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THE VALIDITY OF COGNITIVE ABILITY

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The predictive validity of a selection instrument refers to the extent to which the instrument can predict the best job performers from a pool of applicants. Statistically, predictive validity is computed by correlating ratings of an employee's job performance with their initial scores on the selection instrument. Increased predictive validity is evidenced by higher correlations between the selection instrument and later job performance. The use of hiring methods with increased predictive validity leads to better selection decisions.

One commonly held assumption about validation studies is that a new study is required in each situation, for each job. Schmidt and Hunter (1977) challenged the idea of the situational specificity of validity coefficients. Their examination of hundreds of validation studies of general mental ability tests led them to the conclusion that the inconsistencies in validity coefficients across studies could be attributed to statistical artifacts such as:

- The restricted range of scores in each study (i.e. only the high scorers on the selection test are selected for the job, so there is no criterion data for low scorers on the selection test);
- The low reliability of the criterion (e.g. job performance) measures;
- The small sample sizes that were used in most of the studies (Pearlman, Schmidt & Hunter, 1980).

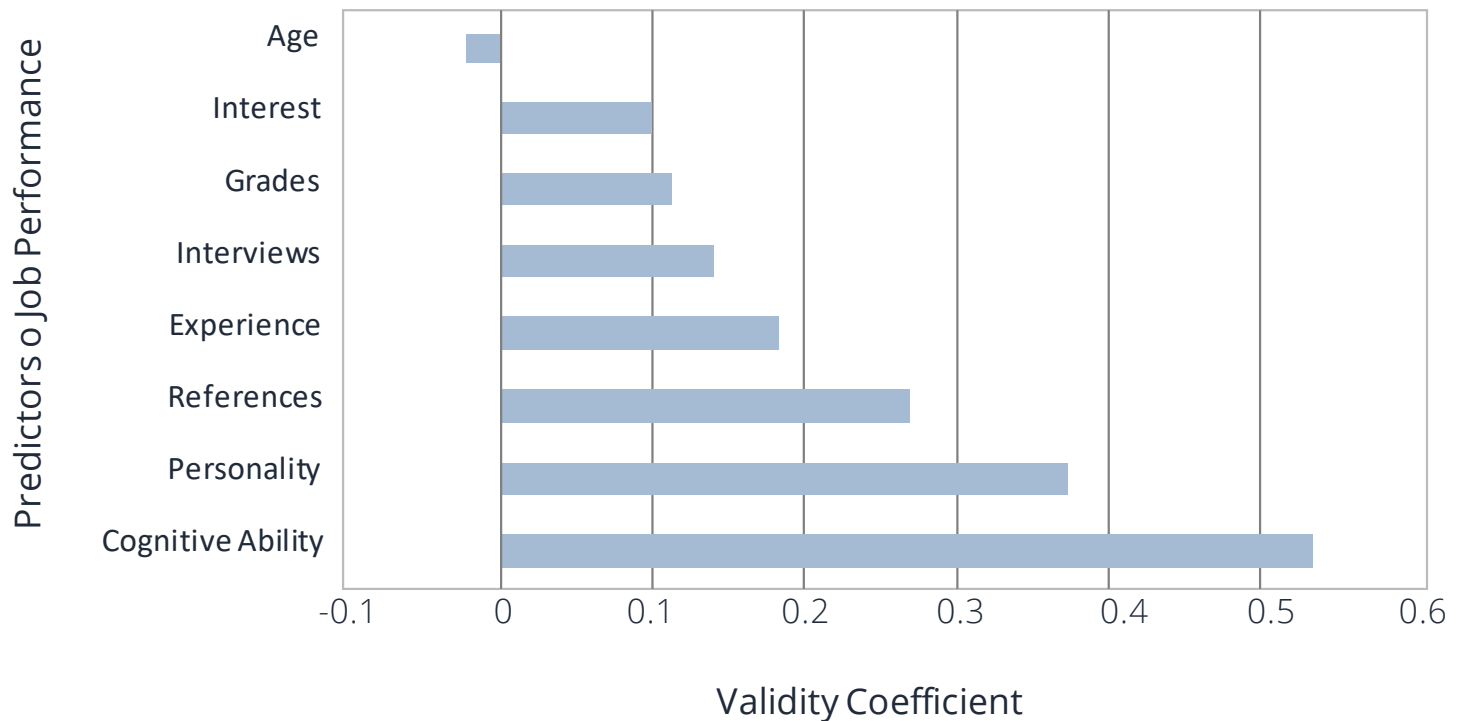
Using a procedure called meta-analysis, designed to aggregate results across many studies, Schmidt and Hunter (1977) determined that it is possible to combine validity coefficients for similar predictor and criterion measures reported in different validation studies. Meta-analytic techniques allow for the combination of validity estimates across studies and correct for the effects of the statistical and measurement problems listed above. Meta-analytic techniques involve weighing the results from each separate validity study according to its sample size. Therefore, studies based on meta-analysis can provide accurate estimates of the average validity for a given predictor and criterion (i.e. general mental ability and job performance). If the meta-analysis database is large and if it adequately represents the type of job in a specific situation, then there is a strong case for using the validity generalization data.

