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A NEW SCALE OF MENTAL AND PHYSICAL MEASUREMENTS FOR ADOLESCENTS, AND SOME OF ITS USES

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The scale to be reported in this paper is based on the idea frequently expressed that while no one test yields a satisfactory measure of ability, a group of tests probably does give a significant result. The scales now ready for use are for fourteen and fifteen year old native born white children. They are based on 750 fourteen year old children who were dropping out of school to go to work, and on 680 of the same children at fifteen years of age, after being at work for one year. The same tests have been given to corresponding groups of children who are remaining in school, but the scales for them are not yet ready for publication. The same series of tests, with minor modifications from year to year, is being given to the two sets of children at sixteen, seventeen and eighteen years. In order to check up this scale with one of the Binet type, the Yerkes Point Scale is also being given to as many as possible of the eighteen year old group. The accompanying lists will show just what tests are being used at each age, and the measures which enter into the summary scales at fourteen and fifteen.

¹This paper is the work of the entire laboratory staff of the Vocation Bureau. All members of the staff have tested children, and evaluated results. Charlotte Rust Fischer and the Director have made up the tables of results, and worked out the percentiles. Edward S. Jones, Assistant Director, has estimated all the Pearson co-efficients of correlation.

For the details of methods of giving and evaluating the tests, we must refer to the Monograph on Mental and Physical Measurements of Working Children, No. 77 of the series of supplements to the Psychological Review.

The new scale is constructed as follows: First, each of the mental and physical measurements taken has been stated in terms of ten-percentiles for girls and for boys separately. This table of ten-percentiles is appended to this paper. Each child was then given a rank from one to ten (according to the percentile within which his results fell) on every one of his mental and physical measurements. The percentile ranks for each child were then averaged, first for the set of physical measures, exclusive of height and weight, and second for the set of mental measures. These percentile averages were in turn arranged in tables of ten-percentiles which are appended to this paper. (See tables of averages of percentile ranks and the percentile table of average percentile ranks.)

Any new individual to be tested can, then, be given the same series of tests on which the tables are based, ranked in each test according to the percentile within which his results fall; an

PHYSICAL TESTS

FOR ALL AGES FROM FOURTEEN TO EIGHTEEN YEARS

Vital Capacity

Grip
Right
Left

Steadiness

Right
Left

Tapping

30"—Right
Left

One min. Right
Left

Index of fatigue

Right
Left

Card Sorting

Index

MENTAL TESTS

14 YEARS	15 YEARS	16 YEARS	17 YEARS	18 YEARS
Cancellation Letter-a Index	Cancellation Letter-m Index	Cancellation Letter-w Index	Cancellation Letter-a Index	Cancellation Letter-m Index
Accuracy	Accuracy	Accuracy	Accuracy	Accuracy
Memory 7 place digits	Memory 7 place digits	Memory 7 place digits	Memory 7 place digits	Memory 7 place digits
8 " "	8 " "	8 " "	8 " "	8 " "
9 " "	9 " "	9 " "	9 " "	9 " "
Substitution	Substitution (different key)	Substitution (different key)	Substitution (different key)	Substitution (different key)
Practise pages	Practise pages	Practise pages	practise pages	practise pages
1	1	1	1	1
2	2	2	2	2
3	3			
memory page	memory page	memory page	memory page	memory page
4	4	3	3	3
Completion of sentences	Completion of sentences (different blank)	Completion of sentences (different blank)	Mutilated Text	Mutilated text (new form)
Correctness	Correctness	Correctness	Time	Time
No. of ideas	No. of ideas	No. of ideas	Per cent correct	Per cent correct
Index of ideas	Index of ideas	Index of ideas		
Association time	Association time	Association time		
Association by Opposites (easy)	Association by Opposites (medium)	Cause and Effect	Association by Opposites (hard)	Association by Opposites (easy and hard)
	Healy & Fernald	Per cent perfect		
	Problem Box	Per cent correct		
	Opening	Healy & Fernald	Hayes	Freeman
	Time	Problem Box	(Instruction)	Problem Box
		Opening	Box	Time
		Closing	(with diagram)	Moves
		Time	No. trials	
		Moves	Errors	
Construction puzzles		Construction puzzle	Construction puzzle	Construction puzzle
A & B (Healy & Fernald)		"Flower Pot"	"Chick"	No. 1
School series on- ly		"Egg"	"Ship"	No. 2
Time				"Aussage"
No. of moves				No. of correct ideas
				No. additions
				Recognition
				Positive errors
				Negative errors
				Hard Directions (Woodward & Wells)
				Time
				Per cent correct
				Additions
				Free Association (Kent-Rosanoff)
				Yerkes Point Scale

average of his percentile ranks can be taken, and this average placed on the general scale. This method places each individual in comparison with a large group of supposedly normal people of his own age and sex, somewhere between the poorest individual, who figures on the scale as one, and the best, who figures as 100.

The method of forming the scale is a very rough one. It could be improved by increasing the number, variety, and difficulty of the tests, and also by making divisions finer than tenths of the original series. Some of the methods of estimation could also be bettered. In a test like rote memory, for instance, it will probably prove desirable to take an average for all the series used, instead of a separate average for each length of series. In the substitution test it would perhaps be better to combine the records for all the practise pages into one measure, and use the record for the memory page as a second measure. As we discover which of the tests correlate most closely with general or special abilities, it will be possible to devise a system of weighting the various tests in taking an average. We now know, for instance, that association by opposites and the mutilated text test correlate better with general ability than the cancellation test. Finally, the value of the scale for general uses will be enhanced when the results for school children and those for working children are combined into a single scale. The present scale, it must be remembered, is a first attempt to formulate this kind of a standard, and is very rough in form.

But even in its present rough form, there are proofs that the scale yields information of great significance. In the first place the results for each individual are fairly constant from year to year. Even though the group of individuals on whom the fifteen year scale is based is not exactly identical with that for the fourteen year scale, and the tests also differ slightly the second year, the Pearson co-efficient for the correlation between the fourteen and fifteen year tests of each individual is .66 P. E. .038 for the physical tests, and .71 P. E. .034 for the mental tests. Shifts of more than 15 points on a scale of 100 are rare. In many instances the large shifts can be explained by special circumstances, such as additional school training, or ill health. The exact amount of shifting from year to year will be published when the series is complete.

The second proof of the reliability of the tests is the remark-

able degree of correlation between the school grade of the children and rank in the mental tests. The tables of averages of percentile ranks, give the details for type of school, sex, and school grade, for both mental and physical averages. Graphs 1 to 8 present the relation graphically. The graphs for the averages in physical tests show a small positive correlation with school grade, and those for the mental tests a large positive correlation, so large that the graphs for fifth and eighth grade children cross for only a small portion of their extent.

While the positive correlation with school grade is large it is by no means perfect, and it seemed worth while to make a study of the very exceptional cases. There was one small group of children who had completed only the fifth grade at fourteen years, who ranked higher in the tests than another small group who had completed the eighth grade at the same age. Supposedly the tests measure native ability rather than the exact amount of training a child has had, though it is of course impossible to make a sharp separation of these two factors. On this assumption we reasoned that the fourteen year old children whose tests showed good native ability, but who nevertheless had completed only the fifth grade, must have had unfortunate social circumstances which caused retardation in school, in spite of their superior endowment; while the group whose tests showed poor native ability, but who had nevertheless completed the eighth grade at fourteen years, must have had favorable social surroundings which assisted them through school in spite of inferior endowment. In order to test this hypothesis, we looked up in our files the records of the physical and educational history, and of the home conditions, of these exceptional children. We found our hypothesis absolutely verified.

