CHAPTER

4

WAIS-IV Use in Societal Context

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INTRODUCTION

An individual's intelligence is traditionally measured relative to a sample of people the same age that is representative of a national population. This helps psychologists answer the question of how a particular person compares to other people across the nation in which that individual lives and competes. This is important because intelligence has been repeatedly shown to be predictive of a wide variety of important life outcomes (Gottfredson, 1998). However, even though we may live in the United States or Australia or China, no person lives in the country "as a whole." Rather, people live in neighborhoods or communities that can vary along simple dimensions such as size (San Antonio, the Bronx, Ontario), and along more complex dimensions such that communities may reflect unique characteristics that can impact the development and maintenance of cognitive abilities in novel ways. Those who measure intelligence also want to know how the person being tested compares to other people in the same community or culture. This is the essence of *contextual interpretation*. It is contextually informed interpretation of population-based cognitive ability scores in concert with salient demographic and environmental variables.

Most chapters written on intelligence test interpretation conclude with a statement such as: "The examiner should also take into account other factors such as the client's educational, medical, cultural, and family history – as well as other test scores." This advice has been repeated so frequently that it is often taken for granted, and while most psychologists acknowledge its veracity, not all implement it in practice. With experience, however, many psychologists come to understand that each profile of test scores has a range of meanings depending on the person's history and the context of the evaluation. In fact, one defining characteristic of an expert assessment psychologist may well be the ability to refine standard, cookbook interpretations of test profiles based on environmental, medical, and other relevant contextual issues.

In *WISC-IV Advanced Clinical Interpretation*, we devoted the first chapter to an exploration of the enriching and inhibiting influences of environment on cognitive development of children and adolescents (Weiss, Saklofske, Prifitera, & Holdnack, 2006a). Some of that ground is revisited in the present chapter because the WAIS-IV also is utilized with adolescents. Further, the adults we assess with the WAIS-IV were once developing children and adolescents, and those early experiences played a critical role in shaping their cognitive abilities as adults. Just as important, the environmental contexts surrounding adults of all ages also may impact cognitive functioning. For example, the range of physical and psychological stressors on individuals living in war-torn countries, suffering from malnutrition due to famine, or affected by environmental pollutants (e.g., mercury, lead) impacts all humans of all ages, albeit in potentially different ways. In applying these discussions to adults, we provide information that may facilitate the integration of salient cultural and home environmental considerations into routine practice with adults. In doing so, we continue to challenge the belief that the intellectual growth and development of individuals represents the unfolding of a predominantly fixed trait only marginally influenced by the nature and quality of environmental opportunities and experiences. As we discuss these issues, we cross-reference studies of other Wechsler intelligence test versions (i.e., WISC-IV, WPPSI-III). This is because the Wechsler series of intelligence tests is based on the same underlying model of intelligence that includes verbal conceptualization, perceptual reasoning, working memory and processing speed (see Chapter 3 in this volume).

BIAS ISSUES IN INTELLECTUAL ASSESSMENT

Prior to beginning our discussion of contextually informed interpretation of cognitive test scores, we must devote several pages to the widely held conception that cultural demographic differences in IQ test scores are

due to biases built into the test. Our intent in this section of the chapter is to put aside these concerns so that we can focus on contextual mediators of cognitive performance, skill acquisition and maintenance. We discuss advances in item and method bias research, and show that disproportionate representation of individuals in specific categories or groups is not limited to cognitive and achievement test scores but is present in many areas of life. We acknowledge a legacy of controversy in these areas, and must address it so that we can move forward.

Item bias has been studied extensively, and all reputable test developers take special precautions to avoid it. Best practice in test development first entails systematic reviews of all items for potential bias by panels of cultural experts, and such methodology is well documented and practiced (see Georgas, Weiss, van de Vijver, & Saklofske, 2003). Test developers typically determine representation of ethnic minority examinees in acquiring test cases based upon census percentages, but purposely exceed the percentages so that advanced statistical techniques may be undertaken to detect and replace items that perform differently across ethnic groups. Conceptually, these techniques seek to identify items on which subjects from different demographic groups score differently despite possessing the same overall ability on the particular construct being assessed.

When items are identified as operating differently by examinee group, the reason for any identified differences cannot be determined by these analyses alone. Expert panels commonly predict that certain items will be biased because some groups have less direct experience with the subject of those items than other groups, but then find that various statistical procedures designed to detect bias do not identify the same items as the panel. Perhaps this is because the cultural expert panel is not typically required to provide an evidence-based theory to explain how culture, as they conceive it, interacts with item content. At the same time, statistical techniques sometimes point to a particular item as problematic when the expert panel can find no contextual reason. This may be due to the very large number of statistical comparisons undertaken (e.g., every test item is evaluated across multiple racial and ethnic group comparisons, and also by gender, region of the country, and educational level), and so even with a $p < 0.01$ criteria there may be some items that randomly test positive for differential functioning when more than a thousand comparisons are made.

For these and other reasons this line of research is no longer referred to as item bias research but as an analysis of differential item functioning (DIF), because the underlying reasons that items perform differently across groups are not always known. In light of the care taken in the development of items for most modern intelligence tests, it seems unlikely that item bias accounts for the bulk of the variance in demographic differences in IQ test scores. However, differential item performance statistics are not very suitable to detect factors that influence entire tests as opposed to single

items (van de Vijver & Bleichrodt, 2001). This is because most DIF studies match respondents from different racial/ethnic groups by using total test scores as the indication of ability or intelligence. If one presumes that some aspect of the dominant culture is inherent in the construct being evaluated by the test, and not just in isolated items, then by matching on test scores researchers may be matching on adherence to some unknown aspect of the majority culture. This larger issue can be framed as one of possible construct or method bias in which the construct being tested, or the method used to measure the construct, functions differently across groups.

This type of bias is more general than item bias, and more difficult to study empirically. According to this view, the formats and frameworks of most major intelligence tests are literacy dependent and middle-class oriented. Further, the testing paradigm itself is a stimulus response set that could be considered a social-communication style specific to Western European cultures (Kayser, 1989). The testing paradigm assumes that the test-takers will perform to the best of their ability, try to provide relevant answers, respond even when the task does not make sense to them, and feel comfortable answering questions from people who are strangers to them. In some cultures, individuals are expected to greet unfamiliar events with silence, or to be silent in the presence of a stranger. Guessing is not encouraged in other cultures, and learning takes place through practice rather than explanation. Unfortunately, there are methodological difficulties in determining the amount of variance that may be explained by each of these factors. No studies have attempted to parse out the extent to which these influences may be ameliorated by the examinees' experiences within the US educational system, where western paradigms are pervasive. At the same time, evidence from studies of adults suggests that amount of US educational experience may explain significant variance in WAIS-III scores of immigrants (Harris, Tulsky, & Schultheis, 2003).

So, an important question is whether a test measures the same constructs across groups. One common way to examine this question is through factor analysis, and more sophisticated approaches include measurement invariance techniques. Basically, if it can be shown that the various facets (i.e., subtests) of a test correlate with each other in similar ways across groups, then such findings are typically taken as evidence in support of the hypothesis that the test is measuring the same constructs across those cultures. A series of studies has shown invariance of the four-factor WAIS-III measurement model between large and representative samples of subjects in the US, Australia, and Canada, as well as across education levels and age bands (Bowden, Lissner, McCarthy, Weiss, & Holdnack, 2003; Bowden, Lloyd, Weiss, & Holdnack, 2006; Bowden, Lange, Weiss, & Saklofske, 2008). While these studies are important, it must be noted that they are limited to comparisons between

English-speaking nations that are westernized, industrialized, and share common historical roots.

In a large international study of 16 North American, European and Asian nations, Georgas and colleagues (2003) found reasonable consistency of the factor structure of WISC-III, with each nation studied reporting either three or four factors. In all cases, the difference between the three- and four-factor solutions was due to a single subtest (Arithmetic) cross-loading on two factors (i.e., verbal and working memory). Importantly, these analyses included not only nations from 3 continents and 16 countries which speak 11 different languages, but also both westernized and non-westernized societies (i.e., South Korea, Japan, and Taiwan). Another important finding from this study is that the mean FSIQ scores for the countries were found to vary systematically with the level of affluence and education of the countries as indicated by key economic indicators such as gross national product (GNP), percent of the GNP spent on education, and percent of the countries' workforce in agriculture. Encompassing as this study is, we also should note that there were no pre-industrialized nations included.

Still, examining differences in mean scores across groups is a relatively simple but flawed procedure for assessing cultural bias in tests (see Gottfredson & Saklofske, 2009). A more sophisticated approach is to examine how the relationship of intelligence test scores to important criterion variables differs across groups. This begs the question, however, of what is an appropriate criterion variable for validating an intelligence test. In many (though not all) cultures educational success is considered an important behavioral outcome of intelligence, and thus the prediction of academic achievement from IQ has been studied extensively. Studies have shown a general absence of differential prediction of standardized achievement test scores from IQ scores across racial/ethnic groups for WISC-R (Reschly & Reschly, 1979; Reschly & Sabers, 1979; Reynolds & Hartlage, 1979; Reynolds & Gutkin, 1980; Poteat, Wuensch, & Gregg, 1988), and this finding has been replicated with WISC-III for nationally standardized achievement test scores in reading, writing, and math (Weiss, Prifitera, & Roid, 1993; Weiss & Prifitera, 1995). Typically, these regression-based studies show differences in the intercept but not the slope, and this lack of difference in the slopes is taken as evidence in support of a lack of differential prediction. In other words, IQ scores predict scores on standardized achievement tests equally well for all demographic groups studied. Yet the possibility exists that this finding is attributable to bias being equally present in both the predictor (i.e., the standardized intelligence test) and the criterion (i.e., the standardized achievement test). This question was partially addressed by Weiss and colleagues (1993), who used teacher-assigned classroom grades as the criterion rather then standardized achievement test scores; again, no differential prediction was

observed. A general lack of differential prediction to achievement was also recently demonstrated with WSIC-IV (Konold & Canivez, 2010).

