



Mechanical Ability Test

M.A.T.

HR•Assessments®

Developed by J. M. Llobet, Ph.D.

Administrator's Manual



Table of Contents

HR•Assessments® Products: An Investment in Your Company's Future	4
Use of Assessment Products as "Tools"	4
Legal Aspects of Assessment Use and Administration	4
Assessment Products and "Adverse Impact"	4
Federal Laws	5
Title VII	5
The Americans with Disabilities Act	6
Recordkeeping Requirements	6
State and Local Laws	6
Assessment Selection and Follow-Up Procedures	7
Selection	7
Monitoring	7
Validation	7
Scoring	7
Importance of Testing for Mechanical Ability	8
Description of the M.A.T.	8
Using Job Analysis to Justify Use of Assessment.	10
Administration Instructions for Paper Tests.	12
Scoring Instructions for Paper Tests	13
Administration Instructions for Web-based Tests.	14
Scoring Instructions for Web-based Tests	15
Interpretation and Use of Scores.	16
Norms	16



Table of Contents (continued)

Developing Company-Specific Norms	18
Discussing Results of the M.A.T.	19
Validity and Reliability	20
Validity Study #1	20
Validity Study #2	21
Reliability	21

To ensure that you are obtaining the full benefits available to you from the use of HR•Assessments® products, please read all information contained in this manual carefully. By using this assessment product, you are acknowledging that you have read and understand the general guidelines provided in this manual, and that if you have any specific questions, you have referred them to a competent testing and/or legal expert for advice. The test developer and publisher do not assume liability for any unlawful use of this product.

The test developer and publisher do not assume any responsibility for the employer's use of this test or any decision the employer makes which may violate local, state or federal law. By selling this test, the publisher is not giving legal advice.

While HR•Assessments® are designed to help predict various aspects of human behavior, score results are presented in terms of probabilities. False Positives and False Negatives are expected. EDI and the test developer are not liable for test taker, applicant or employee behaviors.



HR•Assessments® Products: An Investment in Your Company's Future

The decision to use assessment products in the employment process is one that can be very beneficial to your company in many ways. A well-designed, properly validated test, when used in conjunction with other employment-screening tools, can save your company from investing training resources in an applicant who is not suited to perform the job for which he or she was hired, and, as a consequence, can help protect your company from negligent-hiring lawsuits.

Each HR•Assessments product has been researched and developed by our in-house staff of testing professionals, which includes experienced industrial psychologists.

Use of Assessment Products As “Tools”

Validity studies of the assessment products we offer have shown them to be predictive of job performance and therefore quite useful during the selection process. It is important to remember that assessments should be used in conjunction with other, equally important employment-screening tools – such as criminal background checks, work histories and employer references – to present a balanced picture of the particular job candidate. Only when used in coordination with one another will you be able to truly determine a “fit” between the candidate and the particular job for which he or she is applying.

Employment assessments, as defined in this manual, can be of several different varieties, including trustworthiness or integrity assessments, skills-oriented assessments and personality assessments. Each assessment can emphasize one of these elements, or may include several different components, testing a variety of factors. Choosing the proper assessment product for your needs is a key factor in making your selection process more effective.

Legal Aspects of Assessment Use and Administration

Although employment assessments have been in use for more than 40 years, their use became more prevalent after the passage of the Employee Polygraph Protection Act (EPPA) of 1988, which made it illegal for most private employers to use polygraph examinations as a routine pre-employment screening tool. Employment assessments that are not prohibited by the EPPA are designed to give the employer a legal way to gauge an employee's job-related skills and personality traits as an alternative to the polygraph test. Whereas the polygraph test is designed to monitor an applicant's physiological reaction to certain questions, the employment assessments seek to gain information on the job candidate through a series of questions designed to measure certain job-related attributes.

Today, the use of employment assessments continues to increase. Many of the country's largest corporations use these screening devices on a regular basis, and have found great success in using them to hire and promote the best candidates.

Assessment Products and “Adverse Impact”

A common misperception of these assessments is that they all tend to discriminate against certain classes of applicants, in violation of state and federal laws against discrimination in employment decisions. In fact, this is not the case. Although there is evidence of poorer test performance by some members of protected classes on some skills tests that include language and mathematical components, the use of such tests is still justified so long as the skills assessed by the tests are essential for the successful performance of one or more of the job's key functions. In addition, researchers have found no evidence that well-constructed personality assessments discriminate on any unlawful basis.



