Physical Chart

Name, ...

Date, ... 1896.

Explanation of the Chart.

It is manifestly unfair to make a comparison of the strength of a man of any height with that of another man whose height is not approximately the same, for the reason that the height depends upon bone development, and the law of development connects large muscles with large bones. It is also a recognized law that the strength increases in proportion to the square of the height, wheras height increases in simple arithmetical ratio. The Physical Charts previously arranged by the writer, have been based upon the mean-average individual. In order to furnish a basis for a more just comparison, this chart has been prepared upon the basis of height, including such heights as fall within the limits of 64 and 72 inches. All men not less than 63.6 inches nor more than 64.5 inches in height were placed in the 64-inch class, and so for each height between 64 and 72 inches. The averages were then obtained for each class and the figures set down in their appropriate columns opposite the proper height. These averages are arranged in order at the upper part of the chart. Four blank spaces are left just below for recording the figures found for the same person at different dates. For a comparison of the actual difference between the man examined and another man of the same height, it is only necessary to compare the figures found, when placed upon the chart in the appropriate places, with the figures found in the same column in the line opposite the same height.

GRAPHIC PERCENTAGE REPRESENTATION.

Provision is made for a graphic percentage representation in the diagram occupying the lower half of the chart, upon which percents may be written at any level from 0 to 250. To obtain the percentage relation of the man examined to the average man of the same height, it is only necessary to divide the number found for each individual group of muscles by the number shown in the proper columns for the mean-average man of the given height. Having found the percentage in this manner, a dot is made with a pencil in the proper column, and at a level corresponding with the percentage shown by the quotient obtained. If the quotient is 1, the dot will be made opposite, or in line with, 100, and the meaning is that the strength of the group of muscles tested is equal to that of the mean-average man of the same height. If the amount obtained by dividing the number found by the number representing the strength of the same group of muscles in the average man of the same height, is less than 1, as .50 for example, this represents that the strength of the group of muscles examined is only one-half, or 50%, that of the mean-average man of the same height. A dot is accordingly located opposite to, or in line with, the number 50 in the per cent column. In like manner, points may be located for each group of muscles. Connecting the points by lines, we have a graphic representation in which the relation of the individual examined to the mean-average man of the same height is accurately shown. All the points in the chart which fall below 100 indicate relative inferiority of strength; all the points above the 100-line represent relative superiority in strength.

COEFFICIENTS.

At the right-hand side of the chart are nine columns which relate to coefficients. These coefficients are obtained as follows:—

Height-Weight Coefficient.— Divide the body weight in grams by the height in millimeters. The result expresses the number of grams which the individual weighs per millimeter of height.

$$\frac{\text{Body weight in grams}}{\text{Height in millimeters}} = \text{Height-Weight Coefficient.}$$

Strength-Weight Coefficient.— Divide the total strength in pounds or kilograms by the weight in pounds or kilograms. This coefficient expresses the number of pounds or kilograms a person is able to lift for each pound or kilogram of his weight.

$$\frac{\text{Total Strength}}{\text{Total Weight}} = \text{Strength-Weight Coefficient.}$$

Respiratory-Weight Coefficient.— Obtained by multiplying the lung capacity in liters (shown by the spirometer) by the respiratory strength in kilograms, and dividing the result by the body-weight in kilograms. This coefficient expresses the respiratory capacity for each kilogram of weight.

$$\frac{\text{Chest-Capacity} \times (\text{Strength of Diaphragm} + \text{Strength of Chest,}}{\text{Weight}}$$

$$= \text{Respiratory-Weight Coefficient.} \quad \text{Or,}$$

$$\frac{\text{Chest-Capacity in cu. in.} \times (\text{Strength of Diaphragm} + \text{Chest Strength})}{61 \times \text{Weight}}$$

$$= \text{Respiratory-Weight Coefficient.}$$

Strength-Height Coefficient.— Obtained by dividing the total strength in kilograms by the total height in millimeters. This coefficient expresses the number of kilograms which an individual is able to lift for each millimeter of strength.