It is unknown whether the construct of intelligence as we currently conceptualize it, albeit reliably measured with replicable factor structure across many cultures, predicts behaviors and outcomes that would be uniquely defined as intelligent by each culture, and particularly by non-industrialized cultures. Many researchers weight as important studies which show a relationship between intelligence and academic achievement, because the societies in which they live tend to value education as an important outcome of intelligence. In cultures of pre-industrialized nations, or perhaps some subcultures of industrialized nations where success in school is not necessarily central to success in life, however, such studies may not be as relevant. Other valued outcomes of intelligence may vary considerably across cultures, and might include such behaviors as the ability to resolve conflict among peers, influence one's elders, build useful machines without instructions, survive in a dangerous neighborhood, grow nutritious crops in poor soil, etc. The point is that while tests of intelligence have stable factor structures across groups and predict academic achievement very well, this does not necessarily mean that they predict things which every culture would consider intelligent. Demonstrating the stability of the factor structure across cultures is an important yet insufficient step in demonstrating cross-cultural validity. Further, if we were to design a new test to predict culturally-specific outcomes of intelligence, we would begin by seeking to understand what constitutes intelligent behaviors as defined by that population, and then create tasks designed to predict those behavioral outcomes. If the important outcomes (i.e., the criterion) of intelligence differ across cultures, then we might not end up with the same constructs that comprise most modern tests of intelligence – but we don't know that.

DEMOGRAPHIC DIFFERENCES IN VARIOUS AREAS OF LIFE

Although the literature on test bias acknowledges the role of socioeconomic status on intelligence test scores, it has largely ignored the known effects of poverty on the development and maintenance of cognitive abilities. This is a serious oversight, because poverty is known to be disproportionately represented across racial/ethnic groups.

This section explores racial/ethnic differences in several important areas of life. We confine this discussion to areas that are theoretically and conceptually related to the development and maintenance of cognitive abilities, intellectual performance, and skill acquisition. Compared with non-minority populations in the US, overrepresentation of racial and ethnic groups has been documented for physical and mental illness,

educational underachievement and high school drop-out rate, single- as opposed to dual-parent family homes, unemployment rates, reduced median family income, diminished school funding, lower mean scores on state-mandated high school exit exams, substandard schools, and more. Data reported in this section are from a supplemental report of the Surgeon General (US Department of Health and Human Services, 2001), except where otherwise noted.

Prior to beginning this section, however, we wish to make clear that this discussion is not merely about race or ethnicity. Rather, it is about indirect factors that circumscribe what people can accomplish regardless of race or ethnicity. There has been confusion on this point; because racial/ethnic groups tend to fall into diverse SES categories, people mistakenly believe that they are seeing racial differences when SES-related differences are examined. More importantly, people mistakenly attribute cause and effect to these data in only one direction: that differences in intelligence cause differences in SES. To the contrary, we intend to make the case that differences in SES cause differences in intelligence by limiting opportunities for individuals to achieve their full intellectual potential as they grow and develop cognitively from childhood and adolescence through young and middle adulthood. We focus our discussion on African Americans and Hispanics living in the United States because these are the data we have available through our work on the WAIS-IV standardization project, but we consider that the concepts presented may have wider utility.

Racial/ethnic group disparities in education

We discuss group differences in education because it is widely known that IQ test scores vary sharply and systematically with years of educational attainment. This may be because more intelligent people pursue higher levels of education where their particular abilities are more likely to be rewarded. Perhaps more to the point, however, education is significantly correlated with IQ test scores. Furthermore, this relationship between education and IQ is maintained through childhood, adolescence, and adulthood. For children and adolescents, researchers typically examine the parents' level of education, and it has been shown repeatedly that parental level of education is a good predictor of intelligence for those under 20 years of age. Overall, the correlation of parental level of education with WISC-IV FSIQ scores is as follows: 0.43 for ages 6–16 years (Weiss *et al.*, 2006b), and 0.42 for ages 16–19 years. For ages 20–90 years, the educational attainment of adults – herein referred to as self education – correlates 0.53 with WAIS-IV FSIQ. Thus, the association between intelligence and education is slightly higher in adults than in children or adolescents. Perhaps this is because self education is used for adults while parent education is used for children and adolescents. Self educational

attainment reflects both socio-economic and personal factors directly related to educational attainment (e.g., achievement orientation, individual ability), while parent education reflects background factors that influence the educational attainment of children indirectly.

Table 4.1 shows the mean WAIS-IV FSIQ score at different levels of educational attainment for adolescents ages 16–19 and adults ages 20–90. Mean FSIQ scores increase substantially with each subsequent level of education obtained. From the lowest to highest education levels, mean FSIQ scores increased by approximately 23 and 28 points for adolescents and adults, respectively.

Table 4.2 shows the the percentages of each racial/ethnic group that obtained various levels of education based on adults ages 20–90 (US Bureau of the Census, 2005). College entrance rates are highest for Asians (62.5 percent) and Whites (51.2 percent), and smaller for African Americans (40.1 percent) and Hispanics (29.1 percent). High school drop-out rates are largest for Hispanics (43.8 percent) and African Americans (25.7 percent), and smaller for Asians (16 percent) and Whites (14.7 percent). Thus, large differences in completion of secondary education and college entry are observed by racial and ethnic group.

As dramatic as it is, the 43.8 percent high school drop-out rate for Hispanics does not tell the whole story. There is a large disparity in graduation rates between Hispanics who were born in the US as compared to those born in other countries. In fact, the drop-out rate for foreign-born Hispanics is more than twice the drop-out rate for US-born Hispanics in the same age range (Kaufman, Kwon, Klein, & Chapman, 1999). This may in part reflect language competency issues for foreign-born Hispanics, who perhaps experience greater difficulties with language mastery, depending upon the age of immigration and classroom placement. In addition, economic factors may force some older children into the workforce at an

TABLE 4.1 Mean WAIS-IV FSIQ scores by education level and age band

Education level	Ages 16–19	Ages 20–90
8th grade or less	84.12	82.99
9th–11th grades	91.44	88.77
High school graduate or GED (12th grade)	96.18	97.28
Some college (13–15 years of education)	100.26	102.28
College graduate or above (16+ years of education)	106.97	110.77

Note: Ages 16–19 based on parent education; ages 20–90 based on self education.

TABLE 4.2 Percentage of each racial/ethnic group that completed high school and entered college

	High school drop-out rate	College entrance rate
White	14.7	51.2
African American	25.7	40.1
Hispanic	43.8	29.1
Asian	16.0	62.5

Note: Based on US Bureau of the Census (2005) for ages 20–90.

earlier age, particularly those already struggling with language and academic mastery.

Racial/ethnic group disparities in mental health status

Group disparities in mental health status show that group differences are not limited to educational status. Goldstein and Saklofske (see Chapter 7 of this volume) show how cognitive profiles of individuals with major psychiatric disorders differ from those of non-clinical subjects, especially with respect to level of performance. An appreciation of mental health disparities among groups is also relevant to a discussion of factors that moderate cognitive growth, because people preoccupied with significant mental health problems may have fewer cognitive resources available to apply to learning, be it through formal educational pursuits or solving mentally challenging problems in everyday life. Further, we propose that parents with significant mental health problems may have fewer personal resources available to fully attend to the cognitive enrichment and academic growth of their developing children.

Although rates of psychological disorders among African Americans and Whites appear to be similar after controlling for differences in socio-economic status, experts generally consider such conclusions to be uncertain because of the disproportionate representation of African Americans in high-risk populations that are not readily accessible by researchers (e.g., homeless, incarcerated). Similarly, there is little basis for firm conclusions about the rate of mental health disorders among African American children – although when present, their mental health needs are less likely to receive treatment than in White youths. The proportion of individuals with mental illness is much higher among those who are homeless, incarcerated, or in foster care, and African Americans are disproportionately represented in these settings. The proportion of the homeless population that is African American is at least 40 percent, and possibly higher. About 45 percent of children in foster care are African American, and many of these are victims of abuse or neglect. Although

Whites are nearly twice as likely as African Americans to commit suicide, this may be due to the very high rate of suicide among older White males.

Availability of mental health services depends on where one lives, and the presence or absence of health insurance. A large percentage of African Americans live in areas with limited access to both physical and mental health care services, and nearly 25 percent of African Americans have no health insurance, as compared to approximately 10 percent of Whites. Medicaid, which subsidizes the poor and uninsured, covers nearly 21 percent of African Americans. The proportion of African Americans that do not access mental health services due to the perceived stigma is 2.5 times greater than in Whites. Thus, attitudes about mental health disorders among African Americans may reduce utilization of existing services.

With respect to Hispanics, most studies support the lack of difference in rates of mental illness as compared to Whites; however, sample size issues have restricted the generalizability of this finding beyond the Mexican American population. Further, this summary statement masks important differences between US and foreign-born Mexican Americans. The lifetime prevalence of mental disorders is 25 percent for Mexican immigrants in the US, but 48 percent for US-born Mexican Americans. Also, length of stay in the US is positively correlated with increased incidence of mental illness for immigrants. Mexican immigrants with less than 13 years of US residence have better mental health than their US-born counterparts and the overall US sample. The picture is different for children, with most studies reporting higher rates of anxiety and depression among Hispanic versus White children and adolescents. Most of these studies are limited, however, by methodological issues with self-reported symptoms. Although the overall rate of suicide among Hispanics (6 percent) is lower than among Whites (13 percent), Hispanic adolescents in high school report proportionately more suicidal ideation and specific attempts than both Whites and African Americans. Similarly, although the overall rate of alcohol use is similar between Hispanics and Whites, there are differences in the rates of alcohol abuse among Mexican American men (31 percent) as compared to non-Hispanic White men (21 percent). The rate of substance abuse is much higher among US-born Mexican Americans than among Mexican immigrants (7 : 1 for women, and 2 : 1 for men). Relatively few Hispanics are homeless or in foster care. Hispanic youth are overrepresented (18 percent) in residential placement facilities for juvenile offenders compared to African American and White juveniles.

In general, Hispanics underutilize and in many cases receive insufficient mental health care services relative to Whites. Approximately 11 percent of Mexican Americans with mental disorders access services as compared to 22 percent of Whites. The rate is even lower among those born in Mexico (5 percent) as compared to those born in the US (12 percent).

