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Aptitude Battery for Personnel below Officer Rank in Indian Army

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In a complex technological society like India, the ability to match the unique talents of each person to the requirements of the job has advantages for both the individual and society. What the individual can do now and what he or she could do after appropriate training is not the same. The former speaks of 'achievement' and the latter is known as 'aptitude'. Tests designed to predict what one can accomplish with training are called aptitude tests. In the present study aptitude battery was developed to identify the best fit man for a particular job by matching the qualities possessed by a person and skills required for that particular job. The battery was developed in three phases. In phase I, job analysis was carried out for 197 trades of 15 arms and services. Based upon thorough job analysis 14 essential and required abilities were identified to work efficiently for distant trades. Phase II included identification of broad abilities required for different trades and clustering of abilities as per the trades. Further, for each ability, different tests were developed to assess a particular ability. In total 20 tests were developed assessing fourteen abilities. Phase III included development of trade allocation battery and software package for administration, scoring and analysis of the battery. Initially approximately 1050 cognitive items and three psychomotor tests were developed and were given to experts for scrutiny. Thereafter, approximately 700 cognitive items and three psychomotor tests grouped in 20 tests were prepared for the preliminary testing. Item analysis for all the tests was carried out and the final form of the battery was prepared. Further all these tests are group tests and are convenient to administer and can be easily scored. To conclude it can be said that psychological tests are sensitive tools and should be used for the purpose only for which they have been developed.

It is a well known fact that people differ widely in intelligence, knowledge and skills. To determine whether a person has the optimum skill for a particular job, reliable methods of measuring present abilities and predicting future performance are a must. In a complex technological society like ours, the ability to match the unique talents of each person to the requirements of the job has advantages for both the individual and society.

What the individual can do now and what he or she could do after appropriate training are not the same. The former speaks of 'aptitude' and the latter is known as 'achievement'. For e.g., we do not expect a premedical student to remove an appendix or a preflight trainee to fly a jet. But we do expect each of them to have the potential for acquiring these skills. The distinction between a capacity to learn and an accomplished skill is important in selection and placement. Tests designed to predict what one can accomplish with training are called aptitude tests, or tests of special abilities.

Aptitude

Psychologically speaking, 'aptitude' can be defined as 'a condition or set of characteristics regarded as symptomatic of an individual's ability to acquire with training. His aptitude is however, a present condition, a pattern of traits, deemed to be indicative of his potentialities. Aptitude, however, connotes

more than potential ability in performance, it implies fitness, and suitability for the activities in question. When appraising aptitudes, researcher is on the alert for symptoms of 'ability to acquire' a genuine absorption in the work, that is, a genuine liking for the work, as well as a satisfactory level of competence. Indeed a person who cannot develop a liking for an occupation along with proficiency in it, cannot properly be said to have an aptitude for it because he lacks the necessary drive.

Aptitude is a present condition but with a forward reference. A test of aptitude samples certain abilities and characteristics of the individual as he is today . It helps to find out what he can do now and how well he can do it. The responses he makes under specified conditions are ascertained. By such means, data are secured as to what the person actually does under the circumstances imposed by the test. His behavior is measured. From these symptoms, an estimate of his future possibility of accomplishment is inferred.

Aptitude and Aptitude testing: According to Freeman (1965), an aptitude is a combination of characteristics indicative of an individual's capacity to acquire (with training) some specific knowledge, skills or set of organized responses, such as the ability to speak a language, to become a musician and to do mechanical work Thus, an aptitude test is designed to measure a person's potential ability in an activity of a specialized kind and within a restricted range. When we speak of an individual's aptitude for a given type of activity , we mean the capacity to acquire proficiency under appropriate conditions. Aptitude tests may be grouped into two categories such as Multiple Aptitude Test and Special Aptitude Test

Multiple aptitude tests: They consist of a set of test meant for general use while special aptitude test is used for special program. The first multiple aptitude test battery was published in 1941 known as the Chicago Tests of Primary Mental Abilities. This battery was the direct outcome of Thurstone's factor analytic investigation. One of the most used multiple aptitude batteries is the Differential Aptitude Tests (DAT). The DAT, was first published in 1947 then timely revised in 1962 and in 1974. This was developed by Benet Seashore, and Wesman (1974). It comprises of eight sub-tests-verbal reasoning, numerical ability, abstract reasoning, mechanical reasoning, clerical speed and accuracy space relations, spelling and language usage. Later the general aptitude test battery (GATB) was developed by the US Employment service in 1970 for use primarily in armed force services.