However, it is incumbent upon employers who use assessments products to constantly monitor selection procedures to ensure that no “adverse impact” is occurring in the overall selection process. Adverse impact is defined as a situation in which there is a substantially different rate of selection in hiring, promoting or other employment decisions that works to the disadvantage of members of a race, sex or ethnic group. If adverse impact does occur, the employer needs to be able to demonstrate the job-relatedness of the selection process. For further guidance in this area, read the Test Selection and Follow-Up Procedures section of this manual.

Federal Laws

There are federal laws and regulations governing the use of “selection” tools, such as employment assessments, insofar as they have any “adverse impact” on the employment opportunities of protected classes of individuals. Some of the more subtle aspects of these laws, as they apply to the selection process, are discussed in the section of this manual titled *Using Job Analysis to Justify Use of Test and Its Sections (Legal Implications)*.

Title VII

Title VII of the Civil Rights Act of 1964 (Title VII), covering employers with 15 or more employees, prohibits discrimination in employment decisions on the basis of race, sex, color, religion and national origin. Title VII authorizes the use of “any professionally developed ability test provided that such test, its administration or action upon the results is not designed, intended or used to discriminate” on any unlawful basis. In 1971, the U.S. Supreme Court, in *Griggs v. Duke Power Co.* (401 U.S. 424), adopted the standard that employer practices that had an adverse impact on minorities and were not justified by a business necessity violated Title VII. Congress amended Title VII in 1972, adopting this legal standard.

As a result of these developments, the government sought to produce a unified governmental standard on the regulation of employee selection procedures because the separate government agencies had enforcement powers over private employers and each used different standards. This resulted in the adoption of the Uniform Guidelines on Employee Selection Procedures (Guidelines), codified at 29 CFR Part 1607, which establish a uniform federal position in the area of prohibiting discrimination in employment practices on the grounds of race, color, religion, sex or national origin, and apply to all public and private employers covered by Title VII, Executive Order 11246, the State and Local Fiscal Assistance Act of 1972, the Omnibus Crime Control and Safe Streets Act of 1968, and the Intergovernmental Personnel Act of 1970.

Highlights of the Guidelines include:

- Provision of a uniform set of principles governing use of employee selection procedures that is consistent with applicable legal standards.

- Setting out validation standards for employee selection procedures generally accepted by the psychological profession.

The Guidelines do not require a validation of the selection device unless evidence of adverse impact exists. It is important to note also that compliance with the Guidelines does not remove the affirmative action obligations for assessment users, including federal contractors and subcontractors.



The Americans with Disabilities Act

The Americans with Disabilities Act (ADA) provides that an employer “shall not conduct a medical examination or make inquiries of a job applicant as to whether such applicant is an individual with a disability or as to the nature or severity of such disability.” (42 USC Sec. 12112(d)(2)(A); see also 29 CFR Sec. 1630.13.) Inquiries into a person’s disabilities are prohibited at the pre-offer of employment stage, except in a very narrowly defined situation in which the applicant has voluntarily disclosed a medical condition requiring accommodation. The ADA protects disabilities, not a characteristic that an employer may consider to be a personal flaw or undesirable aspect of an applicant’s personality. The ADA does not prohibit inquiries into such personality attributes as propensity for honesty, ability to get along with others, organizational skills or management skills, to name a few examples. No question or series of questions designed to elicit information about a person’s mental impairment (as defined by the ADA), or questions that would even tend to elicit such information, should appear on a assessment product. Each HR•Assessments® testing product has been carefully reviewed under this standard, to avoid any conflict with the ADA guidelines.

Recordkeeping Requirements

Various federal laws require employers to retain tests and test results for at least one year from the date the test is administered or from the date of any personnel action relating to the testing, whichever is later.

State and Local Laws

Due to the wide variety, complexity and ever-changing nature of state laws, it is impossible to summarize each state’s requirements in this brief overview. If you are unfamiliar with the state and local laws governing the use of screening devices applicable in your locale, consult a qualified labor law attorney or testing specialist who may provide competent guidance on this topic.



