

A THEORY OF INTELLIGENCE AS PROCESSING: Implications for Addressing Racial Differences in IQ

Race and ethnicity correlate strongly with well-being in America. Historically, African American families have experienced lower levels of well-being across a range of indicators. Racial disparities persist in child health outcomes, educational attainment, and levels of family poverty. Measures of educational achievement show that disparities across different populations may be narrowing, but persistent gaps remain. Factors contributing to this disparity and solutions to address it are often hotly debated. One of the most contested discussions has surrounded racial disparities in scores on intelligence tests and the ways in which such differences should be interpreted.

The controversial debate over the meaning of racial differences in IQ scores is one which has a long history and important implications for policy. The impetus for this debate has been a 15 point, or one standard deviation, gap in achievement between White Americans and African Americans in IQ scores. Current evidence suggests that this gap is diminishing, although nationally representative IQ scores are not available.¹ Studies have demonstrated that African American students are doing much better on a range of achievement and educational indicators, although a gap still exists.²

Much of the disagreement rests on the search for the causes of these differences. One argument is that racial differences in intelligence can be attributed to genetic differences.³ Increasingly, this view has been challenged by scholars, such as Case Western Reserve University's Dr. Joseph Fagan, who argue that differences in IQ scores can be explained by environmental factors. For example, IQ testing has conventionally been based on a theory that defines intelligence as how much a person knows relative to peers of the same age. Dr. Fagan's research has led him to

advance a theory that defines intelligence as processing, in which intelligence is measured by performance on elementary cognitive tasks. To conceive of intelligence as processing instead of as knowledge has the potential to reach populations not normally able to take IQ tests, such as infants or children with special needs, and also to resolve the debate over racial differences in IQ scores.

Standard measures of IQ assume that all people have the same access to culturally valued information. However, this is not necessarily the case. Test scores are influenced by the environment in which a child grows up and the exposure to, and quality of, educational experiences in which they participate. Focusing on environmental factors as the cause of disparities in IQ requires a shift in attention to the social and cultural conditions that lead to differential opportunities for knowledge acquisition.

Racial disparities in test scores may have significant implications for a student's educational trajectory. Minority students are significantly more likely to be identified as having a cognitive delay, emotional disturbance, or another learning disability. Furthermore, evidence suggests that the processes of identifying students for testing and assessment, as well as the interpretation of results may be largely subjective.⁴ Differences in educational achievement have been strongly associated with disparities in a variety of educational and economic outcomes. While test score disparities may not directly cause gaps in educational attainment or later employment and earnings, they do reflect a set of circumstances that may be responsible for disparities in both the educational system and economy.

Focus on Research at Case Western Reserve University



Joseph Fagan, PhD

Lucy Adams Leffingwell
Distinguished Professor
Department of
Psychology
College of Arts and
Sciences

Dr. Joseph Fagan's research has focused on development and individual differences in memory, cognition and perception. Dr. Fagan has developed a theory of intelligence as processing as a counterpoint to traditional theories that define intelligence in terms of knowledge. In addition, Dr. Fagan developed the Fagan Test of Infant Intelligence and has been involved in the development of culture-fair intelligence tests.

RESEARCH SUMMARY

Dr. Fagan and his colleague, Cynthia R. Holland of Cuyahoga Community College, wanted to understand whether racial differences in IQ scores were attributable to intellectual ability or to exposure to information. This question is one which has been widely debated both within psychology and in the public sphere.

The theory which guided this research is based on a model of intelligence as processing, which is proposed as an alternative to more traditional measures of IQ which characterize intelligence as knowledge. The theory, advanced by Dr. Fagan, assumes that intelligence is made up of both the information to which a person has been exposed and their ability to process that information. This theory places an emphasis on culture as the source of information and contradicts those scholars who ascribe racial disparities in IQ scores to genetic differences.

In order to gain insight into this issue, Drs. Fagan and Holland conducted two related studies in 2002⁵ and 2007⁶ with a total of 925 college students, 620 of whom were White American and 305 of whom were African American. The research participants were representative of the general US population in terms of age and education. The studies used a variety of different methods for testing intelligence that captured both standard IQ and intelligence as processing. In general, participants were given two types of questions; those that required specific prior knowledge and those that relied on general comprehension. The questions that tested

for specific knowledge were similar to those found on standard IQ tests, while those that tested for general comprehension allowed participants equal opportunity to acquire the information necessary to correctly answer the question.

The research addressed four interrelated questions

- Why do African Americans and White Americans differ in IQ scores?
- How much of the racial disparity in IQ is due to genetic or environmental factors?
- Do racial differences persist when students are given equal opportunity to learn?
- Is there evidence of test bias in standard measures of IQ?

KEY FINDINGS

The results of Fagan and Holland's work provide evidence that observed racial differences in IQ scores are attributable to unequal opportunity for the acquisition of the type of information leading to the knowledge which IQ tests measure. These findings suggest that equal opportunity for exposure to information may eliminate disparities in IQ scores. Specifically, the study showed that, given equal opportunity to learn the information on which they were subsequently tested, African American and White American students performed equally well on assessments. For example, in a test of word knowledge reflective of a standard IQ test, White students outperformed African American students by 18 points. However, there was no significant difference between the students in their processing abilities.

White and African American students were also tested for their understanding of sayings, analogies and similarities. When tested on sayings which required specific prior knowledge, White students averaged 65% correct, while African American students scored 48% correct. However, the results were quite different when equal opportunity to learn the information was available. For sayings that required only general knowledge, White students scored 72% while African American students scored 80% correct. The authors also showed that individual differences in specific comprehension were significantly related to individual differences in general comprehension, demonstrating that the two constructs are related.

