
A Reconsideration of Testing for Competence Rather Than for Intelligence

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David C. McClelland's 1973 article has deeply influenced both professional and public opinion. In it, he presented five major themes: (a) Grades in school did not predict occupational success, (b) intelligence tests and aptitude tests did not predict occupational success or other important life outcomes, (c) tests and academic performance only predicted job performance because of an underlying relationship with social status, (d) such tests were unfair to minorities, and (e) "competencies" would be better able to predict important behaviors than would more traditional tests. Despite the pervasive influence of these assertions, this review of the literature showed only limited support for these claims.

In 1973, David C. McClelland's lead article in the *American Psychologist* profoundly affected both the field of psychology and popular opinion. This article was designed to "review skeptically the main lines of evidence for the validity of intelligence and aptitude tests and to draw some inferences from this review as to new lines that testing might take in the future" (p. 1). The main themes he endorsed and continues to promote (e.g., Klemp & McClelland, 1986) have been published widely in newspapers, magazines, and popular books as well as psychology textbooks. Belief in these views, however, has become so widespread that often they are presented as common knowledge (e.g., Feldman, 1990).

Table 1 reviews a number of works that cited McClelland (1973) and shows that the impact of McClelland's article has increased over time. Soon after the article was published, McClelland's views were integrated into introductory psychology textbooks. By the late 1980s, these themes had become part of generally accepted public opinion, with newspaper and magazine writers commonly citing McClelland as an authority on intelligence testing.

It was McClelland's (1973) belief that intelligence testing should be replaced by competency-based testing. His argument against intelligence testing rested on the assertion that intelligence tests and aptitude tests have not been shown to be related to important life outcomes because psychologists were unable and unwilling to test this relationship. McClelland argued that intelligence tests have been correlated with each other and with grades in school but not with other life outcomes.

McClelland (1973) stated that intellectual ability scores and academic performance were the result of social

status, and he labeled them a sort of game. He asserted that a test must resemble job performance or other criteria to be related to the performance on the criteria. He also claimed that intelligence and aptitude testing were unfair to minorities. He advocated that the profession should focus on what he termed *competency testing* and criterion sampling, maintaining that intelligence testing and aptitude testing should be discarded.

The main points of McClelland's (1973) article can be summarized in the following five themes: (a) Grades in school did not predict occupational success, (b) intelligence tests and aptitude tests did not predict occupational success or other important life outcomes, (c) tests and academic performance only predicted job performance as a result of an underlying relationship to social status, (d) traditional tests were unfair to minorities, and (e) "competencies" would more successfully predict important behaviors than would more traditional tests.

In the present article, these themes are examined through a comprehensive review of relevant literature. Although McClelland's (1973) article contained many subthemes, only those themes we believe to be the main issues are addressed here. This does not imply, however, that we agree with any aspects of McClelland's article that are not addressed here.

Do Grades Predict Occupational Success?

McClelland (1973) claimed that "the games people are required to play on aptitude tests are similar to the games teachers require in the classroom" (p. 1). As evidence, McClelland presented four citations that he interpreted as support for his position, while ignoring disconfirming evidence. He also included his personal experiences at Wesleyan University as evidence, maintaining that "A" students could not be distinguished from barely passing students in later occupational success. This finding differs greatly from that found in a similar, more scientific comparison done by Nicholson (1915) at the same school. Nicholson found that academically exceptional students were much more likely to achieve distinction in later life. The results of Nicholson's study are summarized in Table 2.

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Table 1
Support for McClelland's (1973) Concepts in Newspapers, Magazines, Popular Books, and Textbooks

Publication	Author(s)	Statement
Newspapers		
<i>New York Times</i>	Goleman (1988)	IQ tests severely limited as predictors of job success
<i>New York Times</i>	Goleman (1984)	Intelligence unrelated to career success
<i>Plain Dealer</i>	Drexler (1981)	Tests unrelated to accomplishments in leadership, arts, science, music, writing, speech, and drama; tests discriminate by culture
Magazines		
<i>Atlantic Monthly</i>	Fallows (1985)	Promote replacing aptitude tests with competence tests
<i>Psychology Today</i>	Goleman (1981)	Tests and grades are unrelated to career success
<i>Psychology Today</i>	Koenig (1974)	Tests and grades have less value than competence tests
Popular books		
<i>More Like Us</i>	Fallows (1989)	Tests and grades are useless as predictors of occupational success
<i>Whiz Kids</i>	Machlowitz (1985)	Bright people do not do better in life
Psychology texts		
<i>Psychology: An Introduction</i>	Morris (1990)	IQ and grades are unrelated to occupational success
<i>Introduction to Psychology</i>	Coon (1986)	IQ does not predict important behaviors or success
<i>Psychology: Being Human</i>	Rubin & McNeil (1985)	Suggests replacing IQ tests with competence tests
<i>Psychology</i>	Crider, Goethals, Kavanaugh, & Solomon (1983)	Tests are unfair by race and socioeconomic status
<i>Understanding Human Behavior</i>	McConnell (1983)	Ability is unrelated to career success
<i>Elements of Psychology</i>	Krech & Crutchfield (1982)	Tests and grades are unrelated to life outcomes
<i>Essentials of Psychology</i>	Silverman (1979)	Testing results in categorical labels
<i>Psychology: An Introduction</i>	Mussen & Rosenzweig (1977)	Test scores are unrelated to job success
<i>Introductory Psychology</i>	Dauids & Engen (1975)	Suggests replacing IQ tests with competence tests