Assessment Selection and Follow-Up Procedures

Selection

Generally, when selecting an assessment or any other selection tool, you should choose one that has been specifically designed to measure the skills or traits necessary for the position in question. It is recommended that a thorough job analysis be performed to determine the connections between job functions and the attributes the assessment product is designed to measure.

Monitoring

Monitor your selection process to ensure compliance with all applicable federal, state and local laws, checking your selection process for evidence of adverse impact. This should be conducted on a continual basis. HR•Assessments® testing products include testing logs that can be used to record each assessment taker's scores, as well as other important data that may be used to compute your own test norms and adverse-impact statistics.

Validation

Should your monitoring results indicate that adverse impact is occurring in the selection procedures, you should determine in which component of the selection process this is happening. If the use of a certain assessment product is found to be the cause, you will need to conduct a validation study of the assessment. Qualified testing professionals may be contacted to help in conducting a validity study. These professionals will be able to help determine whether the assessment is the cause of the adverse impact and whether the assessment is emphasizing a bona fide occupational qualification for the job. In some instances, assessments that in some contexts may be considered discriminatory may be lawful to use in others, so long as the assessment is centered on a bona fide occupational qualification.

Scoring

Cut-offs and suggested "pass" or "fail" scores are not provided with these assessments. Instead, norms and, in some instances, average assessment scores for various levels of job performance are provided. This information is provided for the elements the assessment is designed to measure. This information is a result of the testing universe used in the validation studies performed by the developer and is for demonstrative purposes only. Assessment results should always be interpreted along with other information gathered through your selection process, to ensure that you get a complete picture of the job candidate or employee. It is recommended that you administer the assessment to your current employees so you may develop your own company-specific norms for assessment performance. These norms then can be used as benchmarks during your assessing and selection process.



Importance of Testing for Mechanical Ability

When selecting employees who will be performing jobs that involve mechanical or equipment repair, general building maintenance, knowledge of tools and/or general mechanical concepts, it is important to assess such skills objectively. Not doing so could result in hiring individuals who could cause harm to themselves and those around them.

The Mechanical Ability Test (M.A.T.) provides a valid, reliable and objective measure of an individual's knowledge of general mechanical concepts. The test consists of 30 questions that touch on the following areas:

- Use of tools
- Reading rulers and gauges
- Proper lifting techniques
- Mechanical movements
- Assembly
- Electrical

Validation research (see *Validity and Reliability* section) has found the M.A.T. to be predictive of supervisory ratings of employees' knowledge and use of tools on the job, knowledge of mechanical concepts, ability to perform mechanical repairs and light industrial duties, extent of mechanical orientation and mechanical interest.

Your company's success depends on the soundness of your hiring decisions, and the risk of an unskilled and unsafe employee is too great to ignore. Incorporating the Mechanical Ability Test into your selection process for those jobs requiring some aspect of mechanical knowledge should significantly increase your hiring accuracy, and provide an effective means of maintaining workplace safety and satisfactory performance.

Description of the M.A.T.

The Mechanical Ability Test provides a reliable measurement of the basic mechanical concepts required of those jobs consisting of maintenance/mechanically oriented duties and responsibilities (e.g., knowledge of tools, reading rulers and gauges, knowledge of proper lifting techniques, knowledge of mechanical movements, assembly and electrical). Test administration time is 10 minutes.

One of the primary advantages of the M.A.T. is its ease of administration and scoring. Quick and clear scoring procedures make the test accessible to all types of businesses regardless of the size or the industry. Test administration is accomplished in a short time without sacrificing the test's technical qualities (e.g., reliability, validity).

The M.A.T. should provide a significant return on investment for its users. A comparison of the cost of this test and the hidden costs associated with the recruitment and promotion of ability-deficient applicants will reveal that personnel testing is cost-effective. The training and time investment in employees who turn out to be unqualified represent a very significant hidden cost.

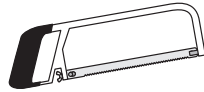


Below are the test instructions and examples of test items.

Directions

This is a test to see how rapidly and accurately you can identify the uses of specific tools and answer general questions about mechanical concepts. Please look over the sample problems below that have been worked for you.

1. This tool is primarily used to cut:



☐ Wood ☒ Metal ☐ Rubber ☐ Concrete

2. In which direction would you turn the screw if you wanted to tighten it?



☐ A ☒ B ☐ Either direction

Do you have any questions?