Test Bias in Measures of Intelligence

Drs. Fagan and Holland also found evidence for test bias in the assessment of understanding sayings, analogies, and similarities based on specific information. This was tested by comparing two samples of White and African American students with equivalent scores on the tests of sayings, analogies and similarities based on specific knowledge. Although these groups had the same score on measures of specific knowledge, the African American students had significantly higher scores than White students on the measures of general knowledge. This indicates that the test for specific knowledge is biased against African American students and provides evidence for bias in intelligence tests based on knowledge of sayings, analogies and similarities.

Evidence against Genetic Explanations for Differences in IQ Scores

An important theoretical and practical finding of this work is that racial differences in IQ scores should not be attributed to genetic differences between races. The research results support the hypothesis that traditional IQ tests measure both intellectual ability and exposure to socially valued information. The findings further suggest that the use of standard IQ testing may lead to the misclassification of individuals as deficient in intelligence when in fact they have had less exposure to socially legitimated information. To counteract this, Dr. Fagan proposes considering traditional IQ scores as a measure of knowledge of culturally sanctioned information and considering tests of intelligence as processing as measures of intelligence per se. Dr. Fagan's work makes a compelling case for racial equality in intelligence and for the reconsideration of the ways in which intelligence is assessed.

IMPLICATIONS FOR POLICY AND PRACTICE

Research suggests that group differences in IQ can be addressed through various educational interventions, a finding that supports Dr. Fagan's conclusion that access to educational opportunities is partly responsible for racial disparities in IQ scores. Several studies have examined whether providing poor children with high quality pre-schooling early in life had the potential to raise their IQs.^{7,8} Results showed that participation in preschool did result in a significant increase in IQ scores. Most importantly, interventions seem to produce small but lasting effects on IQ scores among children. When we think of IQ as a measure of both a child's ability to process information and the information which the child has been given to process, it makes sense that educational intervention leads to an increase in IQ.

Research such as this suggests that there is an imperative to provide children with appropriate information. Providing information as soon as possible, as often as possible, as long as possible, and as clearly as possible will lead to more knowledge. More knowledge is reflected in a higher IQ score. IQ scores suffer when there is delay, disruption, or disorder in providing information to children. However, less knowledge caused by a lack of access to information does not mean that a child is unable to process information.

If we define intelligence as information processing and the IQ score as knowledge, the possibility of culture-fair tests of intelligence based on estimates of information processing arises. A practical application of this research is that it may be possible to develop culture-fair tests of intelligence that will allow basic intellectual abilities to be recognized. Evidence that existing tests of knowledge may be biased against certain groups suggests that alternative measures are necessary. Additionally, the inequality of educational achievement among races in our country highlights a need for culture-fair tests of intelligence. Disparities exist not only in scores on IQ tests but on other tests of knowledge as well such as the SAT, the GRE, and the ACT. These disparities influence educational decisions made on behalf of the child throughout their educational careers. At young ages, African

American students are more likely to be identified as having a cognitive delay or learning disability. At older ages, basing admission to higher education on such test scores results in fewer African American students being eligible for or admitted to colleges and universities.

Dr. Fagan has created tests of intelligence as processing which can be used as early as infancy to identify cognitive strengths and weaknesses. These early tests, which make use of visual memory, are predictive of IQ scores later in childhood, and provide evidence for early intervention for children who fall at either end of the cognitive spectrum. While intelligence testing for very young children is somewhat controversial, there is evidence to suggest that some deficits can be overcome if identified early and addressed appropriately.⁷

Perhaps one of the most important implications of this work is the evidence it presents to counter the idea that racial differences in IQ are based on genetic differences in intelligence. Instead, Dr. Fagan's theory of intelligence as processing provides policymakers and practitioners with opportunities to address the achievement gap through the use of early interventions, culture fair testing and a new perspective on what constitutes intelligence.

¹ Nisbett, R.E. (2005). Heredity, environment, and race differences in IQ: A Commentary on Rushton and Jensen (2005). *Psychology, Public Policy and Law*, 11(2), 302-310.

² Hedges, L., & Nowell, A. (1998). Black-White test score convergence since 1965. In A. Phillips (Ed.), *The Black-White test score gap* (pp. 149-181). Washington, DC: Brookings Institution.

³ Jensen, A. R. (1981). *Straight talk about mental tests*. New York: The Free Press.

⁴ The Civil Rights Project, UCLA. Racial inequity in special education: Executive summary for federal policy makers. http://www.civilrightsproject.ucla.edu/research/specialed/IDEA_paper02.php

⁵ Fagan, J. F. & Holland, C.R. (2002). Equal opportunity and racial differences in IQ. *Intelligence*, 30, 361-387.

⁶ Fagan, J. F. & Holland, C.R. (2007). Racial equality in intelligence: Predictions from a theory of intelligence as processing. *Intelligence*, 35, 319-334.

⁷ Ramey, C. T., Lee, M. W., & Burchinal, M. R. (1989). Developmental plasticity and predictability: consequences of ecological change. In M. H. Bornstein, & N. R. Krasnegor (Eds.), *Stability and continuity in mental development; behavioral and biological perspectives*. Hillsdale, NJ: Earlbaum.

⁸ Ramey, C. T., & Ramey, S. L. (1998). Early intervention and early experience. *American Psychologist*, 53, 109-120.



Schubert Center for Child Studies
614A Crawford Hall
10900 Euclid Avenue
Cleveland, OH 44106-7179

216.368.0540
www.case.edu/artsci/schubert/
schubertcenter@case.edu