The very exceptional groups were not large. There were eleven of the very superior fifth grade children—children who ranked 70 or above either at fourteen, or at fifteen, or both years; and there were seventeen of the very inferior eighth grade children, children who ranked 50 or below either at fourteen or at fifteen or at both ages. Of the well endowed children from the fifth grade, one had been retarded by illness. This child had a good home, and good parents, but she had had in the course of her fourteen years spinal meningitis, smallpox, typhoid fever, scarlet fever, measles, and several minor diseases. She is the

only child in this group who had a good home. There were only two others whose fathers were living. One of them was a saloon keeper, and the other an old clothes dealer. In both instances the family lived in the rear of the shop. The other children in this group belonged to families in which the father was dead or a deserter, and the mother a wage earner outside of the home. These children had themselves worked to earn money out of school hours. The families lived in a few rooms, and had shifted about so much in residence that not one of the eleven had been in one school throughout his school period. All but three of them had been in three or more different schools, and some of them in five and six different schools. The mothers of these children were reported to be uninterested in education, and anxious to have the children go to work.

The group of poorly endowed children who had completed the eighth grade at fourteen years presented a direct contrast in social conditions. There were only four of the seventeen whose fathers were dead. Two of these had lost their fathers less than a year before leaving school, and in the other two cases the record of the date of the father's death had been omitted. This group of children, then, belonged to families in which the father was the wage earner. Not one mother of this group was a wage earner outside of the home. Over half (10) of these families owned their own homes, while none of the families of the fifth grade group did. Over half of them had been in one school from the first grade to the eighth, and only three of them had been in more than two schools. But four of them had done any work outside of school hours, and in those cases it was insignificant in amount. The mothers were reported to be women who were interested in education and determined to keep their children in school at least through the eighth grade. Finally, in response to the question whether the child himself liked school, and would have preferred to stay in school if he could, over half of the well endowed fifth grade children replied in favor of school, while but one of the poorly endowed eighth grade children chose school.

To find the apparent anomalies in the estimates made by the scale so uniformly explicable on social grounds is an important piece of evidence in favor of the reliability of the scale as a measure of native mental ability.

The use of the scale has already yielded some interesting results.

1. We have made on the basis of the scale two group comparisons, one of sex and one of type of school. Since the final scales are made up separately for the two sexes, no direct comparison of sex can be based on them, except with regard to variability. A comparison of the percentile tables for the various tests shows that in most of the mental tests the girls are a little superior at this age. Tests of mechanical ingenuity of any type are a marked exception to this statement. The final scales, which are ten-percentile arrangements of percentile averages, furnish a basis for judging of the variability of the two sexes. If variability is measured by the difference between the five and the ninety-five percentiles, the differences in variability in the two sexes are small, and not entirely consistent. In the physical tests the boys are a trifle more variable at fourteen, and decidedly so at fifteen. In the mental tests, the boys are a little more variable at fourteen, while there is a somewhat greater difference in favor of the girls at fifteen.

There is one fact with regard to variability, however, which holds for all the series. The girls show a wider variation below the median than above it. That is to say, while the difference between the sexes in the total range of variation is slight and not always in the same direction, it nevertheless is true in every series that the girls show a greater number of very exceptionally poor individuals, and a smaller number of very exceptionally good individuals as compared with their own median, than the boys.

In comparing public and parochial school children, the original tables of results showed that in every test except rote memory the public school children were somewhat superior. The tables of percentile averages add one interesting fact, which is that a large proportion of children at both extremes come from parochial schools. Both the exceedingly stupid, and the exceedingly brilliant children are more numerous in the parochial than in the public school group. The predominance of parochial school children at the lower end of the series suggests that the parochial school is not as strict as the public school in weeding out defectives, or in refusing promotion from grade to grade on the ground of poor work. The predominance of parochial school children at

the upper end of the series is explained by the fact that a far larger proportion of the parochial school children drop out of school to go to work at fourteen years of age than in the case of the public school, with the result that our parochial school group contains more of the superior members of the school than does the public school group.

The percentile averages showed the same sex difference between the two types of school that we noted in the monograph. While the difference between the two sets of girls is very small, the difference between the two groups of boys is large. Various explanations of this fact have been suggested. The one which seems to us most probable is that the difference can be traced to the type of training given the two sets of boys. The public school boys have more athletics and manual training than the parochial school boys, and these subjects have a stimulating effect on boys. The training offered the two sets of girls does not differ so much. They each have a little sewing and domestic work, and not much else in the realm of the manual. Reports from foremen of machine shops, given me by Mr. Paul Kreutzpointer, educational secretary of the foundrymen's union, tend to confirm this suggestion in stating that parochial school boys are not as apt in shop work as public school boys.

Two other suggestions have been made, one that there is a sex difference in type of mind of such a nature that girls' minds respond naturally to the kind of training offered in parochial schools, while boys' minds do not respond, and are injured by it. The third suggestion is that the parochial schools take more pain in the training of girls, and give them more supervision than boys.

2. The scale has given us a new method of measuring the higher grades of mental defect. The children on whom the scale was based were all children who were at least sufficiently normal to stay in the regular schools up to fourteen years of age, and to complete at least the fifth grade. Nevertheless it is certain that some of them are high grade defectives, and a few of them rather low grade. In our series of tests at eighteen years, we are giving the Yerkes Point Scale to as many as possible of the working group. At the present writing (June 1915) we have fifty Yerkes records in addition to our five annual tests. Only the fourteen and fifteen year tests of these children are available in the form of percentile averages. Before trying the Yerkes

scale we had supposed that most of our young people would fall within the limits for normal adults, that is 75-100, while a few of our poorest ones would fall below. The fifty cases at hand form an unselected group in which there are a few more individuals above than below our median. To our surprise we found that 13 of them, or 26%, fell below 75, while 28, or 56%, fell below 85. The distribution of this first fifty cases is as follows:

Below 60 (i. e., 58)—1 case	71-75 3 cases	86-90 12 cases
61-65 4 cases	76-80 10 cases	91-95 8 cases
66-70 5 cases	81-85 5 cases	96-100 2 cases

On the Yerkes basis, then, one fourth of our eighteen year old working children belong in the class of mental defectives, while a second fourth is made up of borderline cases.

The correlation of the Yerkes records with our own is not as close as we should have expected to find it. There is of course a decided positive correlation, though a few striking discrepancies occur. There were two individuals who ranked below the median in our tests but were above 85 on the Yerkes scale. One of these is a boy whom we already knew to be an exceptional case. His low rank in our tests was due entirely to his abnormal slowness. He has a remarkable degree of persistence which ultimately brings him success, but in our tests he failed in all the tests with time limits, though he insisted on keeping on until eventually he succeeded in the task. His slowness penalized all his records. It was evident in his association reactions also. The other case is that of a boy who was not far below our median. His tests have been improving decidedly from year to year, though he is certainly not of a superior type. Both of these boys had unusually good homes and English speaking parents.

There were three cases of children who ranked below 75 on the Yerkes scale, but were somewhat above the median on our scale. These were all children with foreign born parents. These results suggest that mere facility with the English language is a much larger factor in the Yerkes tests than in ours.

We have had one other method of comparing results obtained with our scale with those of the usual standards for mental deficiency. We tested by our system a number of the highest grade defectives from our school for defectives. The highest grade pupil the school ever had, who when we saw her at fifteen years tested 79 on the Yerkes scale, ranked 24% on our scale.

That is, there were 24% of our working girls of her age who tested lower than she. The next best pupil ranked just below twelve on the Binet scale, and was 18% on our scale. Most of the defectives, not the most hopeless ones, but those who were to some extent teachable, fell in the lowest five per cent of our scale.

