

## THE EFFECT OF PHYSICAL DEFECTS ON SCHOOL PROGRESS.

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One of the studies which has been conducted by the Backward Children Investigation of the Russell Sage Foundation in New York City is a careful investigation of the school records of 20,000 children in fifteen schools of Manhattan. Among these there were nearly 8000 children who had been examined by school physicians. When the records of their physical examinations were tabulated, the astonishing condition was brought to light that nearly 80 per cent of the children who were of normal age for their grades were found to have physical defects, while only about 75 per cent of the retarded children were defective. This feature was a surprise to the investigators.

Another noteworthy point was that the percentage of defective children in the lower grades was decidedly greater than in the upper grades. The discovery of these unlooked for results led to further study of the figures. The data were retabulated by ages, and the results showed a very marked and consistent falling off of children having each sort of defect from the age of six up to the age of fifteen. Defective vision alone increases slowly but steadily with advancing age.

Moreover, these decreases were not due to the falling out or leaving school of children suffering from defects. This might be put forward as an explanation if we had to do with children above the age of compulsory attendance, or if the characteristic decrease did not take place until the age of fourteen or fifteen; but such is not the case. The children were of from six to fifteen years of age, and the marked decrease began with the eight, nine, and ten year old children and continued steadily.

Were further data not available, it would certainly be difficult to explain the seeming anomaly that retarded children have fewer defects than do children of normal age; but the data showing the decrease of physical defects with increasing age are illuminating. It is evident that here age is the important factor. The importance

of this on all investigations into the influence of physical defects on school progress is at once evident.

Whether the term "retarded" is used to express a condition or an explanation, it will always follow from the definition itself that retarded children will be older than their fellow pupils in the same grades. In all cases it will always be true that the "backward" pupils will be the older pupils. Now, the older pupils are found to have fewer defects. This is true whether they are behind their grades or well up in their studies. Therefore, it is not surprising that we find that 80 per cent of all children of normal age have physical defects more or less serious, while 75 per cent of the retarded children are found to be defective. This does not mean that pupils with more physical defects are brighter mentally. It simply means that those who are above normal age are older, and that older pupils have fewer defects.

In order to ascertain what correlation may exist between physical defects and school progress, the records of the children have recently been retabulated, using as a basis age instead of grade, so that the results should not be vitiated by the heterogeneous age composition of the grades.

It is well known that in our schools there is no exact correspondence between grades and ages. Children of twelve years of age, for instance, are found in all the grades from the first to the eighth. A child of twelve in the eighth grade is unusually bright, one of the same age in the first grade is unusually dull. It is then of interest to us to discover whether the twelve year old child in the first grade will have more or fewer defects than the one in the eighth. In order to study this, the records of all the children at the ages of ten, twelve, thirteen and fourteen were retabulated. These ages were taken because at all of them children are found scattered through the grades from the lowest to the highest.

There were 3304 of these children. Those ten years old numbered 910, the eleven year olds 842, those of twelve years 664, those of thirteen years 496, and of the fourteen year olds there were 392. The following table shows how they were distributed among the grades, and how many were suffering from each sort of defect:



## PHYSICAL DEFECTS OF 3304 CHILDREN IN NEW YORK CITY.

GRADE	Number Examined	Without Defects	Having Defects	Enlarged Glands	Defective Vision.	Defective Breathing	Defective Teeth.	Hypertrophied Tonsils.	Adenoids.	Other Defects.
1.....	33	6	27	12	4	6	17	11	5	7
2.....	263	40	223	103	64	65	139	81	68	56
3.....	608	96	512	127	142	90	334	148	82	96
4.....	892	260	632	99	233	90	364	195	108	140
5.....	619	236	383	52	157	40	198	104	41	36
6.....	453	164	289	18	110	58	141	59	17	42
7.....	299	87	212	13	84	35	77	43	17	36
8.....	137	30	107	11	39	5	45	18	5	14
Total ....	3304	919	2385	435	833	389	1315	659	343	427

A child of ten in the first grade is so badly retarded that we may fairly call him dull and we shall be wrong in only a few cases of children who entered school very late indeed. We may feel even surer that a child of eleven, twelve, thirteen, or fourteen in the first grade is dull. A child of ten in the second, third, or fourth grade is normal. In the fifth or sixth grade he is bright. By making appropriate changes in the grades, similar statements can be made for the other ages. Using this as a basis, the following schedule was drawn up for rating our children at the ages of ten to fourteen:

## DIVISION OF PUPILS INTO DULL, NORMAL AND BRIGHT GROUPS BY AGES AND GRADES.

Ages.

GRADES	10	11	12	13	14
1.....	dull	dull	dull	dull	dull
2.....	normal	dull	dull	dull	dull
3.....	normal	normal	dull	dull	dull
4.....	normal	normal	normal	dull	dull
5.....	bright	normal	normal	normal	dull
6.....	bright	bright	normal	normal	normal
7.....	bright	bright	bright	normal	normal
8.....	bright	bright	bright	bright	normal

Using this as a basis, the records were retabulated, the pupils distributed among the three groups and the results worked out in percentages. They are shown in the following table:

DULL, NORMAL, AND BRIGHT PUPILS SUFFERING FROM EACH SORT OF DEFECT. AGES TEN TO FOURTEEN, INCLUSIVE. ALL GRADES.

