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# The Validity of Job Knowledge Measures

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The validity of written job knowledge tests as predictors of job performance and training success was examined. Based on a sample of 363,528 persons and 502 coefficients, meta-analyses were performed to investigate the extent of validity generalization and the effects of two hypothesized moderator variables: content similarity and job complexity. Corrected mean validities were 0.45 for studies predicting job performance and 0.47 for studies of training success. Support was found for both moderators since validities were higher for high complexity jobs and when job-test content similarity was high. The implications of this study for personnel selection and research in the area of work performance are discussed.

**Keywords:** Job knowledge, Validity generalization, Meta-analysis, Job complexity

Job knowledge is the cumulation of facts, principles, concepts and other pieces of information that are considered important in the performance of one's job. In the performance of work, there are at least two types of job knowledge: knowledge of technical information required to perform the job, and knowledge of the processes and judgmental criteria required to perform correctly and efficiently on the job (Hunter 1983). Those who have greater levels of technical expertise and are more informed of the work processes required for efficient operation are considered to have greater levels of job knowledge. According to Hunter, the advantages of using job knowledge measures in personnel selection are twofold: (1) greater job knowledge leads to reduced time needed for training, and (2) greater job knowledge results in improved levels of job performance.

Job knowledge measures can be characterized by the job specificity of their content. Depending on their use, the content of job knowledge measures can range from specific aspects about a single job within a particular setting to broad categories of general knowledge applicable to a variety of jobs. As an example of the specific type, an applicant for a position of a power plant operator might be asked to describe what series of operations he/she would undertake to test for an equipment malfunction. On the other hand, an assessment of general knowledge about what chemical reactions and processes might be

responsible for a mechanical failure would apply to this job as well as many other jobs.

Recently, two path-analytic investigations have been directed toward determining the impact of job knowledge on job performance ratings (Hunter 1983; Schmidt *et al.* 1986). Both of these studies showed that job knowledge as measured by written tests plays a significant role in job performance. Summarizing the results of these two studies, job knowledge was shown to be the major link between ability and job performance and between job experience and job performance. Job knowledge is acquired more quickly with greater levels of ability; greater levels of job knowledge are acquired through increased levels of job experience; supervisory appraisals of performance are largely influenced by levels of job knowledge.

## *Purpose of present study*

Since job knowledge has been claimed to be a key component in explaining work performance, the present study was undertaken to investigate the validity and validity generalization of job knowledge measures. In addition, two moderator hypotheses were evaluated. Specifically, this study hypothesized that the validity of job knowledge does generalize and that the validity is higher: (1) for jobs of higher levels of job complexity, and (2) when the similarity of the test content to job content is greater.

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## Method

Studies containing criterion-related validity data on job knowledge tests were gathered from the published literature as well as unpublished sources. The published studies were all those reported in *Journal of Applied Psychology* and *Personnel Psychology*, while unpublished studies were obtained from a variety of technical reports and memoranda.

Sufficient data were available to categorize the studies into those which predicted job performance and those which predicted training success. Categorization allows one to estimate validity differences between criteria of job performance and those of training. Separate meta-analyses were performed on the entire sets of job performance studies and training studies.

In order to estimate the moderating effects of job-test similarity and job complexity on job knowledge test validity, additional data were collected. For the similarity variable, the first two authors independently assigned each study a rating of high (3), moderate (2), or low (1) similarity. Similarity was assessed by comparing the content of the job knowledge test used with the job's occupational group as defined by the first three digits of the Dictionary of Occupational Titles (DOT) code (US Department of Labor, US Employment Service 1977). High similarity was assigned to a study in which the job knowledge test had been specifically developed for the job in question. Categories of moderate and low similarity

were used for off-the-shelf tests that were not locally developed. Moderate similarity was assigned to a study if the test used was related to the content of the job (e.g., a mechanical comprehension test for mechanists). Low similarity was assigned to a study if the test content was not explicitly related to the content of the job (e.g., a mechanical comprehension test used for stenographers). The independent ratings were averaged. From the average ratings, similarity was defined as follows: low = 1.00 to 1.67, moderate = 1.68 to 2.33, high = 2.34 to 3.00. For job complexity, a dichotomous version (high versus low) of Hunter's (1983) five-point complexity scale was used. The high value represented the first two levels (1 and 2); the low corresponded to levels 3, 4 and 5. This modified version was used due to the relatively small number of studies available for a similarity by complexity analysis using Hunter's original five-point scale. To evaluate the moderator hypotheses, meta-analyses were performed on the studies for each moderator variable separately as well as for their combined effect.

## Results

Reliability of job-test similarity was calculated by a Pearson correlation of the independent ratings boosted by the Spearman-Brown formula for the average of two raters. This value was 0.89.

