

E138

A SCALE FOR MEASURING THE QUALITY OF HANDWRITING OF ADULTS

LEONARD P. AYRES, PH.D.



DIVISION OF EDUCATION
RUSSELL SAGE FOUNDATION
130 EAST TWENTY-SECOND STREET, NEW YORK CITY

Price 5 Cents

I-15-20

Monograph

A Scale for Measuring the Quality of Handwriting of Adults

In June, 1914, the Municipal Civil Service Commission of New York City requested the Division of Education of the Russell Sage Foundation to aid in the development of some means of measuring the quality of handwriting of the candidates for positions in the city's service. After considerable preliminary experimenting, the Division of Education undertook the preparation of a scale for measuring the quality of handwriting of adults and actively began work on the project in October. This report presents the scale which has been produced.

The scale is a sheet of paper measuring nine by 36 inches and having eight divisions from end to end. In each division samples of handwriting are reproduced. Proceeding from left to right along the strip, these samples are of progressively better quality so that they range by equal gradations from samples of very poor writing at the left end, to those of fair quality in the middle, and to writings of excellent quality at the extreme right end of the strip.

The samples of writing reproduced in each of the eight divisions are of such qualities that each one is as much better than the one in the preceding division as that is better than the one in the next division to the left. That is to say, all of the steps in quality are approximately equal. These samples have been assigned the values 20, 30, 40, 50, 60, 70, 80, and 90.

In order to measure the quality of any given sample of handwriting, all that is necessary is to slide it along the scale until one finds a writing of similar quality. By looking at the top of the scale the number corresponding to this quality will be found and this number represents the value of the writing being measured.

To facilitate this measuring, there have been reproduced in each of the eight divisions samples of vertical, medium slant, and extreme slant writing, all three of equal value. Thus the sample being measured may be compared with samples on the scale of

the corresponding style of slant. The three slants used on the scale include over 95 per cent of the ordinary writings of adults.

To aid in comparison between the writings being measured and the writings on the scale, the reproductions have been printed in dark blue ink which closely corresponds in color to the ink most commonly used in writing.

DETERMINING THE VALUE OF SAMPLES

The value of the samples reproduced at each of the eight points on the scale has been determined by means of a scale for measuring the quality of children's handwriting which was published by the Division of Education in 1912.* This earlier scale was the product of a study of the legibility of 1,578 samples of the handwriting of children of the upper elementary grades of 40 school systems in 38 states. The degree of legibility of the samples was ascertained by a series of 15,780 accurately timed readings made by 10 paid investigators. The quality of each sample of writing was determined by its degree of legibility as shown by these readings, the assumption being that those writings are best for practical purposes which can be most easily read.

The investigation demonstrated that as the legibility of handwritings increases, their appearance improves. Thus in the case of the present scale, as one proceeds from left to right, the samples of handwriting are progressively of increasing legibility and they are also of progressively improved appearance. Those at the extreme left end are relatively illegible and far from good-looking, while those at the other extreme are both highly legible and very good-looking. It is not always true, however, that those of good appearance are the most legible. The rule does not always work both ways.

Analysis of good-looking writings of low degree of legibility shows that their most common shortcoming is the crowding together of the words on the line. Probably the characteristic second in importance in making for illegibility is too close spacing between the lines. Another common fault of good-looking writings that are difficult to read is the breaking which results from lifting the pen in the middle of words in such a way as to make one word look at first glance like two words. The absence of dots

* A Scale for Measuring the Quality of Handwriting of School Children. 16 pp. 1912. Division of Education, Russell Sage Foundation, 130 East 22nd Street, New York City.

over the i's and crosses on the t's is also a common and important shortcoming of good-looking writings that are difficult to read.

The practical utility of legibility as a criterion for judging the merit or value of handwritings has been well illustrated by the extensive and varied classroom use of the scale for measuring the quality of children's handwriting. In the three years since this earlier scale was published, it has been widely tested in school systems throughout the country. It has run through six editions, aggregating more than 16,000 copies, and some faults brought to light by the tests of practical application have been remedied as the successive editions have appeared.

DEVELOPING THE NEW SCALE FROM THE OLD ONE

In selecting the individual samples to be reproduced on the new scale, three objects were steadfastly sought. The first was to select samples of such qualities that the progressive steps in value from poorest to best should be equal as measured by the steps of the former scale. The second was to select the three samples of vertical, medium slant, and extreme slant at each point so that they should all be of equal value. The third object was to select for all the samples at all of the points, writings of a character and general appearance commonly met with among the writings of adults, and carefully to avoid reproducing writings of the requisite value but of unusual appearance.

