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Special School
for Feeble Minded

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Height and Weight of Children in Relation to General Intelligence

BY

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Mental dullness or brightness and general body growth have in the past been associated in various studies by investigators. That on the whole, in groups of children, there seems to be some correlation, is evident. In a study on St. Louis children Porter (9) concluded that bright children are taller than dull children, and that "precocious children are heavier and dull children lighter than the mean child of the same age." Smedley (11) and MacDonald (6) have in substance made similar conclusions.¹

PROBLEM AND DATA

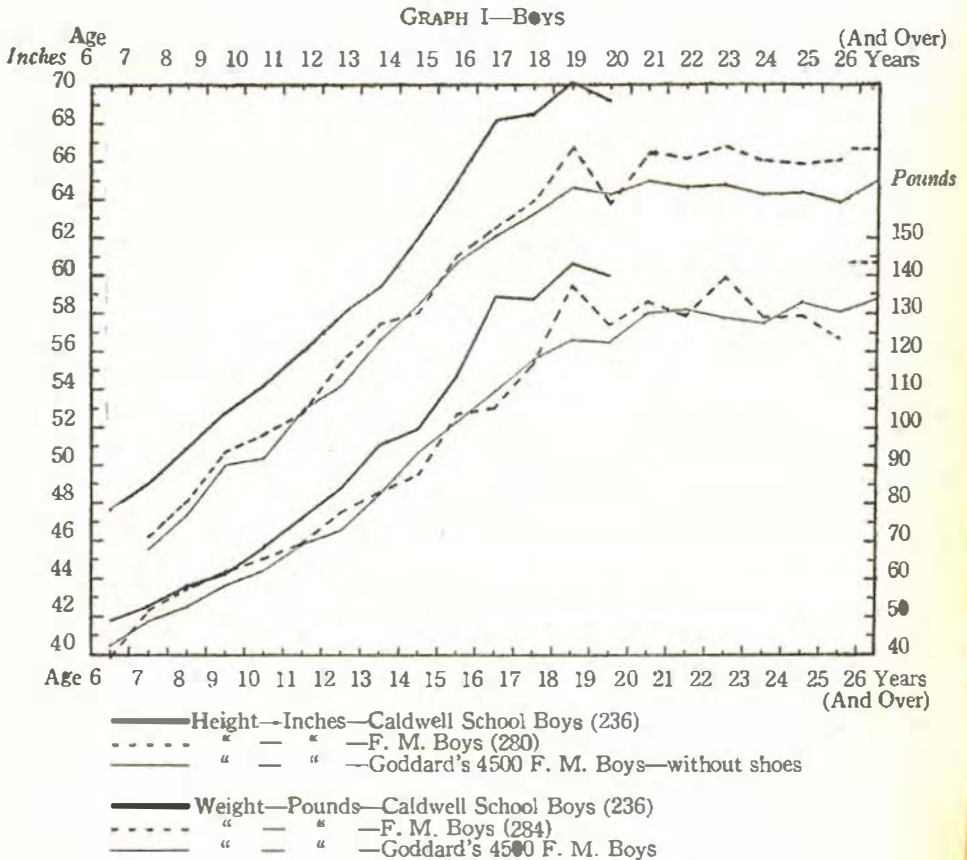
If such relation were evident among normal children, would the differing degrees of mentality as exist in children mentally defective be reflected, on the average, in the height and weight of these children? Would we find also a greater variability among such children? With such questions in mind two hundred eighty-eight boys and one hundred forty-one girls of the Indiana School for Feeble-Minded Youth were examined in February and March 1910. Among other tests physical and mental, the strength of grip and dextrality were also taken. This will furnish the data for a study now in preparation.

In order to have norms with which to compare normal children and the mentally defective, two hundred thirty-six boys and two hundred forty-five girls of the Caldwell, New Jersey, public schools were measured in May, 1912,² as to the same traits by the same examiner and as nearly as possible under the same conditions. The height was recorded with shoes in both groups; the weight, with ordinary cloth-

¹ For a condensed summary of several investigations, see Whipple (14) pp. 47-60. West (13) reaches an opposite conclusion. His classification of children was on the teacher's judgment, while Porter's was the school grade in comparison with age.