Numerous studies have found that general mental ability is the best predictor of job performance across a variety of employment settings. In a very large meta-analytic database consisting of over 32,000 employees in 515 widely diverse jobs, Schmidt and Hunter (1998) reported that the validity of general mental ability for predicting job performance was .58 for professional-managerial jobs, .56 for high-level complex technical jobs, .51 for medium complexity jobs, .40 for semi-skilled jobs, and .23 for completely unskilled jobs. The validity coefficient for the medium complexity jobs (.51) includes 62% of all the jobs in the U.S. economy. Medium complexity jobs include skilled blue-collar jobs and mid-level white-collar jobs, such as upper level clerical and lower level administrative jobs. These authors concluded that the main reason intelligence is related to job performance is that intelligent people have a greater ability to acquire job knowledge. That is, intelligence leads to acquiring a larger amount of job related knowledge and acquiring this knowledge more rapidly. Increased job-related knowledge results in higher job performance.

A meta-analysis of over a thousand studies, conducted by Hunter and Hunter (1984), provides evidence that cognitive ability measures are more valid than many other commonly used selection methods for predicting job performance. The results of this meta-analysis are illustrated in Figure 2-1.

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Figure 2-1. Validity of different predictors of job performance



Adapted from Hunter & Hunter, 1984

Numerous other empirical studies provide support for the finding that measures of general intellectual ability are strong predictors of job performance. In one meta-analysis comprising 52 validation studies and 5,872 participants, the investigators found an estimated true validity of cognitive ability tests of .68 for predicting training criteria. These particular studies examined electrical assembly, telephone technicians and mechanical jobs (Levine, Spector, Menon, Narayanan, & Cannon-Bowers, 1996).

Another meta-analytic study used multiple regression models to compare the relative validity of general mental ability with specific abilities for predicting job performance in a sample of 1036 US Air Force personnel from seven blue-collar jobs. Using hands-on performance tests and work sample tests as the criteria, the investigators found the average validity of general mental ability across the seven jobs was .40. The addition of specific ability measures to the general mental ability measure only increased the predictive validity by an average of .02 (Ree, Earles, & Teachout 1994).

In a meta-analysis of 698 published studies of clerical occupations, Pearlman, Schmidt, and Hunter (1980) found that general mental ability was a valid predictor of both training success and job proficiency for a variety of clerical occupations, and this generalized across organizations. Schmidt, Hunter, and Caplan (1981) provided meta-analytic evidence for the validity of cognitive ability predicting job performance for two groups of craft jobs in the petroleum industry. They found that general mental ability had a predictive validity of .26 with operator jobs and .30 with maintenance jobs. Similarly, Hirsh, Northrop, and Schmidt (1986) reported validity generalization results for law enforcement occupations (e.g. security guards, police officers, bailiffs).

