PHYSIQUE AND DEVELOPMENT OF BOYS AND GIRLS FROM DIFFERENT TYPES OF SCHOOL

BY

W. H. HAMMOND

From the Ministry of Health, London

This paper is a report on certain aspects of a wide investigation into the physique and growth of schoolchildren undertaken from 1945 to 1952, with special reference to age, sex, and social differentia. The particular purpose of this part of the study was to compare the physique of groups of boys and girls from three different types of school representing different socio-economic levels; Group A consisting of children from independent (public or preparatory) schools, Group B children from council schools in the best neighbourhoods of a number of industrial towns, and Group C children from council schools in the poorest (slum) areas of these towns.

MATERIAL.—It was impracticable to obtain children of these groups by random selection. Schools were therefore selected, in consultation with the Medical Officer of Health of the district, as most likely to be representative of the three groups. In most cases all the pupils of the required ages were measured, *i.e.* there was no selection within the schools. Ages range from 5 to 18 years for Group A, 5 to 15 for Group C, and from 7 to 14 for Group B. For the present purpose the age group 10 years includes all children who have attained the age of 10 but who have not yet reached the age of 11.

Apart from a trial group to determine the most appropriate measurement, some 1,430 independent

school children and 1,495 public elementary school children were measured, giving approximately fifty children of each age, sex, and type of school. A team of three* measured all the children, each member being responsible for particular measurements throughout.

Three accuracy trials were carried out, involving full repeat measurement of 190 children. The results can be summarized very briefly by giving the error variances as a percentage of the total variance for each measurement at each age and sex. The order of accuracy on this basis may be tabulated as in previous column.

Mean measurements for Groups A and C (the most complete) at each age are shown for boys and girls in Appendix Tables A and B. Full details of the various techniques, together with standard deviations of the measurements and the means for Group B, may be obtained from the author.

I. INCREASE IN SIZE WITH AGE

(a) *Increase in Absolute Measurements.*—The measurements can be divided into two groups according to their association with age.

Type I measurements (height, arm and leg length, foot and hand length and breadth, and inter-acromial, inter-spinous, and ankle breadth) show a steady increase with age (Fig. 1a).

Measure	Site	Percentage
Weight	Total	0.2
Girth	Arm	0.7
	Knee, ankle	1
	Wrist	3
	Chest, hip	4
	Waist	6
Length	Total height, arm	1
	Leg	2
	Sitting height	3
	Foot	5
	Hand	6
Breadth	Inter-trochanteric	3
	Hand	7
	Inter-spinous, inter-acromial	10
	Foot	12

FIG. 1(a).—Measurements according to age. Type I Height (no pronounced spurt) by sex. Independent schools (Group A).

* Dr. E. W. Adcock, Miss J. Stevenson, and the author.

Type II measurements (weight, trunk, knee, arm, and wrist girth, sitting height, and inter-trochanteric breadth) show a pattern of slow increase through early childhood followed by a spurt just before and during puberty with gradual reduction in rate from age 15 onwards (Fig. 1*b* and *c*). The effect of sex on these two types of measurement is also noted below.

Fig. 1(*b*).—Measurements according to age. Type II Weight (pronounced spurt) by sex. (Independent Schools).

Fig. 1(*c*).—Measurements according to age. Type II. Trochanteric breadth. Specific sex difference. Independent schools.

The differences between successive annual means in weight, height, major lengths, and acromial breadth are significant at all ages. Foot and hand measurements give significant differences at nearly all ages, but trunk and limb girths are more variable, and differences are least significant from 9–10 years in girls and 10–11 years in boys, *i.e.* just before the growth spurts.

(*b*) *Inter-relationships between Measurements.*—

Apart from the differences in absolute measurements which occur with age, we find different relative rates of development which can be shown by plotting

other measurements against height or weight (Figs 2 and 3). When weights or girths are plotted vertically and lengths horizontally, a concave curve results, showing that for equal changes in length, girths and weights increase slowly at first and then at a gradually accelerated rate, in some cases until age 17 or 18, in others until age 15. When other lengths are compared with height they give straight line or a slightly concave curve, *i.e.* the increase is proportional to height, or is greater in relation to height in short (*i.e.* in young) than in older children. Similarly, when compared with weight, girths show an almost

Fig. 2.—Measurements according to weight. Boys.

