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A REPORT ON FACTOR 1000, A CRITICAL TRACKING TASK, AND ITS APPLICATION AS A FITNESS FOR JOB DUTY TEST

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In the fall of 1990, the Center for Labor Research and Education was contacted by a Teamsters local to investigate a testing device called Factor 1000, a PC-based version of what is known as the Critical Tracking Task (CTT) or Critical-instability Tracking Task, designed to measure psychomotor impairment. After about 25 years of use in military, space and other testing applications, the task has been adapted for the PC and is being marketed by Performance Factors, Inc. of Alameda, California for use in industrial settings.

The employer in question was interested in implementing Factor 1000 as a fitness for duty test for its truck drivers. Their stated motivation was to test for impairment for safety reasons. The employer did not see this as an alternative to random drug testing. However, in the current environment, where job-based drug testing has become a major focus of the federal government's "War on Drugs," unions are under pressure from their membership both to help insure a safe workplace and to protect individual rights. Thus more attention is being focused on impairment testing as opposed to random drug testing, which many unions and civil liberties attorneys have criticized as an invasion of individual privacy and as punishment for past behavior, without measuring current impairment.

Factor 1000 is seen as an alternative to drug testing because it does measure impairment rather than off-the-job behavior and it is not in itself invasive of an employee's privacy in that

it does not require providing samples of personal bodily fluids. These considerations form the basis for the favorable reviews given this test by some civil liberties attorneys.¹ However, some attorneys and union representatives feel that any testing of this sort is *per se* an invasion of privacy. Other critics of the test are concerned that the test may give employers an excuse to fire or otherwise discipline workers for temporary conditions or to pry into employees' private lives, but feel that it is a better alternative than drug testing.² There is some concern that the test might be used as the sole basis of finding reasonable cause to test for drugs.

The Labor Center study focused on the questions of whether the task measures what is claimed it measures, whether the measured ability is job-related and what issues should be addressed by the union in collective bargaining if this test is implemented. Initial results suggest that the CTT does measure significant impairment for some jobs.

Assuming the test is used only for jobs requiring unimpaired hand-eye coordination, and if certain safeguards are established relating to the fairness of test administration and the consequences of failure, Factor 1000 could be used to improve workplace safety without being oppressive to the workers involved. However, without these safeguards this test could well become another infringement of employee privacy.

Description of Factor 1000

The test itself looks like a simple video game, the objective being to keep an arrow centered between two boundaries on the video screen. The operator has control over the arrow by means of a knob approximately 1.5" in diameter. Turning the knob clockwise moves the arrow to the right and turning the knob counter-clockwise moves the arrow to the left. The

computer program creates a quasi-random instability that is driven by the operator's responses. The task is designed to increase in difficulty by increasing the pointer's instability. At some point, the pointer's random movements will exceed the individual's ability to control them and the pointer will swing out of control to one of the boundaries. This ends the test trial.

Each person is given time to reach the level of difficulty he or she can control. Once the individual's learning curve flattens out, *i.e.*, once he or she has learned the test well enough that his or her improvement as difficulty is increased slows significantly, the program calculates an average difficulty index for each employee required to take the test. The employee then performs the CTT every day on the job site before he or she starts driving or operating equipment. The employee "passes" the test if he or she can reach his or her average difficulty index one time in four tries and "fails" if he or she cannot. The computer periodically computes a new average for each employee, since the employee will continue to slowly improve his or her ability to control increasingly difficult tasks after the relatively fast improvement which resulted in the first average difficulty index. The test compares the employee against the employee's own baseline performance. The test usually takes under a minute. There are no claims that the test shows the actual reason for impairment if the employee fails.

Validity of the Critical Tracking Task

Studies have demonstrated the sensitivity of the CTT to psychomotor impairment caused by several specific factors, such as alcohol, marijuana, fatigue, acceleration (G-stress), secobarbital and carbon monoxide.³ The CTT has been used to measure impairment in various contexts. The U.S. Air Force was the first organization to use the CTT to study performance of human pilots. NASA used the CTT to study visual-motor responses of crew members during a simulated space mission. The U.S. Department of Transportation used the CTT as one of the measurements of driver fatigue in studying the effect of hours of service, regularity of schedules, and cargo loading, on truck and bus driver fatigue. NATO's Advisory Group for Aerospace Research and Development (AGARD) has selected this task (called the "Unstable Tracking Task" in its report) as one of seven tests included in its Standardized Tests for Research with Environmental Stressors (STRES) Battery, to be used for studies of human performance, with results to be shared among scientists from NATO countries.

