fore will not present them here, as it would occupy too much of your time.*

In the following cases from which these photographs were taken, the microscopic examinations were kindly made by Dr. F. B. Mallory, assistant pathologist of the Boston City Hospital.

The first is an epidermoid cancer of the lip, and the photographs show the results obtained. The diminished amount of hair seen above the lip is not due to the *x*-rays, but to the fact that the patient shaved off his mustache after the first two photographs were taken, but let it grow again shortly before the last two were made.

The second case is an epithelioma of the eyelid, which was treated without causing the slightest trouble in the eye and without interfering with the work of the patient. Treatment was suspended for a time in this case, owing to my absence, but the improvement, already begun, continued during this interval.

The third case is that of a rodent ulcer on the side of the nose and cheek. The photographs, taken before and after treatment respectively, need no comment. They speak for themselves, like those already shown.

The last case that I shall take up is an epithelioma of the right hand; and is improving, but still under

Typical Epithelioma of Hand, before treatment by *X*-rays. This was 4 cm. wide and 7 cm. long.

treatment. The growth was cauliflower-like in form, four centimeters wide by seven long, with raised, indurated edges. The photograph shows the condition before treatment was begun. In inoperable cases, such as those of the orbit, the tongue or the larynx, the *x*-rays should be tried in the most thorough manner.

The external growths that I have treated with good results have varied in the length of time they have existed from a few months to twenty years. This fact shows that even when the growth is of long standing the *x*-rays are of assistance.

It has been known for many years that these growths yield to treatment by various forms of caustics, so that if the *x*-rays simply act as a new form of caustic, some of the older forms might rather be employed; but my experience shows that we have in the *x*-rays a therapeutic agent that is novel in its mode of action, and that these growths disappear without a burn being produced.

The advantages of this new method may be summed up as follows: The treatment causes no pain; healing is produced without creating a burn; some cases improve after a certain number of sittings without further

renewal of the treatment; the treatment can be carried out without interfering with the work of the patient.

The disadvantages are that the necessary apparatus is expensive and difficult to use; that great care must be exercised when the *x*-rays are employed as a therapeutic agent, and that the treatment must often be continued for some weeks.

THE RELATION OF UNBALANCED PHYSICAL DEVELOPMENT TO PUBERTAL MORBIDITY AS SHOWN BY PHYSICAL MEASUREMENTS.*

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The measurements upon which this paper is based were made by the Child Study Department of the Chicago Public Schools, under my direction as Chairman of the Department. The gentlemen composing this department are Mr. F. W. Smedley, Director, and Messrs. C. C. Krauskopf, Daniel P. McMillan, and C. Victor Campbell, assistants. These gentlemen are all thoroughly equipped for the work, and large experience in making measurements has made them exceptionally accurate, and this skill on the part of the observers gives great weight to the observations. I wish to acknowledge particularly my indebtedness to Mr. Smedley, who jointly with me has discussed every phase of the work done by the Department, and every detail of its official publications.

The tables are based upon the measurements of 6259 children, 2788 boys and 3471 girls. Seven measurements were made of each child, except that no ergographic work was done with children under 5 years of age.

The children examined were all pupils in the Chicago Public Schools and were mainly the children of American parents in comfortable circumstances, the schools where the examinations were made being selected with reference to these points. In each school, however, all pupils were examined. These measurements include net stature, height sitting, weight with ordinary indoor clothing, endurance as measured by the ergograph, strength of grip of the right hand, strength of grip of the left hand, and the so-called "vital capacity" or volume of expired air. The methods of making these measurements, and the instruments employed were described in my paper "Measurements of Chicago School Children," read before this Society last year, and therefore need not be repeated here.

Table 1 gives the norms for each sex, in each of the several measurements, at each of the ages from 4 to 21 inclusive. These norms have been determined by averages, the actual computations being made with the aid of an adding machine. The table also gives the average ages and the number of children of each age examined. The norms given last year were medians, and a comparison of the two tables will show that they differ but slightly from each other, except at ages at which the number examined was considerably increased, and even in such cases the differences are really not great, the greatest difference in stature, for instance, which is found being only 13 mm. The close coincidence of these tables measures their approximation to the truth.

* The cuts shown herewith are inserted by permission of the MacMillan Company.

* Read before the American Pediatric Society, at Niagara Falls, May 29, 1901.

At the time of making the measurements, the birthday of each individual was recorded, and from this the exact age in years, months and days was computed. All those having the same age in years were grouped together, and the averages of the exact ages, as well as the averages of the several measurements were calculated. As will be seen from the table, where the ages are expressed in years, months and days, the average ages approximate the even half years, but differ from them more or less, and in both directions. By determining the exact number of days between consecutive ages, figures were obtained which upon division into the corresponding differences in the other measurements gave the average daily increments of those measurements at the several ages. With the aid of these factors the norms were reduced to the integral years and half years. These norms we have called birthday norms, and they are given in Table 2. Table 3 gives the average monthly increments of the several measurements at the different ages. With the aid of these monthly increments and of

CHART 1.—Weight of pupils distributed into percentile groups. The dotted lines represent the girls; the solid lines the boys. Based on data in Table IV.

the table of birthday norms, the average normal measurements of a child of any age can readily be computed.

Table 4 is based upon the distribution of the children measured into percentile groups. Thus, of all the 4-year-old boys measured as to stature the shortest was 86 cm. tall; 10 per cent. were below 96 cm.; 25 per cent. were below 98 cm.; 75 per cent. were below 104 cm.; 90 per cent. were below 107 cm.; and the tallest measured 116 cm. On such basis this Table 4 has been computed, the distribution into percentile groups being given for each of the several measurements taken, for each age and sex. As originally printed in the second report of the Child Study Department, this table contains some errors. These errors have been corrected from the original records of this Department for the table here presented, and the table will be found correctly printed in the Forty-sixth Annual Report of the Chicago Board of Education, which will appear soon. The items of this table which relate to weight are shown graphically in Chart 1.

Table 5 shows separately for each sex and for each of the physical measurements taken the following points: 1, the special measurement under consideration, at the beginning of each year, as shown in the table of birthday norms; 2, the increase in that measurement found at the beginning of the next year, or the increment during the year; 3, the percentage that this increment is of

CHART 2.—Rate of annual increase in stature, weight, and strength of grip. Based on data in Table V.

the measurement at the beginning of the year during which it has occurred. These percentages of annual increase are shown graphically in Charts 2, 3 and 4.

An examination of these charts reveals some important truths of child life. First directing attention to the chart of annual percentage increase in height of boys, it is seen that the general trend of the curve is downward.

CHART 3.—Rate of annual increase in height sitting. Based on data in Table V.

From 7 to 9 the line is practically straight and if extended will be found to coincide with the line from 17 to 18. But from 9 to 12 the curve drops below this general trend, indicating a period of relative quiescence in growth. From 12 to 17, however, it rises above the line of general trend and indicates a period of accelerated growth. The curve for girls shows a less well-marked quiescent period, a better marked and shorter rise, and a

greater and more rapid decline. In each of the other measurements it is seen that there is a sharp rise commencing at 11 or 12 in boys, and generally a year earlier in girls, and in general following the conditions noted with regard to stature. It does not seem justifiable to attempt an interpretation of the minor features of the curves, but the following seems to me to be fairly shown:

There is an exaltation of life processes at the pubertal period which finds its expression not only in an increased rate of growth, but also in the development of physical power. This exaltation is preceded by a period of relative quiescence. In the sexes this exaltation differs in that it commences earlier and has a shorter duration in girls than in boys; moreover, it is more marked in girls than in boys in weight and in stature, and less marked in measurements involving physical power.

CHART 4.—Rate of annual increase in vital capacity and endurance. Based on data in Table V.

This pubertal exaltation has often been shown before as to height and weight, but I am not aware of any other investigation which shows it to be true of so many physical measurements.