It is certain that many who use the scale will be of the opinion that these results have not been successfully attained, but it is probable that these critics could not agree among themselves as to just which specimens are too good or too poor for the positions they occupy on the scale. After all of the samples had been chosen for the final copy, the scale was submitted separately to each of the 10 judges who had participated in its development with the request that he or she indicate any sample of writing that seemed to be of too good or too poor a quality for the position it occupied. The result was that each of the 10 judges indicated such a sample which seemed to be of the wrong quality but said that all the rest of the samples were well chosen and that little fault could be found with them. Each one located the weak spot at a different point. The 10 judges chose 10 different samples which they thought were too good or too poor for their positions. This evidence of collective agreement combined with individual disagreement well illustrates the value of objective means of measurement.

It might seem that to select 24 samples of handwriting that would conform to these specifications would be a relatively simple task, but it proved instead to be a long and difficult one.

Samples of handwriting were first secured from the correspondence files of the Municipal Civil Service Commission and those of the Russell Sage Foundation. These were rated by 10 people of whom nine are employees of the Foundation and the tenth Anna M. Crocker, an experienced examiner in the employ of the Civil Service Commission and detailed by that body to assist in the work. Of these 10 judges, six may fairly be considered as expert in judging the quality of handwriting. The ratings of the samples were made by means of the old scale.

The first work consisted in the careful rating of 100 samples. It at once developed that a much wider range of qualities and styles would be required, and the number of samples from the files of the two organizations was accordingly increased to 1,000. When these had been rated, it was found that samples of all the desired qualities had been secured but that some of them were too unusual in general appearance to be satisfactory candidates for reproduction on the final scale.

The number of samples was accordingly further increased from the files and by securing writings from the Bushwick High School, the Commercial High School, and the Heffley Institute of Brooklyn, the Wood's Business School of New York City, the Eastman Business College of Poughkeepsie, and from the office of the correspondence editor of the New York Globe. The total number of samples of writing thus collected and used in making the new scale was 2,817. Of the 24 samples finally selected and reproduced on the printed scale, 13 are from the files of the Civil Service Commission, seven from those of the Foundation, two from the correspondence of the Globe, and two were written by teachers in the schools.

CLASSIFICATION BY STYLE

As in the investigation which produced the earlier scale, so in the present study, experiments were made in classifying the samples according to the style of the letters. The first attempt was to classify the writings according to the heaviness or thickness of the lines used in forming them. This was found to be impracticable. Among each hundred samples the readers selected only three or four as being written with notably light lines and only four or five as being written with distinctly heavy strokes.

As in the earlier study, an attempt was made to classify the samples as being written with large, flowing letters, medium sized ones, or small, compact letters. Large variations in the size of the letters were found, but less than 10 per cent of the whole number of samples could be classified as written in letters either notably large and flowing, or small and compact. A similar result was obtained when the attempt was made to classify the writings according as the letters were characteristically angular or circular.

The final solution came through basing the classification of style on the slant of the letters. Five classes were defined by sorting the samples into groups termed "vertical", "medium slant", "extreme slant", "backhand", and "mixed".

On the basis of these groupings, "vertical writing" was defined as writing in which the characteristic slant lay between 90° and 80° from the horizontal. The range of "medium slant" was defined as between 80° and 55° , and "extreme slant" was defined as ranging from 55° downward. "Backhand" was defined as being any writing in which the characteristic slant of the letters was to the left of vertical, and "mixed" was a writing composed of two or more styles. For purposes of convenient classification, vertical writing was designated as "A", medium slant as "B", extreme slant as "C", backhand as "D", and mixed as "E".

On the basis of this classification, protractors were constructed of transparent celluloid and with their aid each of the 2,817 samples was rated on the basis of the slant of the letters. Since the same process was followed and the same criteria used in classifying the samples of children's handwriting in the earlier investigation, it is interesting to compare the two sets of results. These two sets of classification of writing according to slant are as follows:

Slant	Children's writings		Adult writings	
	Number	Per cent	Number	Per cent
Class A (vertical)	255	16.2	262	9.3
Class B (medium slant)	670	42.5	1,830	65.0
Class C (extreme slant)	580	36.7	585	20.8
Class D (backhand)	27	1.7	63	2.2
Class E (mixed slants)	46	2.9	77	2.7
Total	1,578	100.0	2,817	100.0