Some limitations do exist when grades are used as predictors. Grades vary greatly among disciplines (Barrett & Alexander, 1989; Elliott & Strenta, 1988; Schoenfeldt & Brush, 1975) as well as among colleges (Barrett & Alexander, 1989; Humphreys, 1988; Nelson, 1975). Because different students usually take different courses, the reliability of grades is relatively low unless a common set of courses is taken (Butler & McCauley, 1987). Despite

these shortcomings, a number of meta-analyses have shown that grades do have a small-to-moderate correlation with occupational success (Cohen, 1984; Dye & Reck, 1988, 1989; O'Leary, 1980; Samson, Graue, Weinstein, & Walberg, 1984). Despite an overlap among the data used by these studies and variability among results ($r = .15$ to $.29$), they all reached similar conclusions. A wide variety of measures of occupational success such as

Table 2
Success of Wesleyan Graduates

Classes/academic standing	Percentage who achieved distinction in later life
1831-1959	
Valedictorians and salutatorians	49
Phi Beta Kappa	31
No scholarly distinction	6
1860-1889	
Highest honors	47
Phi Beta Kappa	31
No scholarly distinction	10
1890-1899	
Highest honors	60
Phi Beta Kappa	30
No scholarly distinction	11

Note. Adapted from "Success in college and in later life" by F. W. Nicholson, 1915, *School and Society*, 12, p. 229-232. In the public domain.

salary, promotion rate, and supervisory ratings have been positively related to grade point average.

The results of these meta-analyses reflect the diverse individual studies that showed a relationship between academic performance and occupational success. This relationship may have stemmed from underlying associations between academic performance and intellectual ability, motivation (Howard, 1986), and attitudes toward work (Palmer, 1964). Hunter (1983, 1986) supported this possibility by demonstrating through path analysis that higher ability led to increased job knowledge, which in turn led to better job performance. This relationship was true at all educational levels, including medical school graduates, graduate-level MBAs, college graduates in both engineering and liberal arts, technical school graduates, and high school graduates in the United States and in other countries, such as Sweden (Husen, 1969). The correlations between grades and occupational success have ranged from .14 to .59. However, some research has indicated that these relationships were underestimated because the range on the predictor grades was restricted (Dye & Reck, 1989; Elliott & Strenta, 1988). Even when limitations are considered, both meta-analyses and diverse individual studies showed grades as predictors of occupational success.

Do Intelligence Tests and Aptitude Tests Relate to Job Success or Other Life Outcomes?

Thorndike and Hagen's (1959) study was McClelland's (1973) central evidence that aptitude tests did not predict occupational success. The Thorndike and Hagen study involved more than 12,000 correlations between aptitude tests and various measures of occupational success for more than 10,000 individuals. They concluded that the number of significant correlations did not exceed the

number that would be expected by chance. From these results, McClelland concluded that "in other words, the tests were invalid" (p. 3).

This characterization of the research by Thorndike and Hagen (1959) has often been quoted as proof that aptitude tests cannot predict job success (Haney, 1982; Nairn, 1980). However, McClelland (1973) did not address some extremely important points.

Perhaps the most basic point overlooked was that aptitude tests did, in fact, predict success for those professionals for whom they were designed, namely, pilots and navigators. The test battery consisted of dial and table reading, speed of identification, two-hand coordination, complex coordination, rotary pursuit, finger dexterity, aiming stress, discrimination in reaction time, reading comprehension, mathematics, numerical operations, and mechanical principles (Dubois, 1947). All of these tests were specifically designed to predict success in avionics, and the content of these tests was directly related to that field. The mechanical principles test, for example, asked the direction of the wind as shown by a wind sock.

The validity of the test battery was demonstrated during World War II (Dubois, 1947) when an unscreened group was used as part of the validation process. Of those who failed the test battery, only 8.6% subsequently graduated from training (45 of 520), and no one in the lowest stanine (150 subjects) graduated. Conversely, 85% of those in the upper stanines graduated (Dubois, 1947).

McClelland (1973) was concerned that cultural bias was present in aptitude tests. The avionics battery studied by Thorndike and Hagen (1959) was used to predict the success of pilots during World War II (Dubois, 1947) and included West Point cadets, Chinese people, women, and Blacks as subjects. The battery was found valid for all of these groups. This agrees with later findings that, in general, aptitude tests are valid for all groups (Boehm, 1972; Hunter, Schmidt, & Hunter, 1979; Hunter, Schmidt, & Rauschenberger, 1984).

Thorndike and Hagen (1959) surveyed a sample of individuals who had taken the pilot and navigators test battery in 1943. The respondents, who ranged in age from 18 to 26 years at the time of testing, were asked to supply self-report data in seven areas, including monthly income in 1955. Validity coefficients were then computed between results on the avionics test battery and self-reported income.

This validation procedure contained obvious flaws. The eight-year age range among subjects influenced the job experience of the respondents. Some respondents were well established in their careers. Others were only beginning. Differences in job experience would translate into wide salary differences, even within the same occupation, contaminating the criterion measure.