In Table 1 the averages of each measurement for each age are given. The curves representing these averages are necessarily lines, but it is certainly true that there is a range of variation about these lines which must be considered normal, so that normal measurements should be represented by a belt rather than a line, for certain purposes at least.

Tables 6 and 7 and the corresponding charts show an attempt to investigate the nature of this belt. For this purpose the tables of percentile groups are utilized. Tables 6 and 7 are classified with reference to the sexes, ages, and the several physical measurements made. Each section of these tables gives four columns. The first column gives the difference in the measurement, or

the range of the measurement, between the 10 per cent. group and the average given in Table 1. The second column gives the range between the average of Table 1 and the 90 per cent. group. The third column gives the range between the 10 per cent. and the 90 per cent. groups, or the range of measurement of the middle 80 per cent. of the children. The fourth column gives the difference in measurement between the 25 per cent. and the 75 per cent. groups, or the range of the middle 50 per cent. of the children. Columns 3 and 4 are graphically represented in Charts 5 and 6, while columns 1 and 2 are graphically represented in Charts 7 and 8.

From examination of Chart 5, which shows the absolute range of measurement of the middle 50 per cent. and the middle 80 per cent. of boys, it is clear that there is a general pubertal increase in the range of the measurements of both groups of the children, and that this increase in range is more marked in the larger than in the lesser group. Chart 6, relating to girls, shows these facts with reference to girls rather more clearly than they are shown with boys. Moreover, the pubertal increase in range occurs earlier in girls, as was to have been expected.

It is still necessary to determine how the ranges of measurements are distributed with reference to the average measurements at the several ages. This is shown in Charts 7 and 8, which show that in both sexes the range is distributed almost uniformly about the average line. While puberty is a period of great exaltation of life processes, Charts 5 to 8 show that it is also a period of great individualization. It is a time when the weak fail and the able forge to the front.

It is well known that mortality is less at puberty than at any other period of child life, and Axel Key has shown that the morbidity is high at this period. In my judgment, the explanation of the low mortality will be found in the laws illustrated in Charts 2, 3 and 4, while the conditions shown in Charts 5, 6, 7 and 8 will be found to have an important bearing upon the causation of the high morbidity.

The neuroses, psychoses, neurasthenias, cardiopathies, deformities and anemias of puberty are the principal morbid manifestations of the physical, intellectual and emotional turmoil which characterize the period.

At first thought it would seem that the subnormal portion of the belt shown in Charts 5 to 8 would contain the children who present the pathologic conditions. This, however, is not the case. It is the great range of the physical measurements of this period which permits of the existence in the child of an enormous lack of balance in the physical measurements, and it is this condition of lack of balance which gives rise to the morbid manifestations. For instance, if in a child the normal exaltation of height and weight, or of either, passes beyond, or taxes heavily, the capacity of the organs of nutritive supply, the child is on the borderland of physical insolvency, and any excessive voluntary expenditure of energy may be followed by morbid symptoms. In one case under my care (see Case 1), a neurotic boy, who increased in weight with great rapidity, had an epileptic convulsion follow every instance of excessive exertion. One such seizure followed a 20-mile bicycle ride, and another a game of baseball. He was practically free from convulsions as long as he refrained from unusual expenditure of energy. Rapid increase in stature, associated with deficient nutritive supply, is commonly productive of stoop and muscular atrophy, and is usually accompanied with rapid and irregular pulse,

and manifestations of fatigue and neurasthenia. It is in such cases also that the dilatation of the heart, well known to occur at puberty, is to be found. These cases require for their proper management rest, improvement in general nutrition, and the much-despised shoulder braces.

In general it may be said that an important factor in pubertal morbidity is unbalanced physical development.

The great range of pubertal measurements which makes possible the extensive unbalanced physical development of the period, being physiologic, is directly traceable to heredity, but there are factors other than

times etiologic relations to factors in the first group, which means that vicious circles exist and that some conditions mutually augment each other.

PLAN FOR INVESTIGATION OF CASES OF UNBALANCED PHYSICAL DEVELOPMENT.

1. Hereditary tendencies and influences.
2. Nutrition. (a) Food supply (quantitative and qualitative). (b) Condition of nutritive organs, viz.: gastroenteric tract and liver. (c) Condition of the blood. (d) Type of the general metabolism. (e) Condition of the eliminating organs.

CHART 5.—Absolute range of measurements between percentile groups—Boys. Based on data in Table VI, columns 3 and 4.

heredity which assist in the production of the actual lack of balance itself, and which must be taken into consideration in determining the management of individual cases. These factors are nutrition and the physical and mental activities of the child.

I present here a plan for the investigation of cases of unbalanced physical development. The first three divisions of this plan are in general etiologic, and the last three are in general resultant, but such a classification would not be strictly accurate, for examination will show that some of the factors of the second group bear at

CHART 6.—Absolute range of measurements between percentile groups—Girls. Based on data in Table VII, columns 3 and 4.

3. Activities, physical and mental.
4. Commensurable physical conditions for which norms have been determined for comparison. (a) Weight. (b) Height. (c) Height sitting. (d) Strength of grip; right and left. (e) Vital capacity. (f) Endurance.

5. Relative capacity of other organs to demands made upon them, especially the heart and brain, and for which norms as to capacity do not exist, and possibly cannot be determined, but which must be estimated by means more or less indirect.

6. Conditions and symptoms resulting from the lack of balance.

For purposes of illustration a few cases are presented. With each case brief descriptive notes are given, together with a series of measurements of heights and weights. The age of the patient at the time of each measurement is given, together with the age at which the measurement found will be the normal average, according to Tables 2 and 3. This gives a basis for estimating the condition of developmental balance. In these cases

CHART 7.—Absolute range of measurements between percentile groups, distributed with reference to the average measurements—Boys. Based on data in Table VI, columns 1 and 2.

no attempt at completeness of exposition is made, as it would only obscure the illustration of the condition of unbalanced physical development and its resulting morbid manifestations.

CASE 1.—WM. S.—BIRTHDAY, AUG. 16, 1883.

Date.	Age.	Normal Age for Ht.	Normal Age for Wt.	Net. Ht. mm.	Wt. lbs.
	Yrs. Mos.	Yrs. Mos.	Yrs. Mos.		
'96-9-16	13 1	15 ..	15 7	1580	113.0
12-14	13 5	.. ..	17 1	.. ..	127.3
'97-1-27	13 6	.. ..	17 6	.. ..	130.5
4-6	13 8	.. ..	18 ..	.. ..	135.3
6-6	13 10	.. ..	17 7	.. ..	131.5

CASE 1.—(Continued.)

7-27	14 ..	.. ..	17 9	.. ..	133.3
10-11	14 ..	.. ..	18 ..	.. ..	135.5
10-26	14 2	15 8	18 3	1621	137.1
11-24	14 4	.. ..	18 7	.. ..	140.0
12-9	14 4	.. ..	18 6	.. ..	139.8
12-24	14 5	.. ..	*	.. ..	142.3
'98-1-18	14 6	.. ..	.. ..	.. ..	143.8
3-2	14 7	.. ..	.. ..	.. ..	138.0
3-28	14 8	.. ..	.. ..	.. ..	142.5
4-20	14 9	.. ..	.. ..	.. ..	143.0
5-25	14 10	.. ..	.. ..	.. ..	144.0

* Above highest normal average of tables.

Epileptic; excessive and rapid weight increase; unusual exertion always followed by convulsions.

CHART 8.—Absolute range of measurements between percentile groups, distributed with reference to the average measurements—Girls. Based on data in Table VII, columns 1 and 2.

CASE 2.—MARJORIE P.—BIRTHDAY, MARCH 5, 1891.

