INFANT GROWTH

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Current literature on the growth of British infants is particularly concerned with studies of weight and weight gain, there being relatively little to be found concerning other measurements of body size and their rate of increase.

Because of this and because the mean size of the present day 6-month-old infant is greater than that of 30 years ago (Thomson, 1954), this investigation into infant growth has been made.

Source of Material

The infants concerned in this investigation were born in the Simpson Memorial Maternity Pavilion of the Royal Infirmary, Edinburgh, and attended the Child Welfare Clinic in that hospital. An accurate record of the birth weight was available. Only healthy singleton legitimate infants were dealt with and in an attempt to eliminate the prematurely and postmaturely born the investigation was confined to infants whose birth weight was over 5½ lb. but not over 9½ lb. Since a few prematurely born infants weigh more than 5½ lb. and some postmaturely born infants weigh less than 9½ lb., selection on this basis may not absolutely confine the investigation to maturely born infants. The infants were drawn from Social Classes III, IV and V.

Method

In general, enquiries of this nature take one of two forms; they may be longitudinal or latitudinal, the latter being also referred to as cross-sectional. In the longitudinal method the same infant is observed at predetermined ages throughout the year. This method is difficult to carry out because the attendance of the infants at predetermined intervals is influenced by many factors, not the least of which are the weather and the degree of cooperation of the mother.

In the present enquiry the longitudinal approach was attempted but the wastage of observations being great, the method was abandoned and a latitudinal approach adopted. In this method all infants, whether attending the clinic regularly or not, were weighed and measured. From the accumulated data, observations made at ages of 2 weeks ± 2 days; 4, 8, 12, 16, 20 and 24 weeks all ± 3 days; 28, 32, and 36 weeks all ± 5 days; and 40, 44, 48 and 52 weeks all ± 7 days were abstracted, and used to construct Tables 1a, b and c, and 5a, b and c.

Clearly in this method an element of the longitudinal approach is incorporated since infants reappear irregularly at various age levels. Moreover, since weighing and measuring did not cease after the observations for the construction of Table 1a, b and c had been abstracted, it should be stated that Table 5a, b and c is not constructed from data contained solely in Table 1a, b and c.

As infants grow older attendances at clinics tend to become less frequent and may even cease before the infant is a year old. This represents a falling off in the availability of material and is in part compensated for by allowing a greater age range with increasing age of the infant.

A supervised pupil midwife weighed the naked infant to the last complete ounce on a beam balance using a sliding weight. The supine crown-heel and crown-rump lengths were measured by me. I used a specially constructed measuring board of my own design (Fig. 1). The board had a fixed curved perspex footpiece which allowed of hip and knee flexion when measuring crown-rump lengths, adequate side flanges to prevent distortion of the

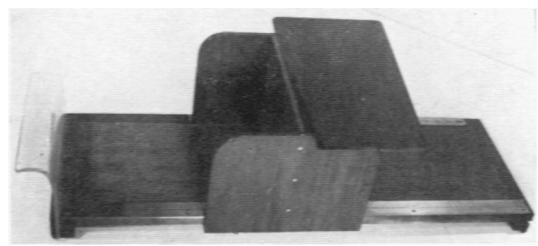

FIG. 1.—Crown-heel and crown-rump measuring board (incorporates a writing board).