$$\frac{\text{Total Strength in kilograms}}{\text{Height in millimeters}} = \text{Strength-Height Coefficient.}$$

$$\text{Or,} \quad \frac{\text{Total Strength in pounds}}{\text{Height in inches} \times 55} = \text{Strength-Height Coefficient.}$$

Respiratory-Height Coefficient.— Obtained by multiplying the lung capacity in liters by the respiratory strength in kilograms, and dividing by the height in millimeters. This coefficient represents the respiratory capacity of the individual for each millimeter in height.

$$\frac{\text{Chest-Capacity} \times (\text{Strength of Diaphragm in kilograms} +}{\text{Height in}}$$

$$\frac{\text{Strength of Chest in kilograms)}}{\text{millimeters}} = \text{Respiratory-Height Coefficient.}$$

$$\text{Or,} \quad \frac{\text{Chest-Capacity in cu. in.} \times (\text{Strength of Diaphragm in pounds} +}{\text{Height in inches} \times 25 \times}$$

$$\frac{\text{Strength of Chest in pounds)}}{61 \times 2\frac{1}{2}} = \text{Respiratory-Height Coefficient.}$$

The last formula reduced for convenience gives the following:—

$$\frac{\text{Chest-Capacity in cu. in.} \times (\text{Strength of Diaphragm} + \text{Strength of}}{\text{Height in}}$$

$$\frac{\text{Chest in pounds)} \times .0003}{\text{inches}} = \text{Respiratory-Height Coefficient.}$$

Coefficient of Vital Efficiency.— Obtained by dividing the Respiratory-Weight unit, or coefficient, by the Strength-Weight unit, or coefficient. This coefficient combines in one expression the relations indicated by the Respiratory-Weight and Strength-Weight coefficients, and represents the relation of a person's respiratory capacity to his working-capacity.

$$\frac{\text{Respiratory-Weight Coefficient}}{\text{Strength-Weight Coefficient}} = \text{Vital-Efficiency Coefficient.}$$

Coefficient of Vital Development.— Obtained by dividing the Respiratory-Height unit, or coefficient, by the Strength-Height unit, or coefficient. This coefficient combines in one expression the relations represented by the Respiratory-Height and Strength-Height coefficients respectively, and furnishes a means of very readily determining whether a person's respiratory development is properly proportioned to his motor development.

$$\frac{\text{Respiratory-Height Coefficient}}{\text{Strength-Height Coefficient}} = \text{Vital-Development Coefficient.}$$

Arms-Strength-Weight Coefficient.— Obtained by dividing the total strength of the arms by the weight of the body.

Legs-Strength-Weight Coefficient.— Obtained by dividing the total strength of the legs by the weight of the body.

A graphic representation of the percentage relation of a person's coefficients to those of the mean-average man of the same height, is obtained in the manner already explained with relation to the actual strength of muscular groups.

PHYSICAL CHART

Classified and Arranged According to Heights from 64 to 72 Inches.

Arranged from the results obtained in testing the strength of the individual groups of muscles in 1500 MEN, by means of the Universal Dynamometer. The figures given represent the mean-average for each group of muscles respectively. Made and compiled under the direction of J. H. KELLOGG, M. D., Superintendent of the Sanitarium and Hospital, Battle Creek, Mich.

Except when Otherwise Indicated, Quantities are Expressed in Pounds Avoirdupois.