The respondents were in diverse occupations and were dispersed geographically throughout the United States. Even if the avionics test had been appropriate for predicting the success of both an English academic and a physician and even if they were the same ages at the time the salary data were collected, the differences in

mean occupational salary would obscure any potential relationship.

While McClelland (1973) was claiming that the avionics battery was invalid for predicting occupational success, other researchers using the same data set as Thorndike and Hagen (1959) refined the procedure and obtained additional criterion data in 1969 (Beaton, 1975; Hause, 1972, 1975; Taubman & Wales, 1973, 1974). These researchers determined that the numerical aptitude factor, derived by factor analysis, was positively related to later income. These studies also showed that this relationship increased over time as the former aviators and navigators matured in their respective occupation. When the data were broken down by occupation, those respondents scoring in the top one tenth in numerical ability earned 30% more than those scoring in the bottom four tenths. When ability was held constant, education was not a significant factor in relation to earnings (Taubman & Wales, 1974).

Taubman and Wales (1974) found that those with scores in the top ability level within each educational category (from high school through professional education) had considerably higher salaries than those at the lowest ability level. For individuals with master's degrees, those scoring in the bottom one fifth averaged an annual salary of \$14,000, whereas those in the top one fifth averaged \$22,200.

Comparable results were obtained in a longitudinal study in Sweden over a 26-year period (Husen, 1969). Men included in the group with the highest intellectual ability, when tested at age 10, earned twice the income of those in the lowest category, a practical and significant difference in income. The evidence presented here leads to the inevitable conclusion that intelligence tests and aptitude tests are positively related to job success.

Recent Evidence

Many researchers have tested the relationship between cognitive ability and job performance using meta-analytic techniques. Data from approximately 750 studies on the General Aptitude Test Battery (GATB) showed that the test validly predicted job performance for many different occupations (Hartigan & Wigdor, 1989). Hunter and Hunter's (1984) meta-analysis demonstrated that in entry-level positions, cognitive ability predicted job performance with an average validity of .53. This study also showed an average correlation of .45 between intellectual ability and job proficiency. Other studies using a number of different measures of job proficiency have found similar relationships to cognitive ability (Distefano & Pryer, 1985; Hunter, 1983, 1986; Pearlman, Schmidt, & Hunter, 1980; Schmidt, Hunter, & Caplan, 1981).

McClelland (1973) implied that supervisors' ratings were biased. However, research has shown that the sex and race of either the rater or ratee do not exert important influence on ratings (Pulakos, White, Oppler, & Borman, 1989). More objective criterion measures produced even higher validity coefficients with aptitude test scores. In Nathan and Alexander's (1988) meta-analysis, the criteria

of ratings, rankings, work samples, and production quantities all resulted in high test validities. Production quantity and work sample criteria resulted in substantial validity coefficients, negating McClelland's claim that validity coefficients were obtained only by using biased supervisory ratings. In fact, Smither and Reilly (1987) found that the intelligence of the rater was related to the accuracy of job performance ratings.

In a study using path analysis, Schmidt, Hunter, and Outerbridge (1986) found that cognitive ability correlated with job knowledge (.46), work samples (.38), and supervisory ratings (.16). They concluded that cognitive ability led to an increase in job knowledge, a position also supported by Gottfredson (1986).

Practical Tasks

To support his assertion that intelligence was not applicable to employment situations, McClelland (1973) stated that intelligence as measured in aptitude and intelligence testing was not useful in practical, everyday situations. Schaie (1978) explored this theory, describing the issues that must be addressed to attain external validity. He suggested that criteria should include actual real-world tasks. Willis and Schaie (1986) tested this proposition on older adults. Both the individuals tested and the criterion tasks used in the study, such as ability to comprehend the label on a medicine bottle or to understand the yellow pages of the telephone directory, differed substantially from typical academic tasks. According to McClelland's view, a relationship should not exist between mental abilities, such as fluid and crystallized intelligence, and performance on the eight categories of real-life tasks used by Willis and Schaie.

This idea was not supported by the study results. An extremely high relationship existed between intelligence and performance on real-life tasks. Intellectual ability accounted for 80% of the variance in task performance (Willis & Schaie, 1986). In a second study, they again found intellectual ability to be related to both self-perceived performance and the ratings assigned by judges for performing a number of practical tasks. These results were replicated on several samples of older adults (Schaie, 1987).

Correlations between performance and scores on intelligence and aptitude tests are supported in other, more unstructured and ambiguous situations including business management (Bray & Grant, 1966; Campbell, Dunnette, Lawler, & Weick, 1970; Siegel & Ghiselli, 1971), performance in groups (Mann, 1959), and success in science (Price, 1963). Michell and Lambourne (1979) studied 16-year-old students and found that those with higher cognitive ability were better able to answer open-ended questions. Students with higher cognitive ability were also able to sustain discussion longer, ask more interpretive questions, and achieve a more complex understanding of issues. In addition, intelligence has been shown to be related to musical ability (Lynn & Gault, 1986) and creativity (Cropley & Maslany, 1969; Drevdahl & Cattell, 1958; Hocevar, 1980; MacKinnon, 1962;

McDermid, 1965; Richards, Kinney, Benet, & Merzel, 1988). From examining these studies, we find cognitive ability to be positively related to a variety of real-world behaviors.