Date.	Age.	Normal Age for Ht.	Normal Age for Wt.	Net. Ht. mm.	Wt. lbs.
	Yrs. Mos.	Yrs. Mos.	Yrs. Mos.		
00-12-22	9 10	12 9	12 2	1464	77.7
'01-2-2	9 11	13 1	12 6	1481	80.0
3-12	10 ..	13 1	12 7	1483	81.9
4-20	10 2	13 1	12 7	1486	81.5
5-18	10 2	13 5	12 9	1506	83.3

Bad temper; cries easily; does not like to play; marked mental hebetude; stooped shoulders; perfect picture of fatigue. In four months' time height has increased 8 months, and weight has increased 7 months, and both were, when first seen, much above normal—height 35 months, and weight 28 months. A typical case of excessive growth and profound fatigue. Is improving.

CASE 3.—GRACE L.—BIRTHDAY, DEC. 9, 1888.

Date.	Age.	Normal Age for Ht.	Normal Age for Wt.	Net. Ht. mm.	Wt. lbs.
	Yrs. Mos.	Yrs. Mos.	Yrs. Mos.		
'98-1-28	9 2	11 6	11 11	1385	75.0
4-11	9 4	11 8	12 1	1385	75.5
'00-1-20	11 1	14 9	14 2	1565	101.5
2-24	11 2	14 6	14 6	1560	103.1
4-21	11 4	14 4	14 9	1557	105.5
5-15	11 5	14 4	14 5	1557	102.2
10-6	11 10	15 10	14 7	1580	104.1
'01-2-15	12 2	16 1	15 6	1585	108.8
4-25	12 5	18 8	15 8	1597	109.8

Fatigue; anorexia; stoop shoulders. From above table the following is formulated: In two months height increased 1 month; fatigue and stoop. In 23 months height increased 39 months, weight increased 26 months; fatigue and stoop. In 9 months height increased 13 months, weight increased 5 months; fatigue and stoop. In 4 months height increased 3 months, weight increased 11 months; improvement: started to school. In 3 months height increased 27 months, weight increased 2 months; again fatigued.

CASE 4.—EDWIN L.—BIRTHDAY, APRIL 4, 1887.

Date.	Age.	Normal Age for Ht.	Normal Age for Wt.	Net. Ht. mm.	Wt. lbs.
	Yrs. Mos.	Yrs. Mos.	Yrs. Mos.		
'97-1-4	9 9	11 9	9 9	1386	61.5
4-7	10	12 3	10 1	1405	63.5
'98-11-23	11 8	13 11	12 1	1514	75.5
'98-5-23	12 2	13 11	12 11	1511	82.8
8-12	12 4	14 10	12 10	1567	82.0
10-20	12 7	13 3	13 3	1567	86.2
'00-2-19	12 11	13 11	13 11	1663	93.0
6-25	13 3	16 5	14 2	1663	95.8
12-26	13 9	18 3	15 4	1723	109.8
'01-3-21	14	18 8	15 3	1743	109.2

Some fatigue; pulse rapid and irregular; heart area slightly increased; no valvular disease; rapid increase in stature; height and weight balance disturbed.

CASE 5.—BERTHA H.—BIRTHDAY, OCT. 6, 1888.

Date.	Age.	Normal Age for Ht.	Normal Age for Wt.	Net. Ht. mm.	Wt. lbs.
	Yrs. Mos.	Yrs. Mos.	Yrs. Mos.		
'98-3-19	9 5	11 3	12	1370	75.5
7-12	9 9	11 7	11 10	1390	74.0
9-4	9 11	11 8	12	1395	75.5
10-22	10 1	12 1	12 6	1420	79.9
11-25	10 2	12 4	12 6	1432	80.4
'99-1-7	10 3	12 4	12 6	1435	80.0
8-9	10 10	12 8	12 9	1456	83.0
'00-1-2	11 3	13 1	13 8	1485	93.4
'01-4-20	12 6	15	14 5	1568	102.3

Excessive stoop, with slight lateral curvature later; rapid pulse; fatigue; rapid and excessive growth in height and weight, especially height; unbalanced measurements. Improved under rest, massage, and shoulder braces. Much of the last increase in height is due to greater erectness.

CASE 6.—JOHN K. M.—BIRTHDAY, JULY 1, 1886.

Date.	Age.	Normal Age for Ht.	Normal Age for Wt.	Net. Ht. mm.	Wt. lbs.
	Yrs. Mos.	Yrs. Mos.	Yrs. Mos.		
'00-2-3	13 7	18 7	16 6	1740	121.8
3-10	13 8	18 7	16 2	1750	119.0
4-7	13 9	18 7	16 7	1756	123.3
6-12	13 11	18 7	16 1	1772	118.3
9-21	14 3	18 7	17 8	1796	132.0
'01-2-12	14 7	18 7	18 18	1818	142.3

Excessive height and weight, and unbalanced height and weight; shoulders badly stooped; pulse irregular. Improved under rest and shoulder braces. Hereditary tendency to great stature.

CASE 7.—ELSIE K.—BIRTHDAY, NOV. 10, 1884.

Date.	Age.	Normal Age for Ht.	Normal Age for Wt.	Net. Ht. mm.	Wt. lbs.
	Yrs. Mos.	Yrs. Mos.	Yrs. Mos.		
'97-12-8	13 1	12 7	11 10	1449	74.3
12-23	13 1	12 7	12	1449	75.4
'98-1-27	13 3	12 7	12 3	1449	78.1
3-5	13 4	12 7	12 4	1449	79.2
10-1	13 11	12 7	12 6	1449	80.5
'00-9-29	15 11	14 4	14 4	1601	102.3
'01-2-5	16 3	14 4	16 12	1612	98.5

* Above highest normal.

Subnormal height and weight, with excessive school work; fatigue. Taken from school, '97-12-8; returned to school, '98-9-5, in excellent condition; '01-2-5, shows work of first year in high school is beginning to drag on her.

CASE 8.—DAVID L.—BIRTHDAY, MAY 4, 1887.

Date.	Age.	Normal Age for Ht.	Normal Age for Wt.	Net. Ht. mm.	Wt. lbs.
	Yrs. Mos.	Yrs. Mos.	Yrs. Mos.		
'00-10-20	13 6	15 1	14 6	1587	99.3
12-22	13 8	15 4	15	1602	105.0
'01-5-4	14	15 11	15 4	1635	110.4

A magnificent fellow, height and weight above normal, but balanced, and not increasing beyond the capacity of his nutritive organs and heart. No functional disturbance of any kind. Prescribed golf, baseball, and tennis. Is the stuff of which good athletes are made.

The following conclusions are offered:

1. There is an exaltation of life processes at the pubertal period which finds its expression not only in an increased rate of growth, but also in the development of physical power. This exaltation is preceded by a period of relative quiescence. In the sexes this exaltation differs in that it commences earlier and has a shorter duration in girls than in boys; moreover, it is more marked in girls than in boys in weight and stature, but less in measurements involving physical power.
2. Puberty is also a period of great individualization, as indicated by the great normal range of physical measurements at this period.
3. The range of physical measurements at all ages in childhood, including puberty, is distributed uniformly above and below the line of average measurement.
4. At puberty mortality is low and morbidity is high.
5. Neuroses, psychoses, neurasthenias, cardiopathies, deformities and anemias are the principal morbid manifestations of the physical, intellectual and emotional turmoil which characterizes puberty.
6. The great range at puberty of the measurements of the physical features of the child expresses the condition which permits the existence in individual children of unusual lack of balance in physical measurements, or maladjustment of physical features.
7. Unbalanced physical development is an important factor in the production of morbid manifestations. It is operative throughout the developmental period of life. It occurs with greatest frequency at puberty, and it there finds its most marked expressions. It is found associated, in a causal relation, with most of the morbid manifestations of puberty, particularly disturbed heart action, dilatation of the heart, fatigue, anemia, and some deformities, such as round shoulders and scoliosis, as well as many of the neuroses of the period.