	Dull.	Normal.	Bright.
Number of children examined..	407	2588	309
Defects per child.....	1.65	1.30	1.07

	Percentages.		
Enlarged glands .....	20	13	6
Defective vision .....	24	25	29
Defective breathing .....	15	11	9
Defective teeth .....	42	40	34
Hypertrophied tonsils ....	26	19	12
Adenoids .....	15	10	6
Other defects .....	21	11	11
Defective .....	75	73	68
Not defective .....	25	27	32

Here the results are very different from those discussed so far. In every case except in that of vision the children rated as "dull" are found to be suffering from physical defects to a greater degree than the "normal" or "bright" children. It is true that 75 per cent of the dull children are defective as compared with 73 per cent among the normal and 68 per cent among the bright children. These differences are very slight. But the defective dull child has on the average 1.65 defects as against 1.07 for the bright one. In other words, the number of defectives among the dull children does not differ widely from the number among the bright ones, but the dull child is found to be much more defective in degree.

That hypertrophied tonsils and adenoids have a distinct bearing upon retardation seems to be clearly indicated by the fact that the former are found in 26 per cent of the dull children and only 12 per cent of the bright ones, and in the case of the latter the percentage falls from 15 to 6. A similar condition is found in the cases of enlarged glands, defective breathing, and defective teeth. In each the falling off is sharp and consistent as we move from the dull to the normal and bright groups. It is too consistent to be dismissed as accidental or not significant.

The case of defective vision, however, is far from being so clear. Found in 24 per cent of the dull pupils, 25 per cent of the normal ones, and 29 per cent of the bright ones, it is difficult to account for it. We have already seen that defective vision increases



slowly with advancing age. A computation of the individual ages of the dull and bright pupils in the groups here studied shows that the dull ones are older than the bright ones. Nevertheless they have better eyesight. The explanation may be that we are here dealing with extreme cases. The pupils we designate as bright are very young indeed for their grades and in all probability include a number who have injured their eyes through undue use and strain. Even a small percentage of such cases would account for the difference observed.

The computations establish in a convincing manner the close connection between certain physical defects and school progress, but they do not tell us just how great the retarding influence is or what part the different sorts of defects contribute to it. To throw light on these problems, computations were made showing the average number of grades completed by the ten year old pupils who were found to be free from physical defects, the grades completed by those suffering from enlarged glands, and so on for each of the other kinds of defects. Similar computations were made for the eleven, twelve, thirteen, and fourteen year old children. Finally the central tendency for the entire group was ascertained. The results are illuminating.

AVERAGE NUMBER OF GRADES COMPLETED BY PUPILS HAVING NO PHYSICAL DEFECTS COMPARED WITH NUMBER COMPLETED BY THOSE SUFFERING FROM DIFFERENT DEFECTS. CENTRAL TENDENCY AMONG 3304 CHILDREN, AGES TEN TO FOURTEEN YEARS, IN GRADES ONE TO EIGHT.

Children having no physical defects . . . .	4.94
“ “ enlarged glands . . . . .	4.20
“ “ defective vision . . . . .	4.94
“ “ defective breathing . . . .	4.58
“ “ defective teeth . . . . .	4.65
“ “ hypertrophied tonsils..	4.50
“ “ adenoids . . . . .	4.24
“ “ other defects. . . . .	4.52

The notable feature of the table is the fact that in every case, except that of defective vision, the children suffering from each sort of physical defect made less progress in their school work

than did those not so handicapped. The seriousness of these handicaps in terms of percentages is shown below:

TABLE SHOWING THE EXTENT TO WHICH CHILDREN SUFFERING FROM EACH SORT OF PHYSICAL DEFECT PROGRESS MORE SLOWLY THAN DO CHILDREN WITH NO DEFECTS.

Kinds of defects.	Per cent of loss in progress.
Enlarged glands .....	14.9
Defective vision .....	none
Defective breathing .....	7.2
Defective teeth .....	5.9
Hypertrophied tonsils .....	8.9
Adenoids .....	14.1
Other defects .....	8.5
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Average .....	8.8

In this table the average loss of 8.8 per cent which appears in the last line is not, of course, the numerical average of the percentages of loss corresponding to the different sorts of defects, but rather the general loss of progress discovered among all the children having physical defects. In other words, the children suffering from physical defects made on the whole 8.8 per cent less progress than did those having no physical defects.

These figures are important, not so much because they represent typical conditions, for they undoubtedly do not, but rather because they constitute almost the first quantitative measure so far secured of the retarding force of physical defects. The New York examination establishes the important principle that except in the case of vision, older children have fewer defects; and it shows that when children who are badly retarded are compared with normal children and very bright children in the same age groups, so that the diminishing of defects through advancing age does not enter as a factor, the children rated as "dull" are found to have higher percentages of each sort of defect than the normal and bright children. In this generalization defective vision must be excepted.

Moreover, the New York investigation gives us quantitative measures of the retarding forces of the different kinds of defects. In general, children suffering from physical defects are found to make 8.8 per cent less progress than do children having no physical



defects. Children suffering from enlarged glands and adenoids are retarded most. Hypertrophied tonsils, defective breathing, and defective teeth are in general somewhat less serious in their effects. No statistical correlation is shown between progress and defective vision. It must be remembered that these results are from a few schools in one city and are not presented as representing general or typical conditions. Moreover, the same child is often suffering from several sorts of defects, so that the figures do not really show the retarding influence of each sort of defect separately. For instance, we find that children suffering from enlarged glands are retarded to about the same degree as are those with adenoids. But these are to a great extent the same children. Most of those having adenoids also have enlarged glands. Thus the figures while having distinct value as revealing general tendencies, must not be interpreted as showing with exact precision the relative retarding force of each separate sort of defect.