Summary

A review of the relevant literature shows that intelligence tests are valid predictors of job success and other important life outcomes. Cognitive ability is the best predictor of performance in most employment situations (Arvey, 1986; Hunter, 1986), and this relationship remains stable over extended periods of time (Austin & Hanisch, 1990). Using samples of the size usually found in personnel work, Thorndike (1986) concluded that cognitive "g" is the best predictor of job success. Ironically, this was the same author whose earlier study was presented in McClelland's (1973) article as evidence that aptitude tests cannot be used to predict job performance.

The evidence from these varied scientific studies leads again and again to the same conclusion: Intelligence and aptitude tests are positively related to job performance.

Is There an Artifactual Relationship Between Intellectual Ability and Job Success Based on Social Status?

A major part of McClelland's (1973) argument against the use of intelligence or aptitude tests was his claim that "the tests are clearly discriminatory against those who have not been exposed to the culture, entrance to which is guarded by the tests" (p. 7). Available scientific evidence has refuted this contention; IQ is related to occupational success. However, McClelland maintained that "*the correlation between intelligence test scores and job success often may be an artifact, the product of their joint association with class status*" (p. 3).

Despite the numerous ways of defining socioeconomic status (SES), we will show that occupational success is primarily a result of individual cognitive ability and education, both factors that are relatively independent of social origin. We will also show that the strength of the relationship between IQ and job success is not strongly related to the social prestige of particular careers, regardless of variations between occupations. We agree with Gottfredson (1986) that it is more useful to focus on areas such as individual ability rather than irrelevant SES factors, such as family income, over which individuals have no control.

Definition of Socioeconomic Status

McClelland's (1973) definition of SES differs considerably from those used by other researchers. To McClelland, socioeconomic status belongs to the power elite—those who have credentials, power, pull, opportunities, values, aspirations, money, and material advantages. Some of these factors (e.g., values and aspirations) have been shown to be related to later success (Sewell & Hauser, 1976). They have not been described as socioeconomic status

by other researchers, however, because these factors do not belong exclusively to the wealthy (Greenberg & Davidson, 1972).

McClelland (1973) also described SES in terms of income. Other researchers in the area (e.g., Scarr & Weinberg, 1978; Sewell & Hauser, 1976) have found income to have weak connections with later success, with correlations of only .17 between the adult's income and the income of his or her parents (Sewell & Hauser, 1976). These findings are consistent with Alwin and Thornton (1984) and Williams (1976), who found correlations between .12 and .25 between family income and the intelligence of the children. Although variation exists in the correlations found, none of the results supported McClelland's view of strong financial effects.

Some variables that have been examined as operational measures of SES include family structure, dwelling conditions, and school attendance record (Greenberg & Davidson, 1972); number of siblings in the family, region of residence, and size of community (Peterson & Karplus, 1981); number of people per room in the home (Greenberg & Davidson, 1972; Herzog, Newcomb, & Cisin, 1972); mother's educational level (Herzog et al., 1972; Peterson & Karplus, 1981; Sewell & Hauser, 1976; Willerman, 1979); father's educational level (Duncan, Featherman, & Duncan, 1972; Peterson & Karplus, 1981; Sewell & Hauser, 1976; Willerman 1979); father's occupation (Duncan et al., 1972; Greenberg & Davidson, 1972; Peterson & Karplus, 1981; Sewell & Hauser, 1976; Willerman, 1979); family income (Peterson & Karplus, 1981; Sewell & Hauser, 1976); and median neighborhood income and educational level (Scarr, 1981). Socioeconomic status has often been operationally defined as a combination of these factors. Because SES has been defined in so many ways, the specific variables explored were theoretically more important and practical than the general term *socioeconomic status*.

Effects of Socioeconomic Status Variables

Measures described as SES, such as parental education, have been related to children's success (Duncan et al., 1972; Scarr & Weinberg, 1978; Sewell & Hauser, 1976). These factors were most likely proxies for explanatory factors such as orderliness in the home and value placed on education. Studies show that parental background variables make little contribution to the distribution of individuals to occupations, whereas years of education and cognitive ability make a large contribution (Duncan et al., 1972; Gottfredson & Brown, 1981). A well-known longitudinal study (Vaillant, 1977) found that broad measures of SES before an individual's enrollment in college had no relation to outcome variables 30 years later. However, among people of equal ability, the most significant predictor of adult occupational achievement was the parents' attitude toward school and education (Kraus, 1984).

The operational measures of SES that have been found to be important determinants of later outcomes (e.g., values and attitudes) were factors that could be in-

fluenced. Even the poorest of families could develop and use these factors to benefit their children (Greenberg & Davidson, 1972). Unfortunately, some families are so destitute that their environment would not even be considered as humane, and this deprivation would have detrimental effects on later accomplishments. For the vast majority of people in all socioeconomic and racial subgroups, however, this is not the case (Scarr, 1981).

Education and measured cognitive ability were shown to be more important to later outcomes than were such factors as income. However, the effect of SES on these variables must be examined further.

Test performance. Oakland (1983) found that the relationship between IQ scores and achievement test performance was the same across SES levels. A factor analysis of ability measures in different SES groups showed that factor structure was not contingent on SES (Humphreys & Taber, 1973). Spaeth (1976) and Valencia, Henderson, and Rankin (1985) found that the effects of parental SES on a child's IQ score were mediated by family interaction and exposure to stimuli provided by parents. In addition, Spaeth concluded that parental influence was a great deal more important than that of teachers and schools. The effects of the latter were much less personal and direct. He concluded that the direct effect of parental SES on child's IQ was $-.03$. In related research, SES has not been found to have a significant effect on the IQ scores of adult, adopted twins reared apart (Bouchard, Lykken, McGue, Segal, & Tellegen, 1990).