Fig. 3.—Weight/Height relationship in School A, B, and C. Boys.

straight line, *i.e.* girths and weights increase in proportion with each other. Differences from the straight line tend to be greater for boys than for girls as boys' rates vary more with age. If, however, heights or lengths are plotted against the logarithm of weight, they also show an almost straight line relation (Figs 4a and b).

(a) Boys and girls compared.

FIG. 4.—Log Weight/Height:

(b) School groups A and C compared. Boys.

If the lines are parallel for two groups they indicate constant differences in proportions (stockiness or slenderness) and if they diverge they indicate that one group is increasing in girth faster than the other. To determine the significance of individual or group differences requires the calculation of the variability of individual log-weight/height values for a representative child population rather than for two selected groups such as the present ones.

(c) *Time of Maximum Growth.*—Other differences in development of the various measurements are found by considering the proportions of the final or mature stage reached by each type of measurement at different ages. On the average, apart from weight, the measurements of boys at age 18 are 1.5 times those at age 5 (1.4 to 1.6). Similarly the measurements of girls at 16 years average 1.4 times those at age 5 (1.3 to 1.6). If for any measurement the growth from age 5 to any intervening age is expressed as a percentage of the total growth from 5 to 18 years, the measurements form two groups consisting of hand length, breadth, height, leg length, and acromial breadth on the one hand, and trochanteric girth, knee girth, arm girth, and trunk girth, on the other (Fig. 5, overleaf), the latter lagging behind until age 10 and then catching up.

It may be fruitful to compare the progress of groups of individuals in the same measurements in

respect of the distance travelled along the road to maturity; especially in cases where direct comparison of size may be complicated by genetic differences between the different social classes. By extending the curves backwards to the probable birth weights and lengths (accepting mean values for boys and girls of 7.5 and 7.3 lb. and 50 and 49 cm. for both

social groups, social differences at birth being comparatively negligible) and forwards to the adult state*, and using similar data which we have obtained for younger ages, we can interpret the present data according to the scale of total growth from birth to maturity (Fig. 6, overleaf). Differences are compared in detail under the sections concerned with sex and social differences. This procedure can, of course, be used only to interpret results observed after maturity, unless data for the adult conditions are obtained from some other comparable group and used as the standard.

II. SEX DIFFERENTIALS IN SIZE AND GROWTH

(a) *Increase in Absolute Measurements.*—Appendix Tables A and B show that only four measurements (arm length, foot length and breadth, and hand breadth) are greater for boys than for girls at all ages. It is significant that these measurements are those in which there is no pronounced pre-pubertal spurt (Fig. 1a). In all other measurements, the pattern is that boys' measurements slightly exceed girls' measurements until age 10, when the girls begin to grow at a faster rate and overtake the boys.

* At age 18 to 19 growth in linear measurements has almost ceased. Kemsley (1952) shows that the mean height increases less than 1 per cent. after 18 years, so that present results for Group A can be accepted as a close approximation to the adult level and Group C's adult height can be taken as somewhat lower than that of the general population. Similarly, the probable weights for the two groups when adult can be estimated.

FIG. 5.—Percentage growth of girls from age 5 to 16, showing Type I height, etc. and Type II girths.

FIG. 6.—Percentage growth of boys from birth to age 18, by weight, comparing Schools A and C.

They remain ahead until age 14 by which time the later, and usually more intensive, pre-pubertal spurt of the boys enables them to pass the girls. Boys continue to grow for a longer period than girls, and hence the gap widens until the adult stage is reached (Fig. 1b). In only two measurements is this pattern modified; in pelvic breadth (whether of spinous breadth or trochanteric breadth) and pelvic girth* girls' measurements continue to exceed those of boys up to age 17. This represents a specific sex difference as distinct from one of all round growth (Fig. 1c).

(b) *Inter-relationship between Measurements.*—The slopes for boys and girls show, for example, that hip girth increases more for corresponding weight increases in girls than in boys, and that the converse obtains for leg length. Similarly, differences in the level of the curves show for which sex the different measurements are more prominent (i.e. which measurements contribute the bigger proportion to weight or height).

The straight lines for log weight and height cross in the diagram, the slopes being steeper for boys than for girls, showing that boys become taller relative to weight after 130 cm. height (at age 8 or 9) and that they become progressively less stocky compared with girls.

