducted and neutrally rotated
(3) Elbow should be flexed to 90 degrees
(4) Forearm in neutral position
(5) Wrist in neutral position
(6) Repeat each test 3 times and record the average

Suggested interfering Factors (2):

(1) Weight
(2) Hand Width
(3) Height
(4) Mesomorph

Average Grip-Strength versus Age (3):

		MALES			FEMALES		
Age	Hand	Mean	SD	Range	Mean	SD	Range
6 - 7	R L	32,5 30,7	4,8 5,4	21 - 42 18 - 38	28,6 27,1	4,4 4,4	20 - 39 16 - 36
8 - 9	R L	41,9 39,0	7,4 9,3	27 - 61 19 - 63	35,3 33,0	8,3 6,9	18 - 55 16 - 49
10 - 11	R L	53,9 48,4	9,7 10,8	35 - 79 26 - 73	49,7 45,2	8,1 6,8	37 - 82 32 - 59
12 - 13	R L	58,7 55,4	15,5 16,9	33 - 98 22 - 107	56,8 50,9	10,6 11,9	39 - 79 25 - 76
14 - 15	R L	77,3 64,4	15,4 14,9	49 - 108 41 - 94	58,1 49,3	12,3 11,9	30 - 93 26 - 73
16 - 17	R L	94,0 78,5	19,4 19,1	64 - 149 41 - 123	67,3 56,9	16,5 14,0	23 - 126 23 - 87
18 - 19	R L	108,0 93,0	24,6 27,8	64 - 172 54 - 149	71,6 61,7	12,3 12,5	46 - 90 41 - 86

NOTE: The mean scores for individuals, aged 14 - 19 years, may be slightly low (0 to 5 kg lower than they should be) due to instrument error detected after the study.

(1) Gill D., Reddon J., Renny C., Stefanyk W. "Hand Dynamometer: Effects of Trials and Session". Perceptiual & Motor Skills 61: 195–8, 1985
(2) Everett P., Sils F. "The Relationship of Grip Strength to Stature, Somatotype Components and Anthropometric Measurments of the Hand". The Research Quarterly 23: 161-6, 1952
(3) Mathiowetz V., Federman S., Wiemer D. "Grip and Pinch Strength: Norms for 6 to 19 Year Olds." The American Journal of Occupational Therapy 40:705, 1986

Average Performance of all subjects on Grip Strength (4): in kilograms

		MALES					FEMALES				
Age	Hand	Mean	Std Dev	Std Error	Low	High	Mean	Std Dev	Std Error	Low	High
20 - 24	R	54,89	9,34	1,72	41,28	75,75	31,93	6,58	1,27	20,87	43,09
	L	47,40	9,89	1,81	33,21	68,04	17,67	5,94	1,18	14,97	39,92
25 - 29	R	54,79	10,43	2,0	35,38	71,67	33,79	6,31	1,22	21,77	44,00
	L	50,12	7,35	2,0	34,93	63,05	28,80	5,53	1,09	21,77	44,00
30 - 34	R	55,25	10,16	1,95	31,75	77,11	35,70	8,71	1,72	20,87	62,14
	L	50,08	9,84	1,91	29,03	65,77	30,84	8,03	1,59	16,33	52,16
35 - 39	R	54,30	10,89	2,18	34,47	79,83	33,61	4,90	1,00	22,68	44,91
	L	51,21	9,84	1,91	33,11	71,22	30,07	5,31	1,04	22,23	41,28
40 - 44	R	52,98	9,39	1,86	38,10	74,84	31,93	6,12	1,09	17,24	46,72
	L	51,17	8,48	1,68	33,11	71,22	28,26	6,26	1,13	15,88	42,64
45 - 49	R	49,85	10,43	1,95	29,48	70,31	28,21	6,85	1,36	17,69	45,36
	L	45,72	10,34	1,95	26,31	72,58	25,40	5,76	1,13	16,78	37,65
50 - 54	R	51,53	8,21	1,63	35,83	68,49	29,85	5,26	1,04	17,24	39,46
	L	46,22	7,71	1,54	31,75	64,86	25,99	4,85	0,95	15,88	34,47
55 - 59	R	45,86	12,11	2,63	26,76	69,85	25,99	5,67	1,13	14,97	39,01
	L	37,74	10,61	2,31	19,50	58,06	21,46	5,40	1,09	14,06	35,83
60 - 64	R	40,69	9,25	1,91	23,13	62,14	24,99	4,58	0,91	16,78	34,93
	L	34,84	9,21	1,86	12,25	52,62	20,73	4,58	0,91	7,71	29,94
65 - 69	R	41,32	9,.34	1,81	25,40	59,42	22,50	4,40	0,82	15,88	33,57
	L	34,84	8,98	1,72	19,50	53,07	18.60	3,72	0,68	13,15	28,58
70 - 74	R	34,16	9,75	1,91	14,52	48,99	22,50	5,31	1,00	14,97	35,38
	L	29,39	8,21	1,68	14,52	42,18	18,82	4,63	0,86	10,43	30,39
75 +	R	29,80	9,53	1,91	18,14	61,24	19,32	4,99	1,00	11,34	29,48
	L	24,95	7,71	1,54	14,06	53,98	17,06	4,04	0,77	10,89	27,67
All Sub-jects	R	47,31	12,84	0,73	14,52	79,83	28,49	7,71	0,44	11,34	62,14
	L	42,23	12,52	0,73	12,25	72,58	24,45	7,12	0,40	10,43	52,16