Probably the most relevant tests for purposes of this discussion were conducted under the auspices of the National Highway Traffic Safety Administration. Drivers convicted of a second offense of drunk driving and who met certain reliability criteria were allowed, as an alternative to a fine, to take part in a field test of a device that would activate alarms utilizing the emergency flasher and horn when the car was driven unless the driver passed the CTT. A computer in each car kept track of the CTT scores, along with when and how much the car was driven. The purpose of the test was to show whether a device of this kind would detect driver impairment and deter driving while impaired. Prior to the field test the CTT was tested for

its ability to detect impairment due to alcohol. Ability to pass the test correlated with both the level of blood alcohol of the test subjects and the number of crashes sustained in a driving simulator.⁴ Similar results were achieved in a low Blood Alcohol Concentration test of the CTT recently conducted by System Technologies, Inc., using professional truck drivers as subjects who were classified as moderate to heavy drinkers.⁵

Concerns About the Application of the Task to an Industrial Setting

There are some concerns that arise in the application of the CTT to an industrial setting. Some people have questioned whether there is enough data available to prove that the test works to determine performance impairment.⁶

Critics of the test argue that the data that correlates the test with alcohol use, fatigue or use of some drugs does not sufficiently validate the test, either for those factors or for impairment from other factors. Certainly any kind of screening test should be structured to filter out workers who pose a safety risk that day and *not* screen out those that do not pose a safety risk. Both unions and management would be concerned that a person's performance might be rendered unsafe by the use of chemical substances, or by a combination of stressors, for which the sensitivity of the CTT has not been shown. However, the fact that studies have not been done for all possible causes of psychomotor impairment does not necessarily mean that the test fails to measure impairment, or that implementation should be delayed until all possible reasons for impairment can be studied. CTT has been shown to measure impairment for some of the most likely causes, and its purpose is not to detect the causes of impairment.

The second issue concerns just what ability is actually being measured and whether that ability is job-related. Some factors that the test is sensitive to, such as impairment due to alcohol or fatigue, have been independently demonstrated to have an effect on driving. An argument can be made, however, that it hasn't been shown that it is the impairment of the tested ability, rather than something else, or some combination of factors, that affects actual performance. In order for the tested ability to be proven to be job-related, there would have to be data correlating job performance with CTT failure, without regard to the causes of the failure. Recent analysis of Factor 1000's record at a petroleum distributor, comparing 1989 without the test and 1990 with the test, did show a reduction in driving accidents of 67%, a reduction in incidents such as delivery errors and motorist complaints by over 70% and the complete elimination of cross-dumps. These results are from a relatively small sample. Larger amounts of data will become available as more workplaces implement the CTT.⁷

Performance Factors, Inc. also addresses this issue by including a clause in their contract with companies using Factor 1000 which requires that the test be used only with employees whose jobs require intact hand-eye coordination to be performed safely. It would be difficult to argue that driving a truck or other heavy equipment doesn't require intact hand-eye coordination, for example, but for many types of work such a requirement is not so readily apparent. A union interested in

safeguarding employee rights would probably not want to rely on an employer's contract with an outside vendor to safeguard those rights, but rather to itself insure through bargaining that the test will be used only in those instances where the test is relevant to safe job performance.

A third issue arises because a person passes or fails the test in relation to his or her own norm. There is no minimum hand-eye coordination score that is set forth as necessary for any particular job. People pass the test with different CTT scores and people safely perform the same job with different average scores. The following question arises: "If one driver's average is higher than another's, why is the first driver unable to do the job safely if she scores under her average but more than the second driver on a particular day?" The response given by the test's marketers is that human functioning depends on a number of characteristics working together, including hand-eye coordination. A worker develops his or her skills by integrating the various characteristics, including hand-eye coordination, at particular, unique levels. His whole way of responding is based on his being used to his own normal speed and ability to react.⁸ This might be a valid argument; however, the test could be open to attack, especially if someone ends up losing pay by being sent home for impairment and there is no evidence of drug or alcohol use. A related concern would arise if an employer attempted to institute a minimum score on the CTT for someone to either secure or retain a particular job. This is not an application for which the test is designed.