Date.	HEIGHT (Inches).	WEIGHT.	ARMS.																LEGS.																TRUNK.							RESPIRATION.			TOTAL STRENGTH.				COEFFICIENTS.							HEIGHT (Inches).
			R. Hand Flexors.	L. Hand Flexors.	R. Hand Extensors.	L. Hand Extensors.	R. Forearm Pronators.	L. Forearm Pronators.	R. Forearm Supinators.	L. Forearm Supinators.	R. Arm Flexors.	L. Arm Flexors.	R. Arm Extensors.	L. Arm Extensors.	R. Deltoid.	L. Deltoid.	R. Pectoral.	L. Pectoral.	R. Shoulder Retractor.	L. Shoulder Retractor.	R. Foot Flexors.	L. Foot Flexors.	R. Foot Extensors.	L. Foot Extensors.	R. Leg Flexors.	L. Leg Flexors.	R. Leg Extensors.	L. Leg Extensors.	R. Thigh Flexors.	L. Thigh Flexors.	R. Thigh Extensors.	L. Thigh Extensors.	R. Thigh Abductors.	L. Thigh Abductors.	R. Thigh Adductors.	L. Thigh Adductors.	Trunk Anterior.	Trunk Posterior.	Trunk R. Lateral.	Trunk L. Lateral.	Neck Anterior.	Neck Posterior.	Neck R. Lateral.	Neck L. Lateral.	Inspiration. Diaphragm.	Inspiration — Chest.	Spirometer (Litres).	ARMS.	LEGS.	TRUNK.	CHEST.	ENTIRE BODY.	Height-Weight.	Strength - Weight.	Strength - Height.	Respiratory - Weight.	Respiratory - Height.	Vital - Efficiency.	Vital - Development.	Arms - Strength - Weight.	Legs - Strength - Weight.	
	72	151	129	121	42	37	72	68	62	62	59	61	56	57	69	69	92	96	82	85	71	70	271	268	92	88	115	120	131	135	156	155	102	101	111	103	118	278	122	115	37	64	54	56	146	160	4.70	1319	2094	844	306	4563	38.13	30.22	1.236	9.50	.389	.314	.316	8.73	13.87	72
	71	150	127	123	35	35	65	63	64	61	55	56	57	58	65	66	92	93	79	77	73	67	294	268	90	88	108	107	130	131	163	148	96	93	105	104	123	297	131	126	31	65	56	54	146	169	4.46	1271	2064	903	315	4553	38.39	30.35	1.250	9.40	.386	.310	.321	8.05	13.76	71
	70	141	118	115	35	34	66	64	63	60	58	58	66	56	66	63	86	88	75	75	67	65	260	244	80	83	104	101	122	120	140	139	92	90	104	100	117	271	115	113	22	64	53	53	141	158	4.20	1246	1912	808	299	4265	36.62	30.25	1.187	8.90	.350	.293	.295	8.83	13.56	70
	69	140	111	109	34	32	60	58	57	54	55	54	55	56	63	63	87	85	74	75	68	68	248	244	82	83	101	103	124	126	130	138	91	90	97	98	117	292	117	117	32	68	52	53	134	154	4.16	1182	1900	848	290	4220	36.89	30.14	1.192	8.56	.339	.284	.286	8.43	13.57	69
	68	134	113	109	33	37	61	59	59	55	55	52	53	55	61	61	83	83	74	74	67	67	247	248	84	81	101	101	129	126	139	138	93	90	94	98	112	286	114	116	32	62	51	51	128	167	4.07	1179	1903	824	297	4203	35.82	31.14	1.205	8.64	.344	.278	.285	8.80	14.20	68
	67	133	111	107	31	30	59	57	58	55	54	53	56	59	62	62	86	86	78	79	66	65	240	239	82	81	100	99	121	122	138	134	92	91	99	99	116	302	117	114	32	61	53	54	134	157	4.00	1181	1868	849	285	4183	36.09	31.45	1.217	8.50	.332	.271	.273	8.89	14.05	67
	66	126	98	94	31	28	58	55	55	53	52	52	51	52	63	62	86	85	72	73	61	60	249	240	79	80	100	98	117	121	134	134	88	88	97	97	111	271	114	110	30	59	49	49	114	141	3.77	1120	1843	793	255	4011	34.71	31.83	1.185	7.70	.284	.241	.239	8.89	14.63	66
	65	126	103	100	33	33	58	55	55	55	57	52	52	52	63	61	83	81	71	71	62	61	230	224	78	78	97	94	115	115	134	138	85	85	93	93	110	270	118	109	31	59	51	50	118	141	3.74	1133	1782	788	259	3962	35.24	31.44	1.188	7.70	.290	.244	.243	8.99	14.14	65
	64	115	93	88	30	30	49	43	45	43	49	51	48	47	55	53	71	71	63	67	56	56	200	188	69	65	81	84	98	99	110	108	72	74	76	79	96	241	96	99	29	53	42	45	109	124	3.36	998	1515	701	233	3445	32.67	29.96	1.049	6.81	.237	.229	.226	8.66	13.18	64

Perct.	
250	250
240	240
230	230
220	220
210	210
200	200
190	190
180	180
170	170
160	160
150	150
140	140
130	130
120	120
110	110
100	100
90	90
80	80
70	70
60	60
50	50
40	40
30	30
20	20
10	10
0	0

Case of ..... *Date* ..... *189* .... *189* .... *189* .... *189* .....