This questionnaire contains 30 problems similar to the ones presented above. You will have 10 minutes to work on as many as you can. You should use a ballpoint pen when completing the questionnaire. If you make a mistake, **Do Not Erase** your mark. Draw a circle around the ✓ like this: (✓). Then place a **checkmark** in front of the desired response. You are not expected to complete all of the problems in the time allowed, but try your best. Your score will be determined by the number of problems you answer correctly. The problems become more difficult as you go along. Therefore, it is not recommended that you skip around.

The examiner will not answer any questions once you have started.



Using Job Analysis to Justify Use of Assessment and Its Sections (Legal Implications)

From a legal standpoint, it is important that users of this assessment take the necessary actions to establish a clear connection between the job tasks and the skills measured by the M.A.T. This relevance should exist, to meet the principles outlined in the Uniform Guidelines on Employee Selection Procedures (1978) and other federal government employment-related legislation, such as Title VII of the Civil Rights Act of 1964, the Civil Rights Act of 1991, and the American with Disabilities Act of 1990.

The tasks that are crucial or essential to the job in question should first be identified. This process should reveal the skills that are relevant and should guide your selection of the test you will administer. You should administer only tests that measure skills found to be important for successful job performance. This process should be carefully documented to justify the appropriateness of the M.A.T. in the employee selection process. The following are examples of job tasks that require the knowledge, skills or abilities measured by the M.A.T.

Sample Job Tasks
Inspects and repairs warehouse machinery as needed.
Uses appropriate tools during equipment repair.
Assists customers with general hardware-related questions.
Performs general building maintenance duties effectively and efficiently.



As a general guideline for compliance with federal discrimination and disability laws, test users should not subject test takers to any adverse employment decision based on a test result, unless the test result and other factors considered in the decision-making process reveal that the person does not possess qualifications that are crucial or essential to the job in question. To illustrate, if a test taker performs poorly on a test section designed to measure inspection skills, and inspection skills are not crucial or essential to the position for which the test taker is being considered, the test result should not serve as a basis for excluding the test taker from the position. Similarly, if a test result indicates that a test taker is unable to perform certain physical tasks that are not crucial or essential to the job position at issue, the test taker should not be excluded from that position on the basis of the test result.¹ Test users can avoid this kind of scenario altogether by carefully identifying the tasks that are essential to the job at issue, and administering only those tests or test sections that are appropriate and relevant to the position's requirements.

Test sections measuring proficiency in the English language also should be administered in accordance with these principles. Thus, if spelling, grammar, vocabulary, or reading comprehension skills are not essential to a job position, a test taker should not be subjected to an adverse employment decision based on poor test results in those areas. Requiring employees or applicants to be fluent in English may constitute national origin discrimination in violation of Title VII of the Civil Rights Act if the requirement is not justified by business necessity or directly related to job performance. There are some limited exceptions to this rule for jobs involving dangerous work requiring a heightened understanding of written or verbal safety instructions in English, or service positions that require significant communication in English with the public. Test users should consult with an attorney before subjecting any test taker to an adverse employment decision on the basis of English language deficiencies.

¹ If the test taker's ability to perform a particular physical task is essential to the job position at issue, the Americans with Disabilities Act may require the test user to provide certain accommodations to facilitate the test taker's performance of the task at issue. Test users should consult an attorney before making any adverse employment decision based upon a test taker's physical inability to perform a task measured by a test result.



Administration Instructions for Paper Tests

Please read these instructions before administering the M.A.T.

1. Before testing, you should be familiar with the test and its instructions. Be prepared to answer any questions that may be asked.
2. The test must be timed exactly (10 minutes). It is recommended that you use a stopwatch to ensure the accuracy of the administration time.
3. The test should be administered in a quiet room, free from distractions and interruptions.
4. Provide each applicant with a ballpoint pen to ensure clear markings on the answer sheets.
5. Distribute the test and have the applicant complete the front cover (e.g., name, Social Security number and date).
6. Tell the applicant to read the test instructions on the front cover.
7. After the applicant has read the test directions, ask, “Are there any questions?” If there are no questions, state: “Remember, there is a 10-minute time limit. Although you are not expected to complete all of the problems, try to work as quickly as possible. Your score will be determined by the number of problems you answer correctly. Are there any questions?”