Although the overall picture is complicated, the general trend appears to be that recently arrived Mexican immigrants have relatively good mental health, and maintain this advantage for at least a decade. However, mental health problems are much more prevalent among those that have been in the US longer, those born in the US, and for children and adolescents. More studies of Hispanics from other countries of origin are clearly needed. For example, many Hispanics from Central America have historically emigrated to escape civil wars in Nicaragua, El Salvador, and Guatemala, and refugees who have experienced trauma are at high risk for depression and post-traumatic stress disorder. But the strengths observed in the Mexican immigrant population are noteworthy. One factor may be a tendency of new immigrants to compare their lives in the US to those of their families in Mexico (typically a positive comparison), whereas those residing in the US longer, or born in the US, tend to compare their situations to a US standard (more often a negative comparison). Another area of strength involves cultural attitudes toward mental health disorders. Among Mexicans at least, views on causes of mental illness appear to be more external than internal, and this may predispose families to respond supportively to relatives with mental disorders. There appears to be a cultural norm to care for illness within the family, regardless of whether it is physical or mental. This may be reflected in underutilization of mental health services, at least for some illnesses and disorders. Availability of treatment providers who speak Spanish may be an additional factor in treatment access.

Racial/ethnic group disparities in physical health status

Next, we point out that group disparities are not restricted to educational attainment, rates of mental health disorders, or access to healthcare services, but exist for physical health as well. The relevance of group disparities in physical health to a discussion of intelligence rests on the proposition that there are indirect relationships between physical, mental, and cognitive status that operate through multiple mechanisms. As discussed above with regard to mental illness, seriously or chronically physically ill people may have less time and energy to invest in activities related to their own intellectual growth or that of their children. Further, some physical illnesses, or their treatments, have direct effects on cognitive functioning.

African Americans have substantially more physical health problems than individuals from other racial and ethnic groups. One of the more sensitive indicators of a population's health status is infant mortality, and the rate of infant mortality for African Americans is twice that for Whites. In most population studies, infant mortality tends to decrease with maternal education, yet the rate of infant mortality for even the most

educated African American women is higher than that for the least educated White women. As compared to Whites, African American adults present rates of diabetes more than three times higher, heart disease more than 40 percent higher, prostate cancer more than double, and HIV/AIDS more than seven times higher. HIV/AIDS is now one of the five top causes of death among African Americans.

The high rate of HIV/AIDS is of particular interest in our discussion of cognitive functioning because HIV infection can lead to various mental syndromes, from mild cognitive impairment to clinical dementia, as well as precipitate the onset of mood disorders or psychosis. Overall mental functioning can be gravely compromised in individuals who are HIV positive, by the combination of opportunistic infections, substance abuse, and the negative effects of treatment (McDaniel, Purcell, & Farber, 1997). The secondary, environmental effects of parents with HIV-related cognitive impairments on the cognitive development of their children are unknown, and this is becoming increasingly important with improved survival rates of the disease.

Another health risk in the African American population is sickle cell disease. Steen, Fineberg-Buchner, Hankins, Weiss, Prifitera, and Mulhern (2005) demonstrated that children with hemoglobin sickle cell, the most serious form of sickle cell disease, show evidence of substantial cognitive impairment even when there is no evidence of structural brain abnormality on magnetic resonance imaging. The effect, approximately 12 FSIQ points on WISC-III, was found as compared to a control group matched for age, race, and gender. Although no SES information was collected on the patient group, we also compared the patient sample to controls whose parents did not finish high school. The effect was reduced by about half, but still substantial. In both cases, the effect was evenly distributed across verbal and performance scores, and there was a significant effect for age such that the cognitive effects of the disease appear to worsen over time. Also of interest is the even larger differences observed between controls and the portion of the patient sample that showed abnormalities on magnetic resonance imaging. In interpreting these finding, one should keep in mind that children with active diseases tend to miss considerable numbers of days in school, and the impact of the reduced instruction on cognitive development may be important as a secondary cause of the low test scores observed. While the neurological mechanism responsible for the observed cognitive deficits in children with sickle cell disease is being debated (i.e., stroke, ''silent'' infarction, or disease-related diffuse brain injury), there is growing evidence for the effect of the disease on cognition. Although generally thought of as a genetic disorder specific to African or African American populations, sickle cell disease is actually associated with cultures that historically have lived in high malarial environments, and has been observed in White populations of Mediterranean descent in

the US. In addition, regions of Mexico such as the Yucatan peninsula are presently considered high malarial areas, and many hospitals in the US do not currently accept blood donations from individuals who have visited that region within the previous year. Based on the studies cited above, we suggest that psychologists consider inquiring about family history of sickle cell disease when evaluating African Americans with cognitive delays, or any person whose family descends from a high malarial area.

The infant mortality rate among Hispanics is less than half that among African Americans, and lower than the rate among Whites. Cuban and Puerto Rican Americans show the expected pattern of lower infant mortality rates with higher levels of maternal education, but the pattern is not so prominent among Mexican Americans or immigrants from Central America. Compared to Whites, Hispanics have higher rates of diabetes, tuberculosis, high blood pressure, and obesity. Health indicators for Puerto Rican Americans are worse than for Hispanics from other countries of origin.

Racial/ethnic group disparities in income

Group differences in income directly impact the socio-economic status of individuals and their spouses, and relate to IQ test scores of offspring through various social and psychological mechanisms that will be discussed throughout this chapter. Group differences in income is a particularly sensitive topic, because there is considerable evidence that African Americans and Hispanics experience discrimination in hiring – which, of course, contributes to lower incomes on average for them relative to Whites. Further, the income statistics neither distinguish newly arrived Hispanic immigrants from Americans of Hispanic decent, nor differentiate US-born African Americans from recent Black immigrants from Africa, Haiti, or Jamaica. As observed above, this latter issue is a problem that is endemic to most research on racial/ethnic group differences. Finally, higher-paying occupations often require higher levels of education, which may be less accessible to lower-income families unable to afford college tuition. Thus, there are large differences in income between racial/ethnic groups, which may be partially related to a legacy of unfair hiring, promotion, and pay practices in some industries and regions of the country, and partially related to differences in occupational opportunity as mediated by educational attainment and, in some cases, English language competencies. As noted above, educational attainment is substantially different across racial/ethnic groups, which is partly due to accessibility and availability of resources. With these caveats, the following information about income disparities is reviewed here from a 2001 report of the US Surgeon General.

In 1999, 22 percent of all African American families had incomes below the poverty line as compared to 10 percent of all US families. For children,

the gap is larger. Approximately 37 percent of African American children live in poverty, as compared to 20 percent of all US children. The gap is still larger for those living in severe poverty. Severe poverty is defined as family income more than 50 percent below the poverty line. The percentage of African American children living in severe poverty is more than three times larger than for White children.

On the other hand, household income rose 31 percent for African Americans between 1967 and 1997 – much faster than the 18 percent increase for Whites during the same time period. Further, nearly a quarter of African Americans now have annual family incomes greater than $50,000. Thus, the African American community may have become somewhat more diverse in terms of socio-economic status during the last generation. Still, the proportion of Whites with incomes above $50,000 is vastly higher, and most millionaires are White.

With respect to Hispanics, median family income and educational level varies substantially with country of origin. Median family incomes range from a high of $39,530 for Cubans to a low of $27,883 for Mexicans, with Puerto Ricans at $28,953. The percentage of Hispanics living below the poverty line ranges from 14 percent of Cubans to 31 percent of Puerto Ricans, with Mexican Americans at 27 percent. These discrepancies reflect real differences in the patterns of immigration from the various Spanish-speaking countries. For example, Mexicans with little education and few job skills tend to immigrate to the US in search of employment opportunities, whereas political and social issues have motivated many economically successful and more highly-educated Cubans to leave their country. Thus, the socio-economic level of Hispanics living in the US systematically varies with country of origin based on differing, historical patterns of immigration.

The proportion of Hispanic children living in poverty is higher than the national average. While 17.1 percent of all children live below the poverty level in the US, 30.4 percent of all Hispanic children living in the US are below the poverty level (US Bureau of the Census, 2003).

Implications of demographic differences in various areas of life

Some reviewers will undoubtedly critique our overview of racial/ethnic group disparities in various areas of life as too limited to do the topic justice, while other readers may wonder why we spent so much time on the topic, and how these issues are relevant to intellectual assessment. In many cases the magnitude of the gaps described above are shocking, and have serious political, legal, and economic implications for our country. Our intention in including this discussion in the current chapter is more modest. First, we wish to make the basic point that disparities between racial/ethnic groups have been observed in many important areas of life, and are not limited to IQ test scores. We do not imply cause and effect in

either direction, but simply note that racial/ethnic group discrepancies are not unique to IQ tests.

Second, and much more importantly for our purposes in this chapter, the differences described above suggest, for the most part, that people of different racial ethnic backgrounds have differing levels of opportunity for cognitive growth and development. The effects of these differences on the development of cognitive abilities are critical during childhood, but also continue well into middle adulthood, depending on level of education, income, mental and physical health, and the resources available in the communities in which people live.

Americans are fond of saying that all children are born with equal opportunity, and that any child can grow up to be President of the United States. The election of Barack Obama as the first African American US President demonstrates that this is true – although not for immigrant children. Still, while opportunity under the law may be equal, implementation of the law can sometimes vary by jurisdiction for racial/ethnic groups, as suggested by differential rates of incarceration. However, this is not the kind of opportunity we are talking about in this chapter. We are talking about opportunity in terms of the development of a person's cognitive abilities; the opportunity for a child's mind to grow and expand to its fullest potential through late adolescence and into early and middle adulthood. Further, we are talking about the kind of opportunity that allows people to maintain good cognitive functioning in late adulthood – barring any disease processes – by living intellectually stimulating lives through mentally active work, community service, and challenging hobbies. Our central tenant is that IQ is not an immutable trait, but a basic ability that can be influenced – to some reasonable extent – positively or negatively during the long course of cognitive development beginning in childhood and continuing through adolescence and into early or middle adulthood. Cognitive development can be influenced by the environment in multiple, interactive, and reciprocal ways. We know, for example, that parental education level correlates with children's IQ test scores. While this may be partly due to the inherited level of cognitive ability passed from parent to child, we also know that the level of education obtained by the parents is highly correlated with the parents' occupational status and household income. This in turn is related to the quality of schools and libraries available in the neighborhoods that are affordable to the parents, the role models present in those neighborhoods, the culturally defined expectations for educational attainment in that context, the expectations for the child's occupational future that surround him or her in the family and community, and the extent to which a young adult can pursue academic or other cognitively enriching activities free from concerns about economic survival or fears of personal safety that may interfere with vocational education and career development.