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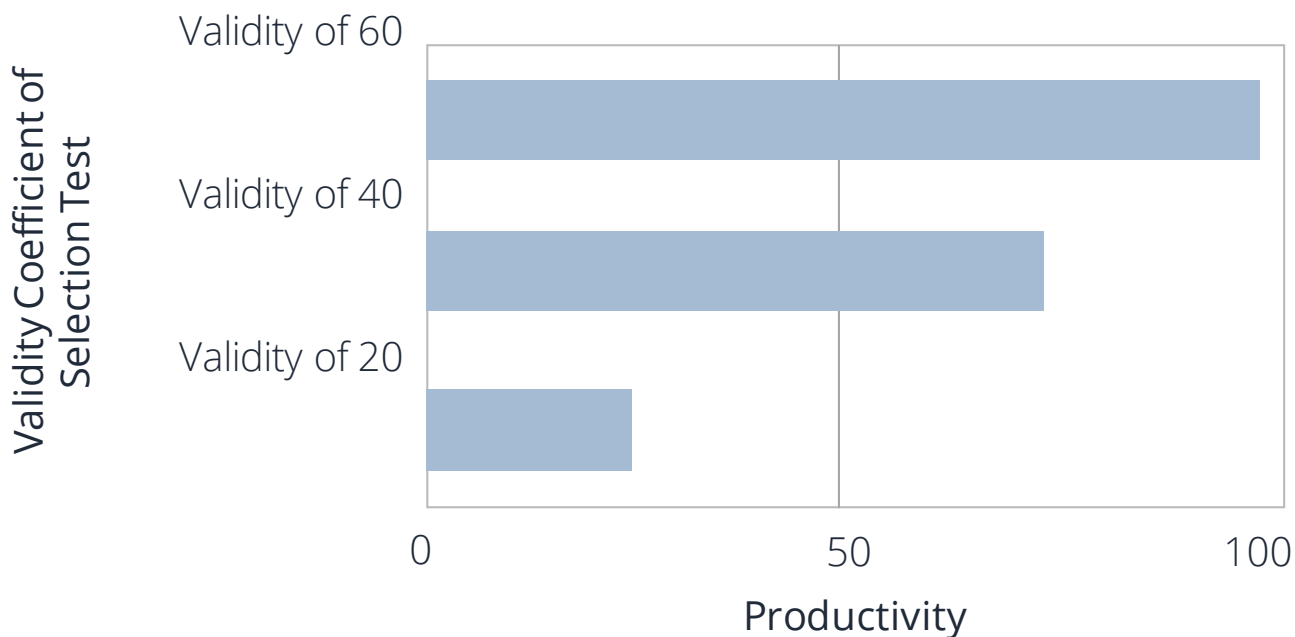
Outside of North America, Salgado and Anderson (2002) looked at cognitive ability testing in Europe. They performed a meta-analysis of British and Spanish studies of general mental ability tests and found an average predictive validity of .44 for job performance ratings. Their review included several types of jobs, including clerical, driver, and trades.

The link between job performance and cognitive ability is intuitive. Any job that requires speed, reasoning, memory, planning or change is implicitly contingent on cognitive ability (Hunter, 1983). Specifically, “ability determines the extent to which the person masters the knowledge required for efficient and excellent performance” (Hunter, 1983, p. 257).

Advantages of Using a Valid Selection Tool

The validity of a selection measure bears directly on the subsequent productivity of a job applicant. The predictive validity coefficient is directly proportional to the practical economic value of the assessment method. As shown in Figure 2-2, higher test validity leads to increased productivity. However, productivity increases even when a test with modest validity (.20) is used. In addition, Schmidt, Hunter, Outerbridge, & Goff (1988) found the validity remained constant even after five years of job experience, despite the fact that other studies have questioned whether or not the validity of general intellectual ability decreased over time.