The GABT consists of intelligence (G), numerical aptitude (N), verbal aptitude (v), spatial aptitude (S), form perception (P), Clerical perception (Q), motor co-ordination (K), finger dexterity (F) and manual dexterity (M). The GABT has been widely used in the employment service. Gradually, a number of aptitude test batteries were developed for different purpose such as Flanagan Aptitude Classification Test (FACT) (Flanagan 1964). This is a multiple aptitude battery generally used for vocational counseling and employee selection.

Special Aptitude Test: It measures only one aptitude. For example Mechanical aptitude, Numerical aptitude, etc. Psychologists have archives and libraries all over the world like Musical Aptitude Test (Seashore, Lewis, Saetveit (1939)). In India, DIPR has developed a number of aptitude test batteries both multiple and special aptitude during the last fifty years.

Aptitude tests developed by DIPR

DIPR has developed a battery of psychological tests for classification of leading radio operators into three specialization training courses in the communication branch of Indian Navy (DIPR Note No. 386/ 1982). A DAT battery was developed for the selection of submariners (DIPR Note No. 419/1985). A special aptitude test battery was developed by DIPR scientists (DIPR Note No. 445/1989) for trade allocation of Other Ranks: Radio operators in Indian Army. Another DAT battery

was developed for Other Ranks for the recruitment of AEC (HAV) instructors (DIPR Note 458/1991) in Indian Army. DIPR has also developed a number of differential aptitude test batteries for selection and trade allocation of other ranks/ personnel below officer ranks (DIPR Note No. 476/1995, 477/1995, and 478/1995) in Indian Army, Navy and Airforce.

In the recent past, DIPR scientists have developed a new battery of psychological tests for the trade allocation of soldiers (Tech) of EME Corps (DIPR Note No. 514/1997) and also DIPR developed an Aptitudinal criterion for MEW Sailors (DIPR Note No. 537 (1999). It clearly indicates that DIPR has the right expertise and is actively engaged in the development of aptitude tests for selection and trade allocation of Jawans and Officers in Indian armed Forces.

Recent advances in science and technology has given birth to many inventions in science and technologies, particularly in the sector of Defence. How to effectively operate the new weapon system and who will operate it, is now the cause of concern to achieve optimization. Selecting the right man for the right job has become mandatory in the Armed Forces placement system. In the recent years, all the western countries have introduced many new psychological test batteries for selection and classification of jobs in their Defence Organization.

Objective

The objective of trade allocation battery is to identify the best fit man for a particular job by matching the qualities possessed by a person and skills required for that particular job. Thus the present paper aimed to identify and develop tests on aptitude parameters for effective trade allocation of different Arms / Services and further different trades. DIPR has right expertise and is actively engaged in the development of aptitude tests for selection and trade allocation of Jawans in Indian Armed Forces. But much work on development of psychological tests has not been done for their selection and placement. This calls for an in-depth analysis of job trades and focusing more attention to develop aptitude tests for trade allocation of Jawans of other ranks in Indian Army to meet the challenges of Indian defence in the coming years.

Method

The battery was developed in three phases. In phase I, job analysis was carried out for 197 trades of 15 arms and services. Phase II included identification of broad abilities required for different trades and clustering of abilities as per the trades. Phase III included development of trade allocation battery and software package for administration, scoring and analysis of the battery.

Job Analysis

Job analysis was carried out at various training centers of different branches of the Indian Army through out the country . The participants who contributed for the job analysis data were 632 experienced trainers from different training centers who had vast experiences of more than 20 years in the relevant profession (arm/services/trades). For the purpose of the job analysis, an open-ended questionnaire was designed in which questions were asked about the job-profile (primary duties, secondary duties, training, and responsibilities) of Other Ranks and the basic personality qualities required to adequately perform the duties of a *jawan.* The respondents were asked to write their experience based opinions in response to the questions asked.