In many ways, education is only a proxy for a host of variables related to the quantity and quality of cognitively enriching activities available to a person, and that parents can provide for their children. Therefore, education is only a gross indicator replete with numerous exceptions. Certainly, there are many individuals with little formal education who are quite successful in business and society, and their success affords critical opportunities to their offspring that belie expectations based on their own education. Similarly, many readers of this chapter will likely know that even advanced academic credentials do not always equate with success in life. What is amazing is that, with all of its imperfections, one variable – education – relates so much to cognitive ability.

THE ROLE OF COGNITIVE STIMULATION IN INTELLECTUAL DEVELOPMENT

At this point in the discussion, we elaborate upon our central thesis: Enriching, cognitively stimulating environments enhance intellectual development and maintenance of cognitive abilities, whereas impoverishing environments inhibit that growth. Further, the factors that inhibit cognitive enrichment interact with each other such that the presence of one factor makes the occurrence of other inhibitory factors more probable. The net result is even worse than the sum of its parts – akin to geometric rather than arithmetic increases. Finally, the negative effects of cognitively impoverished environments accumulate over the course of a lifetime, and the impact further worsens with age. As we have pointed out previously, the IQ gap between African American and White children is substantially larger for teenagers than for pre-adolescent children, and this finding has been consistent across the 12 years that we have studied the phenomenon in WISC-III (Prifitera, Weiss, & Saklofske, 1998) and WISC-IV (Prifitera, Weiss, Saklofske, & Rolfhus, 2005). The terms "enrichment" and "impoverishment," as used here, are not considered synonymous with the financial status of rich and poor; these terms refer to cognitively enriching versus impoverishing environments – specifically, environments that encourage growth, exploration, learning, creativity, self-esteem, etc.

Ceci (1996) has proposed a bio-ecological model of intellectual development which involves (1) the existence of multiple cognitive abilities that develop independently of each other, (2) the interactive and synergistic effect of gene–environment developments, (3) the role of specific types of environmental resources (e.g., proximal behavioral processes and distal family resources) that influence how much of a genotype gets actualized in what type of environment, and (4) the role of motivation in determining how much a person's environmental resources aid in the actualization of his or her potential. According to this model, certain epochs in

development can be thought of as sensitive periods during which a unique disposition exists for a specific cognitive ability – called a "cognitive muscle" in Ceci's model – to crystallize in response to its interaction with the environment. Not all cognitive abilities are under maturational control, however, as new synaptic structures may be formed in response to learning that may vary widely among people at different developmental periods. Yet the sensitive period for many abilities appears to be neurologically determined such that the proper type of environmental stimulation must be present during the critical developmental period, and providing that same stimulation at another time may not have the same impact. In this model, the relative contributions of environment and genetic endowment to intellectual outcome change with developmental stage. For example, general intelligence at age 7 relates to key aspects of home environment at ages 1 and 2, but not at ages 3 or 4 (Rice, Fulker, Defries, & Plomin, 1988). This suggests that it may not be possible to fully compensate for an impoverished early environment by enhancing the child's later environment. Where we need more research is in the elucidation of the key paths and the critical developmental timing.

Interestingly, this model does not separate intelligence from achievement because schooling is assumed to elicit certain cognitive potentials that underlie both. Further, problem-solving as operationalized in most intelligence tests relies on some combination of past knowledge and novel insights. We would add that the act of academic learning enhances formation of new synaptic connections and neural networks, and therefore increases intellectual ability directly, in addition to the indirect effect of accumulated knowledge on problem-solving. Thus, schooling and the quality of education play a powerful role in intellectual development. This is part of the reason why achievement and crystallized knowledge exhibit substantial overlap with reasoning ability in psychometric studies of intelligence tests. Although theoretically distinct, these constructs are reciprocally interactive in real life.

Distal resources are background factors such as SES that affect cognitive development indirectly through the opportunities afforded or denied. Proximal processes are behaviors that directly impact cognitive development. Proximal processes occur within the context of distal resources, and interact to influence the extent to which cognitive potentials will be actualized. For maximum benefit, the process must be enduring and lead to progressively more complex forms of behavior. Parental monitoring is an example of an important proximal process. This refers to parents who keep track of their children, know if they are doing their homework, who they associate with after school, where they are when they are out with friends, and so forth. Parents who engage in this form of monitoring tend to have children who obtain higher grades in school (Bronfenbrenner & Ceci, 1994). In the bio-ecological model, proximal processes are referred to as the

engines that drive intellectual development, with higher levels of proximal processes associated with increasing levels of intellectual competence.

The distal environment includes the larger context in which the proximal, parent–child behaviors occur. Perhaps the most important distal resource is SES, because it relates to many other distal resources such as neighborhood safety, school quality, library access, as well as the education, knowledge and experience that the parent brings with him or her into the proximal processes. For example, helping the developing child with homework, an effective proximal process, requires that someone in the home possesses enough background knowledge about the content of the child's lessons, a distal environmental resource, to help the child when he or she studies.

Ceci argues that distal resources can place limits on the efficiency of proximal processes because the distal environment contains the resources that need to be imported into the proximal processes in order for them to work to full advantage, and because an adequate distal environment provides the stability necessary for the developing child to receive maximum benefit from the proximal processes over time. While an educated parent may be able to help a child with algebra homework, a valuable distal resource, a parent with little education can still provide a valuable proximal process of quiet space and a regular time for homework and ensure that the assigned work is completed. This monitoring and support can be very beneficial.

At the same time, it is unlikely that there is a universal environment whose presence facilitates performance for all children, or even for all children in the same culture. The likelihood of person by environment interactions suggests that there are different developmental pathways to achievement. School and home environments may be benevolent, malevolent, or null with respect to a variety of dimensions. Practitioners conducting clinical assessments with adults might include an evaluation of distal environmental resources within the family and community, and consider how these factors facilitate or inhibit their clients' expectations for themselves and their children.

HOME ENVIRONMENT INFLUENCES ON COGNITIVE DEVELOPMENT

We now touch on the role of home environment – not in terms of fixed demographic characteristics such as education or income, but in terms of specific in-home behaviors that facilitate or inhibit cognitive development of children regardless of educational level or demographic group. Some readers will wonder why we discuss child development at all in a book about adult intelligence. Our answer is simple: all adults were once

children. The childhood experiences of adults we test today account for substantial variance in their own level of cognitive functioning, which in turn has significant impact on the next generation. Further, there is considerable variability in home environment both within and between racial ethnic groups. Readers interested in a more complete discussion of this topic are referred to Weiss and colleagues (2006b).

Several studies correlated home environment and SES ratings with children's measured intelligence and/or academic achievement (Bradley, Caldwell, & Elardo, 1977; Trotman, 1977; Ramey, Farran, & Campbell, 1979; Bradley & Caldwell, 1981, 1982; Bradley *et al*., 1989; Johnson, Swank, Howie, Baldwin, Owen, & Luttman, 1993; Brooks-Gunn, Klebanov, & Duncan, 1996). Although SES was variably defined across studies, this collection of papers generally shows that for African American children the relationship between SES and IQ test scores was neither as strong as the relation between home environment and IQ test scores, nor as strong as the relationship between SES and IQ test scores among White children. This may reflect the likely truncated upper limit of SES within the African American groups. Some writers speculate that historical limitations in educational and employment opportunities unique to African American parents lead to more within-SES-group variability in parental behavior germane to children's intellectual development. In the studies cited above, home environment ratings typically added significant information to the prediction of IQ scores from SES for African American children, and this increment in variance explained was often larger than that for White children. What this means is that SES, however it is measured, may not be as powerful a predictor of IQ test scores for African American as compared to White children and adolescents. It also means that home environment factors may play a more powerful role in the prediction of IQ test scores for African American than for White children.

Several studies have examined the relation of home environment and cognitive ability in Mexican American children (Henderson & Merritt, 1968; Henderson, 1972; Henderson, Bergan, & Hurt, 1972; Johnson, Breckenridge, & McGowan, 1984; Valencia, Henderson, & Rankin, 1985; Bradley *et al*., 1989). In general, the results of these studies support the view that parents' in-home behavior is important to cognitive development and academic performance. Mexican American parents who demonstrate higher degrees of valuing language (e.g., reading to the child), valuing school-related behavior (e.g., reinforcing good work), and providing a supportive environment for school learning (e.g., helping the child recognize words or letters during the preschool stage) have children who tend to score higher on tests of basic concepts and early achievement (Henderson *et al*., 1972), and neither SES nor family size made a significant unique contribution to predicting cognitive ability scores beyond that accounted for by home environment (Valencia *et al*., 1985).

The association of home environment with academic achievement has also been studied. Higher levels of parent involvement in their children's educational experiences at home have been associated with children's higher achievement scores in reading and writing, as well as higher report card grades (Epstein, 1991; Griffith, 1996; Sui-Chu & Williams, 1996; Keith, Keith, Quirk, Sperduto, Santillo, & Killings, 1998). Studies have shown that parental beliefs and expectations about their children's learning are strongly related to children's beliefs about their own competencies, as well as their actual achievement (Galper, Wigfield, & Seefeldt, 1997). Improving the home learning environment has been shown to increase children's motivation and self-efficacy (Mantzicopoulos, 1997; Dickinson & DeTemple, 1998; Parker, Boak, Griffin, Ripple, & Peay, 1999).

Fantuzzo, McWayne, Perry, and Childs (2004) extended the above finding using a longitudinal study of very low SES African American children in an urban Head Start program. Specific in-home behaviors on the part of parents significantly predicted children's receptive vocabulary skills at the end of the school year, as well as motivation, attention/persistence, and lower levels of classroom behavior problems. Homes with high levels of parent involvement in their children's education were characterized by specific behaviors reflecting active promotion of a learning environment at home. These environmental behaviors included creating space for learning activities at home, providing learning opportunities for the child in the community, supervision and monitoring of class assignments and projects, daily conversations about school, and reading to young children at home.