² For the use of the schools, the author is indebted to Superintendent D. C. Barnett and the Board of Education.

ing. All measurements and all calculations have been made by the author himself. The factor of variability has been reduced to the minimum. The ages are given in years and months. In reckoning the age from birth, from one to fifteen days inclusive were dropped, and from sixteen to thirty were added to the month.



The defective children were classed from the experience and association of the teacher, attendant, and principal, into A, B, C, D, E grades. These would group approximately into the common institution classes of morons (A-B); imbeciles (C); idiots (D-E).³ On account of the few cases.

³ The moron has a mentality comparable to that of the normal child of from eight to twelve years; the imbecile, three to seven years; the idiot, two years or under. See Goddard (5) p. 221.

the tables and charts which follow show two grades of intelligence, the morons in one group, and the imbeciles and idiots in the other, in comparison to the normal group. The group of total defectives also is given. The individual measurements of each child are grouped according to sex, age,⁴ grade, and number of cases, with averages and deviations,⁵ in Tables 1-4. The curves representing these data show in Graphs 1-5.

TABLE 1
BOYS' HEIGHT—INCHES. (WITH SHOES)

Age	Grades A and B Moron		Grades C, D and E Imbecile and Idiot		Total Defectives			Normal		
	Cases	Average	Cases	Average	Cases	Average	A. D.	Cases	Average	A. D.
6			1	40.80	1	40.80		8	47.57	1.9
7	5	45.76	3	46.83	8	46.16	2.4	14	49.01	1.5
8	10	48.49	4	47.12	14	48.10	1.4	32	50.94	1.9
9	10	51.61	4	48.65	14	50.76	2.1	29	52.67	2.3
10	11	52.46	7	50.47	18	51.68	1.6	18	54.16	2.2
11	13	53.89	9	51.20	22	52.79	2.4	19	55.99	2.4
12	10	56.51	8	54.36	18	55.55	3.1	24	57.92	2.2
13	11	58.18	6	56.28	17	57.51	3.4	14	59.37	2.8
14	14	60.04	11	55.43	25	58.01	4.2	25	62.06	3.0
15	15	63.01	8	57.50	23	61.09	4.5	26	64.99	3.0
16	8	65.75	9	59.52	17	62.45	3.8	17	68.17	1.7
17	4	65.77	6	62.68	10	63.92	4.2	6	68.53	2.0
18	5	67.00	2	66.20	7	66.77	1.7	3	70.20	1.1
19	3	67.07	6	62.05	9	63.72	3.6	1	69.30	
20	3	67.97	6	65.83	9	66.54	1.5			
21	1		7		8	66.21	1.4			
22	0		5		5	66.80	2.6			
23	4		10		14	66.04	1.8			
24	0		2		2	65.85	3.5			
25	1		4		5	66.12	2.0			
26-48	9		25		34	66.69	2.2			
	137		143		280			236		

INTERPRETATION OF GRAPHS

In all the graphs the age appears at the bottom and also at the top. On the average, the age will fall near the half year. The scale of inches is marked on the left margin; the scale of pounds, on the right. The upper group of curves represent height; the lower group, weight. The accomplishment in either trait is read from the same age point.