These two sets of results, obtained from different points of view, agree in suggesting that from twenty to twenty-five per cent. of our series of working children would on our present standards be ranked as defectives. The lowest five or ten per cent. would be considered rather low grade morons, and the rest high grade morons. We can see no reason for regarding our eighteen year old working children as exceptional. Since they are all native born whites, most of them with English speaking parents, they probably stand higher in the tests than foreign born laboring people. If these preliminary findings are confirmed, it means that one fourth of our laboring population would on the present standards of measurement be classed as defectives, and if the Binet scale were used instead of the Yerkes, the proportion would be still larger, since the tendency is for Yerkes ratings of adolescents and adults to be higher than the Binet ratings.

The question to be faced now is whether these facts constitute a criticism of our working population, or of our standards for mental deficiency.

None of the children in our series is necessarily destined to industrial failure on the ground of mental defect. The girl who stood lowest of all on both scales (58 on the Yerkes system and 15, or 1% on ours) has worked steadily at simple hand work in a shoe factory for four years. At eighteen she is earning \$6.00 a week. A capable girl should be earning nearly twice that in one of the skilled jobs of a shoe factory after that amount of experience. Another girl, only a shade better in the tests, has worked for four years in a candy factory. At eighteen she is earning \$3.50 a week, and is still doing the most unskilled work. Candy factories pay much less than shoe factories, but this girl also should be getting nearly twice her present wage, after four years of steady work. Both these girls have good homes, and are carefully guarded. If they were thrown entirely on their own resources, they probably could not take care of themselves,

but so long as they are socially protected, they can contribute their quota to the family income. The boy who stood lowest has also worked steadily for four years, and is doing fairly well. Another of the lowest grade boys has been for four years with the same department store, and has risen from inside messenger at \$3.00 a week to driver of a delivery auto at \$13.00 a week.

Taken as a group, the inferior children shift about from job to job more than the superior ones, and have longer periods of unemployment. A glance over the list of jobs they hold show that they are of a lower type than those of the superior children. However, differences in mental ability and in amount of education are comparatively small factors in earning capacity during the first few years. There is no relationship between the school grade completed, and the average weekly wage during the first two years. Groups selected on the basis of rank in the tests show more of a difference in weekly wage. The median wage for the group of boys who failed worst in the tests is \$3.75 at fourteen years and \$4.75 at fifteen years, while for the group of boys who did best in the tests, the median wage is \$4.10 at fourteen years and \$5.62 at fifteen years. In measuring industrial fitness, then, rank in the tests is a more significant factor than school grade. The wage statistics for the girls apparently contradict this generalization. The median wage for the girls who stood lowest in the tests is \$3.40 at fourteen years, and \$4.87 at fifteen years, while for those who stood highest, the median wage is only \$2.85 at fourteen years, and \$4.43 at fifteen years. The contradiction is more apparent than real, however. It is explained by the aristocracy of the department store job. Department store jobs are the poorest paid in the city, and shoe factory jobs best paid, but the department store has its choice of the young workers. Nearly half of our girls who stood highest in the tests were working in department stores for wages varying from \$2.00 to \$2.50 the first year, and from \$3.00 to \$3.50 the second. None of the inferior group were able to hold jobs in department stores, though several of them had tried. A large proportion of the inferior group were in the shoe factories at much higher wages. Three of them at fifteen were earning \$7.00, \$8.50, and \$9.00, while the highest wage in the superior group was \$6.00. There is no social factor in boys occupations which corresponds to the lure of the department store for girls.

The exact facts about the relation between grade of intelligence as shown by the tests, and industrial careers, will be published later. Meanwhile we know enough about it to draw a few conclusions with regard to educational policy. It is quite certain that the poorest groups, those who test below standard on both systems, are children who could not profit by much academic instruction. We believe that very few of them could finish creditably, if at all, the work represented by our present eight grades. It is also quite certain that these children could be picked out by experimental methods several years, at least, before time for them to drop out of school. It seems the plain duty of the school to take these children out of the regular classes and give them industrial training for the type of work within their grasp.

In order to safeguard both society, and the most hopeless of these children, we need legislation to provide that as soon as any of the defectives become either delinquent or dependent, they shall be permanently segregated in institutions of an industrial type. Such institutions could be made almost or quite self-supporting.

3. The relation between manual ability and mental ability as shown by the tests offers some interesting suggestions. There is a positive correlation between rank in mental tests and rank in physical tests, but it is small. The Pearson co-efficient is .21 P. E. .064 at fourteen and .33 P. E. .060 at 15 years.

There must, then, be a certain group of children who stand high in the mental tests, and low in the physical and vice-versa, though there is a general tendency for the two to correspond. We can roughly distinguish five groups, poor in both respects, medium in both respects, good in both respects, very good in manual, and poor in mental ability, and very good in mental but poor in manual ability. If these relationships remain fairly constant for the individual, as our results indicate that they do, they furnish one basis for sorting children with reference to the type of training which should be given them.

As a democratic nation, it is our belief that children should be trained for the highest type of pursuit in which they have a fair chance of success. There are of course, many factors involved in success in life. It is by no means certain, for instance, that a child who has the necessary qualifications of mind and hand will

therefore succeed in such professions as medicine, or engineering. The point is, however, that without these basal qualifications he will certainly not succeed, and it is a waste of educational effort to try to make him.

Consider, now, our five rough groups. The individuals who stand consistently low in both respects seems destined for simple manual labor, or low grade industrial positions, provided they have the necessary physical strength. Those who are very lacking in mere strength as well, have slim prospects of being able to earn a living in the modern world. The group whose mental endowment is rather poor, or medium, but whose manual ability is good should be prepared for the skilled trades. Those who have a medium endowment of both kinds should be guided toward the great mass of secondary positions in business and industry. Those whose mental development is exceptionally good, but who are lacking in manual skill should be directed toward such professions as law, the ministry, literary pursuits, the non-experimental academic branches, the higher positions in business and finance, and some types of social work. Those who are gifted with exceptional ability in both directions, manual and mental, should be guided toward such professions as medicine, architecture, engineering, the experimental sciences, the arts, and certain types of social work.

If such a sorting into large groups could be made early, it would be possible to make modifications of our public school curriculum to meet their various needs. In the grammar school the important point would be to pick out early the children whose endowment is so inferior that they cannot profit by a high school course, and give them the kind of training which would best fit them for the industrial work within their grasp. Within the high school the task would be to separate those of medium mental endowment from the exceptionally good ones. The first class should have within the high school preparation for the very skilled trades, including domestic science and nursing, or for clerical or business positions, according to the strength of their tendency toward manual occupations. The second group should have college preparatory work with the stress on experimental science for those with a manual tendency, and on the humanities for the others.

Provided such a system were kept sufficiently flexible so that children whose diagnosis was uncertain, or those who developed unexpectedly could be shifted from one course to another, it would not be open to the criticism that an early sorting of the children into classes is undemocratic and fosters class distinctions. A sorting based upon native endowment, if it proves feasible, is fair to all. To make it effective, it should be supplemented by a system of scholarships for exceptionally gifted children of limited means.

Such a general classification makes no pretense of being able to single out ability in the higher arts. Supposedly the artist is to be sought in the group of individuals who are exceptionally well developed both manually and mentally, though we have as yet no experimental data on the relation between artistic genius and general intelligence. In our own series of children we have one young boy who is very much retarded in school, and very poor in the tests, who nevertheless has a degree of skill in painting which is at least commercially valuable. At fifteen he won a prize of \$200 for one of his pictures. To what heights he can rise remains to be seen. Doubtless special tests, such as Mr. Seashore's tests of ability in singing, could be devised for other fields of art.