It has already been noted that by age 10 girls have accomplished a greater proportion of their total growth in length and girth than boys; this difference

is greater by age 11 or 12 when boys have not yet made their major spurt in growth (especially as regards girth).

III. DIFFERENCES BETWEEN INDIVIDUALS FROM THREE TYPES OF SCHOOL

(a) *Increase in Absolute Measurements.*—If we compare the mean measurements for Groups A and C at each age, we find the number of annual groups in which measurement differences are significantly in favour of the independent schools (2×5.2) are as shown in Table I. There is considerable size difference in favour of the independent school groups

TABLE I
NUMBER OF COMPARISONS IN WHICH
INDEPENDENT SCHOOL MEANS EXCEED COUNCIL
SCHOOLS

Measurements	Number of Comparisons	
	Girls (16)	Boys (17)
Weight (kg.)	14	17
Standing height	16	17
Sitting height	16	16
Leg length	16	17
Arm length	14	17
Foot length	16	16
Foot breadth	7	5
Hand length	9	9
Hand breadth	9	9
Chest girth	6	12
Waist girth	5	6
Hip girth	11	11
Arm girth	11	11
Wrist girth	12	7
Ankle girth	14	17
Knee girth	15	14
Inter-spinous	13	15
Inter-trochanteric	14	13
Bi-acromial	15	14

* The comparison of girth applies to Group B and the follow-up measurements, but not to the measurements shown in the Appendices since the maximum (seat) girth was not taken initially for boys.

at all ages, especially in length measurements. The superiority varies from 1 to 3 years' growth, but differs from one measurement to another, being least marked in girths, especially in waist girth among girls, where Group A results are actually somewhat lower than Group C results below age 11.

(b) *Inter-relationship between Measurements*—We can again plot mean heights and weights on a graph this time comparing the social groups (Fig. 3). The resulting values form parabolic curves, from which much useful information can be obtained. For example, the fact that different weight/height curves are given for the social groups shows that the difference is not merely one of overall size. The horizontal distance between the curves at any point indicates the amount by which the independent school children are taller than the council school children for any given weight, whilst the vertical distance indicates the weight superiority of the council school group compared with independent school children of the same height. The difference between the age points along the two curves amounts to about 2 years' growth at ages 7 to 10.

The particular merit of the log weight/length relation is that, being a straight line, the curve is independent of the size of the variables and therefore of age.

IV. PHYSICAL MATURITY OR DEVELOPMENTAL STAGE

In the same way as sex or social differences are represented by the *pattern* of present measurements as well as by their size, so physical maturity is shown by a changing pattern of measurements with age, *i.e.* by a change in body form, in addition to increase in size. If we express each measurement as a proportion of the total of the measurements (excluding weight) for the particular age, we can indicate the change of form very simply by the sum of those measurements which increase their proportion with age compared with those that decrease. The resultant values (Table II) change sufficiently regularly to enable a straight line to be fitted. This means that the level of physical maturity or developmental age can be indicated for a group or for an individual by reading off the age corresponding to the appropriate shape value on the straight line, in much the same way as Todd's standards of skeletal maturation are used by matching individuals against the standards. Separate curves have been produced for the sexes and school groups.

The results show that the independent School children are more advanced for their age than the council school children by amounts up to 3 years in respect of their "shape age". This confirms other

TABLE II
CHANGE OF SHAPE ACCORDING TO AGE AND SOCIAL GROUP

Sex	Age (yrs)	Schools	
		Council	Independent
Boys	5	.2945	.3016
	6	.2993	.3066
	7	.3023	.3083
	8	.3054	.3123
	9	.3072	.3146
	10	.3090	.3165
	11	.3120	.3198
	12	.3133	.3207
Girls	5	.4000	.4072
	6	.4005	.4096
	7	.4053	.4114
	8	.4080	.4135
	9	.4097	.4166
	10	.4112	.4195
	11	.4137	.4201
	12	.4169	.4281
	13	.4191	

Boys = Sum of contribution of height, leg, and inter-trochanteric breadth as proportion of total of measurements (items 2–19 in Appendix I).

Girls = Sum of contributions of height, leg length, hip, and knee.

indications of the maturity differences of the groups. However, the actual values depend upon the particular combination of measurements used in the present study. A simpler and more generally applicable device is desirable and may be applied as follows.