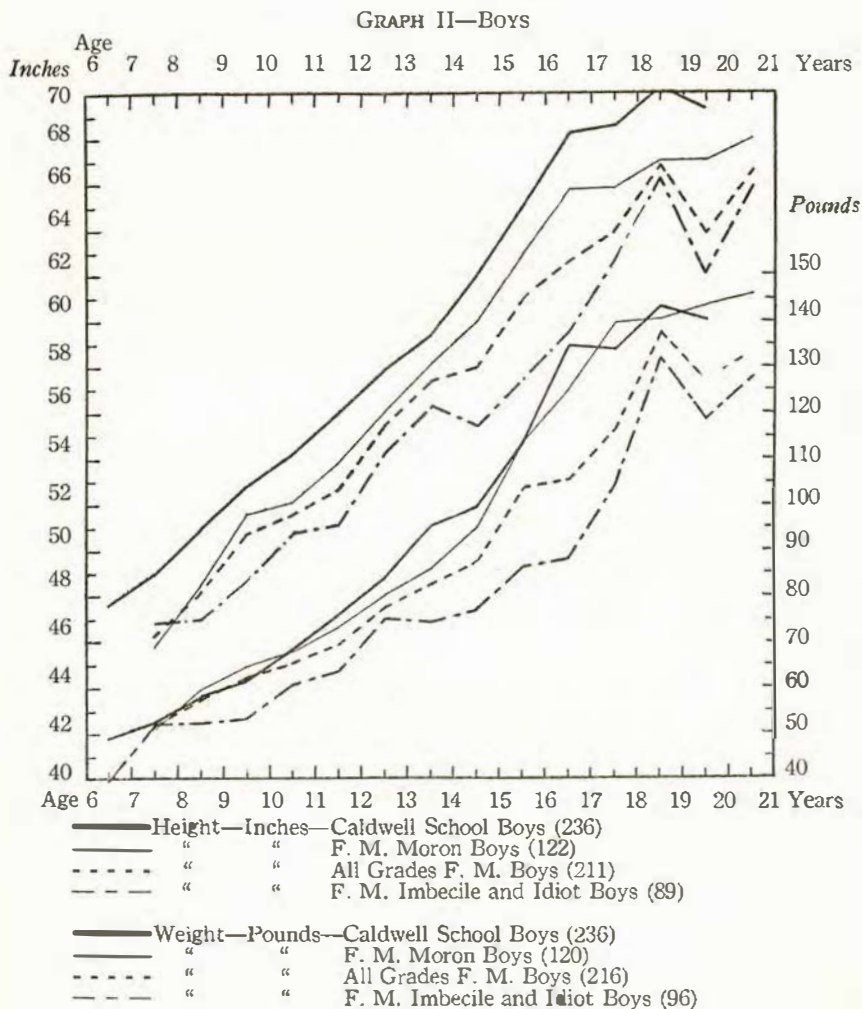
It should be noted that in the group of Caldwell school children a relatively high grade of children has probably been chosen. It is a little city of some five or six thousand,

⁴ Six years of age means from six to seven.

⁵ In calculating the average deviation, decimals from one to six tenths were dropped, and those above added.

about an hour from New York City, and is a most healthful place with the advantages of country life.

From Graph I we see the Caldwell boys higher at each age by from two to five inches than feeble-minded boys, the



difference increasing somewhat gradually with age. All cases of feeble-minded over twenty-six years were grouped and the average height and weight both appear at the right margin, the average height of adult feeble-minded over

twenty-six years being about 66.7 inches. The light continuous line of the upper group shows the average height of about 4,500 feeble-minded boys, six to twenty-six years of age, without shoes, as compiled by Goddard (5)⁶ in 1912. Allowing an inch for shoes, the general similarity of the two curves is evident.

The curves for weight are not as smooth as might be wished, a greater number of cases would of course tend to make them more regular. For ages seven to nine the two curves approximate, feeble-minded boys at nine years show-

TABLE II
BOYS' WEIGHT—POUNDS. (ORDINARY CLOTHING)

Age	Grades A and B Moron		Grades C, D and E Imbecile and Idiot		Total Defectives			Normal		
	Cases	Average	Cases	Average	Cases	Average	A. D.	Cases	Average	A. D.
6			1	39.00	1	39.00		8	49.12	6.5
7	5	51.80	3	52.33	8	52.00	6.0	14	52.82	4.6
8	10	59.60	3	52.33	13	57.92	4.0	32	58.04	5.2
9	10	64.90	4	53.75	14	61.71	7.3	29	61.39	8.0
10	11	68.27	10	60.70	21	64.66	5.8	18	68.51	8.7
11	13	73.30	9	63.88	22	69.45	7.4	19	76.31	12.2
12	10	80.30	9	75.11	19	77.84	12.0	24	84.03	12.7
13	11	86.00	5	74.80	16	82.50	12.1	14	95.53	18.2
14	14	95.21	12	77.16	26	86.88	19.6	25	99.57	14.8
15	14	113.85	8	86.25	22	103.82	19.9	26	113.63	16.7
16	8	125.25	10	88.20	18	104.66	22.1	17	134.52	12.4
17	4	139.75	7	104.14	11	117.09	26.3	6	133.83	11.5
18	4	140.25	2	132.00	6	137.50	8.8	3	143.16	10.5
19	3	143.66	6	118.66	9	127.00	29.8	1	140.00	
20	3	146.00	7	127.86	10	133.30	17.3			
21	1		7		8	129.50	7.2			
22	0		5		5	139.40	18.4			
23	4		10		14	129.07	13.6			
24	0		2		2	129.50	13.5			
25	1		4		5	123.80	19.8			
26-48	9		25		34	143.80	18.4			
	135		149		284			236		