4. We have already referred to the fact that native endowment, manual and mental, is but one of the determining factors in a career, though it is a very important one. The importance of general appearance, manner, style of dress, and such qualities as persistence, ambition, and social ease, is frequently impressed on us. In our fifth year series of tests we are trying to make a rough record of such facts about each individual. Meanwhile a few instances will illustrate the point.

We were particularly interested in the two girls who stood highest on our list for the first two years. They were both parochial school girls. The first one belonged in a family with a drunken father, a drunken step-mother, and some little half brothers and sisters. Her own mother had been a fine woman, and the girl was pretty, well dressed, and attractive. At seventeen she was working in a cigar factory for \$7 a week, all of which she gave her good for nothing father for the support of the family. Through our recommendation the Schmidlapp Bureau offered her a scholarship for a course of training to fit her for

more congenial and suitable work, but, though she hated the cigar factory and her associates in it, she refused the scholarship. The Bureau felt that it was useless for her to try to go on with an education while living at home; her father was of course unwilling to have her leave home; and she had not the necessary ambition or independence to break away and force her father to shoulder his own responsibilities. Under those conditions we could do nothing for her.

The second girl on the list was perfectly content with the eight grades of a parochial school. She had looked into some high school books, and did not think them interesting, nor could she see that more of an education was essential for any calling which she wished to follow. She would not even consider a scholarship.

Meanwhile two girls from the public schools who stood lower in the tests, one of them much lower, started their careers as wage earners with a fixed ambition to have a high school education, and become teachers. Both of them have attended night high school steadily, and are to have scholarships from the Schmidlapp Bureau for higher courses of training as soon as they are graduated. The possession of ambition and of ideals will carry these two girls far beyond the two better endowed ones, whose outlook is different.

Not long ago two eighteen year old boys came to the office at the same time for fifth year tests. They were boys who both fell below 70 on the Yerkes scale. In our series they were both in the lowest ten-percentile. On both systems, then, they ranked as feeble-minded. One of them had the vacant smile which in itself was almost enough to brand him as lacking. He had left several places of employment because as he said, the boys picked on him and teased him. He was collarless and far from neat, though not dirty. His job was simple hand work in a factory, for which he received \$6 a week. The other boy might easily have been mistaken for a University student. His collar and tie were faultless, his suit neat, and he was reserved and self-respecting in manner. This boy had a job in routine machine work in a factory at which he was earning \$15 a week. While neither of these boys had the slightest prospect of succeeding at any calling higher than unskilled labor, within that limit

there was a vast difference in the outlook. One of them will doubtless be able to do routine machine operating acceptably, keep his positions, and earn steady wages between \$15 and \$20 a week. The other will probably always be a hanger-on, tolerated here and there at simple, poorly paid jobs; but it is very doubtful if he can ever earn a steady, living wage.

When our records are complete, we hope that we may be able to make some sort of a formulation as to how large a factor manner, appearance, in short, personality, is as compared with mental and physical endowment, home conditions, and the effect of industrial experiences which are at present accidentally determined.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

Percentiles and Limits	Height in Cms. ²				Weight in Kgs. ³				Vital Capacity in Ccs ⁴			
	Boys		Girls		Boys		Girls		Boys		Girls	
	14	15	14	15	14	15	14	15	14	15	14	15
Lower	131.0	135.0	137.2	142.0	26.1	29.45	29.5	34.9	1100	1325	900	1000
10	142.6	148.5	146.3	149.9	33.2	38.0	36.1	40.6	1804	1824	1493	1803
20	145.3	151.6	149.3	151.5	35.7	40.6	39.1	43.6	1984	2151	1743	1914
30	147.4	154.1	151.6	154.5	37.9	43.0	41.3	46.0	2106	2313	1894	2017
40	149.3	156.3	153.3	156.2	39.3	45.1	43.1	47.5	2206	2439	1983	2097
50	151.3	158.3	155.0	157.5	40.7	47.1	44.9	49.1	2305	2600	2074	2176
60	153.3	159.6	156.6	158.8	42.2	49.0	46.7	50.8	2404	2746	2171	2287
70	155.2	162.3	158.3	160.5	44.3	51.2	48.7	52.9	2539	2882	2273	2415
80	158.2	164.9	160.1	162.7	46.7	53.7	51.1	55.1	2715	3022	2393	2561
90	161.8	168.6	162.8	165.6	50.5	56.6	54.1	57.4	2935	3260	2586	2734
Upper	171.0	178.3	170.0	174.7	66.1	68.45	86.3	95.0	3600	4400	3125	3200

² Height—Taken clothed. Boys without coats.³ Weight—Measured in shoes. Heal measured and deducted.⁴ Vital Capacity—Wet Spirometer. Best of three trials.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

Percentiles and Limits	Grip, ⁵ Right Hand, in Kg.				Grip, Left Hand, in Kg.				Steadiness, ⁶ Right Hand in Hole and Contacts.			
	Boys		Girls		Boys		Girls		Boys		Girls	
	14	15	14	15	14	15	14	15	14	15	14	15
Lower	11.5	15.0	9.0	13.0	12.0	14.0	8.0	11.0	H.-C.	H.-C.	H.-C.	H.-C.
10	18.6	22.6	16.3	20.3	18.5	21.3	16.4	18.8	1-1	2-10	2-11	2-8
20	20.6	24.6	19.1	22.6	20.2	23.5	18.8	20.7	2-0	3-10	3-11	4-12
30	22.2	26.2	20.5	23.7	21.9	25.2	20.2	21.9	3-10	3-3	3-6	4-10
40	23.7	27.6	21.6	24.8	23.3	26.8	21.3	23.2	3-7	4-11	3-0	4-8
50	24.9	28.9	22.7	25.9	24.6	28.5	22.2	24.5	3-0	4-9	4-11	4-4
60	26.0	30.2	24.7	27.0	25.7	29.9	23.6	25.7	4-11	4-7	4-8	5-12
70	27.3	32.7	25.9	28.1	26.9	32.1	25.0	26.9	4-9	4-2	4-6	5-9
80	28.9	35.7	27.4	29.4	28.7	34.8	26.3	28.2	4-7	5-11	5-12	5-3
90	31.6	39.0	29.6	31.0	30.7	37.6	29.1	29.6	4-0	5-7	5-8	6-10
Upper	45.0	48.0	37.0	35.0	45.0	47.0	37.0	35.0	5-7	6-10	6-11	6-2
									7-7	7-6	8-10	8-9

⁵ Grip—Smedley Dynamometer. Best of three trials.⁶ Steadiness—Steadiness tester. Limit for each hole, 12 contacts in fifteen seconds.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

Percentiles and Limits	Steadiness, Left Hand Hole and Contacts				Tapping ¹ 30" Right Hand				Tapping 30" Left Hand			
	Boys		Girls		Boys		Girls		Boys		Girls	
	14	15	14	15	14	15	14	15	14	15	14	15
Lower	H.-C.	H.-C.	H.-C.	H.-C.								
10	1-6	1-7	1-7	1-4	120	118	96	105	85	110	86	91
20	2-9	2-2	2-6	3-11	144	150	147	151	117	124	117	121
30	2-0	3-11	3-12	3-6	152	161	154	159	125	131	124	130
40	3-11	3-8	3-9	3-0	158	167	160	163	131	137	130	134
50	3-9	3-3	3-6	4-10	164	172	163	168	136	143	135	139
60	3-7	4-12	3-1	4-8	170	177	167	171	140	147	139	143
70	3-3	4-10	4-11	4-6	174	182	171	175	145	152	145	148
80	4-11	4-8	4-9	5-12	179	186	176	178	151	156	150	153
90	4-7	4-3	4-6	5-9	185	192	180	185	157	162	156	158
Upper	4-5	5-9	5-6	6-11	191	204	188	195	165	168	166	168
	7-10	7-9	7-10	8-12	226	300	225	234	206	212	198	201

