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Are IQ Discrepancies Between SES Groups Primarily the Result of Verbal Scale Differences?

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ARE IQ DISCREPANCIES BETWEEN
SES GROUPS PRIMARILY THE RESULT OF
VERBAL SCALE DIFFERENCES?

BY

CAROL LEE MACNAUGHT

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
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Abstract

Historically, comparison groups of children from low socioeconomic status (SES) have done less well on intelligence tests than their more well-to-do counterparts. This study was undertaken to explore the contribution of verbal ability to general intelligence and to consider the possibility of developmental change in the relative contributions of the verbal and performance scales. The analyses used verbal, performance, and full scale scores of a subgroup of the standardization sample of the Wechsler Intelligence Scale for Children - Third Edition (WISC-III). The scores used were attained by children in three age groups (7, 11, and 15 years) with four levels of SES as determined by parental educational level. It was found that the age of the children and the interaction of age with parental education level were not significant factors. The factor of parental education level did reveal significant differences between the groups on all three measures.

Follow up analyses within the groups demonstrated no significant differences in the verbal, performance, and full scale scores of children whose parents had attained 12 to 15 years of education. For children whose parents either failed to complete high school, or those whose parents had completed college, there exists a significant difference between their verbal and performance scale scores and between their performance and full scale scores. The verbal and full scale scores of these groups do not evidence such a discrepancy. Those whose parents failed to complete high school attained verbal and full scale scores that were lower than their performance scale scores. The pattern is reversed for children of parents receiving 16 or more years of education.

Contrary to expectations, children grouped by parent education level were found to differ on all three scales. However, for the lowest and highest groups the verbal scale

was more closely associated with the full scale score. While IQ discrepancies between SES groups are not primarily the result of verbal scale differences, the verbal scale is a significant factor in the scores of the highest and lowest SES groups.

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I would like to dedicate this paper to my husband Ken. In many ways he has been the moving force behind my continuing education. His unfailing support and quiet belief in me is deeply appreciated. Ken encouraged me to finish what I started, and made it possible for me to do so when things seemed overwhelming. Thanks Babe.

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INTRODUCTION

Intelligence tests are used extensively in our society by researchers and practitioners. These high stakes measures play a role in many private and public domains (Neisser, Boodoo, Bouchard, Boykin, Brody, Ceci, Halpern, Loehlin, Perloff, Sternberg, & Urbina, 1996). Students' acceptances into college or eligibility for special education services may be in part determined by the scores achieved on cognitive measures (Barona, Santos de Barona, & Faykus, 1993; Esters, Ittenbach, & Han, 1997; Kaufman, Harrison, & Ittenbach, 1990; Kranzler, 1997). Public policy decisions such as funding for social programs frequently rely on such data to evaluate program effectiveness (Ramey & Ramey, 1998; Barnett & Boocock, 1998). These measures play an important role in ongoing research into the very nature of intelligence itself. The genetic contributions and biological substrates of intelligence are explored through correlations of processes such as cerebral glucose metabolism with intelligence tests scores (Jensen, 1998; Scarr, 1997; Williams & Ceci, 1997; Eysenck, 1998).

While these tests are important and useful in many arenas, many questions remain as to the developmental processes that impact test performance. It often appears that disadvantaged children experience difficulty with the verbal subtests of the Wechsler Intelligence Scale for Children - Third Edition (WISC-III). Their answers tend to lack elaboration, their vocabularies are not as well developed, and there is a reluctance to hazard guesses when uncertain. To the observer, this tentativeness does not seem as apparent when the task requires less verbal mediation, as is the case with many of the performance subtests.

Given these observations, one may expect children with lower socioeconomic status (SES) to attain lower scores on the verbal scale than on the performance scale. This leads to the question of whether the well established SES differences in intelligence tests scores are equally reflected in verbal and performance scale scores.

The possibility entertained by this paper is that the SES differences in intelligence test scores, as measured by the WISC-III, may primarily be attributed to SES differences in verbal ability. If that is the case, one could expect low SES children to display a greater similarity between the verbal scale score and the full scale score than between the performance scale score and the full scale score. Also of interest is whether SES differences in the scores on the verbal and performance scales vary as a function of children's ages.

Review of the Literature

The Construct of Intelligence

There is in psychology an ongoing debate as to the nature and origins of intelligence. The meaning and importance of intelligence test scores, along with their implications for educational and social policy, have brought this academic discussion to the forefront in western civilization. In 1994 the American Psychological Association (APA) set up a task force to write an authoritative report on intelligence. This report was published in the February 1996 issue of the American Psychologist. The committee characterized intelligence as the "ability to understand complex ideas, to adapt effectively to the environment, to learn from experience, to engage in various forms of reasoning, to overcome obstacles by taking thought" (Neisser et al., 1996, p. 77).