ing a little heavier than normal boys. After age ten normal boys are consistently heavier than defectives by from five to fifteen pounds, the difference increasing in a general way with age.⁷ The adult weight for thirty-four boys over

⁶ This work is by far the greatest ever done and sets norms for years to come for the feeble-minded in height and weight.

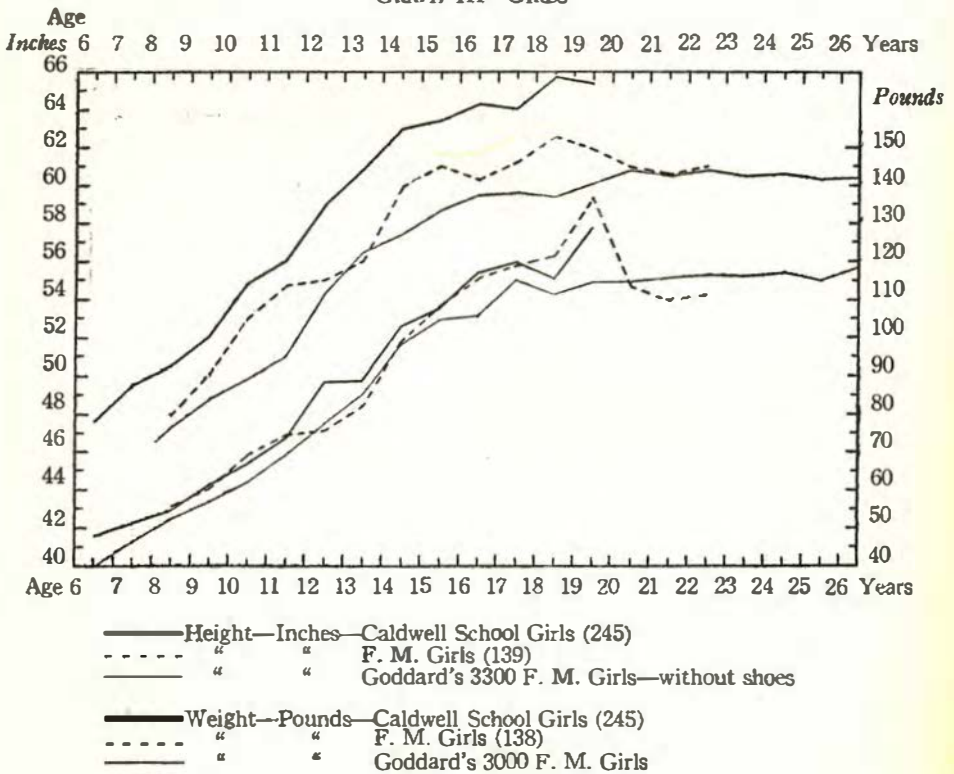
⁷ Tarbell (12) says: "Feeble-minded children (boys and girls) are about two inches shorter and nine pounds lighter than normal children of the same age."

Goddard (5) p. 229 says: "If, however, we take the line representing defectives of all grades, we find that while 'he is not two inches shorter and nine pounds lighter' he nevertheless is one inch shorter and two pounds lighter up to the age of fifteen. After that he is three inches shorter and twelve pounds lighter."

twenty-six shows 143.8 pounds. The sedentary institution life and more regular dieting and sleep tend toward weight, especially in the more imbecile cases. The same might be said of all grades in the earlier years. Goddard's curve for weight for about 4,500 feeble-minded boys, six to twenty-six years of age, is shown in the light continuous line below.