Test users who are subject to the Americans with Disabilities Act of 1990 may be required to provide accommodations to disabled test takers who need assistance during the testing process. This may include, for example, relaxing the time limitations of timed tests, offering visual or audio assistance, or providing special lighting or seating arrangements. Test users who are uncertain of their obligations under the Americans with Disabilities Act should consult an attorney if an accommodation is requested in the testing process.

8. If there are no questions, instruct the applicant to “Turn the page and begin.”
9. Accurately time the applicant. Make sure the applicant gets only the amount of time specified for the test (10 minutes).
10. When the 10 minutes have expired, instruct the applicant to: “Stop; put your pen down.”



Scoring Instructions for Paper Tests

Scoring the M.A.T. is straightforward and time-efficient. Follow the steps listed below:

1. Open the test and tear off the perforated tab on the right side of the test. Carefully separate the test cover from the answer key.
2. The applicant's answers should appear as checkmarks on the carbonless copy. An answer is correct when the check appears inside the answer box. If an applicant checks off two answers for the same question, this should be counted as incorrect. If an answer choice is marked with a , this indicates a mistake made by the applicant and should not be counted as correct or incorrect.
3. Add the number of correct responses and write this number in the space provided on the front cover of the test. This is the applicant's test score.



Administration Instructions for Web-based Tests

Please read the following instructions before administering this test.

To access the Online Testing website:

Make sure to be using Internet Explorer to access the site

1. Open your web browser and go to <http://www.mytests.hrdirect.com>
2. Click **Administrator Login**
3. Enter the user name and password we've provided you via e-mail.

Step 1 – Create applicant(s)

It is important that you complete this step first as most of the other screens will not be functional until applicant names have been entered into the system.

In the Applicant Setup tab, fill out the form with the applicants information and click the **Save** button at the bottom left of the page. You should receive the message “You have successfully created a new applicant.” If you wish to create more applicants, click on the **Create New Applicant** button at the bottom of the page for a blank form and don't forget to click the **Save** button after entering each applicant.

Step 2 – Assign a test to an applicant

Click the “Assign Test” tab and select the applicant you would like to assign a test to from the drop-down list. Below you will see a list of tests that are available to the selected applicant. To the right of each test is a link to view his/her respective Administrator's Manuals. Click the checkbox next to the test you wish to assign, then click the **Assign Test** button at the bottom of the page.

Step 3 – Administer a test

Please inform your applicants:

1. Take the test using **only** Internet Explorer.
2. Make sure pop-up blockers are inactivated as the system will open a new screen.
3. Do not use the back button on the task bar during the test, as this will kick the applicant out of the test.

Click the “Administer Test” tab. Select an applicant, with previously assigned tests, from the drop-down list. Select the test that you want to administer. You may administer the test in one of three formats:

The **Begin Test Now** button will start the test immediately.

The **Send Email** button will e-mail an applicant the URL to our testing site along with a unique Session ID for them to enter to take the test.

The **Print Access Info** button will print out the URL to our testing site along with a unique Session ID, for the applicant, to enter to take the test.



Scoring Instructions for Web-based Tests

All web-based tests are scored automatically. Please read the following instructions to view the scores of a test.

View Test Results

Once a test has been completed, log in as an administrator and click the “Test Results” tab. You may view test results in one of two ways:

1. Select the applicant’s name from the “Applicant Name:” drop-down list and click the **Show Tests for Applicant** button. This presents all tests taken by the selected applicant. Click on one of the tests to present its results.
- or-
2. Select the test from the “Test Name:” drop-down list and click the **Show Applicants for Test** button. This presents all applicants who have taken the selected test. Click on the applicant’s name to present test results.

At any time in the future you may go back and view past applicants’ test results. They are saved in our system indefinitely.

Interpreting the Test Results

There are five tabs on a test’s results page:

Test Scores: Presents raw score, corresponding percentile with interpretive text and the average score for each test scale.

Test Score Graphs: Presents the same information as Test Scores along with the graphical view of the corresponding percentile score.

Interview Questions: Presents suggested follow-up questions to help you further evaluate the candidate’s responses to particular test items. If the test does not include this feature, clicking on this tab will result in the following message: “There are no follow-up interview questions for this test.”