One concern about this line of research is that it may be viewed as a deprivation model in which low-SES homes are considered deficient in certain characteristics that lead to high scores on IQ and achievement tests. Such homes may also be abundant in characteristics not necessarily valued by the researcher. Still, there is growing evidence that home environment is an important predictor of cognitive development both within and between cultures. There is a hopeful message in these findings in that as home environment changes on these key dimensions, IQ and achievement test scores will also increase. At the same time, however, these children exist in a world where institutional racism is still present to some degree, and limits opportunities for cognitive enrichment through access to high-quality schools or, as adults, through mentally challenging work, etc.

THE ROLE OF THE PERSON IN THE DEVELOPMENT AND MAINTENANCE OF COGNITIVE ABILITIES

Without detracting from the critical role that familial and societal forces play in the cognitive development of individuals, we believe that it is also

important to examine the role of individual differences in each person's approach to the environment. Assuming that proper cognitive stimulation is present at the right time, there are non-cognitive characteristics of each individual that mediate the actualization and maintenance of cognitive potential. The list of possible non-cognitive factors is long, and encompasses basic temperament and personality factors. Some people actively engage with the world around them, drawing inspiration and energy from others, and proactively seeking positive reinforcement from their environment. This approach to one's environment enhances cognitive abilities. Others turn inward for energy and insight, passively accommodate to the world around them, and seek only to avoid negative stimulation from the environment. This stance seeks to preserve current status, and if extreme, may inhibit cognitive potential. This *enhancing* versus *preserving* trait is one of the three basic dimensions of Millon's theory of normal personology (Weiss, 1997, 2002). People that seek out versus shut off stimulation will have different experiences even in the same environment, and their opportunities for sustaining cognitive growth into early and middle adulthood will likewise differ. Some people are receptive to new information, continuously revising and refining concepts based on an open exchange of information with the world around them. This curious, open, perceiving stance may facilitate cognitive growth. Others prefer to systematize new information into known categories as soon as possible, and reject or ignore additional information as soon as an acceptable classification can be made. While a strong organizational framework can be a positive influence on cognitive development, a closed, judging stance can inhibit intellectual growth through middle adulthood if extreme.

Also relevant to cognitive development, learning and the life-long expression of intelligent behavior are general conative (i.e., non-cognitive) characteristics such as focus, motivation, and volition. Focus involves directionality of goal. Volition involves intensity toward the goal, or will. Motivation can be proximal or distal. A proximal motivation would be a specific near-term goal. A distal motivation might be a desired state (e.g., to be respected by one's peers) or a core trait (e.g., need for achievement). The list of positive characteristics is long, but includes self-efficacy and self-concept. Self-efficacy is driven by positive self-concept in combination with learned skill sets. Self-efficacy is task-specific, whereas self-concept is general. People who have high self-efficacy with respect to intellectual tasks may have experienced initial successes with similar tasks. They also are likely to gain more from new intellectual activities then others of similar intelligence, especially if they are intellectually engaged in the task and highly motivated to master it. Intellectual engagement and mastery motivation are critical elements of cognitive growth, along with the ability to self-regulate one's actions toward a goal. Presence of these personal characteristics may enhance cognitive development and the likelihood of

success at a variety of life endeavors. However, different factors may be related to success versus failure at intellectual endeavors. After controlling for intellectual level, it may not be simply the absence of positive factors but the presence of specific negative personal factors that are associated with failure to thrive intellectually. Negative predictors may include severe procrastination, motivation to avoid failure, extreme perfectionism, excessive rumination, distractibility from goals, rigid categorical thinking (i.e., functional fixedness), cognitive interference due to social-emotional disorders, or diagnosed psychopathology. Lacking from the psychologist's tool kit is a practical and reliable way to measure these conative factors. Still, practitioners conducting psychological and neuropsychological evaluations may find it useful to broaden the scope of their assessment and inquire about these non-cognitive traits as potential moderators of cognitive development, prophylactics of normal age-related decline, or catalysts for cognitive rehabilitation.

PATTERNS OF IQ AND INDEX SCORE DIFFERENCES ACROSS RACIAL/ETHNIC GROUPS

With the above discussion on test bias, fairness, and demographic differences in various areas of life as background, we now present mean WAIS-IV IQ and index scores by racial/ethnic group in Table 4.3. Although we have taken care to elaborate the psychometric, environmental, and individual difference variables that must be considered when interpreting these data, we are nonetheless concerned that some will take this information out of context and interpret it either as evidence of genetically determined differences in intelligence among the races, or as proof of test bias. We are convinced that such interpretations would be scientifically unsound, divisive to society, and harmful to patients.

TABLE 4.3 Mean and standard deviation (SD) of WAIS-IV index and FSIQ scores for each racial/ethnic group ($n = 2200$)

	White ($n = 1540$)	African American ($n = 260$)	Hispanic ($n = 289$)	Asian ($n = 71$)	Other ($n = 40$)
VCI	102.92 (13.87)	91.15 (14.25)	91.41 (15.25)	103.77 (15.31)	100.63 (13.87)
PRI	102.87 (14.35)	88.33 (12.90)	94.1 (13.43)	104.34 (14.66)	98.15 (14.56)
WMI	102.68 (14.10)	92.12 (14.07)	91.76 (15.16)	104.41 (14.45)	99.65 (13.75)
PSI	101.86 (14.33)	91.89 (14.94)	95.75 (14.51)	107.59 (16.14)	98.03 (16.16)
FSIQ	103.21 (13.77)	88.67 (13.68)	91.63 (14.29)	106.07 (15.01)	98.93 (13.99)

As we have shown above, education levels vary substantially and systematically by racial/ethnic group. This fact has critical implications for the collection of standardization samples when developing intelligence, and neuropsychological tests. The first step in defining an appropriate standardization sample is to identify the variables that account for substantial variance in the construct of interest, and stratify the sample to represent the population on those variables. For intelligence tests, these variables have traditionally been socio-economic status, race/ethnicity, age, gender, and region of the country. These variables may act singly, or in complex interactions such that race/ethnicity may be masking other underlying causal variables. Most test authors select education level as the single indicator of socio-economic status (SES) because of its high correlation with direct indicators of SES, such as household income and occupation, and because it is more reliably reported than income. Given the truncated range of education in the non-White and Hispanic groups resulting from the differential drop-out rates and other factors reported above, however, education may work as a better indicator of indirect SES effects on test scores for Whites than for African Americans and Hispanics.

Current practice in test development is to fully cross all stratification variables with each other, and most major intelligence test publishers follow this practice. Thus, for example, the percentage of Hispanics or African Americans with college degrees in the standardization sample will be much less than that of college-educated Whites in the sample. While this sampling methodology accurately reflects each population as it exists in society, it exaggerates the difference between the mean IQ test scores of these groups because the SES levels of the various racial/ethnic subsamples are not equal in the test's standardization sample. If test publishers were to use the same national SES percentages for all racial/ethnic groups, the IQ score gap between groups would be smaller – although not eliminated for all groups, as we will demonstrate later in this chapter. At the same time, however, this alternate sampling procedure would obscure the magnitude of societal differences in the cognitive milieu of people from diverse cultural and linguistic groups.

As shown in Table 4.3, the highest mean FSIQ score was obtained by the Asian sample (106.1), followed by the White (103.2), Hispanic (91.6), and African American (88.7) samples. The largest difference is observed between the Asian and African American groups – more than a full standard deviation (17.4 points). The White/African American difference is 14.5 FSIQ points, and the Hispanic/White difference is 11.6 points. Recall that these data are based on samples matched to the US Census for education and region of the country within racial/ethnic group. Thus, these racial/ethnic samples reflect all the educational and social inequities that exist between these groups in the population, as elaborated above. Also noteworthy is that the "Other" group (consisting of Native American

Indians, Alaskan Natives and Pacific Islanders) obtained a mean WISC-IV FSIQ score of 98.9 – which is very near the population mean of 100.

As noted above, it is sometimes assumed that African Americans and Hispanics score lower than Whites because the test assesses middle-class White socio-cultural values not fully shared by culturally and linguistically diverse groups. It is noteworthy, therefore, that the Asian sample scores highest, because the Asian sample is very culturally and linguistically diverse as compared to Whites in the US, and is arguably the most culturally distant of the groups assessed in this chapter.

Several additional points are notable concerning differences in the profile of mean index scores within and across groups. While the White group presents mean scores across the four indexes that are all within 1 point of each other, the African American group shows VCI scores 2.8 points higher than PRI. This is important in terms of interpreting VCI/PRI discrepancies in a culturally sensitive manner. It is commonly assumed that the verbal subtests are the most biased for African Americans due to this group's distance from the dominant culture and use of African-American English, but the currently available data do not support this view. However, no studies to date have examined the linguistic diversity within the group classified as African American, which includes Black immigrants from multiple countries and cultures. While the African American group is traditionally considered monolingual, this assumption may not be valid. Researchers tend to limit discussion of African American linguistic diversity to dialects. Within the group classified as African American, however, there is the indigenous African American language (Gullah), as well as French, Spanish, Portuguese, many continental African languages (e.g., Amharic), and Caribbean languages (e.g., Haitian Creole). Because researchers traditionally have assumed that the African American group is monolingual, the influence of language on acculturation and cognitive or achievement test performance has not been adequately investigated.

For the African American group, the PSI score is 3.5 points higher than PRI. For the Hispanic group, the highest index score is the PSI. These observations are of particular interest, because it is sometimes assumed that Hispanics and African Americans score lower on IQ measures like the WAIS-IV because of the speeded nature of some of the tasks. The reasoning behind this is that speed and time are valued differently by culturally diverse groups, so on tasks requiring quick performance, African Americans and Hispanics are likely to score lower. These data suggest that common assumptions about the cultural effects of speed and timed performance among African American and Hispanic test-takers may not be supported by the currently available data.

It is also worth pointing out that the racial ethnic gaps in FSIQ scores are generally larger for adults than for children and adolescents. For

example, the mean FSIQ score for African Americans is 3 points higher on WISC-IV (91.7) than on WAIS-IV (88.7), while the White mean remained constant across the tests (approximately 103). Thus, the 14.5 point African American/White gap found for adults is 11.5 points for children and adolescents. For Hispanics, this comparison revealed similar but smaller trends.