¹ Tapping—Tapping Board and Electric Enumerator. Arm resting on the board,—wrist movement.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

Percentiles and Limits	Tapping one min. Right Hand				Tapping one min. Left Hand				Index of Fatigue ² Right Hand			
	Boys		Girls		Boys		Girls		Boys		Girls	
	14	15	14	15	14	15	14	15	14	15	14	15
Lower	219	204	216	201	179	203	167	175	37.8	42.7	38.9	35.8
10	273	287	280	285	223	228	222	231	26.4	25.9	25.7	23.3
20	290	303	291	301	235	248	238	246	23.5	22.3	22.0	20.7
30	303	314	301	309	246	260	247	256	20.7	20.2	19.8	18.9
40	312	324	308	317	256	268	255	264	18.6	18.4	18.2	17.4
50	321	334	315	325	266	276	263	272	16.9	16.6	16.5	16.0
60	330	344	323	332	275	285	273	280	15.4	14.9	14.9	14.5
70	339	353	333	339	285	294	281	290	13.7	13.3	13.5	12.8
80	350	364	344	351	296	304	294	300	11.9	11.3	10.5	10.7
90	364	379	357	367	313	318	311	315	8.9	7.9	8.4	7.7
Upper	443	571	430	440	391	402	372	372	neg. in.	neg. in.	neg. in.	neg. in.

² Index of Fatigue—Per cent of loss of speed between first and last quarter minute.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

	Index of Fatigue Left Hand				Card Sorting, ⁹ In- dex in Seconds				Cancellation ¹⁰ Index			
Percentiles and Limits.	Boys		Girls		Boys		Girls		Boys		Girls	
	14	15	14	15	14	15	14	15	14	15	14	15
Lower	50.0	38.2	44.3	40.3	80.6	78.5	83.5	83.3	726.9	354.4	521.5	402.4
10	26.7	26.1	28.1	24.2	63.7	57.2	54.7	51.3	342.0	239.0	304.0	206.5
20	24.1	23.1	23.9	21.5	58.8	53.4	51.4	46.9	286.2	222.6	251.3	184.8
30	22.5	21.0	20.9	19.7	55.0	50.4	48.9	44.2	259.4	208.3	228.1	171.1
40	19.6	19.3	19.3	18.1	52.9	48.3	47.0	42.5	237.9	195.0	210.9	159.3
50	17.8	17.8	17.9	16.5	50.7	46.4	45.0	40.8	220.2	182.6	195.2	150.8
60	16.1	16.3	16.1	14.8	48.4	44.5	43.5	39.1	206.3	171.8	182.3	142.2
70	13.9	13.9	13.9	13.0	45.9	42.6	41.9	37.6	193.5	161.4	170.2	133.9
80	11.2	11.6	11.2	10.6	43.4	40.7	40.3	36.0	179.7	149.8	157.9	125.8
90	7.9	8.3	7.9	6.4	40.9	37.4	37.4	33.6	162.4	136.5	143.7	113.7
Upper	neg. in	neg. in	neg. in	neg. in	29.3	28.4	31.4	28.5	113.8	105.1	111.5	84.1

⁹ Card Sorting—Forty-eight cards, four colors. Sorted face up.¹⁰ Cancellation—Printed page of small letters. Letter a, 14 years; letter m, 15 years.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

	Cancellation Accuracy in %				Memory ¹¹ in %. 7 Place Digits				Memory, 8 Place Digits			
Percentiles and Limits.	Boys		Girls		Boys		Girls		Boys		Girls	
	14	15	14	15	14	15	14	15	14	15	14	15
Lower	19.0	50.0	30.8	52.0	39.3	46.0	35.0	57.0	22.0	9.4	25.0	22.0
10	54.8	77.0	56.4	83.9	64.8	75.3	67.9	77.6	49.5	57.2	50.1	54.8
20	66.7	87.2	65.2	88.5	75.6	85.9	76.7	86.9	59.3	66.6	60.0	67.3
30	74.9	90.2	73.9	91.8	84.4	88.9	85.7	89.9	66.8	71.1	68.9	72.6
40	78.3	92.5	78.1	95.0	88.4	91.7	89.0	93.1	70.9	74.5	72.9	77.6
50	83.3	94.8	81.6	96.3	91.1	94.2	91.8	95.8	74.8	80.8	78.6	83.4
60	87.1	96.3	85.0	97.1	93.1	96.1	93.9	96.8	82.1	86.4	84.4	88.9
70	89.6	97.4	88.5	98.0	95.2	97.2	95.9	97.8	87.7	91.3	90.0	93.4
80	93.7	98.4	92.0	98.9	97.1	98.5	97.5	98.6	92.7	94.2	93.7	95.4
90	97.5	99.5	95.4	99.7	98.8	99.5	99.2	99.7	96.5	98.0	97.2	98.0
Upper	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

¹¹ Memory—Series of 7, 8, and 9 Place Digits. Average of two series of each length. Visual,—Auditory,—Motor Method with Metronome, one a second. No ranks of 10 were given in 7 place memory, because from 30 to 50 per cent of each group had perfect records. Ranks of 8 or 9 were used instead according to the size of the group of perfect records.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

	Memory, 9 Place Digits				Substitution, ¹² Page 1, Index				Substitution, Page 2, Index			
Percentiles and Limits	Boys		Girls		Boys		Girls		Boys		Girls	
	14	15	14	15	14	15	14	15	14	15	14	15
	14	15	14	15	14	15	14	15	14	15	14	15
Lower	11.0	17.0	22.0	22.0	400.0	286.6	419.5	307.8	378.0	241.3	298.4	295.1
10	44.4	46.3	43.1	47.2	227.5	205.8	217.1	200.6	184.8	168.6	176.1	168.1
20	51.4	53.6	50.3	56.3	208.1	186.2	192.4	177.0	165.2	151.4	159.0	145.3
30	56.6	59.0	58.7	61.0	195.0	174.6	179.3	166.2	151.4	139.9	149.0	134.3
40	60.6	64.3	63.7	65.5	183.7	165.8	170.9	156.6	139.5	131.8	139.1	126.5
50	66.1	69.5	68.2	71.5	172.7	157.3	162.6	148.6	133.2	123.7	130.4	119.0
60	71.4	73.7	72.5	77.4	161.9	149.6	154.3	140.5	126.9	115.9	121.8	112.9
70	75.8	81.6	78.0	82.8	151.9	141.7	146.1	133.8	120.6	108.4	113.1	106.7
80	83.6	87.2	85.9	87.1	142.0	132.3	136.9	127.1	110.4	100.8	104.4	100.6
90	92.1	93.6	92.5	92.8	129.4	122.4	125.0	120.3	99.8	88.5	92.7	88.6
Upper	100	100	100	100	71.0	82.2	83.3	98.4	68.5	55.0	68.0	67.4

¹²Substitution—Nine geometrical forms to be associated with nine digits. Four pages of fifty forms each. Page 4 from memory.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

