

SOLDIER INTELLIGENCE IN WORLD WARS I AND II¹

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CATTELL (2), Lentz (3), Maller (6) and others, arguing from the observation that family size is inversely related to test performance, education and socio-economic level, have contended that the mean I.Q. of the population is declining at the rate of three or four points per generation. In contrast, data collected by the Personnel Research Section, AGO, during the closing months of World War II indicate at least for that fraction of the population selected for military service, that performance on a group test of the kind usually described as measuring "general learning ability" or "verbal intelligence" has markedly increased from World War I to World War II. The study here reported was a byproduct of another research and is not so unequivocal as one should like. Nevertheless it offers direct evidence on a problem hitherto attacked only indirectly, and suggests that the future may not be as black as the eugenicists would have us believe.

In the course of establishing the score equivalence between certain Army tests and several commercial ones, the Wells Revision (Form 5) of Army Alpha Examination was administered to a representative sample of the World War II draft. The population consisted of 768 white enlisted men selected on the basis of Army General Classification Test (AGCT) scores, as recorded on their qualification cards, to yield a distribution by Army Grade like that for all inductees entering during 1943. The distribution desired and that obtained are compared below:

ARMY GRADE	ARMY STANDARD SCORE	INDUCTEES ENTERING IN 1943	EXPERIMENTAL SAMPLE
I	130 and above	6.4%	6.4%
II	110-129	28.6	28.8
III	90-109	31.1	30.7
IV	60- 89	28.5	28.8
V	below 60	5.4	5.3
		100.0%	100.0%

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Since the correspondence was very close, the 768 men without further selection were administered the Wells Revision (Form 5) of Army Alpha Examination.

The correlation between Wells Alpha and AGCT was .90, indicating a very large degree of community in the functions measured. The AGCT yielded a mean Army Standard Score of 98.3 and a standard

TABLE 1
Centile equivalents of scores on AGCT and on Wells Alpha Examination, Form 5, for a sample of 768 white enlisted men

CENTILE	AGCT STANDARD SCORE	ALPHA RAW SCORE	CENTILE	AGCT STANDARD SCORE	ALPHA RAW SCORE
99	145	194	50	100	104
95	132	175	45	97	97
90	126	160	40	94	90
85	122	150	35	91	82
80	118	143	30	87	74
75	115	136	25	83	66
70	112	130	20	78	58
65	109	122	15	73	50
60	106	116	10	67	38
55	103	110	5	59	23
			1	42	3

deviation of 22.7. The mean raw score on Wells Alpha was 101.2 and the standard deviation was 46.0. Centile norms for the two tests are presented in Table 1.

The comparison of the intelligence test performance of soldiers in World War I and World War II is complicated by the fact that for the purposes of the major study it was necessary to test the World War II group with the commercially available Wells Revision, Form 5 of the Alpha Examination instead of the original Alpha used in World War I. However,

AGO, for statistical assistance, and to Lt. Keith Broman, AGD, who collected the data in the field. However, the contents of this paper are the responsibility solely of the writer and are not to be regarded as representing the point of view of the War Department.

there is general agreement that the two versions yield very similar score distributions, especially in the upper quartile.

Bingham (1, p. 330) states: "The Wells Revision . . . make(s) the examination more suitable for use in schools and industries while preserving the irreplaceable norms. Scores which fall in the upper quartile of the distribution are directly comparable with the original Alpha scores." The published norms (7) on Wells Alpha for the "general adult population" agree closely with norms obtained on the original Alpha for literate white soldiers of World War I. Lorge (4) has published data indicating that the Wells Alpha yields larger raw scores than

agreement with a median of 61 for Wells Alpha as cited in the published norms. However, a raw score of 62 reaches only the 22nd centile of the World War II distribution. Conversely, a raw score of 104, the median for the World War II group, falls at the 83rd centile of the World War I population. Such differences are, of course, highly significant.

No satisfactory answer can be given to the fundamental question of whether a similar difference exists between the national population of 1917-18 and 1940-45 from which the troops were drawn. Indeed, the members of the armed forces constitute by far the largest and most representative sample of the general population ever subjected to psychometric procedures. Considering the greater size of the Army in World War II, it seems likely that the draft population during the recent conflict was more nearly representative of the general population than was the case in World War I. However, the size and direction of selective differences between the armies and the populations from which they were drawn can only be guessed at.

Considering only the Army samples here reported, many factors can be adduced to account for the superiority of the World War II group. Only a few can be mentioned here.

1. For soldiers in World War I objective tests were wholly unfamiliar. Most soldiers in World War II had had considerable experience with them in schools, industry, etc. Previous practice on AGCT probably served to raise the Alpha scores of the men here reported. However, practice effects on AGCT produce an average gain of only about five points in taking a second form of the same test and would be even smaller in taking a different test, as in this instance. It seems unlikely that greater familiarity with objective tests can account for a very large part of the superiority of the World War II sample.

