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THE MEASUREMENT AND UTILIZATION OF BRAIN POWER IN THE ARMY¹

History of Psychological Service.—The psychologists of America, of whom upward of two hundred served in the Army or Navy, have rendered conspicuously important assistance to the government in organizing an efficient fighting machine. Chief among the civilian agencies responsible for the development of this new and unexpectedly significant variety of service are the American Psychological Association and the Psychology Committee of the National Research Council. Nearly a score of committees or subcommittees of these organizations functioned during the military emergency.

Within the Army three principal groups of psychologists appear: one attached to the Office of The Adjutant General of the Army (specifically known as the Committee on Classification of Personnel in the Army), another in the Office of the Surgeon General of the Army (known as the Division of Psychology of the Medical Department), and a third in the Division of Military Aeronautics (the Psychological Section of the Medical Research Board). Although the several tasks of these groups of psychologists differed markedly, the primary purpose of each was the increase of military efficiency through improved placement with respect alike to occupational and mental classifications.

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Psychological service was rendered also to the following divisions or departments in addition to those named above: (1) the Morale Branch of the General Staff, (2) the Division of Military Intelligence, (3) the Committee on Education and Special Training of the War Department, and (4) the Chemical Warfare Service.²

Early in the emergency it became clear to psychologists in the military service that the fundamental psychological problem of the army is one of placement and that the most important service psychologists could possibly render would be to assist in so assigning every soldier that his mental (as well as physical) ability should be used to advantage. It was assumed by the psychological personnel that intelligence, alertness, the will to win, enthusiasm, faith, courage and leadership are even more important than are physical strength and endurance, and that this fact must be scientifically reckoned with wherever a strong military organization is to be built quickly. Very promptly it became the recognized purpose of army psychologists to assist in winning the war by the scientific utilization of brain power. The achievement of this purpose necessitated the preparation of special methods of mental measurement in order that recruits should be properly classified for elimination or assignment to military training.

The army, at first naturally and wisely

² For the United States Navy serviceable methods of selecting, placing and training gunners, listeners and lookouts were devised and developed by Lieutenant Commander Raymond Dodge. The methods prepared by Dr. Dodge as well as certain instruments designed by him for naval use have been extensively and profitably used, and the appointment of this psychologist as Lieutenant Commander in the Naval Reserve is at once a fitting recognition of his practical service and an indication of the appreciation of his work by the officers with whom he has been associated.

skeptical concerning the practical values of psychological service and inclined to anticipate research instead of service, shortly achieved a new point of view and opinion. Skepticism was replaced in some directions gradually, elsewhere rapidly, by faith in the practicability and immediate value of various kinds of psychological work and eagerness for its continuation and extension. In the end the psychological personnel of the army was completely swamped by requests, demands and orders for help. Scores of telegrams and letters from commanding officers testify to their hearty appreciation of efforts towards scientific placement within the army and their desire for the introduction or furtherance of psychological service in various departments or organizations.

Skeptics, of course, still exist and there are inevitable misunderstandings and prejudices, but the data at hand indicate that at least seventy-five per cent. of the officers of the United States Army have been won by actual demonstration of values and first hand acquaintance with psychological service to its hearty support.

It is extremely important to emphasize at the outset that this article deals with only one of the several important lines of psychological military service, that, namely, of the Division of Psychology of the Medical Department.

Purposes of Mental Examining.—As originally conceived, psychological service within the Medical Department was to assist medical officers, and especially neuropsychiatric officers, in discovering and eliminating men who are mentally unfit for military duty. It appeared, prior to actual trial, that reasonably well planned methods of mental measurement should enable psychological examiners to discover mentally inferior recruits as soon as they arrived in camp and to make suitable

recommendation concerning them to the medical officer. It was also believed that psychologists could assist neuro-psychiatrists in the examination of psychotic individuals. The proposed rôle of the psychologist then was that of assistant to the army surgeon: the actual rôle, as a result of demonstration of values, was that of expert in scientific personnel work.

In interesting contrast with the original purpose of mental examining, as stated above, stands the following account of the purposes actually achieved by this service: (1) The assignment of an intelligence rating to every soldier on the basis of systematic examination; (2) the designation and selection of men whose superior intelligence indicates the desirability of advancement or special assignment; (3) the prompt selection and recommendation for development battalions of men who are so inferior mentally as to be unsuitable for regular military training; (4) the provision of measurements of mental ability which shall enable assigning officers to build organizations of uniform mental strength or in accordance with definite specifications concerning intelligence requirements; (5) the selection of men for various types of military duty or for special assignments, as for example, to military training schools, colleges or technical schools; (6) the provision of data for the formation of special training groups within the regiment or battery in order that each man may receive instruction suited to his ability to learn; (7) the early discovery and recommendation for elimination of men whose intelligence is so inferior that they can not be used to advantage in any line of military service.