	Substitution, Page 3, Index				Substitution, Page 4, Index				Sentences, ¹² No. begun in 2"			
Percentiles and Limits	Boys		Girls		Boys		Girls		Boys		Girls	
	14	15	14	15	14	15	14	15	14	15	14	15
	14	15	14	15	14	15	14	15	14	15	14	15
Lower	276.4	355.5	242.9	248.6	1257.6	906.5	60000	19875	0.0	0.0	0.0	0.0
10	165.5	156.9	156.0	150.9	226.0	238.5	217.2	225.3	0.8	0.0	0.6	0.0
20	145.9	138.9	139.9	134.4	162.3	163.2	161.4	153.0	1.7	1.5	1.6	0.9
30	133.6	127.8	129.7	122.9	137.1	131.7	140.5	130.2	2.6	2.9	2.8	1.9
40	124.0	117.9	119.7	115.2	121.0	114.7	125.4	115.1	4.2	4.4	3.7	3.0
50	115.9	110.7	112.7	108.7	111.2	104.9	112.6	103.9	4.9	5.7	4.7	4.9
60	108.7	103.6	105.8	102.3	101.9	96.1	101.0	95.6	5.9	6.9	5.8	6.1
70	101.6	96.0	98.6	95.5	93.6	88.3	92.6	88.5	6.9	8.1	7.1	7.3
80	92.5	88.0	89.4	88.4	85.6	80.5	84.5	81.9	8.3	9.3	8.3	8.6
90	82.8	80.1	80.3	81.3	75.1	69.6	73.5	70.4	10.0	10.7	9.6	10.5
Upper	59.4	54.0	59.8	59.2	53.0	52.6	52.3	50.6	13.0	13.0	13.0	13.0

¹² Sentences—Completion of 13 sentences.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

Percentiles and Limits	Sentences, No. of Ideas				Sentences, Index of Ideas ¹⁴				Sentences, No. Correct			
	Boys		Girls		Boys		Girls		Boys		Girls	
	14 ¹⁵	15	14	15	14	15	14	15	14	15	14	15
Lower	6.0	7.0	7.0	8.0	106.0	99.4	42.0	90.0				
10	12	14	12	14	20.5	20.2	18.0	19.4	8.8	10.3	8.9	9.4
20	13	16	13	17	16.2	15.4	14.9	15.9	9.8	11.4	10.0	11.1
30	14	18	15	19	13.9	12.8	13.2	12.4	10.6	12.1	10.7	12.1
40	15	20	16	21	12.4	11.7	11.9	10.9	11.3	12.6	11.4	12.4
50	17	22	17	23	11.1	10.5	10.7	10.2	11.9	13.0	12.1	12.8
60	18	24	19	25	10.0	9.6	9.7	9.4	12.4	13.2	12.4	13.1
70	20	26	20	26	9.2	8.8	8.8	8.5	12.8	13.4	12.8	13.3
80	23	28	23	28	8.4	7.5	7.9	7.6	13.2	13.6	13.1	13.6
90	25	32	26	32	7.2	6.8	7.0	6.7	13.6	13.8	13.6	13.9
Upper	59.0	59	39	46	4.7	4.3	4.9	4.2				

¹⁴ One complete failure.¹⁵ Number of seconds per idea expressed.

Table of 10 Percentiles for Fourteen and Fifteen Year Old Working Children.

	Opposites ¹⁶		Accuracy in %		Puzzle Box ¹⁸		Time in sec.	
	Boys		Girls		Boys		Girls	
	14	15	14	15	15		15	
Lower	15.0	17.0 ¹⁷	20.0	7.5	Failure		Failure	
10	49.4	56.6	57.8	56.5	720 Failure		720 Failure	
20	59.7	64.9	67.7	67.9	634		720 Failure	
30	68.8	69.9	72.1	73.2	465		720 Failure	
40	73.6	73.9	75.4	76.7	365		712	
50	78.4	77.3	79.6	80.0	304		602	
60	82.3	80.5	84.2	83.9	261		470	
70	85.4	83.9	87.6	87.4	220		386	
80	89.4	87.6	90.4	90.4	175		298	
90	93.5	92.2	94.1	93.9	126		227	
Upper	100	100	100	100	45		95	

¹⁶ Opposites—List of twenty words. Harder lists used at fifteen than at fourteen years.¹⁷ One complete failure.¹⁸ Puzzle Box—Healy and Fernald Box. Painted black inside. Recorded no. of seconds required to open box. 720 failure.

Averages of Percentile Ranks in Physical Tests. 14 Year Old Working Children.
PUBLIC SCHOOL.

	Boys									Girls									
Grade	V		VI		VII		VIII		IX	VIII and IX	V	VI		VII		VIII		IX	VIII and IX
Average	No	%	No.	%	No.	%	No.	No.	%	No	%	No	%	No	%	No	No.	%	
11-15	0		0		0		0			0		0		0		0			
16-20	0		0		0		0			0		0		0		0			
21-25	1	1.1	1	1.4	0		0			0		0		0		0			
26-30	3	3.2	2	2.7	1	2.2	0			1	2.3	1	1.7	2	4.6	0			
31-35	11	11.8	2	2.7	0		1	1	7.7	2	4.6	2	3.3	2	4.6	1		3.7	
36-40	6	6.4	6	8.2	1	2.2	1		3.8	3	7.0	7	11.7	1	2.3	1		3.7	
41-45	6	6.4	6	8.2	3	6.5	3		11.5	5	11.6	3	5.0	4	9.3	4	1	18.5	
46-50	12	12.9	7	9.6	8	17.4	0			9	20.9	8	13.3	6	13.9	4		14.8	
51-55	13	14.0	10	13.7	7	15.2	1		3.8	2	4.6	8	13.8	5	11.6	1	1	7.4	
56-60	13	14.0	9	12.3	2	4.3	3		11.5	7	16.3	10	16.7	3	7.0	2		7.4	
61-65	9	9.7	11	15.1	8	17.4	4		15.4	4	9.3	7	11.7	6	13.9	3		11.0	
66-70	6	6.4	7	9.6	3	6.5	4		15.4	2	4.6	2	3.3	4	9.3	0			
71-75	4	4.3	4	5.5	6	13.0	2		7.7	5	11.6	5	8.3	4	9.3	3	1	14.8	
76-80	3	3.2	5	6.8	4	8.7	2	1	11.5	2	4.6	3	5.0	5	11.6	2		7.4	
81-85	4	4.3	2	2.7	1	2.2	1		3.8	1	2.3	3	5.0	1	2.3	2		7.4	
86-90	2	2.1	1	1.4	2	4.3	2		7.7	0		1	1.7	0		1		3.7	
91-95	0		0		0		0			0		0		0		0			
Totals	93		73		46		24	2		43		60		43		24	3		

PAROCHIAL SCHOOL.

11-15	0		0		0		0			1	3.8		0		0		
16-20	1	2.6	0		0		0			0			1	1.8	0		
21-25	0		1	1.7	0		0			0		3	6.7	2	3.6	1	2.8
26-30	2	5.2	1	1.7	1	1.5	1		2.4	0		3	6.7	0		0	
31-35	2	5.2	3	5.0	6	9.2	2		4.9	3	11.5	3	6.7	2	3.6	1	2.8
36-40	4	10.5	4	6.7	2	3.1	4		9.8	1	3.8	3	6.7	4	7.1	1	2.8
41-45	7	18.4	9	15.0	8	12.3	1		2.4	4	15.4	5	11.1	7	12.5	0	
46-50	5	13.2	11	18.3	10	15.4	4		9.8	3	11.5	6	13.3	7	12.5	3	1
51-55	3	7.9	9	15.0	11	16.9	8		19.5	4	15.4	7	15.5	8	14.3	6	1
56-60	6	15.8	5	8.3	5	7.7	7		17.0	4	15.4	7	15.5	7	12.5	4	
61-65	4	10.5	7	11.7	7	10.8	2	1	7.3	0	0.0	3	6.7	6	10.7	6	
66-70	2	5.2	5	8.3	8	12.3	4		9.8	3	11.5	2	4.4	8	14.3	4	1
71-75	2	5.2	4	6.7	4	6.1	1	1	4.9	1	3.8	2	4.4	3	5.3	2	
76-80	0		0		2	3.1	1		2.4	2	7.7	0		1	1.8	2	
81-85	0		1	1.7	0		2		4.9	0		1	2.2	0		2	
86-90	0		0		0		1		2.4	0		0		0		0	
91-95	0		0		1	1.5	0	1	2.4	0		0		0		0	
Totals	38		60		65		38	3		26		45		56		32	3

Averages of Percentile Ranks in Physical Tests. 15 Year Old Working Children.

