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AGE AND GRADE NORMS FOR THE NATIONAL INTELLIGENCE TESTS, SCALES A AND B

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In June, 1920, the National Intelligence Tests, Scales A and B, Form 1, were given to all the pupils between the ages of eight and fifteen inclusive, who were present on certain days in the public schools of Vallejo, California. They were given by Dr. Terman, Superintendent A. C. Barker, and four members of the school force who had had experience in giving group tests. The scoring and tabulating were done by university students and high-school seniors who were paid for their time. Their work was carefully supervised by Miss Whitmire, but sufficient funds were not available to have the papers scored twice. All computations were carefully checked.

In all cases Scale A was given before Scale B. In about half the classes of grades v to viii both scales were given at a single sitting, broken only by a rest of five to ten minutes. This was recognized as undesirable but was unavoidable because the tests were made during the last week of the school year. In the other classes Scale B followed one day after Scale A.

Giving both scales at a single sitting does not, of course, affect the norms thus secured for the scale given first (Scale A), nor do we believe that it affected appreciably the norms for Scale B. It could only do so by making the norms too high (effect of practice) or too low (the effect of fatigue). In this case, since the tests of Scale B differ in kind considerably from those of Scale A, fatigue effects would ordinarily be expected to outweigh the practice effects. Whether they did so to any considerable extent can be answered by comparing for each grade and each age separately the ratio of the Scale B norm to the Scale A norm in our own data with the corresponding ratios secured at Washington and Pittsburgh, where in all cases Scale B followed Scale A by one day. These ratios are shown in Tables I and II. It will be seen that on the

¹ The "Age and Grade Standards (Norms)" as printed in the Manual of Directions accompanying the National Intelligence Tests were "based upon approximately 2,000 examinations made in Washington, D. C., and 2,000 made in Pittsburgh, Pennsylvania."

whole the ratios for the various ages (Table I) differ but little from those of Washington and Pittsburgh,¹ and that in those ages where the two eastern cities differ most from each other, Vallejo occupies an intermediate position. The ratio differences by grade (Table II) are more irregular and comparison is rendered difficult by the fact that the Washington norms are given by half grades. However, there is little if any evidence that our norms have been affected by the fact that both scales were sometimes given at the same sitting.

TABLE I. RATIO OF SCALE B SCORES TO SCALE A SCORES,
BY AGES^[a]

Age	Washington	Pittsburgh	Vallejo
8	106.16	94.32	102.9
9	102.74	95.61	101.2
10	103.66	97.92	101.3
11	100.00	99.08	100.7
12	98.23	100.00	98.2
13	100.00	100.78	101.1
14	95.45	100.00	100.5
15	97.54	98.38	97.7

[a] Ratios are multiplied by 100. Those greater than 100 indicate that the Scale B score was higher than the Scale A score; those less than 100 indicate the reverse.

TABLE II. RATIO OF SCALE B SCORES TO SCALE A SCORES,
BY GRADES^[a]

Grade	Washington	Pittsburgh	Vallejo
IIIA	..... }	.....	94.7
IIIB	110.34 }	.....	.....
IVA	104.76 }	96.48	103.5
IVB	105.06 }		
VA	129.85 }	96.85	101.5
VB	101.03 }		
VIA	100.00 }	100.00	99.4
VIB	99.14 }		
VIIA	100.85 }	97.64	96.2
VIIIB	98.47 }		
VIIIA	97.10 }	100.71	98.9
VIIIB	96.48 }		

[a] Ratios are multiplied by 100. Those greater than 100 indicate that the Scale B score was higher than the Scale A score; those less than 100 indicate the reverse.

Inasmuch as the primary purpose in giving the tests was to secure data for tentative age norms, effort was made to test every pupil who had reached the eighth birthday and had not yet become sixteen. In order to accomplish this all the pupils in grades III to VIII were tested. Tests were then given to all pupils in the high school who had not reached the age of sixteen, and to all pupils in the first two grades who were eight years old or older.