EQUAL STEPS ON THE SCALE

As has already been explained, the steps on the new scale were determined by measuring the qualities of the samples of adult writing by means of the scale for children's writing. The quality of the writing located at each of the eight points on that scale was determined by calculations based on the comparative degree of legibility of the different samples as indicated by the rate at which they could be read by 10 readers. The final result was a scale objectively representing seven-tenths of the range of quality of children's writing from a theoretic zero, which would be a quality so very bad as to verge on complete illegibility, to a theoretic 100, which would be so excellent as to approximate a copy-book standard. On this scale quality 50 represents the average quality of writings found in the upper grammar grades of our city school systems and in a very real sense quality 60 is twice as good as quality 30, while quality 40 is only half as good as quality 80.

In possessing this characteristic of representing relationships in the same way that numbers in ordinary arithmetic represent relationship, the values on the scales differ from the per cents usually given as school marks or as marks in rating papers submitted to Civil Service Commissions and other examining boards. In ordinary school marking, 50 does not represent work only five-ninths as good as another piece of work which is marked 90.

In most schools, colleges, and examining boards, a mark of 50 is but seldom given. In practice the marks given are apt to range from something less than 100, which represents, not perfection, but rather the accomplishment of the best child in the class, or the most proficient candidate, down to about 60, which represents failure. The part of the marking scale from 60 down to zero is but little used except for marking such work as that in spelling and arithmetic and even then the marks usually do not represent what they appear to.

RELATION OF SCALE RATINGS TO CIVIL SERVICE RATINGS

Since the ratings on the scale represent seven out of 10 equal steps in progression from writings of zero quality, or approximately no value, to those of 50, or average quality, to those of 100 quality, or approximate perfection, and since ordinary Civil Service ratings represent something very different, an attempt

MEASURING SCALE FOR ADULT HANDWRITING

	60	20	65	30	70	40	75	50	80	60	85	70	90	80	95	90
A	History x In the for the men were ask dates which were from among those high school x am	Turn the clock immediately or in case Ben needed or for- and as is happened when I h a check on him for Buster I have to use it. Therefore the	About six weeks ago Mrs. Anne who is National President of the A.P.C. and who lives in San Francisco, sent letter to Mr. G. Lane asking if they any chance of co-operation from the	I beg to make application in the examinations to be held under sion of the Municipal Civil Service Com- mission. I am at present attending Columbia University and have done proctoring several other examinations outside of	David is facing a heavy job. It is adding columns of plus and minus finding the averages. May I suggest papers to New York some Sunday machine? It would save him hours works every night, four hours at a	Eleven men were given amination in American and It was decided to give them in French, German and Danish history. In the first examination	Eleven men were given a short American and English history. It give them a test later on in French Danish history. In the first exami- were asked to identify ten dates with	I beg to be considered among applicants for the position of at the Civil Service Examination New York City. At present, I am student at Columbia University								
B	In the census facts hoping to see expression of what could be done to certain things which appear to be and practice. Won't you let written to a number of others	Having heard that an for interpreter is going place this month, I want you to be kind enough oblige me with an	I have performed such for the College Entrance Board great many times. My reference for that work is Prof. T. B. S. Columbia University. Mr.	at Barnard College. I like to obtain a position monitor at Civil Service aminations. Will you be know if there is an open	Kindly send me application blank for the examination for Draftsmen and all necessary information regarding same and obli-	Will you kindly send me an application examination to be taken clerk? I am desirous municipal service	Eleven men were given amination in American tory. It was decided to give later on in French, German history. In the first exami-	In the first exami- men were asked to which were selected given in the high tions as necessary to								
C	enemies, one these real = any any of Irish history known Hated prevails on 20% place would reign in Ire- with a local Parliament. Belast. In 1845 = 1 on	to the strike of Westing employees in Pittsburgh for cell their union. The A. Congenial Union, Permit to correct you on that.	got transfer from stable 13. 2 months ago transfer for stable 9. I moved to 531 Varick Street I wish to go Because it runs to my 11.	I am informed conduct your examination employment to some other Please accept the cation for a place of	Enclosed you will please find a stamped envelope will please be so me an application blank Thanking you in ad-	I desire to make applica- for a position as proctor in the conduct of the examinations given by board. The experience that	Eleven men were given examination in American history. It was decided test later on in French Danish history. In the	In the first exami- were asked to identify were selected from a in the high school necessary to be heard								

was made to find out what relationship existed between the two sets of ratings. By comparing the ratings given to writings by the Civil Service examiners and the ratings of the same writings as shown by the use of the measuring scale, it was found that the range from 20 to 90 on the scale was approximately equal to that from 60 to 95 in the markings given by the examiners before the scale had been developed. The correspondence at each point was about as follows:

Quality as rated by scale	Quality as rated by examiners
20.....	60
30.....	65
40.....	70
50.....	75
60.....	80
70.....	85
80.....	90
90.....	95

In order to make the use of the scale possible without a radical readjustment of the marking system now in use in the offices of the Commission, it was necessary to indicate on the scale the values as commonly rated by the examiners as well as those as determined by the investigation which produced the scale. Accordingly there has been entered in the printed scale above each set of samples the number representing the quality according to the plan followed in the earlier scale, and in addition there is printed in smaller figures at the left the quality according to the marking practice of the Civil Service Commission.

THE USE OF THE SCALE

In scoring samples of handwriting, two methods are in common use. The first is for the scorer to compare each sample with the scale, decide the value of the handwriting, and mark the paper accordingly.

The second and better method is for the scorer to sort into separate piles all of the papers to be rated, putting in one pile those which he judges to be of quality 20, in another those judged as of quality 30, and so on for all the different qualities. He then carefully compares all of the papers in each pile with each other and with the samples of that value reproduced on the scale so as to make sure that he has not included in the pile any samples that might more justly be assigned to the next higher or lower

piles. This second method, while involving more work than the first, insures better results.

Still more trustworthy results can be secured without the expenditure of an unreasonable amount of time by having the scoring done by three persons simultaneously, of whom at least two must agree before the sample being judged is assigned a rating. Three people working together may use either of the two methods described above. Results so obtained are not so accurate as they would be if three or more judges rated all of the papers independently and the several sets of ratings were then combined so as to find their central tendency. On the other hand, by doing the work simultaneously, the results are far more rapidly obtained and are not greatly different in accuracy from what they would be if the ratings were made independently.

THE VALUE OF THE SCALE

It is hoped that the new scale will prove of value not only to the New York Municipal Civil Service Commission, but to other civil service commissions and examining boards, and to teachers who wish to measure the quality of adult handwriting. The purpose in developing it has been to produce a scale by which to determine *how much* better or worse one sample of writing is than another sample, to furnish a means whereby nearly uniform judgments may be made by the same examiner at different times, and to offer an instrument which will enable different people to proceed on a uniform basis in judging the quality of writing.

Persons using the scale must not expect that its use will insure uniformity in judgments derived through it. Three judges may rate a sample of handwriting which is of about average quality at 40, 50, and 60 respectively. Again, it is quite possible that one examiner will rate a sample as of quality 50 the first time that he examines it, and at some subsequent time may rate it at 60. The use of the scale does not and cannot guarantee uniformity. It will, however, be found that the disagreements arising when the scale is used to measure handwriting will be uniformly less than the disagreements will be when no scale is used.

It must be remembered that not only will differences such as those mentioned above be brought to light through using the scale, but that there are other differences which exist and which the scale will reveal. For example, the handwriting in the first

few lines of the ordinary letter is commonly of better quality than that of the body of the letter by from some five to 10 points as measured by this scale. In a similar way the same person will commonly produce handwriting of a better quality when writing a somewhat formal letter or examination paper than he will when making memoranda for his own use. This range of quality in the handwritings of the same individual is usually more than 10 points on the scale and not infrequently as much as 20, 30, or even 40 points.

In common with all measuring instruments, the scale for measuring the quality of handwriting falls short of insuring exact and uniform results, and in common with all measuring instruments it makes possible more exact and more uniform decisions than can be arrived at without measuring.

Pamphlet Publications of the Division of Education

(Numbers omitted are out of print)