In infancy trunk length contributes the main proportion of total length, whereas at later ages the legs contribute an increasing proportion. Therefore the ratio of sitting height to leg length (Fig. 7) can also be used to indicate maturity (especially since the two coefficients of variation are comparable at all ages). These values are set out for both boys and

FIG. 7.—Ratio of sitting height to leg length of boys from age 5 to 18, comparing Schools A, B, and C.

girls in Table III.* Variability of the values is high and one should not expect individuals to follow this pattern, though groups tend to do so.

TABLE III
RATIO OF SITTING HEIGHT TO LEG LENGTH ACCORDING
TO SEX AND AGE

Age (yrs)	Boys		Girls	
	Independent Schools	Council Schools	Independent Schools	Council Schools
4	—	1.219	—	—
5	1.155	1.174	1.133	1.148
6	1.116	1.126	1.095	1.123
7	1.100	1.118	1.078	1.099
8	1.036	1.107	1.038	1.078
9	1.013	1.078	1.021	1.058
10	0.999	1.061	1.000	1.055
11	0.973	1.036	0.990	1.031
12	0.962	1.000	0.991	1.016
13	0.987	0.982	1.005	1.010
14	0.993	0.979	1.018	1.014
15	1.001	0.991	1.020	—
16	1.000	—	1.017	—
17	1.006	—	1.007	—
18	0.998	—	—	—

V. EFFECT OF DIFFERENTIAL DEVELOPMENT RATES ON GROUP MEASUREMENTS

Differences in size between children in different social groups increase with age, but important differences are already present at age 5, when boys in Group A have the weight of an average 6-year-old child, while those in Group C have that of the average for 4 to 5 years. If we accept the differences between the social groups as due to differences in developmental age, we should expect, at the next year's measuring, that Group A would have increased by the average growth increment for age 6-7 compared with C's increment from 4 to 5. If the same holds good at later ages the increment would always be 1-2 years in advance. Since the annual increments increase in size from year to year this would involve a cumulatively greater difference between the groups in actual size as age increases. If we set out the weights which would result in Group A, assuming the annual progression to be one year ahead of average and beginning with the attained weight of 46 lb. (20.9 kg.) at age 5, and similarly those which would be found in Group C one year behind the average, we find the agreement with the actual weights set out in Table IV.

With girls the difference in measurements is not apparent until age 8, when the independent school group exceeds the council school group by about 1½ years. If, therefore, we treat the results in the same way, allowing the increments appropriate to the two ages, we find the correspondence with the actual weights set out in Table IV. Had we assumed

this difference to have begun at age 5 we should have expected a higher weight for the independent school group at that age than the weight actually found, but the results would have been the same from age 8 onwards. Thus the agreement in girls is not quite so close as in boys.

TABLE IV
COMPARISON OF ACTUAL AND EXPECTED WEIGHTS OF
BOYS AND GIRLS

Sex	Age (yrs)	Weight (kg.)			
		Independent Schools		Council Schools	
		Expected	Actual	Expected	Actual
Boys	5	20.9	20.9	18.4	18.4
	6	24.0	22.8	19.7	19.9
	7	26.5	26.5	21.4	22.4
	8	28.7	29.3	24.5	24.7
	9	31.2	31.1	26.9	27.3
	10	33.5	34.0	29.2	29.4
	11	37.4	36.1	31.7	31.9
	12	40.6	39.3	34.0	36.5
	13	47.5	43.5	37.9	38.8
	14	51.0	50.8	41.1	45.3
	15	55.8	55.5	47.9	47.6
Girls	8	28.4	28.4	23.8	23.8
	9	31.2	30.4	26.2	26.4
	10	35.4	33.6	28.5	28.8
	11	39.7	39.0	31.3	31.7
	12	45.8	43.8	35.5	35.6
	13	49.7	49.8	39.8	41.8
	14	53.6	55.1	45.9	44.2

VI. DISCUSSION

When considering some twenty body measurements in two sexes, and three social groups, by annual age groups, the results can be somewhat confusing unless they can be reduced to patterns. In the first place differences between absolute measurements are of little interest, although differences in their change with sex, age, or social group may be. In respect of change with age the measurements can be divided into two types:

Type I. *Most Lengths and Some Breadths*.—There is an almost straight-line increase in size from age 5 to 14 or 15 (boys) and from 5 to 13 (girls), followed by a slowing down in the rate of growth

Type II. *Weight and Trunk and Limb Girths*.—The growth is less constant, showing a very slight increase from age 5 to 10 and in some cases an actual decrease from 8 to 10*, and then building up to a maximum at age 14 or 15, after which it gradually decreases until 18 years. The "pubic spurt" which is so often referred to in growth studies should be qualified as applying only to this second group of measurements, and possibly even then it is not to be regarded as any sudden change but rather as the critical part of a longer and more gradual change.†

* The I.C.C. weights for 1905 show this falling off at age 7 but not the 1938 or 1949 figures (Daley, 1950, Diagram II).