Although it originally seemed that psychological examining naturally belonged in the Medical Department of the Army and would there prove most useful, it sub-

sequently became evident that this is not true because the service rendered by psychological examiners is only in part medical in its relations and values. In the main its significance relates to placement and its natural affiliation is with military personnel. For practical as well as logical reasons it would doubtless have been wiser had the service of the Division of Psychology been associated from the first with that of the Committee on Classification of Personnel in the Army, so that the psychological as well as occupational, educational and other important data might have been assembled by a single military agency and promptly rendered available for use in connection with the assignment of recruits. Thus also the organization of a special branch of the General Staff or of a Personnel Section of the Adjutant General's Office to deal with varied problems of military personnel might have been hastened and otherwise facilitated and the utilization of brain power as contrasted with man power in the ordinary sense rendered more satisfactory early in the emergency.

Methods of Measuring Intelligence.—The committee of psychologists originally organized to prepare and test methods of psychological examining for the army promptly decided that it would be desirable to examine *all* recruits in order to provide an intelligence rating for every soldier. This decision necessitated the development of methods which could be administered to relatively large groups and in addition the selection of procedures which could be used for the more careful examination of individuals.

Most of the methods which were recommended to the military authorities in the summer of 1917 have since that time been repeatedly revised and improved in the light of results. The procedures finally

adopted and in use throughout the army during the past few months differ radically from those originally recommended. They may be described summarily as follows:

There are four principal systems or stages in the examination. First comes the procedure of segregation, by means of which the original group, which may, if examining rooms permit, include as many as five hundred men, is split into two sub-groups; (a) the literates, men who can speak and read English fairly well, and (b) the illiterates, men who are relatively unfamiliar with the English language. These two groups must necessarily be treated somewhat differently, therefore the literates are given a group examination known as Alpha, which consists of eight markedly different tests. This examination, although it requires almost no writing on the part of the subject, does demand facility in using written and oral instructions. The illiterate group is given an examination known as Beta, which is in effect Alpha translated into pictorial form. In this examination pantomime and demonstration supplant written and oral instructions.

Each group examination requires approximately fifty minutes. Subjects who fail in Alpha are ordinarily given opportunity to improve their ratings by taking Beta, and subjects who fail in Beta are given individual examination in order that they may be more accurately and justly rated than in the group examination alone.

Any particular individual may have to take one, two or three of these types of examination, thus for example, a man of low grade literacy who happens to get into examination Alpha may also have to take Beta and some form of individual examination.

Examination papers for both Alpha and Beta are scored rapidly by the use of

stencils and the resulting rating is promptly reported to the appropriate military authority.

By means of this system of examinations it is possible for an examining staff consisting of four psychologists and a force of scoring clerks to examine as many as one thousand men per day.

Every man examined by one or more of the procedures described is assigned a numerical rating and in addition a letter grade which indicate his general intellectual ability or mental alertness. The numerical rating is used only for statistical purposes, the letter grade for practical military purposes. The latter alone is reported ordinarily to military officers and recorded on the soldier's service record and qualification card.

The letter grades which are in use are defined as follows: A designates very superior intelligence; B, superior intelligence; C+, high average intelligence; C, average intelligence; C—, low average intelligence; D, inferior intelligence; D—, very inferior intelligence. The letter E has been reserved for the designation of men whose mental ability is seemingly inadequate for regular military duty.

Commissioned officers usually possess and obviously should possess A or B intelligence. Many excellent non-commissioned officers possess C or C+ intelligence, but in the main this group is composed of men with C+ or B ratings. The great body of privates grades C. Men with D or D— intelligence are usually slow to learn and rarely gain promotion. Many of them, especially the D— individuals, can not be used to advantage in a military emergency which demands rapidity of training. The results of army mental testing indicate that the majority of D— and E soldiers are below ten years mental age. A few fall as low as three or four years.

The contrast between A and D — intelligence becomes impressive when it is shown that men of A intelligence have the requisite mental ability to achieve superior records in college or professional school, whereas D — individuals are rarely able to pass beyond the third or fourth grade of an elementary school, however long they may attend.

Reliability of Methods.—The methods of mental examining used in the army have been found to possess reliability as well as practical value which far exceeded the expectations of the men who are responsible for them. Indeed, the success of this particular methodological undertaking is a remarkable demonstration of the "fecundity of aggregation." It is extremely unlikely that any individual working alone would have developed within reasonable time equally valuable methods of group examining. Inasmuch as reliability is of first importance, various measures of the validity of the army mental tests are presented.