Graph II shows again the curves of height and weight

GRAPH III—GIRLS



for normal and defective boys as separate groups and in addition, the defectives divided into two groups, the higher grade moron, and the lower grade imbecile and idiot. The heavy line in either group is the normal; the light line, the higher grade defectives; the broken dash line, all defective boys of this study; the broken dot and dash line represents the lower grade imbecile and idiot as a group. This graph shows the imbecile and idiot boy lower in stature and less

in weight than the group of feeble-minded boys in general, excepting age seven. It shows the higher grade moron taller and heavier at each age, excepting seven, than the defective group whole. In weight the moron group more nearly approximates and at places exceeds the normal. At no age in height, and at no age in weight excepting 8, 9, 17, and 19 years, does the high grade mentally defective boy reach or exceed the average normal boy of six to nineteen years in these traits.³ These exceptions may very probably be due to the few or exceptional cases, and the author wishes it

TABLE III
GIRLS' HEIGHT—INCHES. (WITH SHOES)

Age	Grades A and B Moron		Grades C, D and E Imbecile and Idiot		Total Defectives			Normal		
	Case	Average	Cases	Average	Cases	Average	A. D.	Cases	Average	A. D.
6								9	47.60	1.4
7								17	49.53	2.3
8	1	49.00	4	47.55	5	47.84	3.4	17	50.49	2.8
9	3	50.80	5	49.70	8	50.11	2.4	27	52.00	2.1
10	2	50.60	6	5.00	8	53.15	2.0	22	54.84	2.1
11	6	54.45	1	56.50	7	5.74	1.3	23	56.05	3.0
12	7	54.78	5	55.24	12	54.97	2.8	19	59.03	2.1
13	2	53.00	7	56.84	9	55.99	3.0	27	60.84	1.9
14	13	60.28	4	58.52	17	59.87	2.3	20	63.02	3.0
15	7	61.15	2	60.75	9	61.06	3.7	28	63.43	2.1
16	11	61.06	3	57.36	14	60.33	2.5	20	64.3	2.0
17	12	61.58	2	59.00	14	61.21	2.0	10	64.05	1.8
18	6	62.91	5	62.18	11	62.58	2.2	4	65.70	1.5
19	5	61.94	1	62.10	6	61.96	1.8	2	65.40	3.1
20	10	62.52	3	56.17	13	61.05	3.0			
21	3	60.30	1	61.60	4	60.62	3.0			
22	2	60.95	0		2	60.95	2.3			
	90		49		139			245		

clearly understood that conclusions other than the most general based upon these data are not wise.

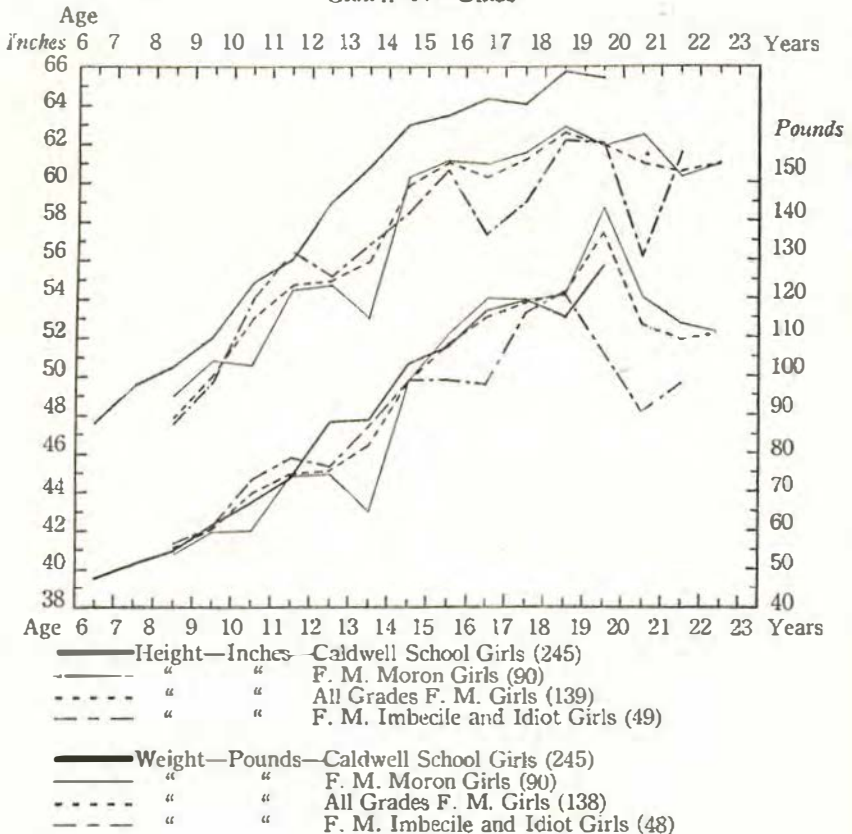
The record of girls is pictured in Graph III. The curves for height are more irregular than those of the boys. From this study mentally defective girls as a group are on the average from two to five inches shorter than normal school girls. This is about the same as with boys. It will be noted that there is a larger difference between the defective girls of this study and Goddard's 3,300 institution girls in regard to height than difference between boys (Graph I). In this study the two groups of higher and lower grades