TABLE 1A

WEIGHT IN FIRST YEAR

Age (Wk.)	No.		Birth Weight				Actual Weight			
			Male		Female		Male		Female	
			Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
	M.	F.	(lb. oz.)	(oz.)	(lb. oz.)	((oz.)	(lb. oz.)	(oz.)	(lb. oz.)	(oz.)
2	209	201	7 6·56	14·7	7 3·77	15·3	7 8·41	13·80	7 5·07	15·03
4	190	196	7 6·37	15·5	7 3·19	14·8	8 7·51	18·25	8 2·87	15·23
8	228	211	7 6·73	14·9	7 3·92	13·7	10 7·96	21·59	10 0·61	17·12
12	194	188	7 7·36	14·1	7 3·35	14·0	12 8·08	23·40	11 10·50	20·83
16	196	159	7 5·68	14·8	7 3·36	14·1	13 14·88	25·42	13 3·55	21·22
20	170	155	7 6·05	14·5	7 3·79	14·3	15 6·38	25·75	14 7·25	24·18
24	163	153	7 6·59	14·4	7 2·91	15·1	16 12·19	28·38	15 10·81	28·30
28	159	159	7 6·10	13·1	7 3·51	14·6	17 15·27	30·95	16 13·36	29·27
32	165	161	7 4·94	13·9	7 4·17	14·3	18 14·95	30·61	17 14·30	32·32
36	173	153	7 6·25	14·2	7 3·44	13·6	19 14·94	29·01	18 10·58	32·46
40	157	151	7 5·45	14·5	7 4·48	14·6	20 8·52	30·22	19 6·81	32·77
44	142	142	7 5·14	14·2	7 5·79	14·5	21 6·58	34·04	20 5·74	36·35
48	153	133	7 5·04	13·2	7 5·83	13·9	22 2·22	38·28	20 14·63	37·62
52	131	130	7 4·79	13·1	7 6·72	15·3	22 12·37	38·13	21 11·20	37·65

TABLE 1B

CROWN-HEEL AND CROWN-RUMP LENGTH IN FIRST YEAR

Age (Wk.)	Crown-heel				Crown-rump			
	Male		Female		Male		Female	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
	(mm.)	(mm.)	(mm.)	(mm.)	(mm.)	(mm.)	(mm.)	(mm.)
2	517·30	20·23	509·55	19·90	347·13	14·56	342·39	13·44
4	533·00	18·85	525·46	19·52	359·59	13·33	353·46	13·72
8	565·79	20·98	557·03	19·20	381·43	15·82	374·84	11·65
12	596·61	19·64	582·55	18·92	401·31	15·12	389·56	14·70
16	619·81	16·02	604·13	17·94	414·62	15·30	404·19	13·34
20	639·52	20·36	623·12	14·67	427·31	15·26	414·26	12·39
24	657·91	19·83	641·42	19·77	437·26	12·69	423·53	14·83
28	673·69	19·40	656·80	20·47	444·94	15·68	432·49	14·07
32	688·25	19·77	673·14	22·20	453·23	14·63	441·51	15·67
36	704·43	16·94	686·59	21·60	461·17	14·33	447·80	16·27
40	714·91	21·45	699·35	20·93	467·82	15·51	453·97	16·05
44	728·77	22·35	712·75	23·29	473·71	15·79	462·03	18·41
48	739·44	23·27	725·31	23·99	479·85	16·38	467·59	18·86
52	750·53	22·70	738·80	25·64	484·61	16·12	475·94	20·50

TABLE 1C

OCCIPITO-FRONTAL CIRCUMFERENCE AND THORACIC CIRCUMFERENCE IN FIRST YEAR

Age (Wk.)	Occipital Frontal Circumference				Thoracic Circumference			
	Male		Female		Male		Female	
	Mean (mm.)	S.D. (mm.)	Mean (mm.)	S.D. (mm.)	Mean (mm.)	S.D. (mm.)	Mean (mm.)	S.D. (mm.)
2	361·70	11·61	354·12	12·12	333·51	17·83	327·47	16·54
4	373·11	11·75	364·30	11·40	347·81	17·00	345·69	15·34
8	390·34	11·43	381·67	10·67	374·55	18·00	370·25	14·80
12	403·92	11·30	394·51	11·23	396·66	18·06	387·37	17·53
16	414·85	11·40	406·01	10·88	410·04	18·26	402·48	17·35
20	426·49	11·04	417·13	10·56	416·50	19·72	412·75	18·56
24	436·71	11·61	424·81	10·53	433·22	18·79	425·52	18·74
28	444·45	11·79	433·25	11·07	442·99	19·81	434·05	20·69
32	451·41	12·14	440·47	12·60	451·00	18·67	442·78	21·07
36	458·20	11·55	445·49	11·66	459·09	18·86	448·62	21·43
40	462·27	11·90	450·70	11·61	464·06	18·98	454·52	18·75
44	466·84	11·01	454·96	12·92	469·73	19·02	461·65	21·50
48	470·57	11·98	457·95	12·32	473·67	20·47	465·26	22·35
52	473·83	11·72	462·12	11·92	481·62	18·97	470·87	21·69