Simple measures of SES did not adequately capture the parts of the environment that produced individual differences, even within families (Mercy & Steelman, 1982; Rowe & Plomin, 1981). Even such simple, specific variables as amount of time spent on homework and amount of time spent watching TV on weekdays were related in the expected direction to performance on academic achievement tests (Keith, Reimers, Fehrmann, Pottebaum, & Aubey, 1986). Ultimately, parents could help children learn to cope with cognitive complexity, an effect independent of SES (Spaeth, 1976).

College attendance. Contrary to McClelland's (1973, p. 3) assertion that entrance into prestigious jobs was based on social background, entrance into higher status jobs has instead been shown to be primarily determined by educational attainment (Alexander & Eckland, 1975; Bajema, 1968; Gottfredson & Brown, 1981; Schiefelbein & Farrell, 1984; Sewell & Hauser, 1976). Therefore, what determines attendance at college is very important.

McClelland (1973) stated that an individual's socioeconomic class was the primary factor in determining his or her ability to attend college. Research has shown the flaws in this assertion. Although socioeconomic background is associated with college attendance, other factors are more important. Alwin and Otto (1977) found that high school teachers encouraged students to attend college on the basis of ability rather than socioeconomic status. Other studies (Baird, 1984; Christensen, Melder, & Weisbrod, 1975; Hearn, 1984, 1985) have shown that intel-

lectual ability stands out as the most important factor in determining college attendance.

Educational success. Using a multiple regression model, Sewell and Hauser (1976) showed that SES variables accounted for 15% of the variance in educational attainment. When intelligence was added to the model, the variance accounted for nearly doubled, rising to 28%. Between 23% and 40% of the variance attributed to SES variables was mediated by ability.

Baird (1984) found that individuals with higher scores on the Scholastic Aptitude Test were more likely to have had higher grades and higher class rank in high school. In direct contrast to McClelland's (1973) assertion that grades are awarded for demonstrating middle- and upper-class attitudes, neither grades nor class rank were related to family income. Higher test scores were also associated with higher grades in college. Baird also found that higher test scores were associated with plans for graduate education; family income was not.

Variation Within Family and Socioeconomic Status

Even within an SES class, as determined by income, individual test scores vary widely. In a sample of Black ghetto children, Greenberg and Davidson (1972) found that home environments differentiated between those who were high and low achievers in school. The differentiating factors included parents' concern for education, awareness of the child as an individual, general social awareness, use of rational discipline, and the structure and orderliness of the home. The high achievers also tended to have slightly more educated parents with slightly better incomes. It could be argued that the possession of certain values led to the better conditions. Herzog et al. (1972) also studied a sample of ghetto children, again showing that education and family interaction were associated with higher IQ and a tendency to benefit more from a nursery school intervention program.

A simple conceptualization of SES effects, in which such factors as family income or parents' education caused differences in IQ test performance, educational performance, and occupational success, leaves very important questions unanswered. If such effects were primary, outcomes would be identical for all children within a family, a conclusion definitely not supported by research evidence.

In a large-scale review of the literature, Duncan et al. (1972) found a mean correlation of $.50$ between the IQs of siblings. Daniels and Plomin (1985) also found that the correlations between siblings for cognitive ability were only about $.40$ to $.50$. Approximately the same difference existed between the IQ of siblings and the IQ of all possible child pairs (Willerman, 1979). The average difference between the IQ scores for a random pair of individuals was about 17 points, whereas the average difference between siblings was about 13 points (Rowe & Plomin, 1981). Within-family correlations on cognitive ability ranged from $.86$ for identical twins raised together to $.15$ for nonbiological parent-child pairs living together (Horn, 1983; Plomin, 1988).

When education and income were correlated with IQ, diversity within similar environments was again demonstrated. The correlation of mother's education with the children's IQ was higher for biological mothers and the children they have never met (.21) than was the correlation of children's IQ with the education of the adoptive mother who raised them (.10; Scarr & Weinberg, 1978). Scarr and Weinberg also found that the correlation between family income and IQ was .06 for adopted children and .22 for biological children. This suggested a limited influence for environment.

Increased diversity of sibling test scores over time. Another argument against the assumption that individuals are destined to remain in the social class of their birth was that intelligence test scores of siblings tended to become more diverse over time (Bouchard et al., 1990; McCartney, Harris, & Bernieri, 1990). Although SES variables tended to be slightly more important in early childhood (Alwin & Thornton, 1984), by the end of adolescence, correlations among siblings are lower than in earlier childhood (Scarr & Weinberg, 1978). These are more pronounced among adopted siblings. The intelligence scores of adopted siblings grow apart until no intellectual similarity exists between them; IQ correlations for this group at age 18 were found to be zero (Scarr & Carter-Saltzman, 1983). Correlations of IQ scores among biologically related siblings were .35 at age 18. Being raised with the same family in the same house and attending the same schools had little or no influence on IQ (Bouchard et al., 1990).