³ A greater number of cases would probably "smooth out" the exceptions at the two latter ages.

are about the same in number with boys, but with girls there are nearly twice the number of the higher grade.

In weight it is very noticeable that the girls of the two large groups, normal and defective, up to nineteen years deviate less than do the boys. Weight would no doubt be subject to modification by regular habits of eating and sleep-

GRAPH IV—GIRLS



ing much more than the individual's natural tendency to stature. These girls of institution care show the good effects of such regularity when it comes to bodily weight.

Graph IV shows the defective girls divided into the higher and lower grades of mental defect. These curves are very unsatisfactory, showing much irregularity. This condition may be due to one or several causes. First, the classing of

the defective children into grades is chiefly empirical, an inter-changing of one or two cases might modify the lines; second, it is to be regretted that the number of girls tested is much smaller than that of boys; third, there may be exceptional cases as number 123 at age 20 (Table II). The most peculiar feature of the lines as they are is the crossing at age fourteen. From Graph II, high and low grade defective boys are distinctly apart at each age in height and weight. But with girls the curves cross at 14. Before this time (excepting 8 and 9 years in height) the lower grade girls are taller and heavier than the brighter girls; after

TABLE IV
GIRLS' WEIGHT—POUNDS. (ORDINARY CLOTHING)

Age	Grades A and B Moron		Grades C, D and E Imbecile and Idiot		Total Defectives			Normal		
	Cases	Average	Cases	Average	Cases	Average	A. D.	Cases	Average	A. D.
6								9	47.94	5.5
7								17	51.29	6.1
8	1	52.00	4	56.75	5	55.80	9.0	17	54.38	6.5
9	3	59.66	5	61.00	8	60.50	7.2	27	61.48	6.9
10	2	60.00	5	73.20	7	69.43	6.7	22	67.14	7.4
11	6	74.00	1	79.00	7	74.71	10.8	23	73.88	13.2
12	7	74.71	6	76.83	13	75.69	8.9	19	88.41	12.7
13	2	65.00	6	87.66	8	82.00	13.7	27	88.44	9.4
14	13	99.00	4	99.00	17	99.00	13.0	20	103.13	12.3
15	7	110.71	2	99.00	9	108.11	17.0	28	107.87	11.2
16	11	120.09	3	98.00	14	115.35	17.6	20	117.00	11.5
17	12	119.50	2	116.50	14	119.07	12.6	10	119.67	10.8
18	6	121.18	5	121.80	11	121.45	12.8	4	115.27	8.8
19	5	143.20	1	106.00	6	137.00	24.0	2	128.65	8.2
20	10	120.00	3	90.66	13	113.23	18.5			
21	3	113.66	1	98.00	4	109.75	11.2			
22	2	111.00	0		2	111.00	3.0			
	90		48		138			245		

age 14, the reverse is true. Can it be that high and low grade defective girls at about the fourteenth year reverse themselves in body growth? Again let it be understood that the condition is probably due to too few or exceptional cases.

