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# COMMENTARIES

## General Ability in Employment: A Discussion

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The set of papers represented in this volume is impressive and the authors are distinguished. I am pleased to have been asked to read them and to provide comments. There are several obvious general themes running throughout the various papers. The first, and perhaps primary, theme is that general cognitive ability is a significant predictor of job performance in all jobs and a relatively strong one in many. The second theme is that general cognitive ability or *g* is a better predictor of overall job performance than are more narrow specific abilities. A third somewhat less developed theme is that jobs as well as workers can be differentiated along a general cognitive ability dimension.

The reality of the *g* factor is without dispute. Professor Jensen's (1986) paper drove home for me, once again, the voluminous evidence for the existence of *g* and its construct validity. I am not in any disagreement here. Dr. Hunter (1986) and his associates have demonstrated time and time again the generalizability of the validity of general cognitive tests for predicting job performance, and his paper in this issue illustrates the dominance of general ability over specific abilities in their predictive efficiencies. Dr. Thorndike (1986) also presents data illustrating the generally greater predictive power of general ability compared to that of test batteries of specific cognitive tests, but he finds one condition where this dominance does not hold. Finally the papers by Dr. Crouse (Gottfredson & Crouse, 1986) and Dr. Gottfredson (1986) discuss the broad societal implications of *g* and of using general cognitive tests in education and employment. Rather than discussing each paper one at a time, I will simply highlight and amplify some of the ideas and concepts that were of particular interest to me.

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*The Dominance of General Ability in Prediction*

One question that struck me as I read these papers was, "*Why* is general ability a better predictor of job performance than more specific abilities?" This set of papers provides little in the way of an answer to this question, but two possibilities come to mind. One is that general ability plays some kind of executive function in relationship to other abilities (and skills and knowledges). That is, perhaps general ability exerts its influence by "managing" the other abilities, skills, and knowledges possessed by the individual. Dr. Hunter alludes to this issue when he suggests that general ability helps individuals adapt to new situations, prioritize rules and regulations, deal with unexpected problems, and so forth. However, I am talking here about *g* acting as some kind of manager of the more specific abilities. For example, perhaps individuals with greater *g* will be able to deploy their specific numerical ability more effectively than individuals with less *g* given the same level of numerical ability. A computer analog fits nicely here, where *g* plays the role of the disk operating system and the various computer applications (word processing, statistical programs, etc.) represent specific abilities. Some disk operating systems deploy or use the specific applications better than others. I am sure that cognitive psychologists who are well acquainted with information processing and management information systems could amplify this point further.

A second possibility is that predictive validities are higher for general than for specific abilities when the performance criteria themselves are general (e.g., overall job performance) but not when they are specific (e.g., numerical aspects of jobs). One of my concerns while reading the papers was that perhaps the predictive efficiencies of the specific ability measures were not being given a "fair" shot because the criterion measures chosen and described seemed to be more highly saturated with *g* compared to the more specific abilities. For example, it seems that a measure of overall job performance might be more saturated with *g* than a narrower job performance measure such as "handles numerical calculations accurately and rapidly." In most of the research cited in the papers presented here, global measures of performance seemed to be the most common criterion; had more specific criterion dimensions been employed, perhaps the predictive validities of specific abilities would have been higher. This point reminds me of Dunnette's (1963) suggestion that greater predictability might be achieved by focusing on narrower criterion dimensions. However, Dunnette also emphasized the need for behavior-oriented measures in contrast to the more trait-based or cognitively based criterion measures I think we need. What I am suggesting is that we investigate the relative validities of general versus specific abilities for predicting the more discrete aspects of criterion performance that may interest employers and researchers.

The paper by Dr. Thorndike (1986) raised a related question for me: "Under what conditions will specific ability measures be superior to general ability in predicting overall performance?" He finds that when sample sizes are relatively large, tailored batteries of specific ability tests have more predictive efficiency than general ability tests. Does this finding replicate? Under what other conditions, if any, might specific abilities be superior to a general ability test?

*The Cognitive Demands of Jobs*

I was quite impressed with the paper by Gottfredson (1986). Her comments concerning a possible *g* factor among occupations need a good deal of consideration. Her paper (like Hunter's) suggests that jobs themselves inherently require different levels of general cognitive functioning. In fact, Gottfredson suggests that specific tasks may be differentially loaded on a *g* factor. Yet industrial psychologists often avoid analyzing and describing jobs (and employees) in other than molecular behavioristic terms. Certainly, most performance appraisal forms and criterion scales ask for judgments (typically from supervisors) concerning employee work performance and outcomes but seldom explicitly assess how "smart" an employee performs his/her tasks. It is often assumed that the job behaviors representing the "high" end of behavioral anchored ratings scales indirectly reflect job behavior that is being performed intelligently. It has become almost codified by legal authorities and regulatory agencies concerned with EEOC issues that jobs be described in observable and behavioral units (e.g., tasks), rather than less tangible "ability" requirements. In fact, job analyses that predominantly emphasize the ability components of jobs have typically not survived in certain court cases (e.g., *U.S. v. State of New York*, 21 *FEP* 1286 (1979)) whereas task-based job analysis systems are more easily defended (Thompson & Thompson, 1982).

