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## EDUCATIONAL AGE AS A BASIS FOR MEASURING RETARDATION

THE science of education is in its infancy, but some of its practices are already verging on senescence. One of these is the common age-grade method of computing what is known as retardation. This method has rounded out a quarter of a century of distinguished service in the field of child accounting, and has now passed the period of its greatest usefulness. In the measurement of retardation, according to the evidence hereinafter supplied, it should be replaced by a more reliable method based on educational age instead of chronological age.

When the late Superintendent Maxwell,

of New York City, made his suggestive study of retardation in 1904, he inaugurated not only a method, but indeed a movement. His method, refined by Thorndike, Ayres, and Strayer, has become a standardized procedure in school surveys, while the results of its application have offered a point of departure, in fact, a foundation, for the scientific study of school administration. On the whole, the studies of retardation, based on the relation between chronological age and grade position of pupils, have made a splendid contribution. When, however, one examines the reports of recent surveys, one finds it hard to escape the impression that this type of study has somehow taken a secondary place since the advent of the testing movement. This is not to say that it has been completely superseded. Age-grade investigations, as one writer contends, furnish "a quantitative statement of output as compared with intake." That is, they provide an index of the holding power of the school. It will, no doubt, be conceded that they are exceedingly valuable for this purpose, and that such an index has an important place in the comparative study of school systems.

The point to which attention will be given in this paper, is the use of this method in the measurement of retardation. The method grew up in the days when the principal basis for the classification of pupils in the public schools was chronological. The supposition was that all pupils should enter at about 6 years of age, and that normalcy consisted in advancing one grade per year thereafter. When a school system was found to have a third or more of its pupils moving behind the normal pace, the usual conclusion was that many, if not all, of these so-called retarded pupils were classified where they ought not to be. The classification resulted, of course, from the common administrative device of using chronological retardation as a means of adjusting the pupil to the school régime. Following the revelations of age-grade investigations,



there was a long period of attempts to increase the promotion rate and correspondingly reduce the amount of retardation under condemnation. The process of reduction, however, has not, according to Strayer and Engelhardt,<sup>1</sup> been highly successful,

tional status. The writers of this paper have made a comparative study of the retardation of the same pupils as measured by three different methods:

1. By the interval between chronological age and grade position;

TABLE I

THE RELATION BETWEEN EDUCATIONAL AGE AND GRADE PLACEMENT IN FOUR SCHOOLS OF RACINE, WISCONSIN

Grade	AGE																			Total	No. Accelerated	No. at Age	No. Retarded	Percentage Accelerated	Percentage at Age	Percentage Retarded					
	9	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	15½	16	16½	17	17½	18								18½				
	to	to	to	to	to	to	to	to	to	to	to	to	to	to	to	to	to	to	to								to				
	9½	10	10½	11	11½	12	12½	13	13½	14	14½	15	15½	16	16½	17	17½	18	18½	19											
4B	3	2	3	7	2				1												18	0	5	13	0.0	27.8	72.2				
4A	1	10	23	39	24	17	6	3		1											134	1	33	100	0.8	24.6	74.6				
5B		4	10	43	29	30	9	3	1		1										120	4	53	73	3.1	40.8	56.1				
5A			1	9	31	35	41	20	10	4		1									152	10	66	76	6.6	43.4	50.0				
6B				3	5	13	20	21	14	5	3	2	3								89	8	33	48	9.0	53.9	37.1				
6A					1	4	16	27	33	35	13	8	10	4	3						154	21	60	73	13.6	39.0	47.4				
7B						1	5	15	10	16	2	3	6	3	2	4					65	19	26	20	29.2	40.0	30.8				
7A							1	2	15	26	31	19	19	10	7	5					135	18	57	60	13.3	42.2	44.5				
8B								1	2	8	20	22	21	9	16	24	14	9	4	2	2	154	31	43	80	20.1	27.9	52.0			
8A									3	8	13	9	18	21	20	20	17	8	8		1	1	147	24	27	96	16.3	18.4	68.3		
9B										2	10	13	8	15	17	26	27	16	10	5	2	151	35	32	86	21.8	21.2	57.0			
9A											1	3	9	14	13	31	33	45	84	41	10	2	4	3	243	40	64	139	16.5	26.3	57.2
Total	4	17	49	130	136	152	128	148	114	86	94	105	115	76	63	25	6	5	4		1572	209	499	864							
Average Percentage																									12.5	33.8	53.7				

EDUCATIONAL AGE AND GRADE PLACEMENT SO METIMES SHOW IRRECONCILABLE DIFFERENCES

for, they remark, "Although the success of a school or school system is indicated in large measure by the ability of such a school or system to permit children to progress at a normal rate, decreases in the percentage of children making slow progress have not been made in many school systems over periods of years."