† It should be recognized that a combination of sudden growth spurts occurring at different times as a result of different physiological ages within the same chronological groups would result in smooth curves for the means.

*Leitch (1951) draws attention to the difference in proportions of leg to total height as a characteristic of different income groups and of maturation.

From age 5 to 18 the fact that the logarithm of weight is proportional to height shows that weight is acting as a cubic function of a linear measurement (actually to the power 3.14); this applies also to major girths. Weight and height (which represent the two measurement groups) have been extended to include results for birth and maturity, and over this period three phases of post-natal growth can be distinguished. They may be summarized in the phraseology of Tanner (1951) as:

Phase 1 (birth to 5 years) high velocity but decreasing acceleration;

Phase 2 (5 to 15 years (boys) or 5 to 13 years (girls)) moderate velocity with zero or slight acceleration (Type I measurements), and moderate velocity with slight retardation around 8 to 10 years followed by increasing acceleration (Type II measurements),

Phase 3 (15 years (boys) or 13 years (girls) to maturity) low velocity with de-acceleration until velocity becomes zero, *i.e.* until growth ceases.

Boys show this relative pause in growth and subsequent surge much more strongly than girls. In fact, girls show no "pubic spurt" in most of their measurements. The characteristics of these two groups of measurements affect and possibly account for some of the differences between the sexes and social groups, *i.e.* girls' measurements are generally lower than those of boys up to age 11, and they then exceed those of boys until the boys overtake them again at age 15. This is mainly because the girls' Phase 2 is telescoped into a shorter period. Moreover, the differences are smaller in those measurements (Type I) which have an almost constant increment, and greatest in those in which growth increases most rapidly with age (Type II).

It is desirable to have a practical indication of maturity from body measurements apart from the estimation of skeletal maturity by *x* rays (which is inconvenient to carry out, and in any case only applies to one system); by estimating the position of a group along its development curves in particular measurements, it is possible to gain suggestive evidence of the stage of maturity of the group. The maturity—in the sense of distance along these curves—may, of course, be different in different measurements, and one aim of this paper has been to show how, not the absolute size, but the relation between measurements (*i.e.* shape) or position along the age curve (*i.e.* relation between present position and the previous and subsequent positions) can be used for this purpose.

The school groups show differences in general size, but the independent school group has also the more slender build which characterizes greater maturity, the shape (based either on all measurements or on the proportion of trunk to limb ratio) of

more mature ages, and the pattern of weight increase appropriate to a group 2 years older. All these factors point to an increase in the rate of maturation of the independent school group, possibly superimposed on general size differences and an overall difference in body build.* It is possible that the different mature physiques of the social groups are due to these differences in the rate of development rather than to specifically social differences. This would imply that children of the lower social group whose development was ahead of the average would tend to converge upon the characteristics of the higher social group.

VII. SUMMARY

The present paper reports the results of analysing cross-sectional body measurements of boys and girls aged 5 to 18 years from three different types of school representing different socio-economic classes.

Body measurements of boys and girls between 5 and 18 years can be classified into two types according to the way in which they increase throughout the period. Type I (consisting mainly of lengths) show an almost constant increase during the period 5 to 15 years (boys) and 5 to 13 years (girls), and Type II (girths and some breadths) show slower growth during the period 5 to 10 years followed by the more rapid growth of the "pubic spurt". Similarly, there is a lag in the development of Type II measurements, whereby the corresponding proportion of the mature size is reached one year later than for Type I measurements because of the relative pause in growth of Type II measurements before the pubertal increase.

When weight or girths are set against lengths over the whole period a smooth curve results, and this can be transformed to a straight line by using a log scale for the girths.

The proportions of the total measurement contributed by each measurement tend to vary in a regular fashion with age, and these proportions have been expressed in the form of a straight line equation.