According to the state compulsory school law in force at the time the tests were given, every pupil in the state who had reached the age of eight years and who was not yet sixteen should have been in school. Reference to Table III, however, will show that some selection has taken place by the age of fourteen, and that by the age of fifteen it is considerable. To what extent this is due to partial failure of the compulsory school law and to what extent it is due to the attendance of pupils in private and parochial schools, it is impossible to say; nor do we know the nature of the selection that has taken place. However, our norms for ages eight to fourteen inclusive are probably fairly satisfactory for the city in question. Those for years eight and nine are certainly far more valid than those published in the Manual of Directions for Pittsburgh and Washington, as the latter included no tests below the upper half of the third grade. Children of these ages who are in the upper half of the third grade are probably bright children. Accordingly, the Washington and Pittsburgh scores for eight- and nine-year-old children are too high. On the other hand, for ages above fourteen the Pittsburgh and Washington norms are quite worthless, since no tests were made above the eighth grade. Thus the brighter children were left out and the norms for these ages are too low. Even the norms for fourteen from those cities are of questionable value, for in the case of Washington the number of pupils at this age is only 60 percent and in Pittsburgh only 56 percent of the average number for the three previous years. The corresponding figure for Vallejo is 79 percent. Even year fifteen in Vallejo shows a retention of 67 percent as compared with the average for the ages 11, 12, and 13.

As regards social and economic status Vallejo is probably not far from the average of California cities of similar population, though it should be remembered that the general average for California is high as compared with the majority of other states. The only important industries of the city are United States navy

TABLE III. NUMBER OF CASES INCLUDED IN AGE AND GRADE AVERAGES

Grade	Washing- ton	Pitts- burgh	Vallejo	Age	Washing- ton	Pitts- burgh	Vallejo
III	159	.....	175	8	84	14	171
IV	308	211	210	9	177	96	200
V	291	221	228	10	237	189	172
VI	316	233	142	11	276	213	185
VII	264	182	183	12	280	169	184
VIII	209	196	135	13	252	182	159
IX	.....	.....	102	14	164	105	144
X	.....	.....	38	15	52	41	119
Total	1,547	1,043	1,213	Total	1,522	1,009	1,334

yard activities (largely shipbuilding) and flour milling. These industries have given the city a large proportion of semi-skilled and skilled labor, chiefly of American stock. There is no reason to believe that the proportion either of unskilled laborers or of the professional and semi-professional classes is abnormally large.

The following figures show the nationality classification of the 18.65 percent of school children whose parents were both foreign born:

EXTRACTION	PERCENT
Latin.....	6.71
Teutonic.....	4.73
Scandinavian.....	3.57
Slavic.....	2.26
Miscellaneous.....	1.38

Total 18.65

Children of foreign-born parents were included in the calculation of norms, as nearly all such children were born in the United States.

Tables IV and V make possible a comparison of the age and grade norms of Scale A, Scale B, and total of A and B for the three cities. In all cases these norms are based on averages. For the convenience of those who prefer to use medians the age and grade

medians for Vallejo are given in Table VIII. In Table IV it will be observed that our average total scores for grades IV, V, and VI correspond very closely to those from Washington, but that grades VII and VIII are each about 12 points lower than the corresponding grades in Washington. A difference of 12 points corresponds roughly to about 0.4 of a grade, the average difference from grade to grade being approximately 30 points.

It should be noted that the tests on which the grade averages were based were, in all three cities, made near the close of the school year.

TABLE IV. GRADE AVERAGES FOR WASHINGTON, PITTSBURGH, AND VALLEJO

GRADE	WASHINGTON			PITTSBURGH			VALLEJO		
	Scale A	Scale B	Total	Scale A	Scale B	Total	Scale A	Scale B	Total
IIIA	.....	.....	.....	.....	.....	.....	51.2	48.5	100
IIIB	58	64	122	.....	.....	.....	.....	.....	.....
IVA	63	66	129	85	82	167	71.9	74.4	146
IVB	79	83	162						
VA	67	87	174						
VB	97	98	195	95	92	187	89.4	90.7	180
VIA	104	104	208						
VIB	116	115	231						
VIIA	118	119	237	127	124	251	120.8	116.0	237
VIIIB	131	129	260						
VIIIA	138	134	272						
VIIIB	142	137	279	140	141	281	132.7	131.3	264

No comparison of age averages need be made except for the years 10 to 13, as the Washington and Pittsburgh norms are misleading and worthless below 10 and above 13. For the years 10 to 13 the Vallejo norms are below those of Washington by 15, 16, 11, and 4 points, respectively, and for the same four years they are below those of Pittsburgh by 38, 35, 13, and 23 points. That is, the Vallejo norms for these four ages average nearly a year below those of Pittsburgh.