2. Numerous investigators have reported that as a nation we are increasing in height, in weight and in longevity. The indirect influence of improvements in public health and nutrition may have operated to increase test performance, though to an unknown degree.

3. The Army of World War II was definitely superior to that of World War I in amount of education. Since amount of schooling is correlated with test performance (e.g., 5), it seems likely that educational differences contribute heavily to the superior test performance of the World War II group. In the present study, the number of years of education completed by each of the 768 enlisted men was re-

TABLE 2

A comparison of performance on Alpha Examinations of 48,102 white enlisted soldiers of World War I and a representative sample of 768 white enlisted soldiers of World War II

CENTILE	WORLD WAR I ² ORIGINAL ALPHA RAW SCORE	WORLD WAR II WELLS ALPHA, FORM 5 RAW SCORE	CENTILE	WORLD WAR I, ORIGINAL ALPHA RAW SCORE	WORLD WAR II, WELLS ALPHA, FORM 5 RAW SCORE
99	166	194	50	62	104
95	137	175	45	57	97
90	120	160	40	52	90
85	108	150	35	48	82
80	98	143	30	44	74
75	91	136	25	39	66
70	84	130	20	35	58
65	78	122	15	30	50
60	72	116	10	25	38
55	67	110	5	18	23
			1	8	3

² Calculated from *Memoirs* (9), p. 748, Table 281.

does the original form, but that the difference is not greater than five percentile points.

If it is conceded that scores on the Wells revision correspond closely to scores on the original Alpha Examination, it is difficult to escape the conclusion that soldiers of World War II were markedly superior to their fathers in the functions measured by this test.

As may be seen in Table 2, the differences between the two groups are very large throughout the range, and are as conspicuous above the seventy-fifth centile, where the equivalence of raw scores on Army Alpha and Wells Alpha is best established, as they are below this point. For the principal literate white sample of World War I reported in the *Memoirs* (9), the median raw score is 62. This is in close

corded from his qualification card. The mean was 10.0 years; the S.D. was 3.0 years. The correlations between years of education and test score were .74 and .75 for AGCT and Wells Alpha, respectively. Comparable statistics for the principal literate white sample of World War I soldiers have been computed from the *Memoirs* (9), Table 281, p. 748. The correlation between Alpha and years of education completed was .63. The mean education was 8.0 years; the S.D. was 2.6 years. As a rough device for estimating the amount of difference in Alpha performance attributable to educational differences, the columns of Table 281 (*Memoirs*) were reweighted to conform to the distribution with respect to education of the World War II sample. Decile values were then computed from the reweighted table, with the following results:

DECILE	WORLD WAR I UNWEIGHTED RAW SCORE	WORLD WAR I WEIGHTED RAW SCORE	WORLD WAR II RAW SCORE
90	120	144	160
80	98	125	143
70	84	110	130
60	72	97	116
50	62	85	104
40	52	73	90
30	44	61	74
20	35	49	58
10	25	34	38

Weighting of the World War I findings to make the population comparable in education to the World War II sample removes over half of the obtained difference in test scores between the two groups. If additional allowance is made for the progressive increase in the length of the school year and for improvements in school facilities and in the professional preparation of teachers, it is evident that the superior test performance of the World War II group *can* be accounted for largely in terms of education.

While the data presented in this study offer no proof, the writer is inclined to interpret them as indicating that the present population is superior in mental test performance to the population of a generation ago, and that a large proportion of this superiority is a consequence of more and better education for more people.

The *magnitude* of the improvement in test performance from World War I to World War II cannot be established on the basis of existing data, nor is it possible to estimate it very precisely even for Army populations. The major potential source of error in

the present study is the use of two different measuring instruments, Army Alpha and Wells Alpha, in comparing the World War I and World War II groups; but a comparison which involved only Army Alpha would not eliminate difficulties of interpretation. Various items of the original version have grown obsolete and cannot be assumed to have remained constant in difficulty. Yet omitting such items, or replacing them with new material would alter the instrument and introduce, though perhaps in lesser degree, the same source of error which may be operative in the investigation reported here.

The findings of the present study, despite their limitations, cast doubts on Cattell's contention that the national I.Q. is dropping at a rapid rate. His references to I.Q. changes seem to imply a belief that the population is declining with respect to intelligence as measured by psychological tests. The present study indicates a change in the opposite direction, though one cannot rule out the possibility of a decline in the purely native component of intellectual performance were it possible to measure it. On one point the writer would be in complete agreement with Cattell,—viz., that changes in the population, as well as the obsolescence of test content, make it desirable that test norms be subjected to periodic revision.

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