Conversion Factors. 1 mm.=0·039370113 in. 1 oz.=28·34953 gr. 1 lb.=453·5924 g.

sliding headpiece and a writing ledge on which to note observations. A steel millimetre scale was incorporated in the base of the board. Lengths were read to the last complete millimetre. The occipito-frontal circumference was measured by placing an accurately graduated millimetre linen tape closely round the head and over the most prominent parts of the frontal and occipital bones. The circumference of the thorax was measured at nipple level with the infant lying on the back on a firm flat mattress. The reading was made at what was considered to be midway between inspiration and expiration. The same tape was used for both circumferential measurements, and was read to the last complete millimetre. The tape was checked frequently against the steel millimetre scale on the measuring board and replaced when an error was shown. I had the assistance of the Sister in charge of the Clinic when I made these measurements and I was unaware of previously recorded measurements.

Results

From the data obtained, the means of weight, crown-heel length, crown-rump length, occipito-frontal circumference and thoracic circumference with their respective standard deviations have been calculated for each sex at each age point (Tables 1a, b, c).

However, because McKeown and Gibson (1951) showed that the mean birth weight of firstborn infants was less than the mean birth weight of subsequently born infants, these tables have been compiled from observations made on infants born of first pregnancies. More than 100 observations were included in each sex age group for each measurement. All computations were made by me.

Discussion

Mean Values. Considering that the present enquiry was confined to infants born of first pregnancies and who were within a restricted birth weight range and social grouping, the mean values of weight now reported compare favourably with those of Parfit (1951) for Oxford infants. In addition the 52 week mean value is similar to that given by Hewitt and Stewart (1952) for firstborn Oxford infants. The values for weight and length compare favourably with the data of Norval, Kennedy and Berkson (1951) for Rochester, Minnesota, infants, but when comparison is made with the Brush Foundation data (Simmons, 1944), the Edinburgh mean weights, crown-heel and crown-rump lengths are lower. In making this latter comparison it is noted that the higher means of the Brush Foundation are 'derived from the measurements of a selected sampling of 999 white children, the majority of whose parents are above average both in education and in economic level and who are of North European ancestry'. The occipito-frontal circumference means are similar to those reported by Vickers and Stuart (1943) for Boston, U.S.A., infants, and while in the first six months of life they resemble the data of Meredith (1946) for Iowa infants in the second six months they exceed Meredith's data. By contrast the present data are lower than the means published by Bayley and Davis (1935) for Berkeley, California, infants.

It is important to compare the present data not only with contemporary data but also with publications of earlier years, especially when these earlier publications deal with infants in the same country and in the same part of the country. Comparison can be made with Paton and Findlay (1926) who give means for weight, crown-heel and crown-rump lengths for Edinburgh infants. In this connexion, weight has already been considered (Thomson, 1955) and shown to be greater than that reported by Paton and Findlay. The present publication shows that the mean crown-heel and crown-rump lengths are also greater than those reported by Paton and Findlay (Table 2). The means for

TABLE 2

CROWN-HEEL AND CROWN-RUMP LENGTH (PATON AND FINDLAY, 1926)

Age (month)	Crown-heel (mm.)		Crown-rump (mm.)	
	Male	Female	Male	Female
1	524·88	522·82	340·61	342·39
3	581·16	565·25	373·13	362·46
6	628·80	621·44	399·80	395·22
9	675·07	655·86	420·88	412·75
12	699·82	698·82	439·42	435·86

weight, crown-heel and crown-rump lengths, occipito-frontal and thoracic circumferemces reported in Low's tables (1952) for Aberdeen infants born in the years 1923-27 are all less than the mean figures now published. Such observations suggest that, as has already been shown in the case of weight (Thomson, 1955), the length norms in use in welfare clinics may require alteration. Workers in welfare clinics are commonly provided with crown-heel norms only, and these, generally undifferentiated for sex, are presented as a graph. The present data have been recalculated on this basis and compared with the graphs which have been in use by three local authorities for many years. Two of the local

authorities have used the same graph (Fig. 2). It is clear that the crown-heel norm now published for Edinburgh infants is, throughout the year, consistently greater than that which was prepared by the late Dr. T. Y. Finlay, Maternity and Child Welfare Officer for Edinburgh, when he collaborated some 30 years ago with Paton and Findlay, and which is still in use in Edinburgh clinics. The origin of the graph used by the other two authorities is not disclosed. It appears to be the same as the graph which was used in the investigation planned and carried out by Paton and Findlay, since a copy of it appears in the appendix to their report. The graph is not the result of Paton and Findlay's investigations. The first six months covered by this graph are approximately the same as the findings of the present investigation. Thereafter, the form of the graph is completely at variance with the present investigation as well as with the graph for Edinburgh infants by Finlay.