Candidate Responses: Lists each test question along with the applicant’s response. If a test includes multiple scales, the test questions and applicants’ responses are separated by Scale.

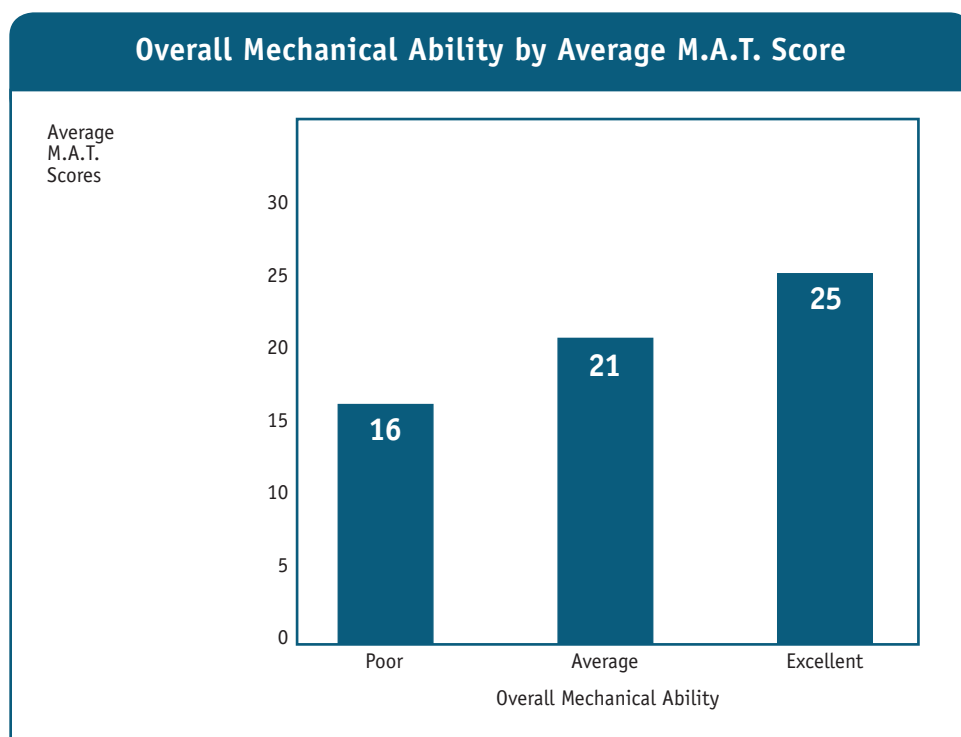
Utilities: Allows you to change your online testing password and print the various test result sections.



Interpretation and Use of Scores

To help you hire the best individual for your organization, the M.A.T. score should be used in conjunction with other applicant information (e.g., the applicant's work history, references and skills assessments). A high score on the M.A.T. indicates there is a strong probability the applicant has a good grasp of mechanical concepts and will do well when performing job tasks that require that particular skill or ability. Therefore, the higher the score, the better the chances are of hiring a top-performing employee.

Based on the data collected and analyzed for the research effort presented in the *Validity and Reliability* section of this manual, the average M.A.T. score associated with various performance levels has been identified and is presented below.



Norms

When interpreting test scores, norms provide a point of reference regarding the relative test performance of each applicant. Norms are the average scores or distribution of scores obtained from a study sample. These score “patterns” can be compared to your own applicant's test score to help define his or her test performance.

Table 1 on the following page contains norms obtained from studies conducted to validate the M.A.T. Table 1 consists of two columns of numbers. The first column is the raw test score. The second column is the percentile rank of that particular score or score range. The percentile rank is the percentage of applicants in the sample who obtained scores lower than the corresponding raw test score. For example, an applicant obtaining a score of 26 on the M.A.T. would have scored in the 77th percentile. This means the applicant would have scored higher than 77% of the applicants in the norm sample.