Furthermore, the racial ethnic gaps are even smaller for children than adolescents. Using matched samples, we previously showed that the African American/White gap in WISC-IV FSIQ is 11.8 points for adolescents and 6 points for children. Similarly, we showed that the Hispanic/White gap was 8 points for adolescents and 1.3 points for children (Prifitera *et al.*, 2005).

Taken together, these findings raise the question of possible generational changes in societal conditions that improve opportunities for cognitive growth and development. Clearly, increases in mean IQ scores have been well documented over many generations – with younger generations obtaining higher scores – and while the reasons for these changes are unknown, they are typically attributed to societal improvements in health, nutrition, and education (Flynn, 1984, 1987; Flynn & Weiss, 2007).

Following this line of reasoning, we examined WAIS-IV mean scores in five birth cohorts for each racial ethnic group, and clear generational increases emerged for the African American and Hispanic groups as shown in Table 4.4. This pattern of scores across generations showed little change between birth cohorts 2 and 3 for Hispanics, and between cohorts 3 and 4 for African Americans. Also, cohort 5 showed a significant reversal among Hispanics. Still, the general trend toward increasing scores with younger subjects is striking. For those born between 1917 and 1942 the mean FSIQ score was 83.6 and 85.1 for the African American and Hispanic groups, respectively. For those born between 1988 and 1991 the mean FSIQ score was 92.2 and 92.9 for African American and Hispanic groups,

TABLE 4.4 WAIS-IV mean FSIQ scores for African Americans and Hispanics by birth cohort

	Birth cohort				
	1	**2**	**3**	**4**	**5**
	1917–1942 (ages 65–90)	**1943–1962 (ages 45–64)**	**1963–1977 (ages 30–44)**	**1978–1987 (ages 20–29)**	**1988–1991 (ages 16–19)**
AA	83.6 ($n = 57$)	86.3 ($n = 42$)	90.7 ($n = 53$)	90.4 ($n = 55$)	92.2 ($n = 53$)
Hispanic	85.1 ($n = 39$)	89.9 ($n = 42$)	89.6 ($n = 65$)	96.5 ($n = 79$)	92.9 ($n = 64$)

respectively. These FSIQ score increases are 8.6 and 7.8 points for the African American and Hispanic groups, respectively, which is more than half a standard deviation.

We considered that higher IQ scores for later birth cohorts may be related to the trend toward more years of education among the younger age groups. If this were the case we would anticipate the largest effects on the VCI, which is sometimes believed to be more related to crystallized knowledge as taught in schools than are the other index scores. We examined the trend for each index score, however, and found that the trend was present for all index scores, and VCI did not demonstrate the largest increase. To further test the hypothesis that FSIQ increases for younger cohorts are attributable to increased levels of education, analyses of covariance (ANCOVA) were computed separately for the African American and Hispanic samples treating FSIQ as the dependent variable, birth cohort as the independent variable (using the bands shown in Table 4.4), and years of education as a covariate. These analyses revealed that there are significant age effects for FSIQ after controlling for amount of education across birth cohorts for both the African American ($F = 2.94$, $p < 0.05$, $df = 3$, $\eta^2 = 0.0202$) and Hispanic ($F = 5.72$, $p < 0.05$, $df = 3$, $\eta^2 = 0.0377$) samples. At the same time these effect sizes are small, which indicates that while there are large differences between education groups, the variability in FSIQ scores within education groups is also large for both African Americans and Hispanics. It is also noteworthy that the effect sizes were very similar with and without controlling for education. This finding is consistent with research with other data sets that has also found relatively small attenuation of the cross-sectional age differences in cognitive functioning after adjusting for amount of education (Salthouse, 2010).

Of course, these analyses only control for the amount of education, and can yield no information about possible changes in the quality of educational experiences available to African American and Hispanic groups across generations. Still, the results suggest that the higher scores obtained by younger generations are not likely due to having more years of education.

The White mean varied by less than 1 point across age bands, as expected, because the test's score distribution is normed by age and the sample is in the majority White. Thus, the racial ethnic gaps are narrowing with each succeeding generation. Table 4.5 shows the mean FSIQ scores differences for the African American/White and Hispanic/White comparisons by birth cohort. These gaps clearly decrease for younger ages. While the WAIS-IV FSIQ mean difference for African American/White comparison is 14.5 points across all ages, it is 19.3 points for those over age 65, and 10 points for adolescents. Thus, the African American/White IQ score gap has decreased by 9.3 points between the oldest and youngest subjects. Similarly, while the Hispanic/White mean difference is

TABLE 4.5 WAIS-IV mean difference scores between racial/ethnic groups by birth cohort

	Birth cohort				
	1917–1942 (ages 65–90)	**1943–1962 (ages 45–64)**	**1963–1977 (ages 30–44)**	**1978–1987 (ages 20–29)**	**1988–1991 (ages 16–19)**
African American/White	19.3	17.2	13.1	13.4	10.0
Hispanic/White	17.9	13.62	14.2	7.3	9.3

Note: Ages shown are at time of standardization testing in 2007.

11.5 points in the total sample, it is 17.9 points for those over age 65, but 7.3 points for those in their twenties, and then reverses to 9.3 points for adolescents. Caution is warranted in interpretation, however, as these data are cross-sectional, not longitudinal, and so it is not known if the younger birth cohorts will maintain their somewhat higher IQ scores as they age. However, cohort-substitution studies have produced results that agree remarkably well with cross-sectional cognitive data (Kaufman, 2009: 276).

In the early part of the last century, Spearman (1927, cited in Vroon, 1980) hypothesized that group differences in IQ test scores could be explained by innate differences in "*g*" between the races, and this position continues to rear its controversial head 70 years later (Jensen, 1998; Murray, 2005). Some will likely follow this antiquated line of reasoning and argue that the AA FSIQ was increased in WAIS-IV by increasing the contribution of subtests with lower "*g*" loadings (e.g., Digit Span and Symbol Search) in the FSIQ, and they could be correct in so far as psychometric studies of "*g*" are concerned. However, we would point out that many of the subtests which are purported to be stronger measures of "*g*" are also those that are more readily influenced by environmental opportunity, such as Vocabulary. Further, the more "*g*"-saturated abstract and fluid reasoning tasks found in the perceptual scale have also been shown to be susceptible to the effects of changes in environment over time (Flynn, 1984, 1987; Neisser, 1998). Finally, the WM and PS subtests tap neurocognitive abilities, which may be less influenced by environment.

At this point in our discussion, it may be worth stating the obvious: studies showing between-group differences in IQ test scores say nothing about the source of those differences. As Sternberg, Grigorenko, and Kidd (2005) concluded, the statement that racial differences in IQ or academic achievement are of genetic origin is a "leap of imagination." We have repeatedly noted that race/ethnicity is likely to be a proxy variable for a set of active mechanisms that have only been partially identified. In fact, the reason why between-group differences appear to exist may be because the

variables that they are substituting for have not been fully identified. Thus, we are not in agreement with Spearman's hypothesis that differences in IQ scores across racial/ethnic groups reflect differences in genotypic ability. We seek to reframe the question in terms of differential opportunity for development of cognitive abilities. Alternatively, cognitively enriched environments may be a synonym for acculturative experiences. Thus, Spearman's hypothesis for IQ score differences across racial/ethnic groups could be reframed in terms of either differential opportunity for cognitive development, or differential acculturation experiences. In the next section, we report the results of a series of analyses designed to evaluate the extent to which differences in socio-economic status account for FSIQ differences between racial and ethnic groups.

SES MEDIATORS OF FSIQ DIFFERENCES BETWEEN CULTURALLY DIVERSE GROUPS

In this section, we explore how SES mediates the gap between racial and ethnic groups in intelligence test scores using the WAIS-IV standardization over-sample. This discussion is not about nature/nurture, or about race and IQ. It is about helping people understand why test scores may vary based on contextual factors, and using that information to help clients.

We applied a regression-based methodology recommended by Helms, Jernigan, and Mascher (2005) to examine how much of the variance in FSIQ test scores attributed to racial/ethnic group is reduced when relevant mediator variables are introduced. Table 4.6 shows these analyses for the African American/White and Hispanic/White comparisons for ages 20–90. In Model 1 of the African American/White analysis, we regress FSIQ on race. As shown in the table, race accounts for 14.98 percent of the variance in FSIQ score, and the mean African American/White difference is 14.88 points. (Note: The results in these analyses may differ slightly from the mean FSIQ difference reported above based on use of the standardization over-sample, which is slightly larger then the standardization sample.) In Model 2, we regress FSIQ on education. As shown in the table, education alone accounts for almost twice as much variance (29 percent) in FSIQ as does race alone. In Model 3, we introduce occupation, income, region, and gender to the education model. Occupation is self reported in 17 categories, ranging from unemployed not seeking work to executive. Subjects were asked to indicate their current and highest job categories, and the latter was used. For income, we used the median income of the subject's zip code. Region of residence indicates the four regions of the country (Northeast, Midwest, South, and West) used to stratify the standardization sample. Model 3 accounts for 35.1 percent of the variance, which is 6.1 percent more than the education alone model. Finally, in

TABLE 4.6 Ages 20–90: Hierarchical regression analyses of mediators of mean racial and ethnic differences in WAIS-IV FSIQ scores

Analyses of African American (n = 297) and White (n = 1219) samples ages 20–90					
		R^2	R^2 DIFF	% of African American/White effect mediated	Mean African American/White difference after mediation
Model 1	Race	0.1498			14.88
Model 2	Education	0.2902			
Model 3	Education, occupation, income, region, gender	0.3514	0.0612		
Model 4	Education, occupation, income, region, gender, race	0.4437	0.0923	38.4%	11.23
Analyses of Hispanic (n = 344) and White (n = 1219) samples ages 20–90					
		R^2	R^2 DIFF	% of Hispanic/White effect mediated	Mean Hispanic/White difference after mediation
Model 1	Ethnicity	0.1112			11.95
Model 2	Education	0.3113			
Model 3	Education, occupation, income, region, gender	0.3713	0.0600		
Model 4	Education, occupation, income, region, gender, ethnicity	0.4090	0.0377	66.1%	6.56

Note: Mediators are the adult's level of education in 5 bands, occupation in 17 bands, income as estimated by zip code, 4 regions of the country, gender, and racial/ethnic group.