From these observations one may conclude that the mean crown-heel length of infants today is greater than formerly and that the norms of crown-heel length as well as of weight in general use by child welfare clinics are in need of revision.

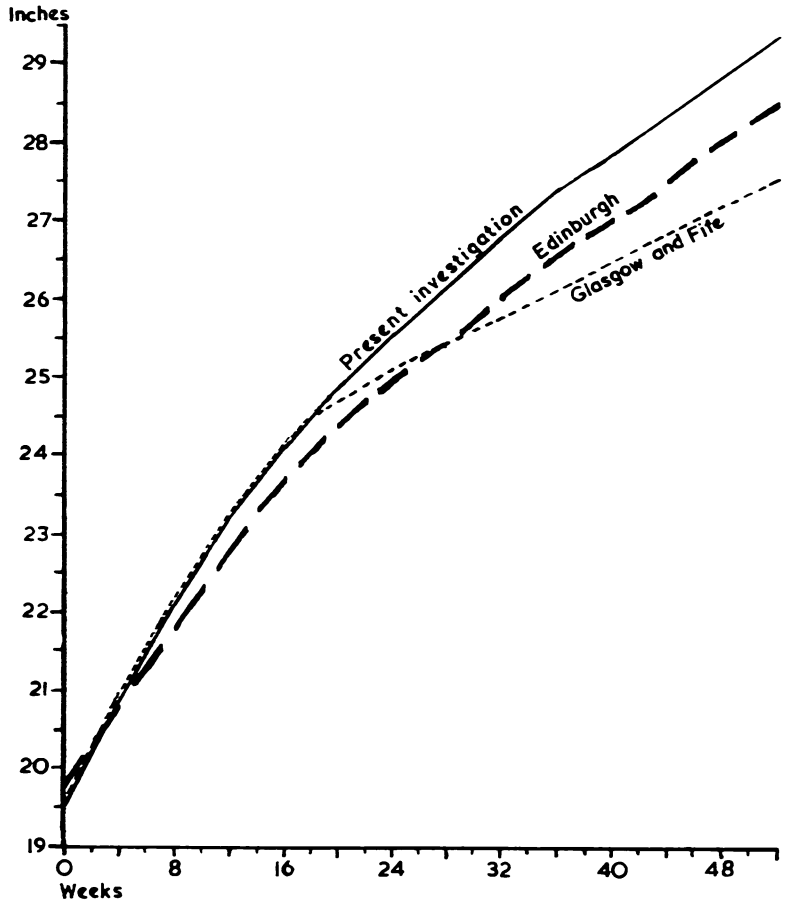

FIG. 2.—Crown-heel length derived from present investigation and welfare clinic norms.

The Influence of Sex. In each of the measurements, boys' are consistently greater than girls' (Tables 1a, b, c), and the amount of the difference is more at the end of the year than at the beginning. Nevertheless, if the male excess is expressed as a percentage of the female mean (Table 3, Fig. 3) only in the case of weight is the year-end difference much greater than that at the beginning of the year. This relatively greater increase in male weight is concentrated into the first 12 weeks of the year, after which there is a period of relatively level growth by the sexes followed by a decline in the percentage difference in the last 12 weeks of the year.

