

Back to Spearman?

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The ideas and the wealth of evidence provided in these papers are extremely important to all those who are concerned about the problems of American society. The authors agree on one central fact: that differences in what we usually call general intelligence underlie and are perhaps largely responsible for differences in success and status in the United States. They differ somewhat in the way they define the *g* they have analyzed, and they realize that the particular *g* factor obtained depends somewhat upon the composition of the test battery out of which it emerges, but the evidence of its relationship to occupational success is clear. There is more question about Hunter's (1986) attempt at an explanation of why this relationship holds and, specifically, about his characterization of the general cognitive factor as "learning ability." Spearman did not define it in this way; in fact, he dismissed this definition as totally inadequate (Spearman, 1927). Ever since Woodrow's series of studies in the late 1930s and 1940s (Woodrow, 1946), psychologists have recognized that intelligence can be equated with learning ability only if learning ability itself is defined in a special way. It is the difficulty, complexity, or abstractness of what can be learned that is linked to *g* rather than the facility with which anything can be learned. Hunter recognizes the importance of complexity by invoking what he calls E. L. Thorndike's "classic" theory of learning in which learning in a formal training environment means "absorbing knowledge." However, few if any learning theorists since Thorndike's time would be willing to define learning on or off the job this narrowly. Perhaps the current research on cognitive psychology summarized here by Jensen (1986) will eventually throw new light on the question of the nature and source of individual differences in general intelligence.

To a person who began studying individual differences in the 1930s, there is nothing surprising in these findings. The first and broadest generalization that emerged from the measurement of human characteristics

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was that *correlation*, not *compensation*, is the rule governing such endowments. One cannot expect the dull boy to be more mechanically gifted or better coordinated than his brighter brother. Special aptitudes are more likely to accompany strong minds than weak ones. Later factor analyses were to recognize this phenomenon as *positive manifold*.

In 1964, after the factor analysis bandwagon had been rolling for some 20 years, and batteries of tests based on factor analysis had come into common use, Quinn McNemar's witty and thought-provoking presidential address to the American Psychological Association, entitled "Lost: Our Intelligence? Why?" presented the same conclusions the authors of these papers have reached, along with a considerable body of evidence to support them (McNemar, 1964).

If the predominance of the *g* factor has been apparent to many if not most psychologists ever since mental tests were invented, why should so much time, energy, and creativity have been invested in the attempt to identify and measure more limited abilities? There appear to be two reasons, one having to do with service to individuals, one with the structure of society, and I am convinced that we must continue to be concerned with whatever portion of the variance is not accounted for by *g*. From the beginning, ability tests have been used not only for selection but also for counseling. For the individual and his or her counselor, a measure of *g* alone is not enough to facilitate a choice about what direction to take, what possibilities to develop. The most useless thing a parent, teacher, or counselor can say to a girl or boy with an IQ of 150 is, "You have the ability to do anything you want to do." The skilled counselor explores all available evidence for indications of special talents, interest directions, background, and opportunity in helping a person to decide what to do with his or her life.

The question, "Which ability shall I try to develop?" was fully as important as the question, "Which applicants shall I select?" in generating a demand for tests. It led first to research on *aptitude testing* in the 1920s and 1930s. In these days it is often forgotten that research on special abilities began with aptitude testing, not factor analysis. Much of the early work was done at the University of Minnesota where I was a student. The research reported by Paterson, Elliott, Anderson, Toops, and Heidbreder (1930) produced some tests of mechanical aptitude that were widely used for years. It was followed by research on clerical aptitude that produced another widely used test. During the same period Carl Seashore (1939) developed a battery of tests of musical aptitude, and attempts were made to measure artistic talent. A similar effort to identify and measure special aptitudes was in progress in England (Cox, 1928). At Minnesota a series of studies during the 1930s (Dvorak, 1935) showed that the average *profiles* of aptitudes for groups of workers in different occupations differed significantly. Bingham's book (1937) *Aptitudes*

and Aptitude Testing was a standard text. During the period it was usually assumed that aptitudes were innate, as the title of O'Connor's 1928 book indicates.

It was during this same period that factor analytic research designed to supplement or replace Spearman's g was initiated. By the decade of the 1940s, psychologists realized that this research was turning up factors that appeared to be similar to the traits identified by the aptitude testers. From then on most research on abilities, general or special, has utilized factor analysis, and batteries of tests based on factor analysis have been the instruments most commonly used in vocational counseling. The batteries of tests used by the military services and the General Aptitude Test Batteries (GATB) represent this merging of two lines of research.

The second major reason for the continuation of research on abilities other than g is concern for the welfare of society as a whole. Gottfredson (1986) in her paper has pointed out some possible unfortunate consequences of relying exclusively on the measurement of g in making employment decisions. Her discussion of the value conflict between the objectives of maximizing productivity and promoting equality brings up a problem that we should be taking seriously. Mental testing originated in societies with fairly rigid class structures. In a society like that of Britain in the early part of the twentieth century, a tool that helped individuals move across class levels according to their ability level made a useful contribution. Intelligence tests served as a means of finding individuals at lower levels who qualified for higher levels, and an educational system was designed to help them move up. Tests served this purpose during all the years when the 11-plus examination was the principal basis for channeling individuals into different types of schools.