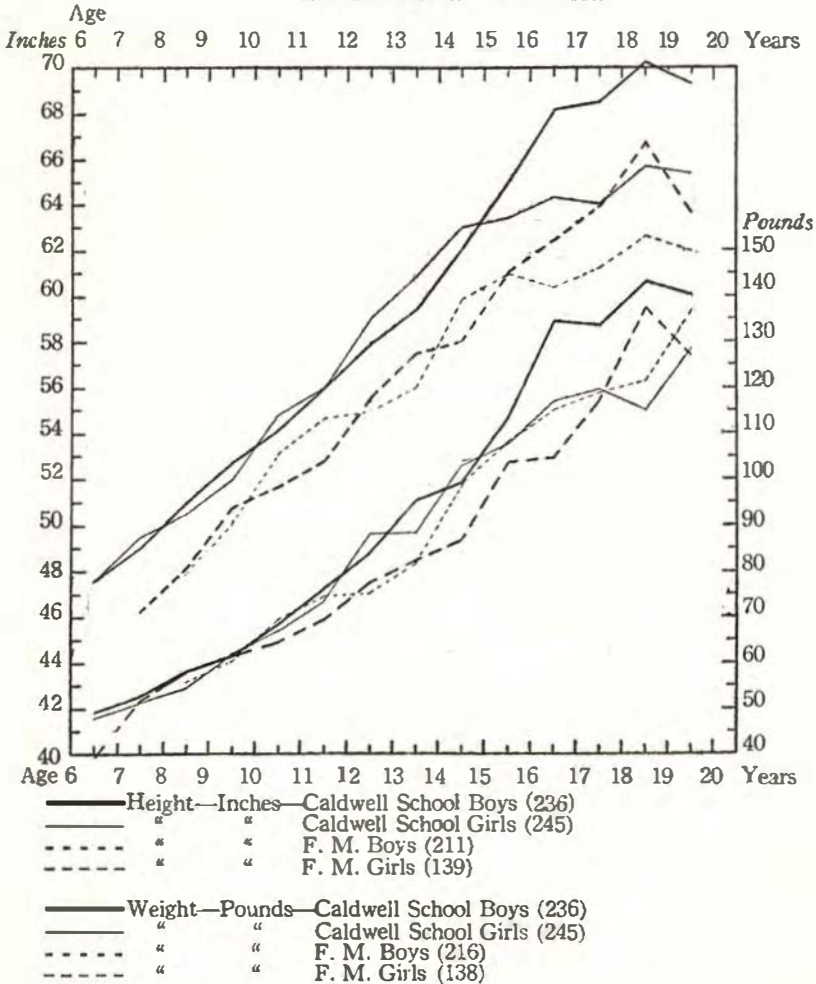
SEX DIFFERENCES

Various studies with large groups of normal children have shown that from about eleven to fifteen years of age the girls were larger than boys in both height and weight. (For example, Smedley (II, p. 1100); or MacDonald (6, p. 1023.)

In order to see whether or not this condition reflected itself in measurements of mentally defective children, Graph

V was made to show the records of both groups in both traits superimposed. The heavy and light continuous lines in the upper group represent the height of the Caldwell school boys

GRAPH V—COMPARISON OF SEXES—NORMAL AND FEEBLE-MINDED—HEIGHT AND WEIGHT



and girls respectively. The broken dash and broken dot lines represent the height of feeble-minded boys and girls. The same comparisons are true in the lower group of lines as to weight. Excepting ages twelve and thirteen with

defectives, in which there is an abnormal rise with boys and drop with girls, normal and feeble-minded girls are taller than normal and feeble-minded boys from ages ten to fifteen. In weight there is the same general condition. Excepting age thirteen with normals at which both curves are irregular, the Caldwell girls weigh more than the Caldwell boys from about beginning twelve to beginning fifteen years. Noting exceptions at the twelfth and thirteenth years in the lines for defectives, feeble-minded girls are heavier than feeble-minded boys from ten to seventeen years. Sex differences as to height and weight in normal children through adolescence is approximately the same with mental defectives.