The crown-heel and crown-rump differences show a similar pattern. In the case of the occipito-frontal circumference the pattern is rather that of a slight

TABLE 3
PERCENTAGE BY WHICH A MALE MEAN MEASUREMENT EXCEEDS FEMALE MEAN MEASUREMENT

Age (wk.)	Weight	Length		Occipito-frontal Circumference
		Crown-heel	Crown-rump	
?	2·8	1·5	1·4	2·1
4	3·5	1·4	1·7	2·4
8	4·6	1·6	1·8	2·3
12	7·3	2·4	3·0	2·4
16	5·4	2·6	2·6	2·2
20	6·5	2·6	3·1	2·2
24	6·9	2·6	3·2	2·8
28	6·6	2·6	2·9	2·6
32	5·8	2·2	2·7	2·5
36	6·8	2·6	3·0	2·9
40	5·7	2·2	3·1	2·6
44	5·2	2·2	2·5	2·6
48	5·9	1·9	2·6	2·8
52	4·9	1·6	1·8	2·5

but definite relatively greater male increment spread unevenly over the year. The thoracic difference

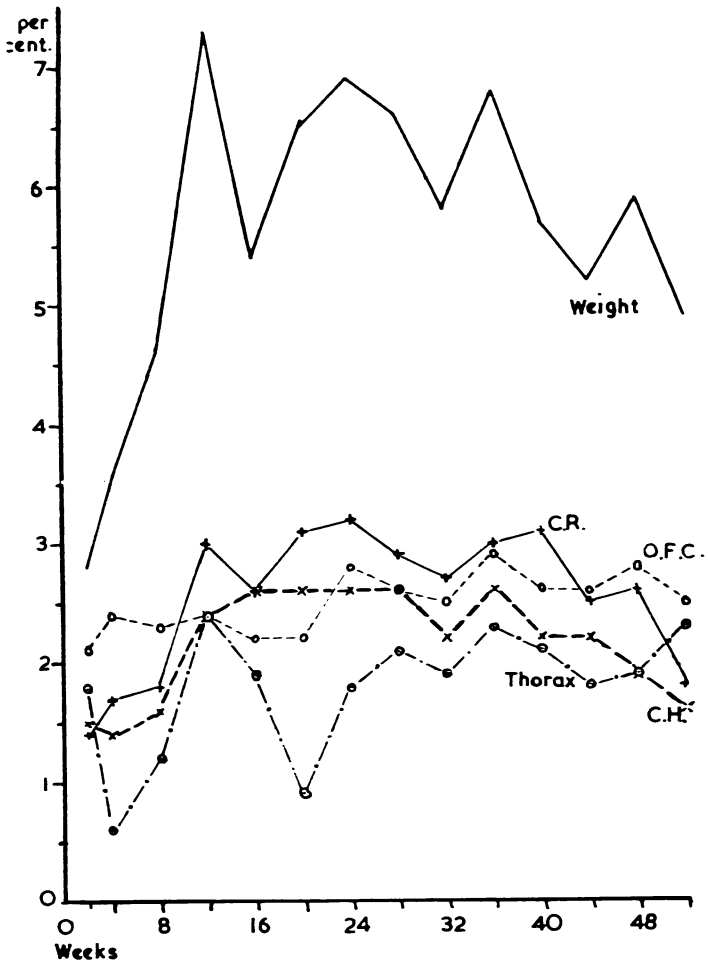

FIG. 3.—The percentage by which a male mean measurement exceeds a female mean.

fluctuates more in the first 24 weeks than any other measurement and in the remainder of the year shows a small but relatively greater male increment.

In considering the graphs (Fig. 3) it is well to remember that they are a representation of the difference between two means, that means are estimations, and are liable to some variation.

A similar trend in the sex difference concerning weight and length, though perhaps less marked in the case of weight, is shown by the data of Norval *et al.* (1951) while a decline in the percentage at the end of the year can be demonstrated in the weight, crown-heel and crown-rump lengths of the Brush Foundation data (Simmons, 1944) which unfortunately do not contain measurements at or near to birth.

For the same crown-heel length Norval *et al.* (1951) state that male infants are heavier than female. One cannot prove this by comparing groups of male and female infants who are of the same mean length and mean age. After the age of 8 weeks, owing to the greater length increment of male infants, sizable matched groups cannot be obtained. One may compare male and female groups of the same mean length provided the age distribution of the groups is symmetrical. On this basis one cannot proceed with the present data beyond a mean length of 695·5 mm. drawn from the range 690-699 mm. At this length the mean age for 122 female infants is 39 weeks ranging from 24 to 52 weeks and the mean weight is 305·93 oz. The corresponding figures for 115 male infants are 35½ weeks ranging from 20 to 48 weeks and 308·8 oz.; not an impressive difference in weight. It is to be noted that the findings of Norval *et al.* (1951) are based on observations carried well into the second year of life.