A similar function which varies regularly with age is the relation between sitting height and leg length. Both these functions can be used to indicate a "shape age".

The sexes can be compared in respect of any of the above. Thus girls show little evidence of the pubic spurt which occurs in Type I measurements for boys. The slopes of the log weight/height lines

* This is supported by the direct assessment of (male) pubic development which is greater in the higher social groups. (Berry and Cowin, 1951.)

cross for boys and girls, as the boys become more slender than girls with age.

The independent school children (Group A), besides being on the average 2 years ahead of the council school children (Groups B and C) in size, are also more slender and have the shape characteristics of at least 2 years ahead. The increases in weight of Group A between successive years' measurements also follow a pattern which is approximately 2 years in advance of Group C. Thus, the evidence is strongly in favour of a difference in maturation rate as a prime cause of the social differences noted.

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APPENDIX TABLE A

MEAN MEASUREMENTS (cm.) BOYS (see Notes on next page)

Age (yrs)		5	6	7	8	9	10	11	12	13	14	15	16	17	18
Weight (kg.) ..	A C	20·9 18·4	22·8 19·9	26·5 22·4	29·3 24·7	31·1 27·3	34·0 29·4	36·1 31·9	39·3 36·5	43·5 38·8	50·8 45·3	55·5 47·6	60·3 —	63·1 —	67·0 —
Standing Height ..	A C	115·2 108·0	121·0 112·6	131·4 118·4	133·6 124·1	137·3 128·8	142·9 133·7	145·4 138·1	151·1 143·5	157·3 147·8	164·4 155·0	167·2 158·5	173·3 —	175·9 —	178·3 —
Sitting Height ..	A C	65·6 61·4	67·5 63·4	70·3 66·4	70·3 69·2	72·6 70·7	74·1 72·6	74·9 74·1	77·5 75·8	81·9 77·3	86·6 80·5	88·2 83·4	91·1 —	92·6 —	93·5 —
Leg Length ..	A C	56·8 52·3	60·5 55·3	64·6 59·4	69·9 62·5	71·4 65·6	75·1 68·4	77·9 71·5	80·6 75·8	83·0 78·7	87·2 82·2	88·1 84·1	91·1 —	92·0 —	93·6 —
Arm Length ..	A C	46·3 45·1	49·0 47·1	52·8 49·7	56·6 51·9	58·2 54·2	60·6 55·9	61·4 57·9	64·4 61·1	66·0 63·5	69·0 64·9	70·7 67·2	73·5 —	73·2 —	76·0 —
Foot Length ..	A C	18·1 17·2	18·8 17·8	20·5 18·9	21·1 19·7	21·6 20·4	22·6 21·4	23·0 21·9	23·6 22·9	24·3 23·7	25·4 24·8	25·5 25·0	26·1 —	26·3 —	26·1 —