(For directions for plotting the curve, see back of sheet.)

MEASUREMENTS

		189 A. M. P. M.	189 A. M. P. M.	189 A. M. P. M.	189 A. M. P. M.
HEIGHT	Standing				
	Sternum, length of (Not Including Cartilage)				
	Abdomen—(From base of Xiphoid Cartilage to Pubes) Sternum to Umbilicus				
	Abdomen—(From base of Xiphoid Cartilage to Pubes) Umbilicus to Pubes				
GIRTH	Neck				
	Upper Chest—Repose				
	" " After Expiration				
	" " after Inspiration				
	Lower Chest—Repose				
	" " after Expiration				
	" " after Inspiration				
	Waist				
	Hips				
	Thigh R				
	Thigh L				
	Calf R				
	Calf L				
	Upper Arm R				
	Upper Arm L				
	Forearm R				
	Forearm L				
DEPTH	Chest				
	Abdomen				
BREADTH	Shoulders				
	Chest				
	Waist				
	Hips				
	Stretch of Arms				
	Bi-Iliac Diameter				
PULSE	Lying				
	Sitting				
	Standing				
	Standing, after Exercise				
Sphygmograph—Tracing No.					
Cardiograph—Tracing No.					
Pneumograph, Sup. Costal—Tracing No.					
" Inf. Costal—Tracing No.					
Spirometer					

TESTS OF STRENGTH

	189 A. M. P. M.	189 A. M. P. M.	189 A. M. P. M.	189 A. M. P. M.
Age				
Weight, Lbs.				
Hand Flexors R				
Hand Flexors L				
" Extensors R				
" Extensors L				
Forearm Supinators R				
Forearm Supinators L				
" Pronators R				
" Pronators L				
Arm Flexors R				
Arm Flexors L				
" Extensors R				
" Extensors L				
Latissimus Dorsi R				
Latissimus Dorsi L				
Deltoid R				
Deltoid L				
Pectorals R				
Pectorals L				
Shoulder Retractors R				
Shoulder Retractors L				
Foot Extensors R				
Foot Extensors L				
" Flexors R				
" Flexors L				
Leg Flexors R				
Leg Flexors L				
" Extensors R				
" Extensors L				
Thigh Flexors R				
Thigh Flexors L				
" Extensors R				
" Extensors L				
Thigh Abductors R				
Thigh Abductors L				
" Adductors R				
" Adductors L				
Trunk Anterior				
" Posterior				
" Lateral R				
" Lateral L				
Neck Anterior				
" Posterior				
" Lateral R				
" Lateral L				
Inspiration, Waist				
" Chest				
Inspirtion—Pneumatometer (mm. of Mercury)				
Expiration—Pneumatometer (mm. of Mercury)				

DEVELOPMENT

SYMMETRY	Ideal Average Man INCHES	Ideal Man of Same H'ght INCHES				
Height	68.					
Length of Arms	68.					
Circumference of Chest	34.					
Height (length) of Sternum (9.5 per cent)	6.5					
Height of Abdomen	14.9					
Sternum to Umbilicus (12 per cent)	8.1					
Umbilicus to Pubes (10 per cent)	6 8					
Bi-Iliac Diameter (16.6 per cent)	11.3					

PHYSICAL COEFFICIENTS.	Normal Average				
Strength-Weight Coefficient	37.34				
Respiratory-Weight Coefficient	11.9				
Strength-Height Coefficient	1.4				
Respiratory-Height Coefficient	.44				
Coefficient of Vital Efficiency	.32				
Coefficient of Vital Development	.31				
Strength-Weight Coeffic't — Arms	10.94				
Strength-Weight Coeffic't — Legs	16.26				

TOTAL STRENGTH

	Average Man				
Arms	1315				
Legs	1903				
Trunk	837				
Chest	286				
Entire Body	4341				