It has been shown (Thomson, 1955) that in both sexes one-quarter, one-half and three-quarters of the mean weight gain for the year is achieved at approximately the same age. The approximate ages at which these fractions of the other mean increments are achieved are given in Table 4. The crown-heel growth and occipito-frontal growth appear to

TABLE 4
APPROXIMATE AGE IN WEEKS AT WHICH ONE-QUARTER, ONE-HALF AND THREE-QUARTERS OF MEAN GAIN FOR THE YEAR IS ACHIEVED

		Fraction of Year Gain		
		¼	½	¾
Weight		10	19-20	32
Crown-heel		10	19-20	34
Crown-rump	Male	8	16	32
	Female		18	
Occipito-frontal circumference		8	16	28
Thorax	Male	7	18	33
	Female		17	28

proceed at the same relative rate in each sex; but, while crown-heel growth rate resembles the weight growth rate, the occipito-frontal growth is faster. In the crown-rump growth rate there may be a slight sex difference at 16 to 18 weeks but it is not sustained. A sex influence may exist in the thoracic growth because the female appears to gain size more rapidly, three-quarters of the year's gain being made four weeks before the male. In considering these rates of growth it should be remembered that, unlike weight which is calculated from birth, the lineal measurements are calculated from 2 weeks of age.

Variability. The standard deviations of the various measurements do not display a sex bias. Weight shows a steady increase in the standard deviation throughout the year and conforms to the findings of all other investigators.

The thoracic measurements and the two length measurements show a wider standard deviation at 52 weeks than at 2 weeks. This is also shown for length by Boyd (1948) and for length and circumference of thorax by Low's tables. The Brush Foundation data also display an increase in the standard deviation with an increase in age. Norval *et al.* (1951) reported no decided change in the standard deviation for length in either sex throughout the year.

The present investigation shows no increase in the standard deviation of the occipito-frontal circumference. This is similar to Meredith (1946), Vickers and Stuart (1943), Bayley and Davis (1935) and Boyd (1948). It is noted, however, that particularly in the female infant Low's tables show a greater standard deviation at 52 weeks than at 3 days.

Increment. A table of weight increment covering the first year has been published and discussed (Thomson, 1955). It was shown that while the standard deviation of weight increment increased with age the coefficient of variation declined. This pattern is also present in the increment tables for crown-heel and crown-rump length and for occipito-frontal circumference measurements (Tables 5a, b, c).

It is well known that post-natal measurements whether of weight or length correlate positively and significantly with the same measurement made at or near to birth. Further, a group of infants who at birth have a mean weight of 1 lb. greater than the mean weight of another group, will at a year old have a mean weight approximately 1 lb. greater. Because of these observations there is a tendency to assume that a measurement made at or near to birth determines the subsequent measurement in the individual child and by implication determines the post-natal increment.

In the case of weight, this aspect of growth has already been investigated (Thomson, 1955). It has been shown 'that the correlation coefficients between birth weight and post-natal weight gain were not of statistical significance, and were almost uniformly negative'. It was also suggested 'that there is a strong tendency for infants of lesser birth weight to gain weight more rapidly than infants of greater birth weight'.

Because of these findings concerning weight increment, it was thought desirable to examine the relationship between crown-heel and crown-rump lengths and the occipito-frontal circumference at 2 weeks and at subsequent ages throughout the first year. The correlation coefficients obtained for the two sexes are given in Table 5a, b, c.

In all three measurements the correlation coefficients are negative and statistically significant. This suggests a strong tendency for infants who are short at 2 weeks old or who have small heads at 2 weeks to gain size more rapidly than those who are longer or who have larger heads.

This finding is in large measure confirmed by Low's tables which also yield, for the same dimensions, negative correlation coefficients when the first year increment is related to the 3-day measurement, the sexes again being examined separately. However, in the case of the male crown-heel length in Low's tables this negative correlation coefficient is not statistically significant.

Absence of significance in this particular group is of little moment since it appears to be due to the presence of at least two infants who deviate far from normal standards. One of these infants measured 25 in. at a year old and the other 26 in., while their respective weights at a year old were 14·10 lb. and 15·75 lb. In this connexion it should be pointed out that the foreword to Low's tables does not say whether all the measurements were derived from normal healthy children. The inclusion in the tables of a girl whose weight is a quarter-pound less at 4 years than it was at 3 years serves to emphasize this doubt.