This situation leads one to suspect that something is to be said in favor of the common practice of the schools. Certainly when Terman and his students demonstrated that the most retarded pupils are the most accelerated, there was evidence enough that the chronologically retarded were receiving even more than their full share of instruction.

Terman was primarily interested in showing the relation between mental and educa-

2. By the interval between mental age and grade position;

3. By the interval between educational age and grade position.

The data for the investigation were kindly made available by Professor A. S. Barr, director of the Racine school survey. They consisted of the chronological age, the grade position, and the scores on both intelligence and achievement tests, of 1,572 pupils in four schools of Racine, Wisconsin. In two of these schools the grades studied were 4B to 9A, inclusive; in two, 4A to 6A. The intelligence scores represented the results on the Otis Self-Administering Test of Mental Ability, Intermediate Examination, Form A; the achievement scores, the results on the Stanford Achievement Test, Advanced Examination, Form A.

The mental and educational ages of each

<sup>1</sup>G. D. Strayer and N. L. Engelhardt, *The Classroom Teacher*, p. 143. (1920.)



pupil were derived from the test scores in years and months. With the chronological age in similar form, three comparable ages of each pupil were available for comparison with grade position. Age-grade tables of three types were prepared for each of the four schools separately and for all combined, as follows:

1. Tables based on the relation between chronological age and grade;
2. Tables based on the relation between mental age and grade;
3. Tables based on the relation between educational age and grade.

In each of the retardation tables a one-year span was used for each half grade.<sup>2</sup> The form of the tables is illustrated by Table I which shows the relation between the educational age and the grade placement of the 1,572 pupils studied.

The facts in the three sets of tables are summarized in Table II in percentage form.

This table shows the percentage of acceleration, normality and retardation according to the chronological, mental, and educational ages of the pupils in each of the four

normal according to mental age. Retardation is greatest in all the schools when measured by educational age, and least in all except one when measured by chronological age. These pupils are therefore least accelerated and most retarded in educational age, and the classification is most nearly normal with respect to chronological age.

The results just described are probably to be expected in a period when grade position is still determined so largely by chronological age. Under the influence of the testing movement, however, situations like this are being rapidly clarified. Investigations have been gradually making it clearer that the classification of pupils is to be judged primarily not by chronological age, nor indeed by mental age, nor intelligence quotient, nor teachers' marks, nor personal traits, nor physical condition, important as each of these is in its proper place. It is to be judged by objective measures of educational attainment, and the most convenient form for these measures is probably educational age.<sup>3</sup>

TABLE II. THE AVERAGE PERCENTAGES OF PUPILS IN THE ACCELERATED, AT-AGE, AND RETARDED GROUPS ACCORDING TO CHRONOLOGICAL, MENTAL, AND EDUCATIONAL AGE

School	Percentage Accelerated			Percentage at Age			Percentage Retarded		
	C. A.	M. A.	E. A.	C. A.	M. A.	E. A.	C. A.	M. A.	E. A.
A	14.7	34.1	17.0	54.1	29.3	34.4	31.2	36.6	48.6
B	24.4	24.8	12.0	46.0	21.9	33.5	29.6	53.3	54.5
C	13.4	28.1	4.0	64.9	25.3	29.2	21.7	46.6	66.8
D	8.6	43.9	2.4	43.0	27.5	38.8	48.4	28.6	58.8

schools. In each school, it will be observed, the highest percentage of acceleration is in mental age, and in all except one the lowest is in educational age. Again, in each of the schools the highest percentage is normal, according to chronological age, and the lowest

In Table II one can see the difference in results when educational age is used in place of chronological age in a study of the classification or grade position of the same pupils. Turn, for example, to School C in this table. On the chronological basis, 13 per cent of the pupils are accelerated, 65 per cent are at age, and 22 per cent are re-

<sup>2</sup>No attempt was made to determine the relative merits of methods in common use, such as the one-year span, two-year span, etc. The problem of the study was to determine the difference in results when educational age and mental age are used instead of chronological age in the calculation. So far as span is concerned, the requirements of the present problem are met by keeping this constant for the different ages.