Content Analysis

The collected job-analysis data was content analyzed for the identification of the qualities for which the battery was to be developed. On the basis of content analysis themes and thorough job analysis 14 abilities were identified which are required by Jawans to work efficiently for different trades. These abilities are explained in table 1.

Table 1 Explaining different Abilities of Other Rank Trade Allocation System

1.Alertness :-	Capacity of an individual to remain alert and perceive details. The test will be used to assess the aptness, quickness of the person. It will help to know ones mental processing speed, mental concentration selective attention and overall ment al control.
2.Observation:-	Ability to keep one or more definite configurations in mind so as to make identification inspite of perceptual distractions. The test will be used to assess ones logical thinking as to which logic is required for assimilation of ones present knowledge and information in the visual fi eld.
3.Spatial ability:-	Ability to perceive sp atial patterns or to maint ain orientation with respect to objects in space. The test will help to measure ones ment al process of image generation, storage and retrieval. S patial ability has frequently been linked to creativity also.
4.Form Perception:-	Seeing correctly the shape and alignment of objects. The test will be used to judge ones tendency to organize things resulting in more balanced and more symmetrical output.
5.Perceptual Speed:-	Speed in finding figures, making comparisons & carrying simple tasks. The test will help the person to observe and comp are different stimulus presented to him at a p articular time.
6.Spatial learning:-	Ability to perceive sp atial patterns or to maint ain orientation with respect to objects in space. The test will be used to assess ability to navigate around the environment and learn about space, objects and routes within it.
7.Memory span:-	Ability to recall perfectly for immediate reproduction of series of items only after one presentation. The test will help to know ones ability to retain and recall the information at the appropriate time. It will also help to know the person's ability to focus on an object, which is considered to be import ant for a longer period.
8.Science Proficiency:-	Ability to know scientific principles correctly . The test will be used to know ones ability to operate dif ferent equipments by applying scientific principles
9.English Knowledge:-	Ability to use English language correctly. This test will be used to know ones ability to communicate effectively in English with other people
10. Visualization:-	Ability to manipulate or transform image of sp atial patterns into other visual arrangements. This test will help to have an exact view of his environment and its parts so that s ame information can be used ac curately and qui ckly
11.General Reasoning:-	Ability to solve a broad range of reaso ning problems like s olving analogies, coding, classification etc. The test will help in knowing ones ability in solving the problems of any degree of difficulty and make decisions. It is a comprehensive, detailed and accurate measure of mental ability
12. Mechanical Knowledge:-	Knowledge of mechanical principles, devices and tools. The test will be used to know ones ability to use mechanical principles in operating various devices and tools.
13. Eye Hand Coordination:-	Regulation of eye and hand muscles in harmonious cooperation in a complete action. The test will be used to know ones ability to use equipments and tools that require physical coordination.
14. Visual discrimination:-	Ability to identify differences and similarity between different patterns or ability to accurately compare and contrast visual images. The test will be used to know ones ability to judge the distance and depth that exists in the environment.

Pre development and development of test

Further, for each ability, different tests were developed to assess a particular ability. To identify tests for assessing different abilities thorough literature survey and brain storming sessions with experts was done. Expert opinion was taken from psychologists as well as the users, thus taking into account both sound theoretical and practical knowledge. In total 20 tests were developed assessing fourteen abilities. Initially approximately 1050 cognitive items and three psychomotor tests were developed and were given to experts for scrutiny. Thereafter, approximately 700 cognitive items and three psychomotor tests grouped in 20 tests were prepared for the preliminary testing. Pilot study was carried out initially to fix the time in which the candidates were provided with ample time to finish the test but at the same time investigators were also noting the real time taken for the purpose of fixing the approximate time limit.

Procedure

Prior permission was obtained regarding the administration of the battery. Detailed instructions were prepared in both Roman Hindi and English languages for the candidates. It was ensured that each candidate understand the instructions properly before starting the test.