For the meta-analyses, the obtained validity

Table 1: Meta-analyses of job knowledge tests by job-test similarity

Job-test similarity	Total N	No. r's	Mean r	p	Observed $SD_r$	$SD_{sc}$	$SD_p$	90% CV
<b>Job performance</b>								
High	3,965	59	0.31	0.62	0.149	0.109	0.158	0.42
Moderate	6,785	48	0.17	0.35	0.119	0.079	0.174	0.13
Low	5,867	32	0.16	0.35	0.091	0.072	0.090	0.23
Total	19,760	164	0.22	0.45	0.145	0.084	0.228	0.16
Note: 25 coefficients were not coded for similarity.								
Job-test similarity	Total N	No. r's	Mean r	p	Observed $SD_r$	$SD_{sc}$	$SD_p$	90% CV
<b>Training Success</b>								
High	1,525	13	0.49	0.76	0.139	0.069	0.158	0.56
Moderate	122,259	165	0.28	0.49	0.128	0.034	0.197	0.24
Low	218,833	150	0.26	0.46	0.117	0.024	0.183	0.22
Total	343,768	338	0.27	0.47	0.122	0.028	0.191	0.23
Note: 10 coefficients were not coded for similarity.								

Notes:  
*Obs.  $SD_r$*  is the standard deviation of the observed (uncorrected) validity distribution.  
 *$SD_{sc}$*  is the standard deviation expected due to sampling error.  
 *$SD_p$*  is the standard deviation of the population validity distribution.

distributions were corrected for the effects of sampling error, range restriction and criterion unreliability. Because data for range restriction and criterion unreliability were rarely reported across the studies, artifact distributions were employed in making the corrections. The criterion reliability and range restriction distributions used by Pearlman *et al.* (1980) were employed in this study.

The meta-analyses for the moderating effects of job-test similarity and job complexity appear in Tables 1 and 2, respectively. The results for all studies combined are presented in each table for comparison purposes. Twenty-five job performance coefficients and 10 training success coefficients could not be coded for job-test similarity due to unavailable test information. Looking at the results for job performance for all studies combined, the corrected validity is 0.45, which is only slightly higher than those reported by Schmidt *et al.* (1986). The validity for training studies (0.47), which is based on a larger number of studies, is slightly higher than for job performance. For both job performance and training success, the 90% credibility values are above zero. These results indicate that the validity of job knowledge tests does generalize. However, a search for moderator variables is warranted as evidenced by the substantial amount of variance ( $SD_p$ ) remaining in the true validity distributions.

Table 1 reveals several findings of interest. First, there is a large number of validity coefficients in the low job-test similarity category. This is especially true for the training studies. Of those that were coded for similarity, 23% of the job performance coefficients and 46% of the training coefficients fall into the low simi-

larity category. Second, validities tend to be higher as job-test similarity is greater, especially when similarity is high. The only exception is between the low and moderate categories for job performance, where they are equal. Third, on average, there is a reduction of variance in the  $SD_p$  distributions when studies are grouped on the basis of job-test similarity, although it shows an increase in one case. These latter two points provide evidence for job-test similarity as a moderator variable. Finally, validity is always greater for predicting training success than for job performance, respectively.

Referring to Table 2, it is seen that for both job performance and training criteria, a much greater number of validity coefficients were found for the lower complexity jobs. This is understandable since there are many more such jobs in the economy. Evidence for job complexity as a moderator is supported by the fact that validities are higher for the higher complexity jobs and there is a reduction in the average amount of variance in the  $SD_p$  distributions when grouped by job complexity.

Meta-analyses looking at the combined effects of job-test similarity and job complexity as moderators are presented in Table 3. These analyses were warranted because of the relatively large standard deviations still present in the  $SD_p$  distributions when examining job-test similarity and job complexity individually. Since employers do not generally develop or use procedures that are unrelated to the job, the studies rated as having low job-test similarity were excluded and overall validity was recalculated. The effect on overall validity was minimal, raising the levels to 0.46 for job

Table 2: Meta-analyses of job knowledge tests by job complexity

Job complexity	Total N	No. r's	Mean r	p	Observed $SD_r$	$SD_{sc}$	$SD_p$	90% CV
<b>Job performance</b>								
High	6,607	71	0.28	0.57	0.158	0.092	0.232	0.28
Low	13,153	93	0.18	0.39	0.126	0.080	0.188	0.14
Total	19,760	164	0.22	0.45	0.145	0.084	0.228	0.16
<b>Training success</b>								
High	27,267	53	0.34	0.57	0.107	0.039	0.139	0.40
Low	315,474	284	0.26	0.46	0.122	0.027	0.192	0.22
Total	343,768	338	0.27	0.47	0.122	0.028	0.191	0.23

Note: One study was not coded for job complexity.