Aggregation of data. Despite evidence to the contrary, the belief that socioeconomic status is a major factor in determining educational and occupational outcomes remains a widely held misperception. What is the source of these misperceptions? In exploring this issue, White (1982) found that correlations between SES and academic achievement typically ranged from .10 to .80. The higher correlations were usually found when data were aggregated. When a school or school district was used as the unit of analysis, correlations averaged .73. The average correlation dropped to .22 when the individual student was considered as the unit of analysis. The higher correlations found with aggregated data resulted from the mathematical properties of the statistical formulas. As the homogeneity of the unit of analysis decreased, the resulting correlation increased, leading researchers to draw inappropriate conclusions on the relationship of interest (Robinson, 1950).

Test Scores and Job Prestige

McClelland (1973) claimed that tests were socially discriminatory because research has sometimes found higher validities for more prestigious jobs. He explained these results by attributing the relationship between cognitive ability scores and occupational success to an underlying social status causal agent. Using a selected segment of Ghiselli's (1966) data, McClelland further claimed that success in some occupations was more highly correlated with intelligence because, as McClelland stated,

These two jobs differ also in social status, in the language, accent, clothing, manner, and connections by education and family necessary for success in the job . . . they depend heavily on the *credentials* the man brings to the job—the habits, values, accent, interests, etc.—that mean he is acceptable to management and to clients. (p. 3)

As evidence, McClelland cited correlations of $-.08$ for proficiency as a canvasser or solicitor and $.45$ with proficiency as a stock and bond salesman, results published in Ghiselli's study.

It is interesting to note, however, that one of Ghiselli's (1966) highest validity coefficients between intellectual ability and job performance was that of janitor ($r = .65$; p. 85). Ghiselli's study contains other examples that do not conform to McClelland's (1973) generalization. Ghiselli pointed out that the highest correlation between intellectual ability and job proficiency was for salespeople, a correlation higher than that of executives and administrators (p. 63). Although more recent evidence showed that performance of more complex jobs was, in general, more highly correlated with performance on ability tests than that of less complex jobs (Gutenberg, Arvey, Osburn, & Jeanneret, 1983; Hunter, Schmidt, & Judiesch, 1990), variation among validity coefficients seen in the evidence presented here was not due to job prestige.

Summary

The relationship between IQ and job success is not an artifact of SES. In fact, as demonstrated in the evidence cited here, IQ is a fundamental cause of the correlation between SES and occupational success. McClelland (1973) had it backwards. Neither ability test scores, occupation, or the relationship between the two is dependent on SES. Typical measures of SES are not strongly related to either college attendance or success in school. Substantial variation between test and school performance exists even within families and neighborhoods. The relationships between SES and other variables that have been observed can be attributed at least in part to the aggregation of data.

Are Tests Unfair to Minorities?

According to McClelland (1973), "Tests have served as a very efficient device for screening out black, Spanish-speaking, and other minority applicants to colleges" (p. 1). McClelland compared the position of a minority student with that of young men of the Middle Ages who were required to know Latin to gain access to learned professions, stating that "many a ghetto resident must or should feel that he is in a similar position with regard to the kind of English he must learn in order to do well on tests, in school, and in occupations today in America" (p. 6).

McClelland's (1973) position has been refuted by scientific evidence. The very test battery in Thorndike and Hagen (1959) that formed part of McClelland's evidence was found equally valid for all subgroups tested (Dubois, 1947). The data we will now review regarding

college attendance and test performance also demonstrate the fairness of aptitude and intelligence tests.

College attendance. McClelland (1973) claimed that tests kept minority students out of colleges, even though these students could do well academically. Minority students with substantially lower test scores than White students were admitted to colleges, even though research has shown that the academic performance of Blacks with identical test scores and prior grades could be expected to be one to two thirds of a standard deviation lower than that for Whites (Klitgaard, 1985).

Baird (1984) showed that Blacks with high ability, as measured by standardized intelligence tests and aptitude tests, were more likely to enter college than were Whites with high ability. Moreover, Black students with high ability were more successful than their White counterparts in entering the most selective colleges. Very few White students with low ability attended selective colleges. Thomas, Alexander, and Eckland (1979) found that test scores were more important in determining college attendance for Blacks than for Whites.

Affirmative action programs were probably at least partially responsible for the fact that equal percentages (i.e., 32%) of Black and White high school graduates entered college in 1975 (Jackson, 1990). However, if test performance accurately reflects college performance, then tests do not unfairly prevent minority students from attending college.

Test performance. McClelland (1973) maintained that intelligence tests were "clearly discriminatory against those who have not been exposed to the culture, entrance to which is guarded by the tests" (p. 7). Evidence has refuted this contention. Scarr-Salapatek (1971) and Oakland (1983) have shown that aptitude tests predicted school performance equally well for both Black and White children across SES groups. In examining employment and training selection procedures, Boehm (1972) found no evidence of differential validity for Black and White population subgroups. Hunter et al. (1984) reported that "massive empirical evidence has now accumulated showing that tests are fair to minority members" (p. 93). They determined that cognitive ability tests predicted equally well for Blacks, Hispanics, and Whites, results that had been seen in an earlier study by Hunter et al. (1979). Studies conducted in Israel (Zeidner, 1987, 1988), as well as studies by the National Research Council (Hartigan & Wigdor, 1989), also disproved the cultural bias hypothesis. Several other studies also did not show a pervasive differential validity by race (Hartigan & Wigdor, 1989; Linn, 1982a, 1982b; Wigdor & Garner, 1982).