TABLE I. NORMS—BY AVERAGES.

BOYS.

Age.	Number Examined.	Standing Height. Millimeters.	Sitting Height. Millimeters.	Weight with Clothing. Kilograms.	Work on Stenograph. Kg.-Cm.	Grip of Right Hand. Kilograms.	Grip of Left Hand. Kilograms.	Vital Capacity. Cubic Centimeters.
4-6-13	41	1012	583	16.984	82.1	5.50	5.08	736
5-7-14	70	1076	612	18.402	82.1	7.80	7.12	930
6-8-6	227	1133	636	20.716	105.4	10	9.32	1098
7-5-27	230	1183	658	22.535	139.2	11.50	10.91	1240
8-5-21	255	1234	677	25.022	168.2	13.27	12.40	1388
9-6-4	228	1289	699	27.616	205.6	15.39	14.54	1549
10-6-2	254	1330	713	29.837	235	17.68	16.66	1659
11-5-17	228	1370	729	32.519	267.7	19.94	18.72	1799
12-5-23	256	1418	747	35.626	297.8	22.40	20.58	1956
13-5-14	230	1488	777	40.276	357.2	26.26	24.23	2246
14-5-20	250	1546	806	44.786	423.8	30.29	27.94	2527
15-5-25	205	1613	837	50.994	513.5	36.30	33.65	2858
16-5-15	146	1665	871	55.219	584.7	42.12	38.82	3363
17-5-18	92	1690	891	59.243	651.4	46.99	42.74	3570
18-4-27	40	1731	914	62.858	700.9	51.04	46.75	3701
19-4-18	23	1721	911	64.326	733.4	54.11	49.33	3872
20-5-12	8	1741	923	68.294	737.8	56	48.50	3788
21-3-14	5	1704	911	63.955	727.4	52	47.40	3770

GIRLS.

Age.	Number Examined.	Standing Height. Millimeters.	Sitting Height. Millimeters.	Weight with Clothing. Kilograms.	Work on Stenograph. Kg.-Cm.	Grip of Right Hand. Kilograms.	Grip of Left Hand. Kilograms.	Vital Capacity. Cubic Centimeters.
4-7-10	36	1008	585	16.342	82.1	5.64	5.17	754
5-7-2	81	1065	602	17.972	82.1	7.23	6.58	855
6-6-8	204	1126	629	19.968	98.3	9.15	8.52	1008
7-6-15	236	1185	653	22.115	109.5	10.71	10.06	1121
8-6-1	232	1228	674	23.995	142.5	11.67	10.96	1215
9-6-7	221	1278	692	26.540	171.4	13.89	13.01	1360
10-5-15	240	1322	708	28.969	190.1	15.37	14.40	1456
11-5-16	223	1381	735	32.132	221.7	17.57	16.50	1587
12-5-15	247	1441	762	36.326	245.9	20.09	18.88	1729
13-6-13	255	1513	797	41.629	294.5	23.60	21.51	1924
14-6-13	301	1564	826	47.181	344.2	26.19	24.11	2117
15-6-1	379	1574	840	49.345	356.5	27.92	25.81	2225
16-6-0	354	1592	851	51.964	397.3	29.50	27.31	2306
17-5-10	251	1597	853	52.761	370.1	29.62	27.11	2304
18-4-25	137	1595	857	53.015	381.6	29.84	27.86	2351
19-5-4	48	1599	855	54.600	416.8	31.21	28.85	2441
20-4-12	22	1588	848	54.033	363.3	29.06	27.45	2348
21-5-8	4	1583	862	54.763	506.9	32.19	29.31	2250

TABLE II. BIRTHDAY NORMS.

AGE.	BOYS.						
	Standing Height. Millimeters.	Sitting Height. Millimeters.	Weight with Clothing. Kilograms.	Work on Ergograph. Kg.-Cm.	Grip of Right Hand. Kilograms.	Grip of Left Hand. Kilograms.	Vital Capacity. Cubic Centimeters.
6-0	1106.9	624.0	19.738	92.86	9.21	8.48	1023
6-6	1132.5	635.4	20.675	104.79	9.97	9.29	1096
7-0	1158.2	646.7	21.613	122.12	10.74	10.11	1168
7-6	1183.9	657.8	22.550	139.45	11.51	10.92	1241
8-0	1209.3	667.5	23.817	154.17	12.41	11.67	1316
8-6	1234.8	677.2	25.083	168.89	13.31	12.43	1392
9-0	1261.4	687.9	26.336	187.07	14.34	13.47	1469
9-6	1288.0	698.5	27.589	205.24	15.37	14.51	1547
10-0	1309.1	705.6	28.707	220.03	16.52	15.69	1603
10-6	1330.3	712.6	29.825	234.82	17.67	16.66	1659
11-0	1351.1	721.0	31.223	251.86	18.85	17.72	1732
11-6	1371.9	729.3	32.619	268.89	20.03	18.80	1806
12-0	1395.4	738.0	34.151	283.83	21.24	19.71	1883
12-6	1418.9	747.0	35.684	298.75	22.45	20.62	1960
13-0	1455.4	762.4	38.084	329.21	24.44	22.51	2108
13-6	1490.9	777.9	40.485	359.69	26.43	24.40	2257
14-0	1517.2	792.1	42.696	392.62	28.42	26.22	2395
14-6	1547.4	806.4	44.908	425.55	30.40	28.04	2533
15-0	1580.7	821.8	47.993	470.13	33.39	30.88	2697
15-6	1614.1	836.8	51.078	514.72	36.38	33.73	2860
16-0	1640.3	854.3	53.233	551.22	39.37	36.39	3120
16-6	1666.5	871.7	55.398	587.73	42.35	39.04	3380
17-0	1678.5	881.6	57.384	620.64	44.74	40.96	3483
17-6	1690.4	891.4	59.371	653.53	47.14	42.87	3586
18-0	1712.3	903.0	61.288	679.73	49.28	45.01	3655
18-6	1734.1	914.6	63.204	705.82	51.43	47.16	3725

TABLE IV. DISTRIBUTION INTO PERCENTILE GROUPS—Height.

AGE	BOYS.					
	Minim. Cm.	10 Per Ct. Cm.	25 Per Ct. Cm.	75 Per Ct. Cm.	90 Per Ct. Cm.	Maxim. Cm.
4	86	96	98	104	107	116
5	96	103	104	110.5	113.5	118
6	101	107	110	116	119.5	125
7	103	112	115	121.5	124.5	132
8	109	116.5	120	127	130	138
9	107	121	125	133	136.5	146
10	116	125.5	129	137.5	141.5	147
11	121	129	133	141	145	159
12	125	132.5	137	146	150.5	164
13	131	140	143.5	154	159	168
14	130	143.5	148.5	160	167.5	178
15	132	151	155.5	166.5	171.5	179
16	142	155.5	161.5	172.5	175.5	185
17	137	160.5	165.5	174	178.5	182
18	161	166.5	168	177	181.5	183
19	148	163	165.5	178	184	197

DISTRIBUTION INTO PERCENTILE GROUPS—Weight.

AGE.	BOYS.					
	Minim. Kg.	10 Per Ct. Kg.	25 Per Ct. Kg.	75 Per Ct. Kg.	90 Per Ct. Kg.	Maxim. Kg.
4	12	14.75	15.5	18	20.25	21
5	13	16.25	17	19.5	21	26
6	15	18.5	19.5	22.25	23.75	27
7	17	20	21	24.5	25.75	32
8	17	21.75	23	26.5	28.75	62
9	20	23.5	25.25	29.5	32	38
10	19	25.75	27.5	31.75	34.5	50
11	23	27.25	29.5	35	37.75	49
12	25	29.5	32.25	38.25	42.25	54
13	28	33.5	36	43.5	48	72
14	29	35	39	49	55	68
15	30	40.5	45.5	56	61.5	97
16	34	46	50	59.5	65.5	105
17	34	47	54.5	65.5	69.5	81
18	45	54.5	57	66	71	83
19	47	52	57	69	74	98

DISTRIBUTION INTO PERCENTILE GROUPS—Right Hand Grip.