Table 3: Meta-analyses of job knowledge tests by job-test similarity and complexity

Job-test similarity/ Job complexity	Total N	No. r's	Mean r	p	Observed SD <sub>r</sub>	SD <sub>se</sub>	SD <sub>p</sub>	90% CV
<b>Job performance</b>								
High similarity								
High complexity	2,459	38	0.33	0.66	0.138	0.110	0.094	0.54
Low complexity	1,506	21	0.27	0.55	0.157	0.106	0.204	0.29
Total	3,965	59	0.31	0.62	0.149	0.109	0.158	0.42
Moderate similarity								
High complexity	1,408	17	0.26	0.54	0.145	0.095	0.191	0.30
Low complexity	5,377	31	0.14	0.30	0.098	0.074	0.117	0.15
Total	6,785	48	0.17	0.35	0.119	0.079	0.174	0.13
Grand total	10,750	107	0.22	0.46	0.148	0.091	0.222	0.17
Job-test similarity/ Job complexity	Total N	No. r's	Mean r	p	Observed SD <sub>r</sub>	SD <sub>se</sub>	SD <sub>p</sub>	90% CV
<b>Training success</b>								
High similarity								
High complexity	639	4	0.41	0.67	0.085	0.066	0.000	0.67
Low complexity	886	9	0.55	0.82	0.141	0.071	0.153	0.63
Total	1,525	13	0.49	0.76	0.139	0.069	0.158	0.56
Moderate similarity								
High complexity	15,524	33	0.34	0.58	0.114	0.042	0.150	0.39
Low complexity	106,735	132	0.27	0.48	0.127	0.032	0.198	0.22
Total	122,259	165	0.28	0.49	0.128	0.034	0.197	0.24
Grand total	123,784	178	0.28	0.49	0.130	0.034	0.201	0.24

performance and 0.49 for training success. A further investigation revealed that the majority of the low similarity studies were conducted by military programmes in which a generic battery of tests is routinely given to all recruits in order to determine optimal job assignments.

The results in Table 3 show evidence for a combined moderator effect. The pattern of validities are all in the hypothesized directions, except for the high similarity studies on the training side. Here, this reversal is likely to be susceptible to the effects of second order sampling error due to few studies (Schmidt *et al.* 1985). The reduction in the average variance of the SD<sub>p</sub> distributions also supports a combined moderator effect.

## Discussion

The results indicate that the validity of written job knowledge tests generalizes. This demonstrates that 'what you know' has widespread importance in the workplace. Compared to validity generalization findings for general

cognitive ability tests, the amount of variance that is not explained is greater for job knowledge tests, as expected. Ability tests measure constructs that are general rather than specific to particular jobs. Job knowledge is, by definition, specific to particular jobs or job families. Also, job knowledge tests vary much more in quality of construction and reliability than ability tests, which are usually commercially published.

The purpose of performing the meta-analyses grouped by job-test similarity and job complexity was to test the hypotheses that these variables act as moderators of job knowledge test validity. Support was found for both their individual effects as well as their combined effect. Validity is nearly twice as high for job-specific tests than for off-the-shelf tests. In fact, the levels for locally developed tests appear to rival those of general ability tests. Certainly, content validity plays some role here. However, the degree of relatedness of test content to the job made little difference in terms of validity for off-the-shelf tests. Implications for selection would suggest to employers that

when tests of job knowledge are used, there is much to be gained by developing them to be job specific.

The results for job complexity turned out as hypothesized. Greater validity was found for higher complexity jobs. Perhaps this is because higher complexity jobs demand greater levels of knowledge and require greater judgment and synthesis of job knowledge. The difference in validity between high and low complexity levels is more pronounced for the job performance studies.

For the combined moderator effect, the data show that a job-specific test is always superior to an off-the-shelf test. On the job performance side, at least, the results also indicate that job-test similarity and job complexity compensate for one another. That is, validity levels are equivalent when an off-the-shelf test is used for a high complexity job and when a job-specific test is developed and used for a low complexity job. These findings were not borne out on the training side. The number of studies for locally developed tests for training was small, however.

#### *Implications for future research*

The conclusions of this study are based on a definition of job knowledge as measured by written tests. Furthermore, job knowledge is considered to be unidimensional since it was based on a total test score. This raises two important considerations for further research concerning job knowledge. First, it would be worthwhile to examine if similar results would hold for non-test forms of measurement. This may be particularly insightful since supervisory appraisals of job knowledge are often based on visual observation and face-to-face contact. Second, further research should consider various facets of job knowledge and their relative impact. For example, is job knowledge

considered to be how much you know, being able to distinguish right from wrong, having the ability to judge the impact of decisions on efficiency, etc.?

The general importance of job knowledge in work performance is clear. Yet, as demonstrated in this paper, its level of validity varies. These differences and a consideration for other important qualifiers should be considered in future development of path models that incorporate job knowledge.

#### **Note**

The opinions expressed in this paper are those of the authors and do not necessarily reflect those of the authors' employers.

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