Although the correlation coefficients presented are statistically significant the degree of association is not a high one. It is about 40% of a complete correlation, with the crown-rump measurement showing a rather closer relationship than the other two measurements. The consistent presence of the negative sign may be of more importance than the presence of significance since there are other factors than size at or near to birth which may be related to subsequent increment and which play a part in

TABLE 5A

CROWN-HEEL INCREMENT CORRELATED WITH CROWN-HEEL LENGTH AT 2 WEEKS ±2 DAYS

Age (Wk.)	Number		Crown-heel Length at 2 Weeks (mm.)				Crown-heel Increments (mm.)						Correlation Coefficient		Standard Error	
			Male		Female		Male			Female						
	M.	F.	Mean	S.D.	Mean	S.D.	Mean	S.D.	C.V.	Mean	S.D.	C.V.	Male	Female	Male	Female
4	137	118	518·9	18·4	508·5	21·1	16·6	6·9	41·6	17·8	8·3	46·6	−0·20	−0·36	0·086	0·092
8	114	99	516·1	20·0	509·4	20·6	49·4	11·0	22·3	47·6	11·5	24·2	−0·18	−0·27	0·094	0·101
12	135	116	517·8	19·9	509·2	21·1	79·6	10·5	13·2	74·0	12·1	16·4	−0·25	−0·37	0·086	0·093
16	128	105	517·3	20·3	509·8	19·6	101·9	12·5	12·3	96·1	13·4	13·9	−0·44	−0·37	0·089	0·098
20	120	97	519·4	19·0	509·9	21·0	120·2	13·3	11·1	115·4	13·6	11·8	−0·41	−0·45	0·092	0·102
24	125	96	521·0	18·9	509·1	21·9	137·8	14·4	10·4	132·9	14·7	11·1	−0·33	−0·45	0·090	0·103
28	124	106	519·4	18·7	509·5	21·7	155·6	16·2	10·4	148·5	16·1	10·8	−0·40	−0·48	0·090	0·098
32	117	96	519·0	18·8	510·6	20·6	170·3	17·1	10·0	164·7	17·8	10·8	−0·45	−0·37	0·093	0·103
36	117	90	518·7	19·1	510·3	19·9	183·9	17·1	9·3	177·6	18·2	10·2	−0·47	−0·39	0·093	0·106
40	94	96	518·9	20·4	509·6	20·4	196·7	18·1	9·2	190·5	19·0	10·0	−0·39	−0·41	0·104	0·103
44	80	99	516·5	21·8	511·7	19·0	209·9	20·0	9·5	201·1	19·4	9·6	−0·40	−0·29	0·101	0·101
48	98	80	517·3	20·4	509·9	20·2	221·8	19·5	8·8	214·0	21·8	10·2	−0·36	−0·31	0·102	0·113
52	100	88	516·1	20·7	512·2	19·0	233·0	20·1	8·6	225·4	20·2	9·0	−0·39	−0·29	0·100	0·107