Model 4, we add race to all previously entered variables. Model 4 shows that the amount of variance in FSIQ scores remaining for race to explain was 9.23 percent after controlling for education, occupation, income, region, and gender. Combined, these variables mediated 38.4 percent of the African American/White effect. Controlling for these variables reduced the mean difference score to 11.23 points.

In Model 1 of the Hispanic/White analysis, we regress FSIQ on ethnicity. As shown in the table, ethnicity accounts for 11.12 percent of the variance in FSIQ scores, and the mean Hispanic/White difference is 11.95 points. (Note: The results in these analyses may differ slightly from the mean FSIQ difference reported above based on use of the standardization over-sample, which is slightly larger then the standardization sample.) In Model 2, we regress FSIQ on education. As shown in the table, education alone accounts for almost three times as much variance (31.13 percent) in FSIQ as does ethnicity alone. In Model 3, we again introduce occupation, income, region, and gender to the education model. Model 3 accounts for 37.13 percent of the variance, which is 6.0 percent more than the education alone model. Finally, in Model 4, we add ethnicity to all previously entered variables. Model 4 shows that the amount of variance in FSIQ scores remaining for ethnicity to explain was 3.77 percent after controlling for education, occupation, income, region, and gender. Combined, these variables mediated 66.1 percent of the Hispanic/White effect. Controlling for these variables reduced the mean difference score to 6.56 points.

Table 4.7 shows the same analyses for ages 16–19. In Model 1 of the African American/White analysis, we regress FSIQ on race. As shown in the table, race accounts for 5.37 percent of the variance in FSIQ score, and the mean African American/White difference is 7.89 points. (Note: The results in these analyses may differ slightly from the mean FSIQ difference reported above based on use of the standardization over-sample, which is slightly larger then the standardization sample.) In Model 2, we regress FSIQ on parent education. As shown in the table, parent education alone accounts for three times as much variance (15.26 percent) in FSIQ as does race alone. In Model 3, we introduce parent occupation, parent income, region, and the subject's gender to the parent education model. Model 3 accounts for 22.49 percent of the variance, which is 7.23 percent more than the parent education alone model. Finally, in Model 4, we add race to all previously entered variables. Model 4 shows that the amount of variance in FSIQ scores remaining for race to explain was 1.46 percent after controlling for parental education, occupation, income, region, and subject gender. Combined, these variables mediated 72.8 percent of the African American/White effect for adolescents. Controlling for these variables reduced the mean difference score to 3.87 points.

In Model 1 of the Hispanic/White analysis for ages 16–19, we regress FSIQ on ethnicity. As shown in the table, ethnicity accounts for

TABLE 4.7 Ages 16–19: Hierarchical regression analyses of parental mediators of mean racial/ethnic differences in WAIS-IV FSIQ

Analyses of African American (n = 25) and White (n = 106) samples ages 16–19					
		R^2	R^2 DIFF	% of African American/White effect mediated	Mean African American/White difference after mediation
Model 1	Race	0.0537			7.89
Model 2	Education	0.1526			
Model 3	Education, occupation, income, region, gender	0.2249	0.0723		
Model 4	Education, occupation, income, region, gender, race	0.2395	0.0146	72.8%	3.87
Analyses of Hispanic (n = 24) and White (n = 106) samples ages 16–19					
		R^2	R^2 DIFF	% of Hispanic/ White effect mediated	Mean Hispanic/White difference after mediation
Model 1	Ethnicity	0.1201			11.96
Model 2	Education	0.2532			
Model 3	Education, occupation, income, region, gender	0.2931	0.0399		
Model 4	Education, occupation, income, region, gender, ethnicity	0.3119	0.0188	84.3%	3.95

12.01 percent of the variance in FSIQ scores, and the mean Hispanic/White difference is 11.96 points. (Note: The results in these analyses may differ slightly from the mean FSIQ difference reported above based on use of the standardization over-sample, which is slightly larger then the standardization sample.) In Model 2, we regress FSIQ on parent education. As shown in the table, parent education alone accounts for slightly more than twice as much variance (25.32 percent) in FSIQ as does ethnicity alone. In Model 3, we again introduce parental occupation, parent income, region, and the subject's gender to the parent education model. Model 3 accounts for 29.31 percent of the variance, which is 3.9 percent more than the parent education alone model. Finally, in Model 4, we add ethnicity to all previously entered variables. Model 4 shows that the amount of variance in FSIQ scores remaining for ethnicity to explain was 1.88 percent after controlling for parent education, occupation, income, region, and subject gender. Combined, these variables mediated 84.3 percent of the Hispanic/White effect for adolescents. Controlling for these variables reduced the mean difference score to 3.95 points.

Several key themes are obvious from careful inspection of these results. First, education accounts for far greater variance in IQ test scores than racial ethnic status – twice as much or more. Second, education explains more variance in IQ scores for adults than adolescents. In part, this may be because parental rather than self education is used with adolescents, so the effect is indirect. Third, parent education explains considerably less variance in IQ for African American than Hispanic adolescents. Fourth, after controlling for all SES mediators available in this data set, the amount of variance remaining for racial ethnic status is higher for adults than adolescents, and clearly highest for African American adults. Further, the percent of the IQ gap mediated in the full models is lower for adults than adolescents, and lowest for African American adults. Taken together, these observations suggest that the mediators used in this study are less strongly related to cognitive ability for African American adults as compared to either African American adolescents or Hispanics of any age.

Theoretically, if SES fully explains differential opportunities in cognitive development, then controlling for SES should eliminate IQ test score differences between groups. Why do most studies show score differences between the African American and White groups after controlling for key SES variables such as education, income, region, etc.? Part of the answer is that these variables exert their effects indirectly, and are therefore called *distal* rather than *proximal*. Indirect effects are typically less precise than direct effects. Another part of the answer is that unmeasured inequities in societal forces – as described above – may dampen the positive effects of increased education on growth opportunities for African Americans. For example, the quality of education available to culturally diverse groups has not historically been equal. Degrees from high schools in different

regions may not have the same value, depending in part on the amount of educational funding in the local district. Historical inequities in employment practices may have limited the earning opportunities for otherwise well-educated African Americans, which in turn may restrict the neighborhoods that are affordable to them, and thus the quality of schools available to their children. And historical inequities in banking and housing practices have likely contributed to the overall problem. These and other social inequities may have been more powerful factors for older generations of African Americans and Hispanics, but are still present to some degree in younger generations.

The indirect nature of the distal variables, as discussed above, means that the relationship is not perfect. These are "proxy" variables – that is, they serve as convenient indicators of other variables that are difficult to measure directly. The level of education attained is a powerful demographic variable influencing cognitive ability scores. Although not perfectly correlated with the financial situation of the family, this variable serves as a reasonable proxy for overall socio-economic status. Education is in turn related to a host of important variables, including the employment opportunities, income level, housing, neighborhood, access to prenatal and postnatal care for offspring, adequacy of nutrition during infancy and early development, and quality of educational experience available to the next generation. Much of this may have to do with enriched early stimulation and opportunity to learn and grow in a safe and secure environment. Researchers assume that people with more education have better access to good jobs, pediatric care, quality schools, and safe neighborhoods – but this is not always the case. Because of the historical inequities noted above, education, income, and other SES-related variables may operate differently in different groups. The typically strong associations between intelligence, education, employment, and income may have been muted by historical patterns of discrimination that continue to some degree today, but were clearly stronger among the older birth cohorts. To date, no matched studies have been accomplished that directly control for all medical, societal, legal, environmental, financial, and educational factors known to account for variance in cognitive development.

Similarly, medical researchers have found that controlling for SES eliminates race disparities in health outcomes for some, but not all, medical disorders, and that psychosocial factors have been found to mitigate the relationship between SES and health outcomes. Such factors have been shown to include perceptions of unfair treatment (race, gender), cynical hostility, anger expression, coping style, and locus of control (Whitfield, Weidner, Clark, & Anderson, 2002).

More generally, results gleaned from research studies (such as those reviewed in this chapter) provide invaluable information that informs psychologists, sociologists, political scientists, and others about group

characteristics. However, psychology is unique in its commitment to understanding an individual's differences. Although research studies may provide helpful insights as to qualities that enhance or attenuate cognitive development and maintenance for groups, psychologists must not assume that the group data characterize every individual being assessed. When we uncritically apply group-level research findings in our clinical practices, we may inadvertently stereotype the very individuals who were referred to us for help.

It is for all of these reasons that we wish to leave behind the study of racial/ethnic differences in cognitive ability test scores and turn the reader's attention to proximal mediators of the development, expression, and maintenance of cognitive abilities for all people. Our direction is influenced by Helms and colleagues (2005), who called upon the field to cease the use of race as an independent variable in psychological research. This direction is also consistent with recent advances in the study of the humane genome that have led writers from diverse academic disciplines to argue that race is a socially constructed and biologically meaningless concept (Cavalli-Sforza, 2001; Schwartz, 2001; Marks, 2002), while others suggest that the division lines between racial/ethnic groups are highly fluid and that most genetic variation exists within genetic groups, not between them (Foster & Sharp, 2002: 848). Further, despite the lightning pace of recent advances in genetics, attempts to establish genes for intelligence have so far found only weak effects, been inconclusive, or failed to replicate (Plomin *et al.*, 1995; Chorney *et al.*, 1998; Hill *et al.*, 1999; Hill, Chorney, & Plomin, 2002).

At some point in the future psychological researchers will most certainly cease using racial/ethnic status groupings, because of the increasing fluidity of racial and ethnic boundaries as well as the wide variability of culture and language within racial and ethnic groups. Future researchers may wish to study how socially constructed concepts of culture other than race mediate development of particular cognitive abilities.

At this point, we leave behind the study of racial/ethnic differences in intelligence, as others are already doing. We now turn the proverbial corner and begin a preliminary discussion of personal and developmental variables that influence cognitive skill acquisition and maintenance of cognitive abilities for adults within and across cultural groups – that is, regardless of one's race or ethnicity.

ARE THERE INDIVIDUAL MEDIATORS OF INTELLIGENCE THAT ARE UNIVERSAL?