PUBLIC SCHOOL.

Grade	Boys									Girls								
	V		VI		VII		VIII	XI	VIII and IX	V		VI		VII		VIII	IX	VIII and IX
	No.	%	No.	%	No.	%	No.	No.	%	No.	%	No.	%	No.	%	No.	No.	%
Averages																		
11-15	0		0		0		0			0						0		
16-20	0		0		0		0			0		1	1.9			0		
21-25	0		0		0		0			0		0				0		
26-30	2	2.5	2	3.2	0		0			1	2.8	0		2	5.6	0		
31-35	8	10.0	4	6.5	4	9.3	0			0		3	5.7	4	11.1	2		9.5
36-40	8	10.0	2	3.2	1	2.3	1		4.2	0		4	7.5	2	5.6	1		4.7
41-45	9	11.2	3	4.8	2	4.6	3		12.5	5	13.9	4	7.5	2	5.6	1		4.7
46-50	6	7.5	11	17.8	5	11.7	1		4.2	10	27.8	6	11.4	2	5.6	0	1	4.7
51-55	12	15.0	8	12.8	6	14.0	4	1	20.8	3	8.4	7		3	8.3	3		14.3
56-60	10	12.5	11	17.8	3	7.0	4		16.7	2	5.5	9		4	11.1	0		
61-65	10	12.5	8	12.8	6	14.0	0			7	19.5	11	20.8	4	11.1	5		23.9
66-70	5	6.2	5	8.3	4	9.3	5		20.8	4	11.1	5	9.4	7	19.5	1		4.7
71-75	5	6.2	3	4.8	5	11.7	2		8.3	2	5.5	2	3.8	3	8.3	2		9.5
76-80	2	2.5	4	6.5	2	4.6	0			2	5.5	1	1.9	2	5.6	2		9.5
81-85	2	2.5	1	1.6	3	7.0	1	1	8.3	0		0		1	2.8	3		14.3
86-90	1	1.3	0		0		0			0		0		0		0		
91-95	0		0		2	4.6	1		4.2	0		0		0		0		
Totals	80		62		43		22	2		36		53		36		20	1	

PAROCHIAL SCHOOL.

11-15	0		1	1.9			0			1	4.2	0		0		0		
16-20	0		1	1.9			0			0		1	2.7	0		0		
21-25	0		0				1		3	0		0		2	3.9	0		
26-30	0		1	1.9	1	1.6	0			3	12.5	0		0		0		
31-35	2	5.7	4	7.6	5	8.0	1		3	0		6	16.2	1	2.0	2		6.9
36-40	4	11.4	6	11.6	4	6.5	4		12.1	2	8.3	0		4	7.8	1		3.4
41-45	5	14.8	3	5.7	7	11.3	3		9.1	1	4.2	7	18.9	7	13.7	1		3.4
46-50	3	8.6	12	23.1	8	12.9	3		9.1	6	25.0	6	16.2	3	15.7	3	2	17.3
51-55	5	14.8	4	7.6	6	9.7	4		12.1	2	8.3	2	5.4	10	19.6	6		20.7
56-60	7	20.0	4	7.6	13	20.9	4		12.1	5	20.9	3	8.1	2	3.9	6		20.7
61-65	4	11.4	8	15.4	6	9.7	1		3	0	1	4.2	6	16.2	4	7.7	2	6.9
66-70	2	5.7	2	3.8	5	8.0	4		12.1	1	4.2	3	8.1	6	11.9	3	1	13.8
71-75	2	5.7	2	3.8	2	3.2	4		12.1	1	4.2	3	8.1	4	7.7	2		6.9
76-80	1	2.9	2	3.8	4	6.5	2		6.1	0		0		2	3.9	0		
81-85	0		2	3.8	0		2		6.1	0		0		0		0		
86-90	0		0		1	1.6	0			0		0		1	2.0	0		
91-95	0		0		0		0			1	4.2	0		0		0		
Totals	35		52		62		33			24		37		51		26	3	

Averages of Percentile Ranks in Mental Tests. 14 Year Old Working Children.

PUBLIC SCHOOL.

Grade	Boys								Girls							
	V	VI	VII	VIII	IX	VIII and IX			V	VI	VII	VIII	IX	VIII and IX		
Average	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
11-15	1	1.1	0	0	0	0			0	0	0	0	0			
16-20	2	2.1	0	0	0	0			2	4.6	0	0	0			
21-25	0		1	1.4	0	0			3	7.0	0	0	0			
26-30	5	5.4	0	0	0	0			1	2.3	3	5.0	1	2.4	0	
31-35	7	7.5	3	4.1	0	2		7.7	1	2.3	5	8.3	1	2.4	0	
36-40	15	16.1	4	5.5	1	2.2	0		8	18.6	3	5.0	4	9.5	0	
41-45	17	18.3	7	9.6	2	4.3	0		5	11.6	9	15.0	4	9.5	0	
46-50	12	12.9	9	12.3	1	2.2	1	3.8	7	16.3	4	6.7	5	11.9	1	7.7
51-55	12	12.9	8	11.0	3	6.5	0		6	14.0	7	11.7	7	16.7	3	11.5
56-60	11	11.8	14	19.2	11	23.9	2	11.5	6	14.0	13	21.7	4	9.5	3	11.5
61-65	4	4.3	15	20.5	6	13.0	4	19.2	1	2.3	10	16.7	5	11.9	2	11.5
66-70	3	3.2	3	4.1	7	15.2	4	15.4	1	2.3	1	1.7	4	9.5	3	11.5
71-75	1	1.1	4	5.5	8	17.4	5	19.2	1	2.3	2	3.8	4	9.5	4	15.4
76-80	3	3.2	4	5.5	5	10.9	0		0		8	5.0	2	4.8	5	19.2
81-85	0		1	1.4	2	4.3	4	15.4	1	2.3	0		1	2.4	1	3.8
86-90	0		0	0	0	2		7.7	0	0	0		0		2	7.7
91-95	0		0	0	0	0			0	0	0		0		0	
Totals	93		73		46		24	2	43		60		42		24	2

PAROCHIAL SCHOOL.

11-15	0	0	0	0	0		0	1	2.2	0	0					
16-20	1	2.6	0	0	0		1	3.8	1	2.2	1	1.8	0			
21-25	3	7.9	1	1.7	0	0	1	3.8	1	2.2	1	1.8	0			
26-30	3	7.9	5	8.3	2	3.1	0	1	3.8	3	6.7	0	0			
31-35	7	18.4	2	3.8	2	3.1	2	4.9	4	15.4	3	6.7	1	1.8	0	
36-40	8	21.0	7	11.7	3	4.6	0		5	19.2	6	13.3	1	1.8	0	
41-45	5	13.2	9	15.0	5	7.7	1	2.4	4	15.4	4	8.9	4	7.1	2	5.7
46-50	1	2.6	6	10.0	3	4.6	2	4.9	2	7.7	4	8.9	1	1.8	1	2.9
51-55	3	7.9	6	10.0	17	26.1	5	12.2	5	19.2	6	13.3	9	16.1	1	2.9
56-60	5	13.2	8	13.3	7	10.8	5	12.2	0		4	8.9	9	16.1	7	20.0
61-65	0	0	5	8.3	6	9.2	7	19.5	1	3.8	6	13.3	6	10.7	4	11.4
66-70	2	5.3	7	11.7	5	7.7	3	7.3	2	7.7	0		7	12.5	6	20.0
71-75	0		1	1.7	3	4.6	5	14.6	0		2	4.4	8	14.3	5	20.0
76-80	0		1	1.7	1	1.5	2	7.3	0		1	2.2	5	8.9	5	14.3
81-85	0		1	1.7	7	10.8	3	7.3	0		3	6.7	2	3.6	0	
86-90	0		1	1.7	3	4.6	3	7.3	0		0		1	1.8	1	2.9
91-95	0		0		1	1.5	0		0		0		0		0	
Totals	38		60		65		38	3	26		45		56		32	3

Averages of Percentile Ranks in Mental Tests. 15 Year Old Working Children.