Can Competencies Predict Better Than Traditional Aptitude and Intelligence Tests?

A fundamental problem with McClelland's (1973) research was his failure to define his concept of *competency*. To obtain a definition of this term, we had to rely on subsequent papers he and his associates had written. This unique type of testing, advocated by McClelland, has been seen as a way to facilitate long-term prediction (Cronbach,

1990). As a result, close examination of the evidence was very important. The literature presented here does not support the use of competency testing to replace aptitude testing.

Boyatzis (1982) completed a comprehensive integration of the data on competency testing available from McClelland and his associates. He described a job competency as "an underlying characteristic of a person in that it may be a motive, trait, skill, aspect of one's self-image or social role, or a body of knowledge which he or she uses" (p. 21). He further asserted that these underlying characteristics may be unconscious and that the person may be "unable to articulate or describe them" (p. 21). However, the method he prescribed to uncover competencies was to have individuals describe what made them successful on the job.

The entire method rested on stories people told about themselves, labeled the Behavioral Event Interview (BEI). For the BEI, job incumbents were interviewed and asked to describe three incidents in which they felt effective on the job and three in which they felt ineffective. Although the reported events were not substantiated, the BEI was said to be a content-valid assessment method. McClelland (1973, p. 8) himself said that it is not job analysis to ask what people think good job performance is; yet this was precisely the method recommended to uncover competencies.

The stories told in the BEI were subjected to an unspecified scoring system. The same sample of people was then tested with the Picture Story Exercise. This test, described by Boyatzis (1982) as a variation of Murray's (1938) Thematic Apperception Test (TAT), required people to tell stories about pictures. These stories were then coded to measure motives such as need for achievement, need for affiliation, and need for power. Not surprisingly, people tended to include behaviors in their stories similar to the behaviors they described themselves using. Because this similarity was found, the competencies were declared to be criterion related. The possibility of mono-method bias (Cook & Campbell, 1979) was ignored.

The Picture Story Exercise was then defined as a content-valid assessment technique (Boyatzis, 1982), on the basis of the claim that the test measured thought patterns used on the job. This was very different from the usual definition of a content-valid test (Uniform Guidelines on Employee Selection Procedures, 1978).

Controversy has recently developed concerning the appropriateness of various validation designs (Barrett, in press; Barrett, Phillips, & Alexander, 1981; Binning & Barrett, 1989; Guion & Cranny, 1982; Landy, 1986). None of these researchers would have accepted the validation design used by Boyatzis (1982). In fact, Boyatzis stated that his validation studies did not provide enough information to permit the development of a selection or promotion system. Most psychologists would likely agree with Boyatzis, who stated,

To develop and implement such systems and procedures, an organization would have to conduct studies to validate competencies against performance in their organization and in spe-

cific jobs or job families. This step is necessary to conform to legal and professionally accepted practices. (p. 251)

Typical of the literature available on competency testing, Klemp and McClelland (1986) reported a study involving a small sample of not more than 27 managers. From this sample, Klemp and McClelland claimed to have identified useful information concerning senior managers but did not present empirical data to support their contention.

Klemp and McClelland (1986) did not develop or validate an assessment device, leaving five important issues unanswered. First, did Klemp and McClelland's techniques provide any incremental gains over widely used methods? Kornhauser (1922) pointed out that selection procedures typically began with the hunches of test developers. Has the work of McClelland and his colleagues contributed to the field beyond the hunches used at the turn of the century?

Second, did the techniques of Klemp and McClelland (1986) identify any competencies different from the constructs already developed and tested for many years by other techniques, such as assessment centers? For example, was the competency of planning and causal thinking identified by Klemp and McClelland any different from the variable labeled *organization and planning*, identified 20 years earlier (Bray & Grant, 1966)?

The third issue was whether a reliable assessment device could be developed to measure identified competencies. Fourth, if a device were developed to measure a competency, would performance on the test relate to job performance?

Fifth, the competency of self-confidence was identified as a characteristic of successful managers; whether this competency was a cause or effect of success was not determined. Would a measure of self-confidence taken early in a manager's career, before the manager had experienced career successes or failures, have results similar to one taken later in his or her career?

In an unpublished study reported in McClelland (1981), 50 different predictors were used, but only 9 had any relationship with the criterion. These results were derived only after the original sample was subdivided to obtain significant relationships. We agree with McClelland that these results need to be cross-validated.

In deriding cognitive ability tests, McClelland (1973) stated, "even a little criterion analysis would show that there are almost no occupations or life situations that require a person to do word analogies, choose the most correct of four alternative meanings of a word, etc." (p. 7). We could add that few occupations require a person to look at a picture and tell a story.

Driving. McClelland (1973) implied that competency testing was based on criterion sampling. His arguments need to be examined. McClelland suggested that "if you want to know how well a person can drive a car (the criterion), sample his ability to do so by giving him a driver's test" (p. 7). McClelland claimed that "faking a high score is impossible if you are performing the criterion

behavior, as in tests for reading, spelling, or driving a car" (p. 9).