<sup>3</sup>One of the recent experimental studies lending support to this view is A. D. Hollingshead's *An Evaluation of the Use of Certain Educational and Mental Measurements for purposes of Classification*. Teachers College Contributions to Education, No. 302, New York (1928).



tarded. By the older standard, this school would be regarded as in a very satisfactory condition. Now examine the placement of these pupils in relation to educational age. Four per cent are accelerated, 29 per cent are at age, and 67 per cent are retarded. This well shows how misleading a judgment of classification based on the traditional age-grade data may be, and suggests the need for a more scientific criterion. The findings

The next problem of the study was to determine to what extent the groups accelerated, normal, and retarded according to one age are identical respectively with the groups accelerated, normal and retarded according to each of the other ages. The aim was to get a precise answer to such questions as the following: If 30 per cent of the pupils in a given school are retarded chronologically and 30 per cent education-

TABLE III. PERCENTAGES OF IDENTITY IN ACCELERATED, AT-AGE, AND RETARDED GROUPS OF A SAMPLE GRADE MEASURED BY CHRONOLOGICAL AND EDUCATIONAL AGES

Group	Chronological Age	Educational Age	No. Identical in Both	No. Non-identical	Percentage Identical	Percentage Non-identical
Accelerated .....	10	3	0	13	0.0	100.0
At-Age .....	15	14	5	19	20.8	79.2
Retarded .....	10	18	3	22	12.0	88.0

TABLE IV. AVERAGE PERCENTAGES OF NONIDENTITY IN CHRONOLOGICAL-AGE AND EDUCATIONAL-AGE GROUPS IN FOUR SCHOOLS

Group	4A	5B	5A	6B	6A	Grade 7B	7A	8B	8A	9B	9A	Av'g.
Accelerated ...	100.0	98.8	91.7	100.0	100.0	100.0	94.9	100.0	100.0	100.0	94.4	98.2
At-Age .....	86.1	78.8	73.3	73.3	69.6	86.2	65.5	81.4	80.4	81.7	82.7	78.1
Retarded .....	81.1	93.0	87.8	79.3	92.1	92.1	81.5	94.3	87.4	83.5	93.1	87.7

TABLE V. AVERAGE PERCENTAGES OF NONIDENTITY IN CHRONOLOGICAL-AGE AND MENTAL-AGE GROUPS IN FOUR SCHOOLS

Group	4A	5B	5A	6B	6A	Grade 7B	7A	8B	8A	9B	9A	Av'g.
Accelerated ...	90.4	94.2	92.4	100.0	90.6	100.0	91.6	97.2	96.4	96.0	87.4	94.2
At-Age .....	80.1	69.4	76.9	85.5	74.4	89.4	78.6	84.5	90.7	83.4	83.2	81.5
Retarded .....	88.5	95.3	88.9	81.3	91.6	84.4	80.5	84.8	85.8	80.4	91.3	86.6

TABLE VI. AVERAGE PERCENTAGES OF NONIDENTITY IN EDUCATIONAL-AGE AND MENTAL-AGE GROUPS IN FOUR SCHOOLS

Group	4A	5B	5A	6B	6A	Grade 7B	7A	8B	8A	9B	9A	Av'g.
Accelerated ...	100.0	94.7	88.5	85.6	73.9	57.0	61.4	48.7	56.5	54.2	61.9	71.1
At-Age .....	89.9	81.7	80.8	83.2	61.3	69.6	81.4	82.3	84.5	77.0	70.7	78.4
Retarded .....	48.6	48.7	78.0	40.7	47.3	55.3	50.7	35.4	30.1	39.8	34.2	46.3

suggest, in fact, that the technique of educational surveys may be appreciably improved by the introduction of a new type of table based on the relation between educational age and grade position. The educational ages of the pupils would be derived in years and months from the best educational achievement test now available, namely, the Stanford Achievement Test, and the chronological ages would be obtained in the same form by any reliable method. With these two sets of data, the process of constructing the table is the same as that used in the familiar age-grade investigation, and is illustrated in Table I.

ally, to what extent are identical pupils involved? The procedure in this part of the study is probably too tedious for most survey purposes, but has value in throwing light on the nature of the indices obtained by the different methods.

In each grade and school the accelerated groups were compared as follows:

1. The chronologically accelerated with the educationally accelerated;
2. The chronologically accelerated with the mentally accelerated;
3. The educationally accelerated with the mentally accelerated.

Similar comparisons were then made



among the various normal and among the various retarded groups. In the case of any two compared groups the number of identical and nonidentical pupils was determined. The percentages that appear in the following tables are based on the total number of different individuals found in any two compared groups. For example, if

$I$  = Number of identical pupils  
and

$D$  = Number of nonidentical pupils,  
then

$I + D$  = Number of different pupils in  
both groups;  
hence

$\frac{I}{I + D}$  = Percentage of identical pupils,  
and

$\frac{D}{I + D}$  = Percentage of nonidentical  
pupils.

The percentage,  $\frac{I}{I + D}$  represents the proportion of the whole number of different individuals in two compared groups, who appear in both groups.

Table III will indicate how the data for a single grade was compiled. This table shows the number of pupils in a 7B group who are accelerated, normal, and retarded, first in chronological age, and second in educational age. Then follow data on the identity of personnel in the two groups. It will be observed, for example, in the last row of the table, that 10 pupils are chronologically retarded, and 18 educationally retarded, but that only 3 of the 25 different pupils involved belong in both groups, which gives an identity of 12 per cent.