PUBLIC SCHOOLS.

Grade	Boys							Girls						
	V	VI	VII	VIII	IX	VIII and IX		V	VI	VII	VIII	IX	VIII and IX	
Averages	No.	%	No.	%	No.	%	No.	No.	%	No.	%	No.	No.	%
11-15	0		0		0		0	0		0		0		
16-20	0		0		0		0	0		0		0		
21-25	0		0		0		0	1 2.8	1 1.9	0		0		
26-30	3 3.7	1 1.6	0		0		0	1 2.8	1 1.9	0		0		
31-35	10 12.5	3 4.8	0		0		0	8 22.2	3 5.7	1 2.8		0		
36-40	12 15.0	5 8.1	1 2.3		1	4.2	2 5.5	3 8.3	3 8.3	0		0		
41-45	11 13.7	8 12.9	2 4.6		0		3 8.3	8 15.1	2 5.5	0		0		
46-50	12 15.0	5 8.1	1 2.3		0		4 11.1	6 11.3	5 13.9	0		0		
51-55	6 7.5	8 12.9	7 16.3		4	16.7	6 16.7	9 17.0	6 16.7	0		0		
56-60	15 18.7	11 17.7	12 27.9		5	20.8	3 8.3	7 13.2	4 11.1	3		14.3		
61-65	3 3.7	8 12.9	8 18.6		2	8.3	3 8.3	8 15.1	0	4		19.0		
66-70	3 3.7	4 6.4	6 13.9		2	12.5	3 8.3	6 11.3	10 27.8	4	1	23.8		
71-75	3 3.7	5 8.1	5 11.6		4	16.7	1 2.8	0	5 13.9	4		19.0		
76-80	2 2.5	4 6.4	0		2	12.5	1 2.8	1 1.9	0	5		23.8		
81-85	0	0	0		1	4.2	0	0	0	0		0		
86-90	0	0	1 2.3		1	4.2	0	0	0	0		0		
91-95	0	0	0				0	0	0	0		0		
Totals	80	62	43		22	2	36	53	36	20	1			

PAROCHIAL SCHOOLS.

11-15	0		0		0		0		1 2.7	0		0		
16-20	2 5.7	0	0		0		0		1 2.7	0		0		
21-25	1 2.8	0	0		0		1 4.2	0	0	0		0		
26-30	0	0	0		0		1 4.2	1 2.7	2 3.9	1		3.6		
31-35	4 11.4	6 11.3	2 3.2		1	3.1	3 12.5	6 16.2	2 3.9	0				
36-40	9 25.7	4 7.5	5 8.1		1	3.1	1 4.2	4 10.8	2 3.9	2		7.1		
41-45	7 20.0	5 9.4	5 8.1		2	6.3	6 25.0	3 8.1	2 3.9	1		3.6		
46-50	3 8.6	10 18.9	7 11.8		1	3.1	2 8.3	4 10.8	6 11.7	0				
51-55	3 8.6	10 18.9	11 17.7		5	15.6	1 4.2	7 18.9	11 21.6	4		14.3		
56-60	2 5.7	4 7.5	12 19.3		8	25.0	2 8.3	5 13.5	7 13.7	0				
61-65	2 5.7	8 15.1	8 12.9		2	6.3	5 20.8	1 2.7	5 9.8	6		21.4		
66-70	2 5.7	5 9.4	2 3.2		3	9.4	1 4.2	2 5.4	3 5.9	4	1	17.9		
71-75	0	1 1.9	3 4.8		6	18.7	1 4.2	2 5.4	6 11.7	4		14.3		
76-80	0	0	5 8.1		1	3.1	0	0	1 2.0	2	1	10.7		
81-85	0	0	2 3.2		1	3.1	0	0	4 7.8	1	1	7.1		
86-90	0	0	0		1	3.1	0	0	0	0		0		
91-95	0	0	0		0		0	0	0	0		0		
Totals	35	53	62		32		24	37	51	25	8			

*One omitted. Tests incomplete.

Distribution of Average Percentile Ranks.

Age	Physical Tests				Mental Tests			
	Boys		Girls		Boys		Girls	
	14	15	14	15	14	15	14	15
11-15	0	1	1	1	1	0	1	1
16-20	1	1	1	2	3	2	5	1
21-25	3	1	6	2	5	1	6	3
26-30	11	6	7	6	15	4	9	7
31-35	28	28	16	18	25	26	15	23
36-40	28	30	21	14	38	38	27	17
41-45	43	35	33	28	46	40	32	25
46-50	57	49	47	44	35	39	26	27
51-55	62	50	43	36	54	54	44	44
56-60	50	56	44	31	64	69	46	31
61-65	53	43	35	40	49	41	36	32
66-70	39	32	26	31	34	28	25	35
71-75	28	25	26	19	28	27	28	23
76-80	18	17	17	9	17	15	21	11
81-85	11	12	10	4	18	4	8	6
86-90	8	2	2	1	9	3	4	0
91-95	2	3	0	1	1	0	0	0
Total No. Cases	442	391	335	287	442	391	333	286

Percentile Table of Average Percentile Ranks.

	Physical Tests				Mental Tests			
	Boys		Girls		Boys		Girls	
	14	15	14	15	14	15	14	15
Lower Limit	19.0	14.0	13.0	10.0	15.0	17.0	15.0	11.0
5	31.3	31.9	30.5	30.9	29.3	32.4	27.6	30.5
10	37.2	38.3	35.6	34.9	34.0	36.8	34.1	33.6
20	42.0	41.6	42.3	42.6	40.1	40.9	40.6	41.0
30	46.6	46.6	46.6	46.7	45.0	45.8	45.9	46.6
40	50.5	50.5	50.2	50.0	50.8	50.6	51.4	51.2
50	54.0	54.4	54.1	54.0	54.9	54.2	55.2	54.4
60	58.3	58.0	58.0	58.4	58.4	57.2	58.8	58.8
70	62.5	61.9	62.2	62.4	62.4	60.1	63.1	63.3
80	67.3	66.5	67.7	66.2	69.2	64.8	68.9	67.8
90	74.1	74.0	74.1	71.4	75.2	71.8	74.9	72.5
95	79.7	79.2	78.6	75.4	81.6	75.8	78.9	76.2
Upper Limit	94.0	92.0	88.0	92.0	93.0	89.0	88.0	85.0

GRAPH I. Average percentile ranks in physical tests, 14 years. Boys.

GRAPH II. Average percentile ranks in physical tests, 14 years. Girls.

GRAPH V. Average percentile ranks in mental tests, 14 years. Boys.

GRAPH VI. Average percentile ranks in mental tests, 14 years. Girls.

GRAPH VII. Average percentile ranks in mental tests. 15 years. Boys.

GRAPH VIII. Average percentile ranks in mental tests. 16 years. Girls