The probable error of an Alpha score is about five points. This is approximately one-eighth of the standard deviation of the scores for unselected soldiers. The reliability coefficient of examination Alpha approximates .95. This group examination correlates with other measures of mental ability as follows: (1) With officers' ratings of their men, .50 to .70 for the total Alpha score and .30 to .54 for the separate tests; (2) with Stanford-Binet measures of intelligence, .80 to .90 for the total Alpha score and .31 to .85 for the separate tests; (3) with the Trabue B and C Completion tests combined, .72 for the total score and .39 to .76 for the separate tests; (4) with Examination Beta, .80; (5) with the composite result of Alpha, Beta and Stanford-Binet examinations, .94; (6) in the case of school children results of Alpha examina-

tion correlate (a) with teachers' ratings .67 to .82, (b) with school marks .50 to .60, (c) with school grade location of thirteen and fourteen year old children .75 to .91, (d) with age of children .83 (for soldiers the correlation of Alpha score with age is practically zero).

The Alpha examination given with double the usual time allowance correlates approximately .97 with the regular time examination.

The following data indicate the reliability of Examination Beta: It correlates with Alpha, .80; with Stanford-Binet, .73; with the composite of Alpha, Beta and Stanford-Binet, .915. The correlation of the separate Beta tests with the Stanford-Binet ranges from .47 to .63 (average .58). Results of Beta given with double time allowance correlate with those obtained with the regular time allowance .95.

For the several forms of individual examination used in the army the principal correlations at present available are as follows:

Results obtained by repetition of Stanford-Binet examination of school children correlate .94 to .97. Results of one half of the scale compared with the other half correlate .94 to .96. An abbreviated form of the Stanford-Binet examination consisting of two tests per year was used extensively in the army. The results of this abbreviated scale correlate .92 with those obtained by use of the complete scale.

For the Point Scale examination the measures of reliability are practically the same as for the Stanford-Binet.

A Performance Scale examination prepared especially for military use consisted of ten tests. Results for the several tests of the scale correlate with Stanford-Binet results, .48 to .78. Five of the ten tests yield a total score which correlates .84 with the Stanford-Binet score. The same

five tests correlate .97 with the results of the entire scale.

Summary of Results.—After preliminary trial in four cantonments psychological examining was extended by the War Department to the entire army, excepting only field and general officers. To supply the requisite personnel, a school for training in military psychology was established in the Medical Officers' Training Camp, Fort Oglethorpe, Georgia. Approximately one hundred officers and more than three hundred enlisted men received training at this school.

The work of mental examining was organized finally in thirty-five army training camps. A grand total of 1,726,000 men had been given psychological examination prior to January 1, 1919. Of this number, about 41,000 were commissioned officers. More than 83,000 of the enlisted men included in the total had been given individual examination in addition to the group examination for literates, for illiterates, or both.

Between April 27 and November 30, 1918, 7,749 (0.5 per cent.) men were reported for discharge by psychological examiners because of mental inferiority. The recommendations for assignment to labor battalions because of low grade intelligence, number 9,871 (0.6 + per cent.). For assignment to development battalions, in order that they might be more carefully observed and given preliminary training to discover, if possible, ways of using them in the army, 9,432 (0.6 + per cent.) men were recommended.

During this same interval there were reported 4,744 men with mental age below seven years; 7,762, between seven and eight years; 14,566, between eight and nine years; 18,581, between nine and ten years. This gives a total of 45,653 men

under ten years mental age. It is extremely improbable that many of these individuals were worth what it cost the government to maintain, equip and train them for military service.

The psychological rating of a man was reported promptly to the personnel adjutant and to the company commander. In addition, all low grade cases and men exhibiting peculiarities of behavior were reported also to the medical officer. The mental rating was thus made available for use in connection with rejection or discharge, the assignment of men to organizations and their selection for special tasks. The mental ratings were used in various ways by commanding officers to increase the efficiency of training and to strengthen organizations by improved placement.

It was repeatedly stated and emphasized by psychological examiners that a man's value to the service should not be judged by his intelligence alone, but that instead temperamental characteristics, reliability, ability to lead and to "carry on" under varied conditions should be taken into account. Even after the feasibility of securing a fairly reliable measure of every soldier's intelligence or mental alertness had been demonstrated, it remained uncertain whether these measurements would correlate positively with military value to a sufficient degree to render them useful. Data which have become available during the past year settle this question definitely by indicating a relatively high correlation between officers' judgments of military value and the intelligence rating.

The various figures which follow are presented not as a summary of the results of psychological examining in the army but instead as samples of these results, the chief value of which is to indicate their principal relationship and practical values.

(To be concluded.)