AGE	BOYS.					
	Minim. Kg.	10 Per Ct. Kg.	25 Per Ct. Kg.	75 Per Ct. Kg.	90 Per Ct. Kg.	Maxim. Kg.
4	3	3.25	4	7.25	9	10.50
5	4	5.25	6	9.75	10.25	12
6	7	8.50	9.25	11.50	12.50	16
7	5	9.25	10.25	13.25	14.50	27
8	6	10	11.25	15.25	17.50	24
9	8	11.25	13.25	18.25	20.50	30
10	10	13.25	15.25	20.50	22.75	33
11	11	15.50	17.50	23	25.50	31
12	11	17.25	20	26	29	37
13	17	20.25	22.25	30.50	34.25	62
14	15	22	25	35.75	40.75	51
15	19.50	27	30.25	42	47.50	56
16	21	32.5	36.50	47.50	51.5	75
17	20	39	42	53.50	59	72
18	36	43.50	46.25	58	63	71
19	43	46.50	48	62	68	77
20	40	51	52	57.50	59	59

DISTRIBUTION INTO PERCENTILE GROUPS—Left Hand Grip.

AGE	BOYS.					
	Minim. Kg.	10 Per Ct. Kg.	25 Per Ct. Kg.	75 Per Ct. Kg.	90 Per Ct. Kg.	Maxim. Kg.
4	3	4	4.50	7	8.75	9
5	3	4.50	5.50	8.25	10	12
6	4	7	8.50	10.50	12	14
7	5	9	10	12.25	13.75	16
8	6	9	10.25	13.50	15.25	18
9	8	10.50	12.25	15.75	18.25	24
10	9	11.50	13	18	20.50	32
11	8	13.25	15.25	20.50	23	27
12	10	15.25	17.50	23.50	27.50	35

TABLE III. AVERAGE MONTHLY INCREMENT OF BIRTHDAY NORMS.

AGE.	BOYS.						
	Standing Height. Millimeters.	Sitting Height. Millimeters.	Weight with Clothing. Kilograms.	Work on Ergograph. Kilogram-Centimeters.	Grip of Right Hand. Kilograms.	Grip of Left Hand. Kilograms.	Vital Capacity. Cubic Centimeters.
6½ to 7½	4.3	1.8	1.56	2.89	.13	.14	12
7½ to 8½	4.2	1.6	2.11	2.45	.15	.13	13
8½ to 9½	4.4	1.7	2.09	3.03	.17	.17	13
9½ to 10½	3.5	1.2	1.87	2.46	.19	.18	9
10½ to 11½	3.5	1.4	2.33	2.84	.19	.18	12
11½ to 12½	3.9	1.5	2.56	2.50	.20	.15	13
12½ to 13½	6.1	2.6	4.00	5.08	.33	.32	25
13½ to 14½	4.7	2.4	3.68	5.49	.33	.30	23
14½ to 15½	5.0	2.5	5.14	7.43	.50	.48	27
15½ to 16½	4.4	2.9	3.60	6.08	.50	.44	43
16½ to 17½	2.6	1.6	3.31	4.49	.40	.32	17
17½ to 18½	3.7	1.9	3.20	4.34	.36	.36	11

AGE.	GIRLS.						
	Standing Height. Millimeters.	Sitting Height. Millimeters.	Weight with Clothing. Kilograms.	Work on Ergograph. Kilogram-Centimeters.	Grip of Right Hand. Kilograms.	Grip of Left Hand. Kilograms.	Vital Capacity. Cubic Centimeters.
6½ to 7½	4.7	2.0	1.75	1.68	.12	.12	9
7½ to 8½	3.8	1.8	1.64	2.02	.09	.08	8
8½ to 9½	4.2	1.5	2.11	2.39	.18	.17	12
9½ to 10½	3.9	1.4	2.13	1.65	.13	.12	8
10½ to 11½	4.9	2.3	2.65	2.67	.18	.18	11
11½ to 12½	5.0	2.2	3.53	2.00	.21	.20	12
12½ to 13½	5.6	2.7	4.13	3.83	.28	.23	16
13½ to 14½	4.3	2.4	4.61	4.21	.22	.19	16
14½ to 15½	1.0	1.3	1.96	1.08	.15	.15	10
15½ to 16½	1.5	2.9	2.19	.80	.13	.12	7
16½ to 17½	.1	.2	.070	.80	.01	.02	2
17½ to 18½	.1	.3	.019	.80	.02	.02	2

TABLE IV—(Continued).

DISTRIBUTION INTO PERCENTILE GROUPS—Right Hand Grip.

GIRLS—(Continued).

Age.	Minim.	10 Per Ct.	25 Per Ct.	50 Per Ct.	75 Per Ct.	90 Per Ct.	Maxim.
	Cu. cm.	Cu. cm.	Cu. cm.	Cu. cm.	Cu. cm.	Cu. cm.	Cu. cm.
13	11	18	20.25	27.50	30.75	45	
14	14.50	20	22.50	31	33.50	38	
15	16.50	22	25	31.50	34.50	47	
16	18	23.50	26.50	32.50	36	48	
17	18	24	26.50	33	37	45	
18	22	24.50	27	32.50	36.25	46	
19	20	25	27.50	33.50	36.50	39	
20	21	26	28.50	34	35.50	36	

DISTRIBUTION INTO PERCENTILE GROUPS—Vital Capacity.

BOYS.

Age.	Minim.	10 Per Ct.	25 Per Ct.	50 Per Ct.	75 Per Ct.	90 Per Ct.	Maxim.
	Cu. cm.	Cu. cm.	Cu. cm.	Cu. cm.	Cu. cm.	Cu. cm.	Cu. cm.
4	500	625	675	825	950	1050	
5	500	775	850	1025	1150	1250	
6	700	925	1000	1225	1325	1600	
7	700	1025	1150	1375	1475	1800	
8	800	1150	1250	1575	1750	2100	
9	950	1300	1400	1750	1925	2200	
10	900	1350	1450	1850	2050	2700	
11	1100	1475	1600	2025	2200	3000	
12	1150	1575	1750	2200	2400	3100	
13	1600	1850	2000	2450	2800	4200	
14	1100	1900	2175	2900	3350	4000	
15	1400	2250	2450	3300	3575	4500	
16	2000	2550	2950	3800	4300	5100	
17	1800	2900	3200	4000	4350	5000	
18	2400	3225	3425	4175	4700	5000	
19	3000	3100	3500	4200	4800	5600	
20	2200	2100	3300	4600	5000	5100	

GIRLS.

Age.	Minim.	10 Per Ct.	25 Per Ct.	50 Per Ct.	75 Per Ct.	90 Per Ct.	Maxim.
	Cu. cm.	Cu. cm.	Cu. cm.	Cu. cm.	Cu. cm.	Cu. cm.	Cu. cm.
4	600	675	725	825	850	900	
5	600	725	800	975	1025	1100	
6	600	800	900	1175	1300	1400	
7	750	925	1000	1250	1350	1600	
8	700	1000	1125	1350	1450	1800	
9	900	1125	1225	1500	1650	2100	
10	900	1225	1325	1600	1800	2100	
11	1000	1325	1450	1800	1950	2300	
12	800	1400	1550	1975	2150	3000	
13	1100	1600	1750	2175	2400	3000	
14	1350	1700	1925	2350	2675	3100	
15	1450	1850	2000	2450	2675	3400	
16	1350	1925	2100	2550	2750	3600	
17	1250	1900	2075	2550	2800	3300	
18	1500	1950	2150	2600	2800	3600	
19	1700	2000	2200	2700	3000	3300	
20	1300	1900	2200	2700	2825	2900	

DISTRIBUTION INTO PERCENTILE GROUPS—Ergograph.