Tables IV, V, and VI show the average percentages of nonidentity in compared groups for the 1,572 pupils in the four schools. In Table IV the comparison is between chronological age and educational age; in Table V, between chronological age and mental age; and in Table VI, between educational age and mental age. The most

significant percentages are found in the last column of each table. The results show that computations of retardation based on chronological age are in extreme disagreement with those based on educational age and on mental age. The percentage of nonidentity is 88 in the one case, and 87 in the other. The disagreement in the results is even greater for the accelerated groups, where the percentages are, respectively, 98 and 94. It is clear, therefore, that readjustment of the classification of these pupils on the basis of the older studies would be in almost complete violation of modern scientific principles, complete in the sense that acceleration or retardation on the chronological principle would advance or detain almost none of the pupils that should be advanced or detained. This does not mean that chronological age is a matter of inconsequence in classification, but that it is a matter of relatively minor consequence. It means also that the older definition of retardation has quite clearly led to an overemphasis on and an exaggeration of the evils of chronological retardation. Our attention needs just now to be centered on educational retardation.

The basal viewpoint of Ayres<sup>4</sup> was that "it is the mission of the common school to give as large a proportion of the children of the community as possible a complete elementary education." This statement might well be revised to read: It is the mission of the common school to give each child the most profitable training possible during the period of compulsory attendance. With multiple-track plans and homogeneous grouping, with minimal essentials and a policy of enrichment, or with minimal essentials and a policy of acceleration, the schools now seem happily on their way to a solution of the retardation problem. In the opinion of the writers, the administrative devices that will contribute most to its solution are the measurement of retardation on

<sup>4</sup>L. P. Ayres, *Laggards in Our Schools*, p. 217. New York: Charities Publication Committee, 1909.



the basis of educational age rather than chronological age, and a properly differentiated curriculum.

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### SUNDAY AT COLLEGE

**T**HE *Harkness Hoot*, the most provocative of college magazines, which invented the term "girder Gothic" for the current gargoylism of college architecture, has turned its attention to the college Sunday and the week-end exodus from all campuses, great and small. Its suggestions are picturesque—a brass band morning concert (we hope with little tables) in the quadrangle, church services with some ritual and pomp to them, visiting speakers who can lift the undergraduate mind from its week-day rut, orchestral music, and in general enough excitement to induce by Sunday evening a much needed weekly rest. It does not, one admits, sound like a Cambridge or a New Haven Sunday, and has little resemblance to Herbert's—

Sweet day, so cool, so calm, so bright!  
The bridal of the earth and sky.

Yet the picture is not without its attractions, although a brass band in the morning would probably get crockery instead of clapping from the dormitory windows.

The writer of the article in question is gently ironical; even so, he seems to betray some of that dependence of moderns upon noise and rapid movement which psychologists are noting. Can academic dullness be cured by doses of metropolitanism? If the English biographies and studies of Victorianism now appearing are to be trusted, it was certainly not dull in Oxford or Cambridge of the '60s, '70s, and '80s, even on Sundays. Was the reason perhaps the presence of the Victorian don, whose disappearance Mr. Benson and Mr. Wingfield-Stratford and Lord Balfour have all lately deplored?

They were great scholars, some of those dons, and some were not. They were great men, nationally distinguished some of them (Lewis Carroll, Walter Pater, Matthew Arnold, Benjamin Jowett), and some of them were great men but only local celebrities. It would be difficult to fit them with a general description, for they were individual to eccentricity, and Benson in his "As We Were" records almost unbelievable episodes. Yet they had certain traits in common, one of which was a confident assurance in the worth of the intellectual life and the dignity of their profession. They were not to be classified as we classify today—as classicists, chemists, professors of English—but rather as Influences, prejudiced often, pervasive always, sincere, and powerful.

The success of the rusty and often anachronistic educational program of the Victorian period, with its slipshod methods, and blind narrowness, was due, it would seem, almost entirely to these men. They were an educational experience in themselves.

We have such men now, but there is a widespread feeling that, when they are in the universities, they are overburdened by executive work, kept aloof on lecture platforms, or driven into the solitude of research work. It would be more accurate to say that the American desire to educate everybody has made the teacher a slave to his mark book, while the demand for specialization has sharpened the scholar into a keen but exceedingly narrow instrument, which blunts if used for anything but the most specialized operation. Yet the great classicists of the Victorian age dealt in a specialty which could be and often was of a narrowness beside which physics or romance literature seems broad. No, there are other explanations for the dearth of intellectual personalities, one of which may well be that decay of responsibility for life seen steadily, to quote a Victorian don, and seen whole, which began when our col-