This assertion is problematic. Research data have indicated that driving tests do not predict accident involvement or citations received (Edwards, Hahn, & Fleishman, 1977; Freeberg & Creech, 1971; Newsome, 1975; Ratz, 1978; Wallace & Crancer, 1971). At least in the context of driving a car, evidence has demonstrated that this behavior could be faked and that the usual driving test would not necessarily differentiate a responsible driver from one who was likely to be involved in accidents or commit violations, criteria widely used as standards of driving ability. Similar results have been found for motorcycle operators (Jonah, Dawson, & Bragg, 1981). Criterion sampling was not an adequate testing strategy in predicting these important criteria.

In contrast to McClelland's (1973) assertion that the best testing involved criterion sampling, instruments such as selective attention and perceptual style, both without face validity, have been shown to be related to involvement in accidents (Arthur, Barrett, & Alexander, 1991; Arthur, Barrett, & Doverspike, 1990; Avolio, Kroeck, & Panek, 1985; Barrett & Thornton, 1968; Mihal & Barrett, 1976). Even paper-and-pencil tests of intelligence have been related to accidents and violation records (Conger, Miller, & Rainey, 1966; Smith & Kirkham, 1982).

Patience. McClelland (1973) believed that patience was a desirable competency for many service occupations, especially for police officers. As we did with McClelland's reports on the research of Thorndike and Hagen (1959) and Ghiselli (1966), we examined the actual tests and results to conclude for ourselves the value of patience as a competency to predict occupational success.

McClelland (1973) said, "Kagan, Pearson, and Welch (1966) have shown that it [patience] is an easily measured human characteristic that is relatively stable over time and can be taught directly" (p. 10). Kagan et al. used a Matching Familiar Figures Test (MFFT) to study impulsive versus reflective cognitive tempos in first-grade children. This test was composed of line drawings of familiar objects, such as trees, toys, and airplanes, from which the subject selected one to match a standard. Even in first-grade children, this test was not related to any meaningful behaviors. Nothing suggested that the test involved patience or was related in any way to police performance.

The only performance dimension on the MFFT that the first-grade children could be trained to change was increasing response time. They could not decrease their error rates. Ironically, although response time scores had no personality implications, the error rate on the MFFT was related to intellectual ability. Students with higher ability made fewer errors (Block, Block, & Harrington, 1974, 1975; Block, Gjerde, & Block, 1986; Gjerde, Block, & Block, 1985; Messer, 1976).

Summary

The patience competency illustrates the state of competency testing. More than 18 years have passed since

McClelland (1973) published his conclusions, but McClelland and his associates have not yet been able to produce any professionally acceptable empirical evidence that their concept of competencies is related to occupational success.

In contrast to the lack of evidence for competency testing, a large body of literature has shown that tests of cognitive ability are related to the job performance of managers and people in other occupations (Arvey, 1986; Hunter, 1986; Thorndike, 1986). Boyatzis (1982) stated that competency testing was distinct from, and superior to, assessment centers, but the evidence does not show that competency tests can match the known strengths and validity of assessment centers (e.g., Gaugler, Rosenthal, Thornton, & Bentson, 1987; Thornton & Byham, 1982). McClelland (1973) expressed concern about bias against minorities, yet the relative performance of minorities on competency tests is unknown (Boyatzis, 1982). In contrast, assessment centers have been shown to be fair to both Blacks and Whites (Huck & Bray, 1976; Thornton & Byham, 1982), as well as to women (Ritchie & Moses, 1983; Thornton & Byham, 1982; Tziner & Dolan, 1982).

An unfortunate problem with competency testing is that relationships between these tests and traditional ability tests, aptitude tests, assessment centers, personality tests, and work sample tests have not been examined. Each of these traditional types of tests is known to have predictive value (Day & Silverman, 1989; Gellatly, Pounonen, Meyer, Jackson, & Goffin, 1991; Hunter & Hunter, 1984; Robertson & Downs, 1989). What is not yet determined is whether competency testing has the potential to make a unique contribution to the field of testing.

Conclusion

McClelland's (1973) article has deeply affected the public's perception of tests and has influenced the psychological profession. As a result of its acceptance in professional literature, law journals, and introductory psychology textbooks, its authority has become more pervasive over time. The views were also disseminated into newspapers, magazines, and popular books. The time has come to clarify the issues involved.

Despite the wide acceptance of McClelland's (1973) views, the evidence he used to support his arguments leads to conclusions that actually oppose the ones he has proposed. His assertions are contradicted by other evidence. Grades did predict occupational success. Intellectual ability and aptitude tests predicted occupational success even when the aptitude test was an avionics battery not specifically designed for general use. Test results were not an artifact of social status, nor were they unfair to minorities.

The concept of criterion sampling may be appropriate in some situations, but the evidence does not support McClelland's (1973) views in any of his own examples. The evidence has not shown that competencies can surpass cognitive ability tests in predicting any important occupational behavior. Note that although

McClelland expressed concern about bias against minorities, he did not examine minority performance on competency tests (Boyatzis, 1982).

Since 1973, the evidence increasingly shows that cognitive ability tests do predict job performance in a wide variety of occupations (Hunter, 1986). Use of cognitive ability tests as part of an assessment center (Thornton & Byham, 1982) or in combination with standardized personality tests (Day & Silverman, 1989) has been shown to provide increased validity in predicting job performance. If McClelland's concept of competencies is to make a contribution to the field of psychology, he must present empirical data to support his contention.

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