Several supplemental survey questions were asked of all subjects who participated in the standardization of the WAIS-IV. From this group of

questions we selected a subset that were found useful in the preparation of formulas for the purpose of estimating premorbid IQ and index scores of patients who had been tested following a brain injury or the onset of a brain disorder which had presumably reduced their scores from some pre-injury level (see *Advanced Clinical Solutions*; Wechsler, 2009). The first set of items is shown in Table 4.8, and has been tentatively labeled personal factors. One of the questions asks for the individual's subjective impression of the SES level of the neighborhood in which he or she lives. Subjective experiences of SES are important when they are different from objective ratings such as neighborhood income. For example, as noted earlier, some immigrants compare themselves to the status of relatives in their country of origin, and may not feel poor even though they would be considered poor by US standards. On the other side of the SES continuum, although the first author of this chapter lives in an upper middle-class professional neighborhood, he sometimes feels stress because all three of his first cousins are highly successful stockbrokers who live in mansions! The point is that stress induced by perceived SES disparities is quite real to the individual, and can be a driver of risk behaviors for physical and mental health. Further, such stress also can be a driver of behaviors associated with intellectual stimulation and growth, or environmental stagnation and cognitive decline. Partly for this reason, a second question from the

TABLE 4.8 Personal Items

1. The neighborhood I currently live in is
   a. Wealthy
   b. Well-off
   c. Average
   d. Somewhat poor
   e. Poor
2. When I change jobs, it is a step up for me
   a. Strongly agree
   b. Agree
   c. Neither agree nor disagree
   d. Disagree
   e. Strongly disagree
3. How many times per month do you participate in social gatherings or activities?
4. How many times per month do you participate in aerobic activities (e.g., jogging, walking, running, stair climbing)?
5. How many times per month do you participate in weightlifting?
6. How many hours sleep did you have last night?
   a. Open response

Note: For items 3–5, the response options were as follows: Never, 1–2 times per month, 3–4 times per month, 5+ times per month. Item 6 utilized an open ended response format.

supplemental survey asks whether job changes are typically steps upward. Further questions ask about the number of times per month the person participates in social activities, aerobics, or weightlifting. Finally, one question asks how much sleep the person had the night before testing. These questions assume that staying social active and physically healthy are related to maintenance of cognitive abilities.

Another set of items recorded the educational level of the subject's mother and father, and then asked for the subject's subjective rating of the quality of the elementary school he or she attended on a five=point scale ranging from superior to poor. These three items are tentatively called developmental background factors. They are used only in the analyses of adults ages 20–90. This is because parent education is already accounted for in our prediction models for adolescents.

Table 4.9 shows a series of prediction models designed to examine the impact of these personal and developmental factors on FSIQ for adults ages 20–90. Model 1 shows that the adult's education level accounts for 28.7 percent of the variance in FSIQ. As expected, education accounts for a large amount of variance in intelligence. Model 2 shows that developmental factors account for 22.9 percent of the variance in FSIQ. Model 3 shows that personal factors account for 9.5 percent of the variance. Model 4 shows that developmental and personal factors together account for 25.6 percent of the variance. This means that personal factors account for 2.6 percent incremental variance after controlling for developmental factors. Model 5 shows that the combined contributions of education, occupation, income, region, and gender account for 35.6 percent of the variance. In Model 6, we enter developmental and personal factors first and then add education, occupation, income, region, and gender. This full model explains 40.4 percent of the variance in FSIQ scores of adults ages 20–90. Model 6 also shows that the combined contribution of education, occupation, income, region, and gender reduces from 35.6 percent to

TABLE 4.9 Ages 20–90: Hierarchical regression analyses of personal and developmental factors as mediators of WAIS-IV FSIQ

		R^2	R^2 DIFF
Model 1	EDL	0.2871	
Model 2	Developmental factor	0.2296	
Model 3	Personal factor	0.0950	
Model 4	Developmental + Personal	0.2558	
Model 5	EDL + Occupation + Income + Region + Sex	0.3564	
Model 6	Developmental + Personal + EDL + Occupation + Income + Region + Sex	0.4042	0.1484 (compared to Model 4)

14.8 percent after controlling for developmental and personal factors. We elected to enter developmental and personal factors first in the full model, because these variables precede most of the others in time and may be drivers of future educational attainment, occupation, and income for adults.

In Table 4.10, we examine these same issues for adolescents ages 16–19, except we eliminate the developmental factor, as this is substantially the same as the parent education variable which is already in the model. In this age group, parent education alone accounts for 16.1 percent variance in Model 1. Personal factors alone account for 19.8 percent of the variance in Model 2. Personal factors and parent education combine to explain 26.6 percent of the variance in Model 3, which also demonstrates that the effect of parent education decreases from 16.1 percent alone to 6.7 percent after controlling for personal factors. Parent education, occupation, income, region, and gender of subject combine to account for 20.1 percent variance in Model 4. This means that parent occupation, income, region, and subject gender combined account for approximately 4 percent incremental variance after controlling for parent education. In Model 5, personal factors are added to Model 4 and entered last. This full model explains 28.8 percent of the variance in WAIS-IV FSIQ scores for adolescents between the ages of 16 and 19. Model 5 also shows that the effect of personal factors decreases from 19.8 percent alone to 8.7 percent after controlling for parent education, occupation, income, region, and subject gender. We elected to enter personal factors last in the full model for adolescents because we suspect that these variables generally exert their effect within the context of the family-related variables (e.g., parent education, occupation and income).

Several interpretations can be stated based on these analyses. For adolescents, personal factors account for more variance (approximately 20 percent) in WAIS-IV FSIQ than does parent education (approximately

TABLE 4.10 Ages 16–19: Hierarchical regression analyses of personal and developmental factors as mediators of WAIS-IV FSIQ

		R^2	R^2 DIFF
Model 1	EDL	0.1614	
Model 2	Personal factors	0.1986	
Model 3	Personal factors + EDL	0.2657	
Model 4	EDL + Occupation + Income + Region + Sex	0.2013	
Model 5	EDL + Occupation + Income + Region + Sex + Personal factors	0.2885	0.0872 (compared to Model 4)

Note: EDL is parent education for ages 16–19, and self education for ages 20–90.

16 percent). The effect of parent education reduces by more than half after controlling for personal factors. Further, the explanatory power of the personal factor remains substantial (approximately 9 percent) even after controlling for parent education, occupation, income, region, and subject gender.

Personal factors accounted for more variance among adolescents than adults. For adults ages 20–90, the developmental factor (including mother and father's education and perceived elementary school quality) accounted for a surprisingly large amount of variance (approximately 23 percent), although not as much as self education (approximately 29 percent). All factors combined explained more variance for adults (approximately 40 percent) than adolescents (approximately 29 percent). One hypothesis for this finding is that the predictive power of IQ for major life outcomes may increase with age. Alternatively, these factors may mediate opportunities for cognitive stimulation, which has a cumulative effect on cognitive functioning over time.

This is the second study we are aware of which shows another variable to be more powerful than parent education in predicting the FSIQ score of children or adolescents. We previously showed that parental expectations for children's academic success accounted for substantially more variance than parent education and income combined in WISC-IV FSIQ of children and adolescents ages 6–16. We concluded that when it comes to cognitive development of children, what parents do in the home with their children is more important than what they are in the world outside the home (Weiss *et al.*, 2006b).

Implicit assumptions are often made about how more educated mothers interact with their children in different ways from mothers with less formal education. More educated mothers are assumed to provide increased language stimulation to infants and toddlers, read more often to preschool age children, assist elementary school children more with homework, and generally provide more intellectually stimulating activities throughout childhood and adolescence. This is a broadly sweeping assumption that deserves to be examined in more detail. It is quite possible that there is considerable variability in parenting practices within SES groups, and that this variability influences the cognitive development of children.

Research with the WPPSI-III suggests that three home environment variables play an important role in the development of verbal abilities among young children. These variables are the numbers of hours per week that the parents spend reading to the child, that the child spends on the computer, and the child spends watching television. Mean WPPSI-III Verbal IQ (VIQ) scores increased with number of hours spent reading and on the computer, and decreased with number of hours watching television. There is also a clear relationship between these variables and parent education. At the same time, however, there was substantial variability in

the frequency of these behaviors within levels of parent education. Thus, even among young children whose parents have similar levels of education, spending more time reading and using the computer, and less time watching television, is associated with higher verbal ability test scores (Sichi, 2003).

We would be the last to suggest that education is not important. To the contrary, our point is that individual differences in behavior and perceptions matter, too. Intelligence test scores are not isomorphic with parent education, self education, occupation, income, race, or ethnicity. Intelligence is not predetermined by these socio-demographic factors, although these factors seem to account for increasing variance with age.

In interpreting these results, it is also important to keep in mind the rather limited set of personal and developmental factors included. What is perhaps most intriguing is that meaningful effects can be demonstrated with such a small and incomplete survey of all the personal and developmental factors that research has shown to be related to intellectual growth and maintenance of intellectual abilities.

SUMMARY

We have endeavored in this chapter to make the case that contextual interpretation entails more than the historical regurgitation of racial and ethnic differences in performance on cognitive ability tests. These differences are neither due to item or test bias, nor are they unique with respect to many other important areas of life, such as educational attainment, mental and physical health, occupation and income. There is both an intersection and an overlap of factors that impact the development of intellectual abilities and processes, and one's capability to demonstrate those abilities, including both proximal and distal resources and social norms. We have offered a view that intelligence is malleable, within limits, by environmental factors that mediate opportunities for cognitive growth and maintenance of cognitive abilities, and that the effects of these mediators may be cumulative across the lifespan. We have presented evidence to suggest that racial ethnic differences in test scores may be decreasing with successive generations, and suggest that this may be because the cumulative effects of institutional racism were more pronounced on older generations, although it must be conceded that such factors are still present to some degree today. Further, racial/ethnic differences are likely to be proxies for a multitude of other variables that we are just beginning to identify and study. We have shown that personal factors account for significant variance in intelligence. We suggest that future researchers go beyond these easily collected proxy variables (i.e., race/ethnicity, and SES) and directly study the factors that are related to the development and

maintenance of cognitive abilities both within and across culturally and linguistically diverse groups.

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