Foot Breadth ..	A C	6·9 6·8	7·1 7·0	7·6 7·2	7·5 7·4	7·8 7·7	8·0 8·0	8·2 8·2	8·3 8·5	8·6 8·9	9·1 8·8	9·2 8·7	9·5 —	9·4 —	9·6 —
Hand Length ..	A C	12·8 12·4	13·3 12·8	14·2 13·3	14·7 13·7	15·1 14·1	15·6 14·7	15·8 15·2	16·4 15·7	17·0 16·3	18·2 16·3	18·3 —	18·9 —	19·0 —	19·5 —
Hand Breadth ..	A C	6·3 5·9	6·5 6·2	6·8 6·3	6·9 6·6	7·1 6·8	7·3 7·0	7·3 7·2	7·5 7·3	7·8 7·5	8·3 7·9	8·6 —	8·9 —	8·9 —	8·9 —
Chest Girth (xiphoid level)	A C	55·2 54·3	57·0 55·4	58·8 57·4	59·8 59·2	62·0 61·0	64·5 62·4	— 63·5	65·0 66·2	69·0 67·4	72·6 —	75·5 —	78·5 —	80·4 —	82·2 —
Waist Girth ..	A C	52·1 52·5	53·3 53·0	55·1 55·0	57·8 55·5	57·9 56·8	59·5 58·0	60·0 59·1	60·8 61·0	62·1 62·2	65·5 64·7	67·1 66·1	68·9 —	70·3 —	72·7 —
Hip Girth (iliac level)	A C	55·9 54·7	57·3 54·8	60·3 57·0	60·6 58·8	61·8 60·4	63·3 62·1	64·1 63·6	66·0 66·3	68·3 66·4	72·3 70·7	73·9 72·9	75·2 —	76·9 —	79·3 —
Upper Arm Girth ..	A C	15·7 15·8	16·1 15·8	17·5 16·5	18·0 16·9	18·4 17·4	19·1 18·0	19·5 18·5	20·0 19·5	20·5 19·6	22·0 21·3	22·7 21·6	23·7 —	23·6 —	25·1 —
Wrist Girth ..	A C	11·9 11·8	11·9 11·8	12·7 12·1	12·7 12·3	12·9 12·7	13·2 13·0	13·3 13·3	13·6 13·7	14·3 13·8	15·3 15·1	15·9 15·2	16·4 —	16·5 —	17·0 —
Ankle Girth ..	A C	15·2 14·5	15·8 14·7	16·7 15·4	17·4 15·8	17·3 16·3	18·4 16·8	18·6 17·5	18·9 18·1	19·3 18·6	20·7 20·3	20·9 20·2	21·1 —	21·2 —	21·9 —
Knee Girth ..	A C	21·2 20·5	21·5 20·6	23·5 21·6	24·7 23·0	25·9 23·7	26·5 24·5	27·5 25·9	28·2 27·5	29·5 28·2	31·4 29·0	31·2 29·5	32·0 —	32·2 —	32·9 —
Inter-spinous Breadth ..	A C	16·2 14·9	17·0 15·3	17·4 15·6	17·6 16·4	18·1 16·9	19·3 17·7	19·3 17·9	19·5 18·4	20·2 18·6	21·4 21·4	21·7 22·7	22·1 —	22·9 —	23·8 —
Inter-trochanteric Breadth ..	A C	20·1 19·3	20·7 20·0	22·3 21·0	22·7 21·9	23·4 22·7	24·3 23·6	25·0 24·5	26·1 25·4	27·8 26·2	29·5 28·5	30·3 29·5	31·6 —	32·4 —	32·9 —
Inter-acromial Breadth ..	A C	24·7 23·3	25·7 24·0	27·4 25·4	28·0 26·2	29·0 27·3	29·5 28·4	31·0 29·2	31·0 29·8	32·7 30·8	33·9 33·5	34·9 33·8	36·4 —	36·8 —	37·2 —
Number in Group ..	A C	20 50	26 52	23 55	50 57	82 65	82 60	95 72	86 65	66 81	64 23	70 12	64 —	72 —	23 —