BOYS.

Age.	Minim.	10 Per Ct.	25 Per Ct.	50 Per Ct.	75 Per Ct.	90 Per Ct.	Maxim.
	Kg.-cm.	Kg.-cm.	Kg.-cm.	Kg.-cm.	Kg.-cm.	Kg.-cm.	Kg.-cm.
5	50	52.5	55	100	130	150	
6	30	62.5	77.5	127.5	150	230	
7	40	92.50	115	165	190	280	
8	40	110	135	200	227.5	300	
9	50	140	167.5	242.5	287.5	390	
10	110	162.5	190	272.5	315	520	
11	110	190	222.5	295	365	490	
12	100	202.5	242.5	347.5	402.5	580	
13	130	230	285	405	490	880	
14	160	265	332.5	510	585	880	
15	150	320	390	615	745	1040	
16	260	410	470	680	800	1320	
17	230	440	545	770	855	1110	
18	380	560	600	790	905	1010	
19	390	520	610	850	1040	1140	

GIRLS.

Age.	Minim.	10 Per Ct.	25 Per Ct.	50 Per Ct.	75 Per Ct.	90 Per Ct.	Maxim.
	Kg.-cm.	Kg.-cm.	Kg.-cm.	Kg.-cm.	Kg.-cm.	Kg.-cm.	Kg.-cm.
5	20	30	45	70	90	100	
6	30	60	75	117.5	142.5	200	
7	40	75	95	145	170	280	
8	30	90	112	170	195	280	
9	50	115	137.5	202.5	230	430	
10	40	125	155	225	260	600	
11	70	150	175	260	305	390	
12	70	165	195	285	350	650	
13	80	185	225	355	430	570	
14	90	215	227.5	405	480	660	
15	100	230	290	415	480	690	
16	120	232.5	305	442.5	530	840	
17	150	230	292.5	430	520	640	
18	130	240	300	450	510	820	
19	160	270	340	480	575	870	

TABLE V.

ANNUAL RATE OF INCREASE—BOYS.

Age.	Height at Beginning of Year.	Amount of Gain.	Per Cent. of Gain.
	mm.	mm.	
6 to 7	1106.9	51.3	4.63
7 to 8	1158.2	51.1	4.40
8 to 9	1209.3	52.1	4.30
9 to 10	1261.4	47.7	3.77
10 to 11	1309.1	42.0	3.20
11 to 12	1351.1	44.3	3.27
12 to 13	1395.4	60.0	4.29
13 to 14	1455.4	63.8	4.39
14 to 15	1519.2	61.5	4.04
15 to 16	1580.7	59.6	3.70
16 to 17	1640.3	38.2	2.32

TABLE V—(Continued).

ANNUAL RATE OF INCREASE—BOYS.

Age.	Height Sitting at Beginning of Year.	Amount of Gain.	Per Cent. of Gain.
	mm.	mm.	
6 to 7	624.0	22.7	3.64
7 to 8	646.7	20.8	3.21
8 to 9	667.5	20.4	3.05
9 to 10	687.9	17.7	2.57
10 to 11	705.6	15.4	2.18
11 to 12	721.0	17.0	2.35
12 to 13	738.0	24.4	3.30
13 to 14	762.4	29.7	3.89
14 to 15	792.1	29.7	3.74
15 to 16	821.8	32.5	3.95
16 to 17	854.3	27.3	3.19
17 to 18	881.6	21.4	2.41

Age.	Weight at Beginning of Year.	Amount of Gain.	Per Cent. of Gain.
	Kg.	Kg.	
6 to 7	19.738	1.875	9.50
7 to 8	21.613	2.204	10.20
8 to 9	23.817	2.519	10.57
9 to 10	26.336	2.371	9.00
10 to 11	28.707	2.516	8.76
11 to 12	31.223	2.928	9.37
12 to 13	34.151	3.933	11.51
13 to 14	38.084	4.612	12.11
14 to 15	42.696	5.297	12.40
15 to 16	47.993	5.245	10.92
16 to 17	53.238	4.146	7.78
17 to 18	57.384	3.904	6.80

Age.	Ergograph at Beginning of Year.	Amount of Gain.	Per Cent. of Gain.
	Kg.-cm.	Kg.-cm.	
6 to 7	87.47	34.65	39.62
7 to 8	122.12	32.05	26.24
8 to 9	154.17	32.90	21.34
9 to 10	187.07	32.96	17.56
10 to 11	220.03	31.83	14.46
11 to 12	251.86	31.97	12.68
12 to 13	283.83	45.38	15.98
13 to 14	329.21	63.41	19.29
14 to 15	392.62	77.51	19.74
15 to 16	470.13	81.09	17.23
16 to 17	551.22	69.42	12.59
17 to 18	620.64	59.09	9.52

Age.	Right Hand Grip at Beginning of Year.	Amount of Gain.	Per Cent. of Gain.
	Kg.	Kg.	
6 to 7	9.21	1.53	16.61
7 to 8	10.74	1.67	15.55
8 to 9	12.41	1.93	15.55
9 to 10	14.34	2.18	15.20
10 to 11	16.52	2.33	14.10
11 to 12	18.85	2.39	12.67
12 to 13	21.24	3.20	15.06
13 to 14	24.44	3.98	16.28
14 to 15	28.42	4.97	17.44
15 to 16	33.39	5.98	17.90
16 to 17	39.37	5.37	13.38
17 to 18	44.14	4.54	10.14

Age.	Left Hand Grip at Beginning of Year.	Amount of Gain.	Per Cent. of Gain.
	Kg.	Kg.	
6 to 7	8.48	1.63	19.22
7 to 8	10.11	1.56	15.43
8 to 9	11.67	1.80	15.42
9 to 10	13.47	2.12	15.73
10 to 11	15.59	2.13	13.66
11 to 12	17.72	1.99	11.23
12 to 13	19.71	2.80	14.20
13 to 14	22.51	3.71	12.03
14 to 15	26.22	4.66	17.77
15 to 16	30.88	5.51	17.84
16 to 17	36.39	4.57	12.55
17 to 18	40.96	4.05	9.88

Age.	Vital Capacity at Beginning of Year.	Amount of Gain.	Per Cent. of Gain.
	Cu. cm.	Cu. cm.	
6 to 7	1023	145	14.17
7 to 8	1168	148	12.67
8 to 9	1316	153	11.62
9 to 10	1460	134	9.12
10 to 11	1603	129	8.04
11 to 12	1732	151	8.71
12 to 13	1883	225	11.95
13 to 14	2108	287	13.61
14 to 15	2395	302	12.60
15 to 16	2697	423	15.68
16 to 17	3120	363	11.63
17 to 18	3483	172	4.93

ANNUAL RATE OF INCREASE—GIRLS.

Age.	Height at Beginning of Year.	Actual Gain.	Per Cent. of Gain.
	mm.	mm.	
6 to 7	1096.6	57.1	5.20
7 to 8	1153.7	51.2	4.44
8 to 9	1204.9	47.5	3.94
9 to 10	1262.4	48.3	3.86

TABLE V—(Continued).
ANNUAL RATE OF INCREASE—GIRLS.