Table 1
M.A.T. Scores
and Corresponding Percentile

M.A.T. Score	Corresponding Percentile
29-30	100
28	97
27	90
26	77
25	69
24	60
23	52
22	41
21	39
20	37
19	32
18	28
17	26
16	21
15	16
14	13
13	8
12	6
11	3
9-10	2
8 or less	1

Average Score	22
Standard Deviation	5.30
Number of Participants	145



Developing Company-Specific Norms

You can use the information in Table 1 and the bar graph on page 11 as a guide to selecting the best job candidate; however, we strongly recommend that you collect and validate your own test data. The applicant/employee pool in your organization may differ from the study sample presented in this manual. Factors such as geographic location, business type and job responsibilities may have a significant effect on test scores.

One way to develop your own norms and benchmarks is to administer the M.A.T. to your employees. This will allow you to compare the scores of your top performers with those of your less productive employees. The information can then serve as a guide during your applicant evaluation process.

In addition, if you can establish and document that, in general, high scorers on the test are also your better-performing employees, this can serve as an initial step in establishing the validity of the M.A.T. within your organization.

If you do administer the M.A.T. to your employees for establishing company-specific norms, make sure your employees understand that the results of your study will be used for norm development only and that their employment status will in no way be affected by their test scores.

The EEOC and the Uniform Guidelines of Employee Selection Procedures recommend that job analyses be performed in conjunction with validation studies to determine the job-relatedness of each test and other selection tools used throughout the hiring process. It is the employer's responsibility to periodically monitor its employment-screening process to ensure it is fair and valid.



Discussing Results of the M.A.T.

Your company should develop a procedure for telling the applicant what the next step in the hiring process is, regardless of his/her score on the M.A.T. or any other assessment tool. Emphasize that the M.A.T. is only one of the criteria used to determine whether the applicant is a good match for the position. Remind the applicant that there are many people applying for the same position, and that each applicant will be considered based on how all of his/her qualifications and experience match the position's requirements.

Some interviewers may be tempted to look for a quick or easy reason to tell the applicant why he/she was not selected. "Blaming" a test may seem like a plausible reason, but it is no comfort to the rejected applicant, and should not occur. The fact is, the reason to hire or not hire should **never** be based solely on any single test score. It is the interviewer's responsibility to review all of the information gathered from the various tools used during the hiring process – such as the job application, the interview, reference checks and other tests – to form the decision on the applicant's appropriateness for the position.

The issue is and should always be whether there is an appropriate job fit between position and applicant. Using the M.A.T. is only a part of the information you need to make a decision. The other important part is knowing what else is required and desired in the employee filling the position, and effectively using all the sources available to you to make the best decision. This will ensure an effective selection process that offers a more comprehensive view of the applicant and results in hiring the best for your organization.

The employer assumes full responsibility for the proper use of the M.A.T. as mentioned in this manual. This includes establishing its job-relatedness to the position in question. If you have any questions about the proper use of employment tests, contact an employment testing specialist.



Validity and Reliability

Effective applicant/employee evaluation procedures need to be valid and reliable. Validity can be defined as the extent to which the measure helps in predicting job performance. In other words, validity can be conceptualized as to whether there is a relationship between test scores and job performance. Reliability refers to how consistent an instrument is at measuring what it is supposed to measure. The research studies described next have been conducted to determine the validity and reliability of the M.A.T.

The type of validation design conducted here is known as concurrent criterion-related validation. A professionally conducted, concurrent, criterion-related validation study is acknowledged to be an acceptable means of test validation as described by the federal government's Uniform Guidelines on Employee Selection Procedures. Essentially, this approach requires that the test be administered to current employees and, concurrently, data on the performance of these employees be gathered. If the test is valid, one would expect a statistically significant correlation between individual test scores and job performance. In other words, those employees who score high on the test would be those who also perform best on the job; those who do poorly on the test would be likely to receive poor performance evaluations.

Validity Study #1

The Mechanical Ability Test (M.A.T.) was administered to 77 individuals employed in a variety of jobs requiring some knowledge of mechanical concepts (e.g., carpenters, assembly line workers, mill workers, mechanics and machine operators). Supervisors were asked to rate the study participants on the seven performance dimensions presented below.