The above norms are from Mahiowetz, V., Kasman, N., Volland, G., Weber, K., Dowe, M., Rogers S.

Average Performance of all subjects on Grip Strength (4): in pounds

		MALES					FEMALES				
Age	Hand	Mean	Std Dev	Std Error	Low	High	Mean	Std Dev	Std Error	Low	High
20 - 24	R L	121,0 104,5	20,6 21,8	3,8 4,0	91 71	167 150	70,4 61,0	14,5 13,1	2,8 2,6	46 33	95 88
25 - 29	R L	120,8 110,5	23,0 16,2	4,4 4,4	78 77	158 139	74,5 63,5	13,9 12,2	2,7 2,4	48 48	97 97
30 - 34	R L	121,8 110,4	22,4 21,7	4,3 4,2	70 64	170 145	78,7 68,0	19,2 17,7	3,8 3,5	46 36	137 115
35 - 39	R L	119,7 112,9	24,0 21,7	4,8 4,2	76 73	176 157	74,1 66,3	10,8 11,7	2,2 2,3	50 49	99 91
40 - 44	R L	116,8 112,8	20,7 18,7	4,1 3,7	84 73	165 157	70,4 62,3	13,5 13,8	2,4 2,5	38 35	103 94
45 - 49	R L	109,9 100,8	23,0 22,8	4,3 4,3	65 58	155 160	62,2 56,0	15,1 12,7	3,0 2,5	39 37	100 83
50 - 54	R L	113,6 101,9	18,1 17,0	3,6 3,4	79 70	151 143	65,8 57.3	11,6 10,7	2,3 2,1	38 35	87 76
55 - 59	R L	101,1 83,2	26,7 23,4	5,8 5,1	59 43	154 128	57,3 47,3	12,5 11,9	2,5 2,4	33 31	86 76
60 - 64	R L	89,7 76,8	20,4 20,3	4,2 4,1	51 27	137 116	55,1 45,7	10,1 10,1	2,0 2,0	37 29	77 66
65 - 69	R L	91,1 76,8	20,6 19,8	4,0 3,8	56 43	131 117	49,6 41,0	9,7 8,2	1,8 1,5	35 29	74 63
70 - 74	R L	75,3 64,8	21,5 18,1	4,2 3,7	32 32	108 93	49,6 41,5	11,7 10,2	2,2 1,9	33 23	78 67
75 +	R L	65,7 55,0	21,0 17,0	4,2 3,4	40 31	135 119	42,6 37,6	11,0 8,9	2,2 1,7	25 24	65 61
All Sub-jects	R L	104,3 93,1	28,3 27,6	1,6 1,6	32 27	176 160	62,8 53,9	17,0 15,7	0,96 0,88	25 23	137 115

The above norms are from Mahiowetz, V., Kasman, N., Volland, G., Weber, K., Dowe, M., Rogers S.