TABLE V. AGE AVERAGES FOR WASHINGTON, PITTSBURGH, AND VALLEJO

AGE	WASHINGTON			PITTSBURGH			VALLEJO		
	Scale A	Scale B	Total	Scale A	Scale B	Total	Scale A	Scale B	Total
8	65	69	134	88	83	171	34.6	35.6	70
9	73	75	148	91	87	178	57.1	57.8	115
10	82	85	167	96	94	190	75.7	76.7	152
11	98	98	196	108	107	215	89.6	90.2	180
12	113	111	224	113	113	226	107.4	105.5	213
13	119	119	238	128	129	257	116.3	117.6	234
14	132	126	258	130	130	260	133.3	133.9	267
15	122	119	241	123	121	244	137.0	133.8	271

TABLE VI. GRADE INCREMENTS IN TOTAL SCORES OF SCALES A AND B

Grades	Washington	Pittsburgh	Vallejo
iv to v	36	20	34
v to vi	36	37	35
vi to vii	29	27	22
vii to viii	17	30	27
Average	29	28.5	29.5

TABLE VII. AGE INCREMENTS IN TOTAL SCORES OF SCALES A AND B

Ages	Washington	Pittsburgh	Vallejo
8 to 9	+14	+ 8	+45
9 to 10	+19	+12	+37
10 to 11	+29	+25	+28
11 to 12	+28	+11	+33
12 to 13	+14	+31	+21
13 to 14	+20	+ 3	+33
14 to 15	-17	-16	+ 4
Average for 9 to 14	22	16.65	30.65

Tables VI and VII show the age and grade increments in total score of Scales A and B in the three cities. Since the Washington norms are given by half grades, the grade increments for that city are based upon the averages for the upper half of each grade.

The grade increments for all three cities suggest that a year of growth ought to yield an increment of about 29 points. However, when we examine the age increments of Table VII we find that only those of Vallejo give results which agree with this assumption. Washington and Pittsburgh show increments at most ages which are considerably less than this. In both of these cities the increments are small in the lower years, increase gradually until toward the middle of the age range they approximate the expected increments, then decrease in the higher ages until finally the increment becomes really a decrement corresponding to about a half year of mental age. This is, of course, due to selection. It is evident that at Washington and Pittsburgh only the brighter children below ten years were tested. On the other hand, at Washington only the duller children above twelve and at Pittsburgh only the duller children above thirteen were tested. At Vallejo, however, the annual increments from ages nine to fourteen approximate those which would be expected according to the grade results. Here the low increment from fourteen to fifteen is probably due in the main to the selection which has operated with our fifteen-year-olds. The unexpectedly large increment at Vallejo from eight to nine is probably due to the fact that many eight-year-olds are not adequately measured by the scale, perhaps because of its literacy requirements. This would tend to reduce the average for year eight considerably below where it ought to be, and is an error which the median tends to exaggerate even more than does the average. At any rate our comparison of the age and grade increments suggests that our age norms for the years nine to fourteen are probably not far wrong for the city in question, and that those of Washington and Pittsburgh are probably of little value except in the very middle of the age range.

The author of the Manual of Directions has made a set of provisional age norms in which an effort has been made to allow for the factor of selection in the upper and lower ages. The method of making these corrections is not stated, but the corrections themselves are shown in the third column of Table VIII. In the fourth and fifth columns of the same table are shown the age