	Very Low Level		Average Level		Very High Level		
1. Knowledge of Tools Has a thorough understanding regarding the proper use of job-relevant tools and/or mechanical equipment.	1	2	3	4	5	6	7
2. Use of Tools Utilizes job-relevant tools and/or mechanical equipment efficiently and effectively.	1	2	3	4	5	6	7
3. Mechanical Concepts Has a good understanding of mechanical concepts including how machines and equipment work, and how to best utilize such machines and equipment.	1	2	3	4	5	6	7
4. Mechanical Repairs Is able to perform most job-related mechanical repairs effectively and efficiently with little supervision. Would be considered to be "handy" in laymen's terms.	1	2	3	4	5	6	7



Very
Low Level Average
Level Very
High Level

5. Light Industrial Duties

Is able to perform light industrial duties (e.g., lifting, operating equipment/machinery, loading and unloading shipments, warehouse duties) effectively and efficiently.

1 2 3 4 5 6 7

6. Mechanical Ability

Is mechanically oriented. Learns mechanical concepts easily and quickly.

1 2 3 4 5 6 7

7. Mechanical Interest

Enjoys working with tools to repair and/or build things.

1 2 3 4 5 6 7

A Principle Components factor analysis of these seven dimensions resulted in one factor. Therefore, an overall performance rating was calculated for the study participant by adding the performance ratings of these seven dimensions and dividing by seven. This average rating will be referred to as Overall Performance in the following tables.

Table 2
Correlation between M.A.T. Scores and Supervisory Ratings of Job Performance

Work-related Behavior	Validity Coefficient	Significance Level	N
Knowledge of Tools	.67	p<.001	77
Use of Tools	.63	p<.001	77
Mechanical Concepts	.64	p<.001	77
Mechanical Repairs	.70	p<.001	77
Light Industrial Duties	.33	p<.006	69
Mechanical Ability	.65	p<.001	77
Mechanical Interest	.70	p<.001	65
Overall Performance	.69	p<.001	64

Note: N equals the number of participants in the analysis.

These correlations indicated that, in general, those employees who scored high on the M.A.T. received high ratings by their supervisors on numerous and important job-related behaviors. Those employees who scored low on the test received lower performance ratings.



Validity Study #2

In addition to Validity Study #1, the M.A.T. was administered to 30 university students enrolled in a psychology course. Students were first asked to provide self-ratings of their mechanical ability using the same form as in Validity Study #1. Table 3 presents the correlation coefficients found between M.A.T. scores and the students' self-ratings. Consistent with the results of Validity Study #1, these correlations indicated that students who scored high on the M.A.T. also tended to rate themselves high on various aspects of mechanical ability.

Table 3
Correlation between M.A.T. Scores
and Self-ratings

Self-Ratings	Validity Coefficient	Significance Level	N
Knowledge of Tools	.60	p<.002	30
Use of Tools	.54	p<.003	29
Mechanical Concepts	.69	p<.001	30
Mechanical Repairs	.63	p<.001	30
Light Industrial Duties	.56	p<.004	27
Mechanical Ability	.65	p<.001	30
Mechanical Interest	.44	p<.021	27
Overall Performance	.60	p<.003	25

Note: N equals the number of participants in the analysis.

Reliability

In addition to validity research, a split-half reliability analysis was conducted to determine the reliability of the M.A.T. test items. That is, to what degree do the items in this test measure the same construct. In a "split-half study," the items are first "split" into two groups (odd versus even) for each individual in the study sample. The total score for these two groups of items then is calculated. These two sets of scores then are compared to each other using correlation analysis to determine the degree to which they are related. The higher the correlation, the greater the relationship, suggesting both sets of items are measuring the same thing. Using the tests from Validity Studies #1 and #2, the split-half reliability analysis yielded a reliability coefficient of .73, indicating a high degree of relationship between the two test halves.

The results obtained in the validity studies and the reliability research conducted for the M.A.T. offer strong evidence that the M.A.T. is a valid and reliable predictor of mechanical ability and/or orientation.

Once you have established that mechanical ability is important for performing the essential functions of the job, incorporating the M.A.T. into your selection process should significantly help you identify the best person for the job. Understanding an applicant's ability as it relates to the job in question is critical to finding the right fit and enhancing the effectiveness of your selection process.

While HR•Assessments were designed to help predict various aspects of human behavior, score results are presented in terms of probabilities. False Positives and False Negatives are expected. EDI and the test developer are not liable for test taker, applicant or employee behaviors.

To order the Mechanical Ability Test or any other HR•Assessments® product, or if you have any questions, call toll-free 800-264-0074.