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Individual differences as predictors of work, educational, and broad life outcomes

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ABSTRACT

Ongoing research on measures of individual differences (personality, cognitive ability, and admissions tests) has revealed their importance in academic success (including outcomes beyond college grades), work success (including objective and subjective measures of job performance), and everyday life (including divorce and mortality). Despite the body of evidence, confusion remains about foundational empirical questions including their strength, importance beyond a threshold, and independence from social class and other confounds. We first discuss the likely sources of confusion when considering the literature. We then review a series of large-scale studies and meta-analyses conducted to unambiguously address nine common, but false, assertions about the relationship between intelligence and personality measures with life outcomes.

1. Introduction

In this paper we offer a very brief overview of the question of the consequences of individual differences for three outcome arenas: post-secondary academic performance, work performance, and broad life outcomes, such as mortality, divorce, and occupational attainment. We focus on two broad individual difference domains, namely, cognitive ability and personality.

Individually, collectively, and in conjunction with a broad range of collaborators, members of our Minnesota group have examined the relationships among individual differences in cognitive ability and personality and this set of outcomes in a wide array of studies. What our investigations have in common is an emphasis on meta-analytic syntheses and on the use of large nationally representative samples. We believe that much confusion about the relationships among these individual difference variables and life outcomes is the result of a set of common errors.

The first is the over-interpretation of small-sample studies. For example, Chamberlain (2009) characterized the research on the relationship between the GRE and graduate school success as mixed, contrasting the positive findings reported by Kuncel et al. with less supportive findings from Sternberg and Williams (1997). But the Kuncel et al. study was a meta-analysis of 1753 studies (N = 82,659) while Sternberg and Williams was a single-sample study (N = 166) of Yale students. Small-sample individual studies are prone to the effects of sampling error and other artifacts discussed below, and argue for the value of large-scale systematic examinations of a domain, via meta-analyses and large national data bases.

The second is the failure to understand the consequences of studying highly restricted samples. In settings such as educational admissions and employee selection it is not uncommon to encounter highly selected research samples, where only individuals with scores on individual difference measures at the top end of the score distribution have been screened and for whom subsequent performance measures are available. Widely used indices such as the correlation coefficient are systematically biased downward by such restriction of range, and failure to take this into account via strategies such as the use of psychometric corrections can lead to severe mis-estimation of the role of individual differences (Sackett & Yang, 2000).

The third is the failure to understand the roles of the reliability and validity of the outcome measure in understanding the role of individual differences. For example, in the job performance domain, the most widely used approach performance measurement involved ratings by a supervisor. However, if two supervisors are asked to rate the same individual, the two ratings will, on average, correlate r = .52 (Viswesvaran, Ones, & Schmidt, 1996). Thus a single supervisor's rating is a highly fallible measure of job performance, and the use of such a measure will lead to a downwardly-biased estimate of the role of individual differences (Ones, Viswesvaran, & Schmidt, 2008).

The combination of small-sample individual studies, restricted samples, and flawed criterion measures leads to substantial underestimates of the magnitude of individual difference-outcome relationships and to the appearance of great variability in these relationships from sample to sample. In each of several areas of

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individual differences, we argue that a much clearer picture involving stronger associations emerges when these issues are taken into account.

2. Individual differences and post-secondary academic performance

2.1. Cognitive measures

We focus on a series of four common assertions raised by critics who claim that admissions tests are not valid indicators of subsequent academic performance (see Sackett, Borneman, and Connelly (2008) for responses to a larger set of criticisms). A recent overview of the usefulness of cognitive measures in post-secondary admissions is available in Kuncel and Hezlett (2007). In addition, meta-analyses documenting validities of cognitive ability tests in post-secondary educational settings are comprehensively summarized and detailed in Ones, Viswesvaran, and Dilchert (2004a). In college settings, we draw on meta-analyses and a recent large data set which we have used in a series of studies. In the data set, SAT scores for over 165,000 students from a diverse set of 41 colleges and universities in the United States are paired with first year grades, cumulative grades for up to 6 years, and individual course grades for each course taken by each student.