Figure 2-2. Advantage of hiring using valid selection measures



*Note: Selection ratio 10:1
Adapted from Hernstein & Murry, 1994*

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Cognitive Ability and Job Complexity

Some researchers argue that general intelligence is only a valid predictor for specific aspects of performance (e.g., Hunter & Hunter 1984). These authors found that cognitive ability is not as useful a predictor for routine, well-learned job functions as it is for novel job tasks. In fact, there is evidence that as job complexity decreases so does the validity of the cognitive ability measures (Gottfredson, 1997; Hunter & Hunter, 1984). For example, the mean validity for a managerial position was .53, while the mean validity for a vehicle operator was only .28 (Hunter & Hunter, 1984). However, other psychological characteristics, such as personality and psychomotor abilities, become important predictors for occupations with varying levels of complexity.

Generalizability Across Job Families

The empirical support for the predictive validity of general intelligence is found across a variety of occupations, including food service managers, pilots, psychiatric aides, police officers, and computer programmers (e.g., Hunter & Hunter, 1984; Ree, Earles, & Teachout, 1994; Pearlman, Schmidt & Hunter, 1980). Although the specific functions of the aforementioned occupations differ, the ability to process information quickly, problem-solve, and to adapt well to change is consistent. In fact, a meta-analysis conducted by Hunter and Hunter (1984) found that across nine different job families (e.g., salesperson, industrial worker, and manager) the mean validity of cognitive ability as a predictor of a training success criterion was .54, and .45 as a predictor for a job proficiency criterion. Hunter and Hunter (1984) state that, “there is no job for which cognitive ability does not predict training success” (p. 80).

Incremental Validity of Cognitive Ability with Alternative Predictors

Studies indicate that there is no predictor of job performance that is comparable in validity to measures of general cognitive ability (e.g., Hunter & Hunter, 1984). However, some alternative predictors, such as integrity tests and reference checks, increase the predictive validity of job performance when used in combination with measures of general intellectual ability (e.g., Schmidt & Hunter, 1998). Table 2-1 illustrates this increase in predictive validity by adding a second predictor to a test of general mental ability. The first column in Table 2-1 shows the mean validity of several selection methods as found in meta-analytic studies. The subsequent columns show the gain in validity from adding additional selection instruments. Thus, other selection tools can be used in addition to a test of general mental ability, in order to maximize the predictive validity of the selection system.

Generalizability Across Job Families

It is critical that employment testing is fair to all applicants and focuses on measuring knowledge, skills, and abilities specifically related to job performance.

Research has clearly established that cognitive ability testing is valid, fair, and the single most powerful predictor of successful performance on the job (Schmidt & Hunter, 1998). However, it is important to remain vigilant about proper administration of the test and the use of test scores in order to ensure that minority applicants do not experience an unfair disadvantage.

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Research indicates that minority applicants may not employ optimal test-taking strategies and may experience higher levels of test anxiety (Ryan, 2001), which can exacerbate the negative effects of improper test administration procedures. Test anxiety can be minimized by having the test administrator take the extra time needed to ensure that all test instructions are clear, and that applicants are not confused and do not feel rushed when instructions are provided. It can be helpful to provide examples of test questions and maintain a testing environment that is free from distractions.

It is also very important that OCA results be considered together with other relevant information about the applicant before making final selection decisions. Other criteria to consider may include education level, previous training and experience gathered from relevant positions, as well as personal references that can attest to the competence of the applicant. It is important to consider all the information presented, give appropriate weight to both test and non-test criteria, and to avoid placing too high an emphasis on a single test score. Failure to adhere to these guidelines may present a disadvantage to minority applicants.

It is good practice to maintain flexibility in terms of interpreting results, in that cognitive ability test scores contribute only one piece of the information that should be considered along with other applicant qualifications relating to skills, experience, and personality traits. Generally, managers and other hiring decision makers should try to avoid any patterns or practices that may lead to a selection bias for specific applicant groups.

Table 2-1.
Predictive validity for overall job performance of general mental ability scores combined with a second predictor using multiple regression

Predictors	Validity (r)	Multiple R	Gain in validity	% Increase in validity
GMA tests	.51			
Integrity tests	.41	.65	.14	27%
Conscientiousness tests	.31	.60	.09	18%
Structured employment interview	.51	.63	.12	24%
Assessment centers	.37	.53	.02	4%
Reference checks	.26	.57	.06	12%

Adapted from Schmidt & Hunter, 1998

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