In the United States we have always prided ourselves on being less class conscious than the countries from which our citizens came. But several large-scale research projects in the 1940s indicated that class distinctions still played a considerable role in the classification of people in several parts of the country. Warner, Meeker, and Eels (1949) stated that class positions of individuals were based on occupation, source of income, house type, and dwelling area. The first of these factors, occupation, has repeatedly been shown to correlate with intelligence. The average IQ obtained by participants decreases significantly as the prestige level of occupations decreases, as we move downward from professional workers to managerial people to skilled laborers to unskilled laborers. Furthermore, the averages for children of parents from these decreasing levels show a similar decline (see Tyler, 1965, chap. 13 for a summary). Until recently the increasing selectivity of our schools from elementary to secondary to postsecondary levels fit in with this pattern.

Whether the major steps we have taken in America during the last two or three decades to promote equality have changed this situation to

an appreciable extent is not certain. What Gottfredson shows is that educational equality for black and white groups has not brought their average scores on measures of *g* nearer together. And even though one's place in the occupational prestige hierarchy usually depends more on education than on *g* score, the black-white difference in *g* sustains large differences in occupational status. This suggests that if equality of status for whole groups in the population is to be maximized, the importance of *g* in differentiating such groups must be reduced.

It seems to me that with the passage of years this problem has become more rather than less urgent. In the past, there was always a considerable quantity of unskilled work to be done, so that persons whose test scores did not qualify them for any of the higher occupational levels could always find some kind of work to do. Steady technological progress has depleted the reservoir of need for unskilled labor, and the millions of hard-core unemployed, perhaps unemployable, people we now have is the result. If *g* is as important in all kinds of work as these papers indicate that it is, the prospects are indeed bleak for millions of individuals.

Perhaps what we need to do is to rethink our concepts of productivity and equality. Instead of trying to maximize productivity in each separate industry, business, and government department, we should consider the problem of maximizing productivity in the society as a whole. Can we have a productive society if one-twelfth of its members make no contribution whatever to its functioning and constitute a considerable drain on its resources? And must equality be defined in terms of occupational level or social class? Cannot we conceive of a society in which each individual member makes a *qualitatively* different contribution, thus increasing the productivity of the whole? Such questions challenge measurement specialists, psychologists, educators, and economists to develop new techniques, new patterns of organization.

I see some hope in an approach to measurement intermediate between the selection and counseling approaches I have compared. It is the *classification* approach. Working in this way, the aim of a testing program is to sort *all* applicants into groups where each individual can contribute something to the success of the whole. Even though a high IQ is an advantage in any job, it may not be an advantage to society to have a person with an IQ of 130 in a place that could be filled by a person with an IQ of 90. This was, of course, the approach in the testing programs carried on by the Armed Forces, although the papers in this collection do not emphasize it.¹ The Air Force assigned applicants to training for pilot, navigator, or bombardier positions. Decisions were not simple accept-reject matters. The GATB tests were similarly designed for optimum classification rather than maximum prediction of single criteria. It is the

¹ See Humphrey's (1986) commentary for discussion of this research.—Ed.

validity of the sorting procedure rather than the validity of tests or test batteries in predicting single criteria about which we need to know more. There is an indication in Thorndike's (1986) paper that if applicants are prescreened for g , the relative importance of the more specialized tests tends to increase. This may give researchers a hint as to one way of proceeding. At the other end of the intelligence scale, we have made a great deal of progress in fitting mentally retarded individuals into places their g scores would never have selected them to occupy. These techniques may also provide some useful leads.

A final factor that needs to be taken into consideration as we think about the implications of mental testing for individuals and for society is *development*. We know now that although individual differences in intelligence and special abilities have a genetic basis, they also reflect differential experience. The score a person obtains at any one time depends upon the whole course of development up to that time. Individuals and society have some choice about which abilities to attempt to strengthen through training and experience, and maximum development of different special talents in different individuals is fully as important in a complex society as is maximum development of general intelligence.

In conclusion, I would sum up my reactions to this important group of papers by saying that the authors have done the psychological professions a great service by demonstrating the importance of g in comparison with special abilities. But I do not think that the research efforts to identify special abilities, aptitudes, or factors have been wasted. The average correlation of g scores with occupational criteria, reported by Hunter to be .75, accounts for only about half of the criterion variance. Other factors of many sorts play a part. For me, the greatest weakness of this collection of papers is its reliance on correlational research exclusively. We must take into consideration the research in special education, rehabilitation, mental retardation, and other specialized areas that has demonstrated that individuals at many g levels can do productive work.

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