In agreement with Gottfredson (1986), I believe that jobs can be described along a general cognitive ability dimension and that this dimension is a central one. Recent research of my own supports this belief. Several years ago I developed a performance appraisal instrument that could be used to evaluate employees working in a variety of petrochemical jobs (e.g., operations, maintenance, and laboratory jobs). The development of this instrument was based on factor and cluster analyses of 39 task and 26 ability job analysis statements collected for over 140 jobs in the petrochemical industry (Arvey & Davis, 1983). Using a combination of a priori confirmatory factor analysis and exploratory methods, we achieved an eight-factor solution. The first factor, which accounted for almost 45% of the common variance, was finally labeled "Judgment and Reasoning" and was defined in the following way: "This factor has to do with how well an employee is able to reason and make judgments, deal with un-

TABLE 1
Job Analysis Items and Factor Loadings Associated with Judgment and Reasoning Factor Developed from 140 Petrochemical Jobs

| Factor: Judgment and reasoning | |
|---|---|
| Items | Factor loading |
| Deal with unexpected situations | .754 |
| Able to learn and recall job-related information | .711 |
| Able to reason and make judgments | .694 |
| Able to identify problem situations quickly | .694 |
| React swiftly when unexpected problems occur | .674 |
| Able to apply common sense to solve problems | .664 |
| Able to learn new procedures quickly | .663 |
| Alert and quick to understand things | .548 |
| Able to compare information from two or more sources to reach a conclusion | .487 |

expected situations, learn & recall job-related information, use common sense, etc."

Table 1 presents the items and the factor loadings on this particular performance requirement dimension. Other data indicated that certain jobs were more saturated with this factor than other jobs. For example, judgment and reasoning was described as being more of a requirement for operator jobs than for labor/service jobs. As is clearly discernible, this factor corresponds quite well to a general *g* factor among jobs.[1] Some jobs clearly require more complex cognitive functioning than others. Perhaps we should begin to describe jobs more analytically according to these kinds of cognitive demands.

This reasoning is clearly in line with the work by Hunter (1986) where he shows that general ability tests are more valid for predicting performance in complex and challenging jobs than in less demanding jobs. Similarly, Gutenberg, Arvey, Osborn, and Jeanneret (1983) showed that the information-processing/decision-making dimensions of jobs (based on the Position Analysis Questionnaire) generally moderated the validities of the GATB general intelligence test. General ability was most predictive of job performance for jobs that were relatively "high" or saturated on the information-processing/decision making components of jobs.

The upshot is that it may be at least as useful (and perhaps more useful) to describe jobs and evaluate employees along general cognitive

[1] Interestingly, a later study showed that black and white employees did not differ on this particular performance dimension when being evaluated (Thompson & Thompson, 1985). I would have predicted that the typical differences found between these racial groups on general ability measures would also be demonstrated on this particular performance dimension.

dimensions rather than more molecular behaviors. I agree with Hunter and his colleagues (Schmidt, Hunter, & Pearlman, 1981) that personnel psychology has been damaged by its pronounced emphasis on behaviorism.

Gottfredson's (1986) discussion of suggestions about restructuring jobs to minimize their demands for *g* and her hypotheses about the combination of tasks into more or less cognitively complex jobs are provocative. It is also interesting to think of tasks and the cognitive demands of tasks in terms of the "supply and demand" concepts provided by economists. Tasks with higher cognitive demands are perhaps more expensive (and valuable) to the organization. Similarly, these cognitively demanding tasks may not be performed by just anyone (as indicated by Gottfredson) but only by individuals in the upper distributions of general (and perhaps specific) cognitive abilities. That is, there is a relatively limited supply of individuals who can perform these tasks. On the other hand, tasks that can be easily performed by many individuals (an oversupply) might be less well rewarded, more amenable to combination with other similarly demanding tasks, and perhaps more amenable to training interventions. The general point I am making here is that the limits and possibilities for job restructuring may be better appreciated by viewing the cognitive demands of tasks in terms of the supply and demand for general and specific abilities.

My final comments have to do with our need to understand more about the operational value of measures of general ability. Again, I really responded to the papers by Gottfredson (1986) and Hawk (1986) where they begin to paint the possible consequences of using measures of general ability for employment purposes across all jobs. For example, an aspect which is seldom mentioned in the validity generalization research and discussion is that while test validities may generalize across settings and jobs, cutting scores may not. In fact, the present set of papers (particularly the paper by Gottfredson) make clear that jobs differ considerably in terms of the level of *g* demanded by their various tasks and duties. Thus, different jobs will very likely involve different cutting scores. Just how these different cut scores are obtained needs greater explanation and amplification.

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