- No. 61. The Relation of Physical Defects to School Progress. 9 pp. Price, 5 cts.
- No. 77. Why 250,000 Children Quit School. 30 pp. Price, 5 cts.
- No. 94. Measurements as Applied to School Hygiene. 7 pp. Price, 5 cts.
- No. 96. The New Attitude of the School Towards the Health of the Child. 8 pp. Price, 5 cts.
- No. 101. What American Cities Are Doing for the Health of School Children. 44 pp. Price, 15 cts.
- No. 107. The Binet-Simon Measuring Scale for Intelligence: Some Criticisms and Suggestions. 12 pp. Price, 5 cts.
- No. 108. The Identification of the Misfit Child. 11 pp. Price, 5 cts.
- No. 110. The Relative Responsibility of School and Society for The Over-Age Child. 6 pp. Price, 5 cts.
- No. 111. The Money Cost of Repetition Versus the Money Saving Through Acceleration? 12 pp. Price, 5 cts.
- No. 112. The Relation Between Entering Age and Subsequent Progress Among School Children. 9 pp. Price, 5 cts.
- No. 113. A Scale for Measuring the Quality of Handwriting of School Children. 16 pp. Report, 5 cts. Scale, 5 cts.
- No. 116. The Measurement of Educational Processes and Products. 9 pp. Price, 5 cts.
- No. E 124. A Comparative Study of Public School Systems in the Forty-Eight States. 32 pp. Price, 15 cts.
- No. E 128. Psychological Tests in Vocational Guidance. 6 pp. Price, 5 cts.
- No. E 130. The Effect of Promotion Rates on School Efficiency. 12 pp. Price, 5 cts.
- No. E 132. Fire Protection in Public Schools. 16 pp. Price, 10 cts.
- No. E 134. Open Air Schools. 16 pp. Price, 10 cts.
- No. E 135. Some Conditions Affecting Problems of Industrial Education in 78 American School Systems. 24 pp. Price, 5 cts.
- No. E 136. Constant and Variable Occupations and Their Bearing on Problems of Vocational Education. 12 pp. Price, 5 cts.
- No. E 137. A Survey of the Public Schools of Springfield, Illinois. 160 pp. Price, 25 cts.
- No. E 138. A Scale for Measuring the Quality of Handwriting of Adults. 11 pp. Report, 5 cts. Scale, 5 cts.
- Bulletin E. The Division of Education of the Russell Sage Foundation. 8 pp. No charge.

MEASURING SCALE FOR HANDWRITING

	20	30	40	50	60	70	80	90
A	Beard, his rusty fowler and army of name he who demanded hat co be willement his of	brated have I as much all cream and milk of bou roasted and shad broiled pears and peaches, and plus moreover, and by smoked pumpkin and pie, pear then and cakes sweet &c.	The appearance of Rip, heard, his rusty fowler and the army of name I who demanded hat co wildernment of his mada	Fain would I pause to dwell burst upon the enraptured ge every to justice ample did great so in not was here on on get to eager too am ar	He entered the house, wh had, always kept in ne General characters large and hat cocked a with c ceptre or of instead has	his by called city gre the upon eye gardia terprise his of scenes this in permitted be	The appearance of Rip, with his rusty fowling piece, his uncor of name his was what an id hat cocked the in man midst the m. Man another	We had not been home long w was heard from the distance A good before way gave soon ge Daughters their with romped the with gossiped cottage and
B	The great error in Rip's composition hands of profitable labor. It could not be conditioned worse the was it yet potatoe as left and a little was their wrist and by a had a state Patrimo, cal his through that	very refined had a rider furious a his of steel favorite a beam fact in judge maybe it, dog, his in mottled end of is a of gleam the last the the last section la bins with knotties and tangles were back much were a will, shopped and garment	The hair of the affrighted peo terror. What was to be done? utter not could he and mo tongue his true time pea am h him within sink to lega other his quack's nea however leaving of hopes in steel the	His school was a low building constructed of logs the window partly strong the of those m the of back off burden the is	The great error in Rip's compos aversion to all kinds of prof be for neighborhood the in fo was it yet potatoe and cor a than left more little wo management his under w	At length he reached to, w opened through the cliffs atre but no traces of lo brand his found he astor same the do to involu gesture this of recurrence	As Schabod jogged way his eye over o town of ordinary as with delight Under gesture this of recurrence	We had not been home of music was heard, f of country. hear good by guests the of bashful
C	world of the painting, f figures the of Rip van W then in voice with shot stocking red feather and hanger and felt brood	It was then on evening that he friend with he found the of unworthy as home to be need, his of his constant of hands all to give an air	The gallant hero now ap hour at his toilet brush his best country the in him in devil, lurking looked he as down bro into spent own his of so had and rider furious a	Schabod pride himself much as upon his ideal not a fibre about expl himself make to reco and fiction becoming	and ran into a ma traveller the upon monster gigantic the in up gathering	stranger's appearance square built familia and inspired that about incomprehe	It is the very wi night that he hear correctly. few ever words a loss the	was to pass long the old Dutch w turny time the that and round