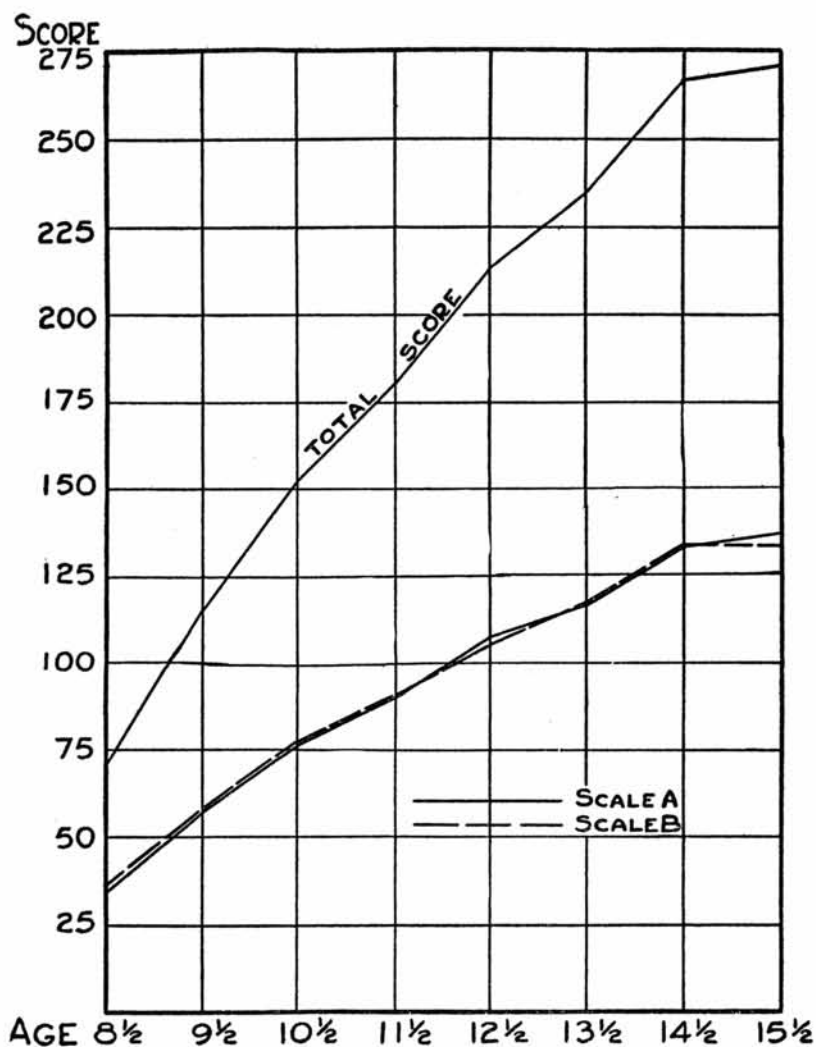


FIGURE 1 Scale A, Scale B, and Total of A and B by age. Children from 8 to 9 are classed as 8½ etc.

averages and age medians for Vallejo. Until extensive data are available on a more nearly unselected group, we believe that the age norms given in columns 4 and 5 should be used in preference to the figures in the third column, which are the tentative norms recommended in the Manual of Directions.

TABLE VIII. AGE NORMS FOR TOTAL SCORE OF SCALES A AND B

Age ^[a]	Washington Average	Pittsburgh Average	Norms Recom- mended in Manual	Vallejo Average	Vallejo Median	Average for Scale A Alone
	1	2	3	4	5	6
8.5	134	171	130	70	60	35
9.5	148	178	155	115	118	57
10.5	167	190	180	152	158	76
11.5	196	215	205	180	186	90
12.5	224	226	225	213	216	107
13.5	238	257	245	234	243	116
14.5	258	260	260	267	268	133
15.5	241	244	275	271	274	137

[a] In all cases age 8 includes children from 8 to 9, age 9 those from 9 to 10, etc. Accordingly, the age standards given are always those for ages 8.5, 9.5, etc. This more correct notation has been used in Table VIII and Figure 1.

The age medians for Scale A and Scale B are very nearly equal at all ages when Scale A is given first. If a pupil has taken only Scale A, and it is desired to estimate what his probable total score would have been had he taken both scales, it is only necessary to multiply the score on Scale A by 2. While this rule is not absolutely accurate, it is sufficiently so for all practical purposes. The correlation between Scale A and Scale B was computed and found to be 0.928, Pearson.

Figure 1 shows graphically the Vallejo age curves for Scale A and Scale B. These curves are based upon averages. Within the range of validity (probably 9 to 14 years) the curve of each scale approximates a straight line. If it were not for the reduced validity of the test below 9 years and the unfavorable selection of cases above 14, it is probable that the line would be approximately straight from 8 to 15.