APPENDIX TABLE B
MEAN MEASUREMENTS (cm.) GIRLS

Age (yrs.) ..		5	6	7	8	9	10	11	12	13	14	15	16
Weight (kg.) ..	A C	19·4 18·4	21·6 20·5	24·6 21·9	28·4 23·8	30·4 26·4	33·6 28·8	39·0 31·7	43·8 35·6	49·8 41·9	55·1 45·8	56·7 —	59·5 —
Standing Height ..	A C	113·7 107·8	119·4 112·2	124·7 118·3	131·3 122·4	134·2 127·5	142·0 131·7	147·2 137·2	154·5 142·8	159·6 149·8	163·1 152·9	163·3 —	166·1 —
Sitting Height ..	A C	63·8 60·5	66·0 62·8	68·5 65·5	71·1 67·3	72·1 69·2	75·1 71·5	77·5 73·7	80·9 76·0	84·6 79·4	86·6 80·9	87·2 —	88·6 —
Leg Length ..	A C	56·3 52·7	60·3 55·9	63·8 59·6	68·5 62·4	70·6 65·4	75·1 67·8	78·3 71·5	81·6 74·8	84·2 78·6	85·1 79·8	85·5 —	87·1 —
Arm Length ..	A C	45·4 44·2	47·4 47·1	50·2 49·7	53·3 50·8	54·5 53·0	57·9 54·4	60·5 57·1	63·7 59·8	66·6 63·0	67·7 63·4	67·9 —	69·4 —
Foot Length ..	A C	17·8 16·8	18·5 17·7	19·4 18·8	20·6 19·4	20·8 20·3	21·8 20·6	22·7 21·6	23·3 22·3	23·8 23·3	23·9 23·4	24·1 —	24·4 —
Foot Breadth ..	A C	6·5 6·6	7·0 6·9	7·2 7·0	7·5 7·2	7·7 7·5	7·9 7·8	8·2 8·0	8·3 8·3	8·6 8·6	8·8 8·8	8·7 —	8·8 —
Hand Length ..	A C	12·4 12·1	13·2 12·7	13·7 13·1	14·4 13·5	14·7 14·0	15·3 14·3	16·3 14·9	16·6 15·7	17·3 16·6	17·5 16·9	17·5 —	17·7 —
Hand Breadth ..	A C	6·0 5·8	6·2 6·0	6·4 6·1	6·7 6·3	6·9 6·5	7·1 6·7	7·3 6·9	7·4 7·1	7·7 7·5	7·8 7·7	7·8 —	8·0 —
Chest Girth (xiphoid level)	A C	53·4 54·3	55·4 56·4	56·6 56·2	59·4 57·8	60·2 60·1	62·3 61·2	65·5 63·0	67·2 65·7	68·9 66·2	71·2 68·0	71·7 —	—
Waist Girth ..	A C	48·5 51·7	50·2 53·8	52·0 53·3	54·9 54·4	55·0 56·5	56·3 57·0	59·4 58·3	60·9 60·0	63·5 62·3	65·9 62·7	66·8 —	66·9 —
Hip Girth ..	A C	58·9 58·5	60·8 61·7	64·1 62·9	68·3 65·0	70·5 67·8	72·8 70·1	77·8 72·7	82·2 76·5	87·6 79·6	92·6 85·0	94·9 —	97·1 —
Upper Arm Girth ..	A C	15·7 16·0	16·4 16·5	17·2 16·7	18·1 17·2	18·7 17·9	19·2 18·6	20·5 18·9	20·9 19·7	22·1 20·5	23·0 21·2	23·3 —	24·2 —
Wrist Girth ..	A C	11·9 11·6	11·9 12·0	12·3 12·0	12·9 12·3	13·0 12·5	13·5 13·0	14·2 13·3	14·5 13·5	15·0 14·3	15·3 14·8	15·5 —	15·7 —
Ankle Girth ..	A C	15·2 14·7	15·7 15·3	16·5 15·6	17·4 16·2	17·8 16·6	18·1 16·9	19·2 17·7	19·5 18·4	19·6 19·2	20·3 20·2	20·5 —	20·8 —
Knee Girth ..	A C	21·1 20·4	22·0 21·5	23·3 21·8	24·3 22·7	25·2 23·9	26·4 24·6	28·2 25·5	29·4 27·0	30·7 28·8	32·1 30·2	33·0 —	34·0 —
Inter-spinous Breadth ..	A C	15·8 14·7	16·5 15·3	16·7 15·5	17·7 16·1	18·0 16·8	18·8 17·6	19·3 17·9	20·5 18·6	20·9 19·8	21·4 21·5	22·0 —	22·2 —
Inter-trochanteric Breadth ..	A C	19·8 19·5	20·6 20·5	21·7 21·1	23·1 21·8	23·7 22·7	24·7 23·5	26·2 24·6	28·3 26·1	30·2 28·0	31·3 29·3	31·7 —	32·6 —
Inter-acromial Breadth ..	A C	24·3 23·2	25·5 25·3	26·6 25·3	28·1 26·2	28·8 26·7	30·1 28·1	31·0 29·3	32·0 30·2	33·5 31·2	34·4 33·2	34·7 —	35·1 —
Number in Group	A C	12 61	39 52	56 51	53 70	46 69	57 49	53 63	50 54	73 52	71 55	53 —	52 —

A = independent schools.

C = council schools (poor districts).

- (1) All girths taken by $\frac{1}{4}$ -in. wide steel tape, light pressure (about 2 oz. tension).
- (2) Trunk breadths taken with spreading calipers (pelvimeter).
- (3) Leg length taken by steel tape from floor to top of great trochanter.
- (4) Arm length by steel tape from acromium edge to medius, arm horizontal.
- (5) Foot and hand measurements by projection on to squared base.
- (6) Knee girth, minimum below tibial tuberosity and head of fibula.

CORRIGENDA

British Journal of Social Medicine (1953), 7, 162, col. 2:

1. 5 from bottom, for Jenkins read Jenkin.

1. 2 from bottom, for 1935 read 1953.