TABLE 5B

CROWN-RUMP INCREMENT CORRELATED WITH CROWN-RUMP LENGTH AT 2 WEEKS ± 2 DAYS

Age (Wk.)	Crown-rump Length at 2 Weeks (mm.)				Crown-rump Increment (mm.)						Correlation Coefficient	
	Male		Female		Male			Female				
	Mean	S.D.	Mean	S.D.	Mean	S.D.	C.V.	Mean	S.D.	C.V.	Male	Female
4	348·0	14·0	341·2	15·0	12·4	8·2	66·1	11·6	6·7	57·8	−0·35	−0·26
8	345·2	14·8	341·2	14·7	35·2	9·9	28·1	33·9	9·8	28·9	−0·27	−0·37
12	347·4	14·8	341·1	14·9	53·8	11·5	21·4	49·7	10·6	21·3	−0·34	−0·47
16	347·3	15·3	340·0	14·6	67·5	12·3	18·2	63·6	12·8	20·1	−0·47	−0·51
20	348·6	14·5	341·6	15·6	78·4	14·9	19·0	74·6	12·1	16·2	−0·41	−0·57
24	349·0	14·9	342·2	15·8	88·2	14·6	16·6	82·8	12·7	15·3	−0·46	−0·57
28	348·1	14·5	341·8	15·5	98·2	15·3	15·6	92·3	14·3	15·5	−0·54	−0·59
32	348·0	14·5	342·2	14·8	105·8	16·4	15·5	100·3	15·1	15·1	−0·48	−0·50
36	348·0	15·0	341·3	15·4	113·3	16·4	14·5	105·5	15·5	14·7	−0·56	−0·60
40	347·7	14·6	341·6	15·5	120·0	15·7	13·1	110·6	15·1	14·0	−0·58	−0·63
44	347·0	14·9	343·3	15·2	125·5	16·7	13·3	116·9	17·1	14·6	−0·50	−0·54
48	347·5	14·5	341·2	15·3	132·0	16·5	12·5	124·7	19·4	15·5	−0·50	−0·39
52	346·1	15·8	343·4	15·8	137·5	17·9	13·0	130·3	18·9	14·5	−0·56	−0·47

TABLE 5C

OCCIPITO-FRONTAL CIRCUMFERENCE INCREMENT CORRELATED WITH OCCIPITO-FRONTAL CIRCUMFERENCE AT 2 WEEKS ± 2 DAYS

Age (Wk.)	Occipito-frontal Circumference at 2 Weeks ± 2 Days				Occipito-frontal Circumference Increment						Coefficient Correlation	
	Male		Female		Male			Female				
	Mean	S.D.	Mean	S.D.	Mean	S.D.	C.V.	Mean	S.D.	C.V.	Male	Female
4	362·1	11·4	353·0	11·7	11·9	5·6	46·7	10·5	4·5	42·4	−0·25	−0·25
8	360·9	12·4	353·2	11·9	28·2	7·2	25·3	28·3	7·0	24·6	−0·37	−0·42
12	361·0	12·3	353·0	11·8	43·4	8·0	18·5	41·4	7·4	17·8	−0·32	−0·41
16	360·4	12·4	353·8	11·2	54·4	8·9	16·3	52·7	8·4	15·9	−0·36	−0·47
20	361·8	12·2	354·1	11·5	64·8	9·2	14·1	62·8	8·5	13·5	−0·43	−0·50
24	362·5	12·4	354·0	11·6	74·3	10·1	13·6	71·4	9·3	12·9	−0·44	−0·51
28	362·5	12·4	353·7	11·4	82·7	10·2	12·4	79·1	9·9	12·5	−0·49	−0·45
32	361·3	12·6	354·4	11·5	90·1	11·3	12·5	85·3	10·9	12·8	−0·42	−0·45
36	361·8	12·3	353·6	11·3	95·5	11·5	12·1	92·2	10·7	11·6	−0·44	−0·46
40	361·4	12·5	354·2	11·1	101·1	11·3	11·2	96·8	11·4	11·8	−0·52	−0·49
44	361·9	12·6	355·2	11·3	105·4	11·9	11·3	100·3	11·9	11·9	−0·63	−0·49
48	361·1	11·5	353·8	11·5	109·4	12·3	11·2	104·8	13·3	12·6	−0·39	−0·40
52	359·9	12·8	355·0	11·3	112·4	12·9	11·5	107·6	13·2	12·3	−0·47	−0·57

determining the pattern of infant growth. The present findings should not be interpreted to mean that of any two individual infants the one who is smaller at birth will certainly grow faster than the other: the tendency is that way, it is not a certainty.

Summary

Based on 2,430 sets of observations of males and 2,292 sets of observations on females, means with standard deviations for weight, crown-heel and crown-rump lengths, occipito-frontal and thoracic circumferemces of Edinburgh infants are presented. They cover the first year of life at four-week intervals. The observations were made on legitimate, singleton, first pregnancy infants whose birth weights were within the range of over 5½ to 9½ lb.

Mean measurements now reported are greater than those of Paton and Findlay or of Low, while the mean crown-heel length undifferentiated for sex is appreciably greater than that in use in Edinburgh welfare clinics.

There is a significant negative correlation coefficient between measurements at 2 weeks and the subsequent increment. This suggests a strong tendency for infants who are small at birth to grow more rapidly than infants who are bigger.

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