The Hydraulic Hand Dynamometer is designed to provide years of dependable service, with minimal maintenance. Tom make sure the instrument is reading accurately, we suggest occasionally making the few checks listed below.

If you detect a problem, return the instrument to MSD Europe bvba for servicing.

Posts

Remove the adjustable handle and check that each post moves up and down freely on its guide (the part that the post bears on), even when you exert pressure on the side of the post. If excessive friction exists between the posts and guide return the dynamometer for service.

Hydraulics

To check the hydraulic mechanism, first remove the adjustable handle.
While keeping an eye on the top post, push down on the bottom post.
Generally, both posts should move about 0,5 cm, with top and bottom posts moving in opposite directions, with top and bottom posts moving in opposite directions.
Movements of less than 0,25 cm indicates a probable leak in the hydraulic system, which requires service.

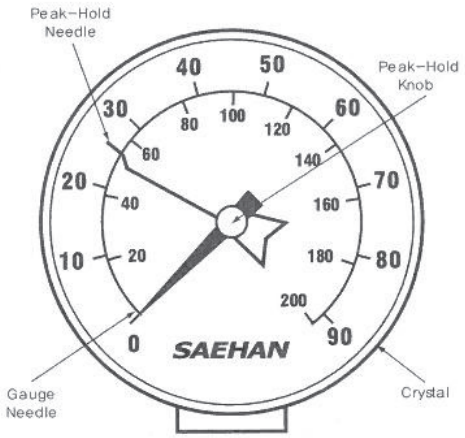
Handle

Hold the instrument normally and look carefully at the way the forks of the adjustable handle are supported on the posts.
Each fork should touch the post close to its center.
If they do not, return the instrument to MSD Europe bvba for adjustment.

Peak-Hold Needle

Check for excessive friction in the peak-hold assembly by turning the peak-hold knob counter clockwise. If the peak-hold needle deflects the gauge needle, return the gauge for service.

If the peak-hold needle should disconnect from the support pin, it can easily be repositioned. Unscrew the crystal and turn it upside down.
Locate the brass pin in the center of the crystal (the pin is part of the chrome knob on the outside of the crystal).
Locate the slot on the brass pin and place the peak-hold needle into this slot.



Calibration

This instrument was calibrated at the factory by loading it at the center with weight and making appropriate adjustments in the gauge.
The calibration should be checked once a year. If the instrument has been dropped or there is some particular reason to suspect that the calibration is in error, the instrument should be serviced immediately.
When the instrument is found to be in need of re calibration we recommend that it be returned to MSD Europe bvba.

DO NOT TRY TO PERFORM THIS OPERATION YOURSELF!

Service / Re calibration

When preparing to ship the dynamometer, be certain it is packed in its carrying case and protective carton.
Always insure the instrument with the postal service or other shipping service.

Returning the Hydraulic Hand Dynamometer

Observe the following guidelines if you are requesting repair service:

(1) Follow the service tips outlined in this manual to very the malfunction

(2) If you are determine that repair is required, include a letter describing the nature of the difficulty and the **serial number** of the instrument you are returning:

(3) Return to AFTER WRITTEN DEMAND:
MSD Europe bvba
Neringstraat 7
1840 Londerzeel
Belgium - Europe

Returning Hand Dynamometer

When you decide to send us the hand dynamometer back we expect a written demand from you. When you receive our confirmation/approval to send the hand dynamometer back, you can send it to us.

If you send us the hand dynamometer back without our written approval to do so, all the costs (transport, repair, ...) are for your account.