Age.	Height at Beginning of Year. mm.	Actual Gain. mm.	Per Cent. of Gain.
10 to 11.....	1300.7	52.8	4.06
11 to 12.....	1353.5	59.6	4.40
12 to 13.....	1413.1	63.7	4.51
13 to 14.....	1476.8	59.6	4.04
14 to 15.....	1536.4	31.9	2.08
15 to 16.....	1568.3	14.7	0.94
16 to 17.....	1583.0	9.6	0.61
17 to 18.....	1592.6	1.6	0.10

Age.	Height Sitting at Beginning of Year. mm.	Actual Gain. mm.	Per Cent. of Gain.
6 to 7.....	617.0	23.7	3.84
7 to 8.....	640.7	22.7	3.54
8 to 9.....	663.4	19.8	2.98
9 to 10.....	683.2	17.3	2.53
10 to 11.....	700.5	21.8	3.11
11 to 12.....	722.3	27.0	3.74
12 to 13.....	749.3	29.8	3.98
13 to 14.....	779.1	30.8	3.95
14 to 15.....	809.9	22.2	2.74
15 to 16.....	832.1	13.3	1.60
16 to 17.....	845.4	6.6	0.78
17 to 18.....	852.0	3.1	0.36

Age.	Weight at Beginning of Year. Kg.	Actual Gain. Kg.	Per Cent. of Gain.
6 to 7.....	18.870	2.104	11.15
7 to 8.....	20.974	2.036	9.71
8 to 9.....	23.010	2.247	9.77
9 to 10.....	25.257	2.538	10.05
10 to 11.....	27.795	2.867	10.31
11 to 12.....	30.662	3.711	12.10
12 to 13.....	34.373	4.601	13.38
13 to 14.....	38.974	5.245	13.46
14 to 15.....	44.219	3.942	8.91
15 to 16.....	48.161	2.491	5.17
16 to 17.....	50.652	1.734	3.42
17 to 18.....	52.886	0.537	1.03

Age.	Ergograph at Beginning of Year. Kg.-cm.	Actual Gain. Kg.-cm.	Per Cent. of Gain.
6 to 7.....	87.79	20.21	23.02
7 to 8.....	108.00	22.24	20.59
8 to 9.....	130.24	26.49	20.34
9 to 10.....	156.73	24.25	15.47
10 to 11.....	180.98	25.92	14.32
11 to 12.....	206.90	28.02	13.55
12 to 13.....	234.92	34.97	14.89
13 to 14.....	269.89	48.23	17.87
14 to 15.....	318.12	31.71	9.97
15 to 16.....	349.83	11.27	3.22
16 to 17.....	361.10	9.64	2.67
17 to 18.....	370.74	9.63	2.60

Age.	Right Hand Grip at Beginning of Year. Kg.	Amount of Gain. Kg.	Per Cent. of Gain.
6 to 7.....	8.36	1.52	18.18
7 to 8.....	9.88	1.28	12.90
8 to 9.....	11.16	1.61	14.43
9 to 10.....	12.77	1.78	13.94
10 to 11.....	14.65	1.89	12.95
11 to 12.....	16.54	2.38	14.39
12 to 13.....	18.92	2.92	15.43
13 to 14.....	21.84	2.95	13.52
14 to 15.....	24.79	2.21	8.91
15 to 16.....	27.00	1.70	6.30
16 to 17.....	28.70	0.86	3.00
17 to 18.....	29.56	0.19	0.60

Age.	Left Hand Grip at Beginning of Year. Kg.	Amount of Gain. Kg.	Per Cent. of Gain.
6 to 7.....	7.74	1.50	19.37
7 to 8.....	9.24	1.24	13.42
8 to 9.....	10.48	1.49	14.21
9 to 10.....	11.97	1.75	14.62
10 to 11.....	13.72	1.80	13.11
11 to 12.....	15.52	2.26	14.56
12 to 13.....	17.78	2.61	14.66
13 to 14.....	20.39	2.53	12.40
14 to 15.....	22.92	2.00	8.72
15 to 16.....	24.92	1.64	6.58
16 to 17.....	26.56	0.87	3.27
17 to 18.....	27.43	0.23	0.85

Age.	Vital Capacity at Beginning of Year. Cu. cm.	Amount of Gain. Cu. cm.	Per Cent. of Gain.
6 to 7.....	930	111	11.68
7 to 8.....	1061	104	9.80
8 to 9.....	1165	121	10.39
9 to 10.....	1286	123	9.56
10 to 11.....	1409	117	8.30
11 to 12.....	1526	138	9.04
12 to 13.....	1664	163	9.79
13 to 14.....	1827	187	10.24
14 to 15.....	2014	154	7.64
15 to 16.....	2168	98	4.52
16 to 17.....	2266	53	2.34
17 to 18.....	2319	24	1.03

TABLE VI.
ABSOLUTE RANGE OF MEASUREMENTS BETWEEN PERCENTILE GROUPS.—BOYS.

Age.	Height. Cm.				Weight. Kg.			
	10 per cent. to average.	Average to 90 per cent.	10 to 90 per cent.	25 to 75 per cent.	10 per cent. to average.	Average to 90 per cent.	10 to 90 per cent.	25 to 75 per cent.
4.....	5.2	5.8	11.0	6.0	2.23	3.27	5.50	2.50
5.....	4.6	5.9	10.5	6.5	2.15	3.60	4.75	2.50
6.....	4.3	6.2	12.5	6.0	2.28	3.03	5.25	2.75
7.....	4.3	6.2	12.5	6.5	2.53	2.22	5.75	3.50
8.....	4.9	6.6	13.5	7.0	3.27	3.73	7.00	3.50
9.....	7.6	7.6	15.5	8.0	4.12	4.38	8.50	4.25
10.....	7.9	8.5	16.0	8.5	4.09	4.66	8.75	4.25
11.....	8.0	8.0	16.0	8.5	5.27	5.23	10.50	5.50
12.....	8.3	8.7	18.0	9.0	6.13	6.62	12.75	6.00
13.....	8.8	10.2	19.0	10.5	6.78	7.72	14.50	7.50
14.....	11.1	12.9	24.0	11.5	9.79	10.21	20.00	10.00
15.....	10.3	10.2	20.5	11.0	10.49	10.51	21.00	10.50
16.....	11.0	9.0	20.0	11.0	9.22	10.24	19.50	9.50
17.....	8.5	9.5	18.0	8.5	12.24	10.26	22.50	11.00
18.....	7.1	8.4	15.0	9.0	8.36	8.14	16.50	9.00

TABLE VI.—(CONTINUED).
ABSOLUTE RANGE OF MEASUREMENTS BETWEEN PERCENTILE GROUPS.—BOYS.

Age.	Grip of right hand. Kg.				Vital capacity. Cc.			
	10 per cent. to average.	Average to 90 per cent.	10 to 90 per cent.	25 to 75 per cent.	10 per cent. to average.	Average to 90 per cent.	10 to 90 per cent.	25 to 75 per cent.
4.....	2.25	3.50	5.75	3.25	111	214	325	150
5.....	2.53	2.45	5.00	3.75	155	220	375	175
6.....	1.50	2.50	4.00	2.25	173	227	400	225
7.....	2.25	3.00	5.25	3.00	215	235	450	225
8.....	3.27	4.23	7.50	4.00	238	362	600	325
9.....	4.14	5.11	9.25	5.00	249	376	625	350
10.....	4.45	5.07	9.50	5.25	309	391	700	400
11.....	4.44	5.56	10.00	5.50	324	401	725	425
12.....	5.15	6.60	11.75	6.00	381	444	825	450
13.....	6.01	7.99	14.00	8.25	396	554	950	450
14.....	8.29	10.46	18.75	10.75	627	823	1450	725
15.....	9.30	11.20	20.50	11.75	608	917	1325	850
16.....	9.62	9.38	19.00	11.00	813	737	1750	850
17.....	7.99	12.01	20.00	11.50	670	780	1450	800
18.....	7.54	11.96	19.50	11.75	476	999	1475	750

TABLE VI.—(CONTINUED).
ABSOLUTE RANGE OF MEASUREMENTS BETWEEN PERCENTILE GROUPS.—BOYS.