Sample and Development of Final Test

Data was collected from Artillery Centre, Hyderabad from 200 candidates for item analysis and from 328 candidates from Armoured Corps Centre and School and Mechanized Infantry Regimental Centre, Ahmednagar for validation. Item analysis for all the tests were carried out and items with difficulty index ranging from 0.30 to 0.70 and validity index 0.30 and above were selected for the final battery. The final form of the test was prepared by arranging the items in graded difficulty level starting from the easiest to the most difficult. The details of ability with its tests, number of items for each test along with its timing are given in table 2

Table 2: Abilities, tests and number of items of Other Rank Trade Allocation System

SNo.	Ability	Test	Initial Items	Final Items
1	Alertness	Alertness	10 pages	03 pages
2	Observation	Concealed FigureHidden Figure	2548	2030
3	Spatial ability	Card RotationCube Comparison	5050	1530
4	Form Perception	Form Board	35	15
5	Perceptual Speed	Identical TestNumber Comparisons		
		Finding A Test	4080160	303030
6	Spatial learning	Maze tracing	10	03
7	Memory span	Digit / letter span	50	20
8	Science Proficiency	Science Test	50	30
9	English Knowledge	English Test	50	10
10	Visualization	Surface Development	50	25
11	General Reasoning	Verbal /Non Verbal	100	15
12	Mechanical Knowledge	Mechanical Knowledge	68	15
13	EHC	Block test	10 pages	03 pages
14	Visual discrimination	Nearer PointShortest route	5050	3030

Reliability and Validity

Reliability of the test was established by using Rational Equivalence Method. The test was found to be reliable with a reliability index of 0.65. Validity of any test is computed with some certain criterion. But because present battery has unique constructs defined as per specific requirements, no pre-established criterion test was available against which it could be validated. Still effort has been made to compute criterion validity by taking the training marks as the external criterion. Validity index of the test was 0.53.

Norms

Norms are defined as the average performance of the standardized sample on a particular test. Subsequent scores obtained on the test are compared with this average performance of the standardized sample. Norms were computed for all the fourteen tests for the different arms. Cut-offs are tentative at present as it is based on the data collected during the process of the study. The cut-offs can be relaxed or made more strict based on the Users requirement.

Conclusion

To conclude it can be said that, as Jawans are the frontline guardians of Indian Army, they should be found fit for their respective jobs. Thus developing the trade allocation system for Other Ranks in Indian Army will facilitate to find out the potential candidate for a particular trade. The battery will help in placing each candidate as per the skills and abilities he possesses.

References

Bennett, G.K., Seashore, H. G., & Wesam, A.G. (1974). *Fifth Edition Manual for the Differential Aptitude Tests, Forms, S and T.* New York: Psychological Corporation.

DIPR Note No. 386 (1982). *Construction of Battery of Psychological Tests for Classification of Leading Radio Operators.*

DIPR Note No. 419 (1985). *Development of a Battery of Tests for the selection of submariners.*

DIPR Note No. 445 (1989). *Development of A Battery of Specific Aptitude Test for Allocation of Other Rank Trade: Radio Operator in the Army.*

DIPR Note No. 458 (1991). *Construction of An Aptitude Test Battery for Recruitment of AEC (HAV) Instructors.*

DIPR Note No. 476 (1995). *Validation of the Differential Aptitude Test Battery for selection of Airmen for Technical Trades in the Indian Air force.*

DIPR Note No. 477 (1995). *Development of a Psychological Test Battery for selection of Artificers for Indian Navy.*

DIPR Note No. 478 (1995). *Development of an Aptitude Test Battery for the Selection of Infantry personnel to Sniper Cadre/ Courses.*

DIPR Note No. 514 (1997). *Development of Battery of Psychological Tests for Trade Allocation of soldiers (Tech) of EME Corps.*

DIPR Note No. 537 (1999). *Development of an Aptitudinal Criterion for MER Sailors*.

Flanagan, J.C., et. al. (1964). *The American High School Student*. Pittsburgh: Project TALENT Office, University of Pittsburgh.

Freeman, F.S. (1965). *The Theory and Practice of Psychological Testing*. Third edition, Oxford & I B H Publishers, New Delhi,

Seashore, C.E., Lewis, D. & Saetveit, J.G. (1939). *Manual of Institutions and Interpretations for the Seashore measures of Musical Talents,* USA.

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