2.2. Assertion 1: Admissions tests predict badly

The prototypical correlation between admission test scores and first year grades is .35. Critics view this as very small, as the squared correlation (i.e., .12) represents a rather small proportion of the variance in grades even though such an effect can have a large effect on the percent of students who are successful versus unsuccessful in school. Berry and Sackett (2009) used the 41-school SAT data set and found a correlation of .36 between observed SAT combined scores (Verbal + Math) and first year GPA. These data were range restricted, as the colleges used the SAT as part of the admissions process. Correcting for range restriction resulted in a corrected r of .46. Berry and Sackett had access to individual course grades and thus were able to compute separate validity coefficients for each course at each college, resulting in a meta-analysis of over 130,000 course-specific validity coefficients. While validity estimates based on first year GPA suffer from the problem of students choosing to take courses differing in difficulty, estimates based on individual course grades, by definition, do not (i.e., course difficulty is held constant, as all students are taking the same course). From the individual course data, Berry and Sackett were able to estimate the correlation that would be obtained between the SAT and GPA if all students took a common set of courses (i.e., course difficulty is held constant): that correlation is .55. Thus, .55 is our best estimate of the relationship between the SAT and academic performance in this large sample. While there is no doubt that there is criterion variance unexplained by the SAT, we think these findings frame the search for additional predictors as a search for supplements to a strong predictor, rather than as a replacement for a weak predictor.

2.3. Assertion 2: Validity is an artifact of socioeconomic status

Sackett, Kuncel, Arneson, Cooper, and Waters (2009) present results from eight data sets, including the 41-school SAT data set, a meta-analysis, data on all individuals entering an accredited law school in 1991, and three large longitudinal studies following samples of high school students through college. They found that SES is indeed related to test scores. In broad unrestricted populations, this correlation is quite substantial (i.e., r = .42 among the population of SAT takers). Consistent with our earlier discussion of range restriction, it is considerably smaller in restricted samples (i.e., r = .15–.20 among samples of students enrolled in a single institution). Second, test scores are indeed predictive of academic performance, as indexed by grades. Observed correlations in samples of admitted students average about r = .35; applying range restriction corrections to estimate the validity for school-specific applicant pools results in an estimate of .47 as the operational validity. Third, the test-grade relationship is not an artifact of common influences of SES on both test scores and grades. Partialling SES from the above estimate of the operational validity of tests (r = .47) reduces the estimated validity to .44. The assertion that the predictive power of tests disappears once the effects of SES are removed is at odds with the findings from these multiple sources of data.

2.4. Assertion 3: Above a modest threshold, higher scores don't matter

The assertion here is that while tests may have value in screening out those with very low levels of ability, increments in ability do not lead to increments in performance for those above a threshold. If true, it would be argued that it is not appropriate to prefer high-scoring individuals over lower-scoring individuals once this threshold is reached. This assertion features prominently in Gladwell's (2009) best-selling book, *Outliers*. However, there is strong evidence that higher test scores are associated with higher criterion scores throughout the test score range. Arneson and Sackett (submitted for publication) examined relationships between test scores and college grade point average in three large data sets (i.e., the 41-school SAT data set, the National Educational Longitudinal Study of 1988, and Project TALENT), and found monotonic test-grade relationships throughout entire score range in each data set. Throughout the entire test score distribution, higher performance levels are found for any increase on the test.

2.5. Assertion 4: Tests only predict first year grades

As we were preparing this article, one of us was asked to review a paper submitted to a prominent journal, which opened with the statement, without citation, that "as is well known, admissions test predict nothing but first year grades". Contrary to this piece of folklore, test scores are related to a wide array of outcomes. Berry and Sackett (2009) examined the 41-school SAT data set, and found that the mean observed correlation between SAT and first year grades (r = .36) was quite similar to the SAT's correlation with cumulative grades (r = .33). More critically, once taking differences in student course choice into account and also correcting for range restriction, a correlation of .55 was found between the SAT and both first year and cumulative grades.

In addition, admissions tests predict other learning outcomes besides course grades. Kuncel and Hezlett (2007) summarize findings demonstrating relationships between all major graduate admissions tests and important outcomes beyond first year grades including research productivity, faculty evaluations of dissertation quality, and finishing a graduate degree. Within the science and humanities, the GRE predicts comprehensive examination performance, faculty ratings of student performance, and subsequent citation counts (Kuncel, Hezlett, & Ones, 2001) while LSAT scores and MCAT scores are predictive of passing the Bar Examination and medical board tests, respectively.

Lubinski, Benbow, Webb, and Bleske-Rechek (2006) reported that the SAT predicts getting a Ph.D., getting tenure, and getting patents in a gifted sample. Thus, these meta-analyses and large-scale samples provide strong support that the usefulness of these test scores in academic settings is not limited to predicting first year grades; indeed, these scores are predictive of a variety of long-term indicators of academic and career success.