Age.	Endurance as measured by ergograph. Kg. cm.			
	10 per cent. to average.	Average to 90 per cent.	10 to 90 per cent.	25 to 75 per cent.
4.....	29.6	47.9	77.5	45.0
5.....	42.9	44.6	87.5	50.0
6.....	46.7	50.8	97.5	50.0
7.....	58.2	59.3	117.5	65.0
8.....	65.6	81.9	147.5	75.0
9.....	72.5	80.0	152.5	82.5
10.....	77.7	97.3	175.0	82.5
11.....	95.3	104.7	200.0	105.0
12.....	127.2	132.8	260.0	120.0
13.....	158.8	161.2	320.0	177.5
14.....	193.5	231.5	425.0	225.0
15.....	174.7	215.3	390.0	210.0
16.....	201.4	203.6	405.0	225.0
17.....	140.9	204.1	345.0	190.0

TABLE VII.
ABSOLUTE RANGE OF MEASUREMENTS BETWEEN PERCENTILE GROUPS.—GIRLS.

Age.	Height. Cm.				Weight. Kg.			
	10 per cent. to average.	Average to 90 per cent.	10 to 90 per cent.	25 to 75 per cent.	10 per cent. to average.	Average to 90 per cent.	10 to 90 per cent.	25 to 75 per cent.
4.....	4.8	5.2	10.0	6.0	2.34	2.91	5.25	2.00
5.....	6.5	7.5	14.0	9.0	2.72	3.23	6.00	2.75
6.....	6.1	5.9	12.0	6.5	2.97	3.23	6.25	3.25
7.....	7.5	6.0	13.5	7.0	3.62	3.88	7.50	3.50
8.....	6.8	6.2	13.0	7.5	3.49	3.51	7.00	3.50
9.....	7.3	7.7	15.0	8.0	3.79	4.46	8.25	4.50
10.....	7.2	7.8	15.0	7.5	4.97	4.53	9.50	5.25
11.....	8.6	8.4	17.0	8.5	5.63	5.87	11.50	5.75

TABLE VII.—(Continued.)

12.	10.1	9.4	19.5	10.0	7.33	7.67	15.00	8.75
13.	10.8	7.7	18.5	10.0	8.63	11.37	19.00	10.00
14.	8.9	6.6	15.5	8.0	9.18	8.82	18.00	9.25
15.	7.4	6.1	13.5	7.0	7.84	8.91	16.75	8.50
16.	8.7	6.3	15.0	7.5	7.96	8.79	16.75	8.50
17.	7.7	5.8	13.5	7.0	8.26	8.74	17.00	7.75
18.	8.0	6.5	14.5	7.5	6.77	6.48	13.25	7.50

TABLE VII.—(CONTINUED.)

ABSOLUTE RANGE OF MEASUREMENTS BETWEEN PERCENTILE GROUPS.—GIRLS.

Age.	Grip of right hand. Kg.				Vital capacity. Cc.			
	10 per cent. to average.	Average to 90 per cent.	10 to 90 per cent.	25 to 75 per cent.	10 per cent. to average.	Average to 90 per cent.	10 to 90 per cent.	25 to 75 per cent.
4.	1.64	3.11	4.75	2.50	79	96	175	100
5.	2.73	2.77	5.50	2.75	130	170	300	175
6.	2.15	2.85	5.00	2.00	208	292	500	275
7.	1.71	3.04	4.75	2.25	196	229	425	250
8.	2.67	3.58	6.25	3.25	215	235	450	225
9.	3.39	4.36	7.75	3.50	235	290	525	275
10.	3.87	5.13	9.00	5.00	231	344	575	275
11.	4.32	5.49	9.75	5.25	262	363	625	350
12.	4.84	7.41	12.25	6.00	329	421	750	425
13.	5.60	7.15	12.75	7.25	324	476	800	425
14.	6.19	7.91	13.50	8.50	417	558	975	425
15.	5.92	6.58	12.50	6.50	375	450	825	450
16.	6.00	6.50	12.50	6.00	381	444	825	450
17.	5.62	7.38	13.00	6.50	404	496	901	475
18.	5.34	6.41	11.75	5.50	401	449	850	450

TABLE VII.—(CONTINUED.)

ABSOLUTE RANGE OF MEASUREMENTS BETWEEN PERCENTILE GROUPS.—GIRLS.

Age.	Endurance as measured by ergograph. Kg. cm.			
	10 per cent. to average.	Average to 90 per cent.	10 to 90 per cent.	25 to 75 per cent.
4.	32.2	27.8	60.0	25.0
5.	38.3	44.2	82.5	42.5
6.	34.5	60.5	95.0	50.0
7.	52.5	52.5	105.0	58.0
8.	56.4	58.6	115.0	65.0
9.	65.1	69.9	135.0	70.0
10.	71.7	83.3	155.0	85.0
11.	80.9	104.1	185.0	90.0
12.	109.5	155.5	245.0	130.0
13.	129.2	135.8	265.0	177.5
14.	126.5	123.5	250.0	125.0
15.	134.8	162.7	297.5	157.5
16.	140.1	149.9	290.0	157.5
17.	141.6	128.4	270.0	150.0

Clinical Reports.

REDUCTION OF DISLOCATION OF THE SHOULDER BY CONTINUOUS TRACTION.

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Dr. L. A. Stimson¹ described a method of reducing recent shoulder and hip dislocations, which he used with very gratifying results. His method appealed to me as being scientific and practical; hence, I have made use of the principle in all recent cases of dislocation of those parts coming under my care since his article was published. The results were so satisfactory that I feel justified in noting them.

The principle on which reduction of dislocations of the shoulder by continuous traction depends, is that the muscles are relaxed and rendered passive, thus offering no resistance to the movements of the humerus. There remains, then, only the ligaments and the atmospheric pressure to prevent reduction. The ligaments of the shoulder are so arranged that they offer no resistance to it and the looseness of the capsule is so great

that the arm will fall about an inch from the scapula when the muscles are dissected from the capsular ligament and an opening is made in it to remove the atmospheric pressure. From the foregoing, it is evident that when the resistance offered by the muscles and by the atmospheric pressure is overcome, which is done by the slow, continuous traction on the arm, the capsular ligament allows the articular surfaces of the scapula and head of the humerus to be separated to such an extent that they become placed opposite each other, and when the traction is removed they return to their proper places—reduction having been accomplished.

Technique of Reducing the Dislocation.—The method of reducing the dislocation, as recommended by Stimson, is as follows: Place the dislocated arm through a 6-inch hole, made 18 inches from one end, in a canvas stretcher, the patient lying on the stretcher in a lateral position; a ten-pound weight is then attached to his wrist. In all cases tried, reduction was completed in six minutes.

Hofmeister applied the same principle and obtained equally good results, by using a complicated set of pulleys. In my first cases, the following method was used: The patient was

placed on an ordinary dining table, in the lateral position; the dislocated arm allowed to hang through an opening made by removing one of the leaves; the patient supported by pillows and blankets, and the necessary number of flatirons attached to the wrist or elbow. In six cases treated by this method, reduction was accomplished at the end of six minutes in each of them. In some of the cases, at least, the reduction appeared to be effected in a shorter period; but this was not proven, as each time the weight was attached for the six minutes.

It occurred to me that carefully applied muscular force could be substituted for the weights, and, therefore, in treating the next dislocation of the shoulder, I pulled gently and steadily on the arm, held at right angles to the body, the patient relaxing his muscles. This he did, willingly, for he found that the traction was painless. After I had pulled gently and continuously for about two minutes, I felt the arm twist slightly, and, on relaxing my hold, found the dislocation reduced. I have tried this method in 7 cases and have succeeded in reducing the dislocations in all of them. In no case was I obliged to apply the traction longer than four minutes, and in most instances, a shorter period was sufficient.

The advisability of employing this method of reducing shoulder dislocation may be considered from two standpoints.

1. An Easy Method of Reducing Dislocations of the Shoulder and Hip, N. Y. Med. Rec., March 3, 1900.