There are only a few workplaces using this impairment test so far. As more companies have experience with it, more data will become available about its effect on workplace safety. Studies could be designed and implemented, perhaps using a driving simulator or other sufficiently validated measure, to determine whether individuals who fail the test, for reasons other than alcohol or drugs, are actually impaired on the job. Such studies would need to be conducted by experts in human performance and are beyond the scope of this inquiry.

Concerns About the Uses of the CTT

Once the decision is made to implement the test, the union's concerns will likely center on fairness of test administration and the consequences of failure. In the companies where the test has been implemented, an employee who fails the test goes to see his or her supervisor. So far, where the test has been implemented, the causes for failure have been adequately explained to the supervisor's satisfaction and the employees have been assigned non-driving jobs for the day.⁹ The union may want to plan future bargaining strategies to secure safeguards for the usage of this test, so that members' rights are protected. For example:

A. The test should be administered only in cases where unimpaired hand-eye coordination is a requirement for safe job performance.

B. The test should not be administered in a place where distractions would be able to adversely affect test performance.

C. On a day where impairment is indicated, some provision should be made for allowing a worker to do a job not requiring his or her normal hand-eye coordination.

D. Failing the test should not be used as the basis for sending someone for drug testing. Additional factors, such as the ones currently required in collective bargaining agreements to implement "reasonable cause" drug testing, should be present, along with all the other guarantees and safeguards afforded employees by the agreement.

Conclusion

The Critical Tracking Task is not in widespread use in the private sector economy, so the amount of data available for an industrial setting is not large. However, Factor 1000 has demonstrated that under some circumstances it can reliably detect impairment of hand-eye coordination. If it is used as intended and only for jobs that require unimpaired hand-eye coordination for safe operation it could increase safety at the workplace. The issue of impairment on the job is likely to remain of concern to employers for the foreseeable future, and unions looking ways that that concern can be addressed without allowing employers to impose unreasonable restrictions on employees might want to explore this avenue. In addressing the issue of actual impairment rather than testing for drugs, the CTT can be seen as a step in the direction of ensuring a safe workplace with less infringement of employees' rights than drug testing. If the test is implemented, concerns about the possible misuse or abuse of the test can be addressed in collective bargaining.

NOTES

(1) See, for example, Levine, Daniel S., "Drug Test Alternative Hailed," *San Francisco Examiner*, March 14, 1990 and Maltby, Lew, "Performance Testing: New Approach to Workplace Drug Abuse," *Civil Liberties*, Summer, 1990.

(2) A discussion of some of these arguments is contained in Bernstein, Harry, "Performance Tests vs. Drug Tests," *Los Angeles Times*, December 25, 1990.

(3) A summary of the validity and sensitivity testing for CTT appears in NATO Advisory Group for Aerospace Research and Development, *Human Performance Assessment Models*, 1989, at p. 35.

(4) Allen, R. Wade, Anthony C. Stein, and Henry R. Jex, "A Vehicle Mounted Drunk Driving Warning System (DDWS): Concept, Laboratory Validation, and Field Test," presented at the Annual Meeting of the Transportation Research Board, January, 1985.

(5) Allen, R. Wade, Anthony C. Stein, and James C. Miller, "Performance Testing as A Determinant of Fitness for Duty," Society for Automotive Engineers (SAE) paper No. 901870, presented at the SAE Aerotech '90 Conference in Long Beach, CA, October, 1990.

(6) See the comments of Dr. Monroe Snyder of the National Highway

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Traffic Safety Administration in Stevens, William K., "Measuring Workplace Impairment," *The New York Times*, March 6, 1990.

(7) These figures are contained in an unpublished letter to the author from Todd Richman of Performance Factors, Inc.

(8) This is the author's understanding of the explanation advanced by Dr. Ezra Krendel of the University of Pennsylvania and by Jack Fruchtmann of Performance Factors, Inc.

(9) Maltby, Lewis L., "Put Performance to the Test," *Personnel, The Human Resources Magazine of the American Management Association*, July, 1990.

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Dr. Ezra Krendel, University of Pennsylvania

Todd Richman, Performance Factors, Inc., Alameda CA

Dr. Monroe Snyder, National Highway Traffic Safety Administration, Washington, D.C.

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