TABLE V
PER CENT OF DEFECTIVES REACHING OR EXCEEDING AVERAGE CALDWELL
NORMAL CHILDREN

Age	Boys' Height			Boys' Weight			Girls' Height			Girls' Weight		
	Cases	No.	Per cent	Cases	No.	Per cent	Cases	No.	Per cent	Cases	No.	Per cent
6	1	0	0.0	1	0	0.0						
7	8	1	12.5	8	5	62.5						
8	14	1	7.1	13	5	38.5						
9	14	5	35.7	14	7	50.0	5	2	40	5	2	40
10	18	2	11.1	21	6	28.6	8	3	37.5	7	3	42.9
11	22	3	13.6	22	4	18.2	7	2	28.6	7	4	57.1
12	18	5	27.8	19	7	36.8	12	1	8.3	13	3	23.1
13	17	7	41.2	16	3	18.7	9	1	11.1	8	3	37.5
14	25	6	24	26	7	26.9	17	3	17.6	17	6	35.3
15	23	7	30.4	22	6	27.3	9	3	33.3	9	4	44.4
16	17	3	17.6	18	2	11.1	14	2	14.3	14	4	28.6
17	10	1	10.0	11	5	45.4	14	3	21.4	14	5	35.7
18	7	0	0.0	6	1	16.6	11	2	18.2	11	7	63.6
19	9	1	11.1	9	3	33.3	6	0	0.0	6	4	66.6
Total	203	42	20.7	206	61	29.6	120	25	20.8	119	49	41.2

VARIABILITY

As far as is known to the author only one other study has calculated the age variability in height and weight of mentally defective children. Wylie (16) in a study of about four hundred children of each sex, from one to thirty years of age, found the mean variation to be greater with defectives than with normals.⁹ Referring to Tables I to IV, one can

⁹ He says, p. 6: "For height the curve of mean variation exceeds that of normal children except in two or three instances. In general the mean variation is greatest at times of fastest growth, but there are many marked exceptions to the rule. . . . The curve of mean variation for weight shows the same general features as that of height except that it is nearer normal up to ten years."

compare the variability at age of the two classes of children in this study. Excepting ages 8, 9, and 10, defective boys are more variable than normal boys in height. In weight, up to about age thirteen, defective boys are more constant; after thirteen they are more variable than normal boys.

From eight to nineteen inclusive, defective girls vary more than normal girls in height if we except ages 10, 11, 14, and 19. In weight, after the thirteenth year, defective girls vary more than normal girls at age. Very probably a greater number of cases, if distributed over the grades of defect, would show defective children more variable in height and weight than normal children, excepting possibly weight in the earlier years, if defective children had the regular care of institution life.

PER CENT OF DEFECTIVES REACHING OR EXCEEDING AVERAGE CALDWELL NORMAL.

This is shown in Table V for each age. To interpret, take age seven for example: Of eight mentally defective boys, one or 12.5 per cent reached or exceeded the average height of Caldwell boys at the same age. Or taking the total: of 203 mentally defective boys from six to nineteen years of age inclusive, forty-two or 20.7 per cent reached or exceeded in height the average Caldwell boy at age. This is significant and means approximately that only one defective boy or girl in five reaches the average height for his age of a normal boy or girl. In weight boys make nearly a thirty per cent showing, while girls almost reach the average. Norsworthy (7) found these per cents to be considerably higher. She very probably had on the whole a higher grade of defective children.

CONCLUSION

It seems a safe conclusion from the above data that not only is mental defect reflected on the average in the height and weight of children, but the more decided the defect the more checked the physical growth. (From Graph IV there may be an exception with girls before fourteen years.)

This is more evident in height than weight, the first being probably less subject to modification by regular habits of sleep, diet, etc., than the latter.

Feeble-minded girls more nearly approximate normal girls in weight than do feeble-minded boys approximate normal boys.

The commonly known fact that girls are taller and heavier

than boys during early adolescence shows itself also with mental defectives.

Defective boys and girls are more variable in height than normal boys and girls. Before thirteen years, defective boys and girls of institution life are more constant in weight than normal boys and girls.

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