While the above definition may capture the essence of intelligence, it sheds scant light on the various approaches used to explore this construct. Sternberg (1990) points out that frequently the questions asked by scientists are driven by the model, or metaphor, from which they work. He suggests that the many approaches used to investigate intelligence lead to different answers because they are asking very different kinds of questions. What follows is a review of some approaches to the study of intelligence and the kinds of questions asked by these models.

Developmental Approaches. Developmental approaches to intelligence are not particularly concerned with the question of individual differences. The focus is on developmental regularities that are common to all humans. Piaget is perhaps the most well known of the researchers in this tradition. Trained in biological science, Piaget felt that cognition, like breathing, is an example of a biological process. He proposed that the function of intellect is adaptation to the environment, which is accomplished through the processes of assimilation and accommodation (Flavell, 1985).

Cognitive assimilation occurs when the child fits new information into already existing ways of thinking. Perception of the external object or event is altered to fit the internal cognitive structures. Accommodation happens when the child adjusts the internal representations in response to external objects or events. Piaget maintained that assimilation and accommodation were complementary processes that an organism would attempt to balance, or equilibrate. Ongoing interactions with the environment leads to disequilibrium and further accommodations (Lerner, 1986).

Drawing from observations of his own children, Piaget went on to hypothesize four stages of cognitive development. The first is the sensorimotor stage which extends

from birth to 2 years of age. The most important accomplishment of this period is the understanding of object permanence. The preoperational stage is next and that extends to between 6 and 7 years of age. Children develop representational abilities such as language and pretend play.

This stage is followed by the concrete operational stage, which lasts until approximately 12 years of age. In this period children acquire the ability to think about actions without actually experiencing them. For instance, the child becomes aware that changes in the shape of an object do not indicate a change in the mass of an object. The final stage is one of formal operation. It is in this stage that children exhibit hypothetical thinking (Lerner, 1986). They develop the ability to analyze problems and synthesize information. Piaget did not believe that the formal operational stage was universally attained.

The Russian psychologist Lev Vygotsky was extremely interested in the impact of socialization within a culture on cognitive development. Vygotsky maintained that intelligence is based in an internal reconstruction of an external operation. The child learns through imitation and internalization of events experienced with others. The convergence of speech and practical activity is the milestone in children's intellectual development that allows for complex analysis of things and events.

The development of verbal thought takes place at the intersection of two roads: Speech becomes intellectualized and intelligence becomes verbalized (after age 2). After mastering words, children discover new ways of manipulating and dealing with objects (Grigorenko & Kornilova, 1997, p. 415).

In the west Vygotsky is best known for his idea of the zone of proximal, or potential, development. This is described as the difference between independent problem

solving and what can be accomplished with assistance. It is in this area that the child's potential to exceed what can currently be accomplish is noted. Some children benefit greatly with a little help and others improve marginally, if at all (Sternberg, 1990).

Since developmental approaches seek to understand the process of cognitive growth, assessment hasn't been geared toward individual differences. Assessments tend to probe concept mastery or theoretical challenges. While it may be possible to compare the amount of guidance required by different children to solve particular classes of problems, the standardization of such techniques would be difficult. This would lead to questions about the reliability of such assessments.

Biological Approaches. One of the older traditions in the assessment of intelligence comes from the work of Sir Francis Galton (1822-1911). Jensen (1998) credits Galton with founding differential psychology, which attempts to classify and measure differences between individuals and groups. Heavily influenced by the work of his cousin, Charles Darwin, Galton proposed that the key to early human survival lay in mental abilities related to sensory discrimination and speed of reaction to external stimuli. He attempted to measure these traits and relate them to various achievements. Due in part to the limited technological and mathematical sophistication of the era, Galton's work in this area was largely unsuccessful.

Modern advances in science and medicine have allowed scientists to explore in greater detail the anatomy and physiology of the brain and central nervous system. This has led some to reconsider the relationship of mental speed to reaction time. Hans Eysenck (1998) writes about biological intelligence. By this he means the anatomy and chemistry of the brain, which Eysenck believes to be determined by genetics. Speed of

processing is again considered a biological hallmark of intelligence, but the focus of the investigations has shifted to the basis of this speed. Consideration is given to brain size, organization, and electrochemistry.

Brain waves can be recorded with an electroencephalograph (EEG) by the positioning of electrodes on a scalp. The waves are monitored in terms of frequency and amplitude. EEG studies have indicated a positive correlation between both alpha frequency (Jensen, 1990) and brain wave complexity (Eysenck, 1998) and IQ. Brighter children are found to have more of both when in resting state.

Cerebral glucose metabolism has also been investigated by means of positron emission tomography (PET scan). Findings indicate that people with higher levels of intelligence metabolize less glucose when performing cognitive tasks. Another interesting finding is that as tasks become more familiar and automatized they become less demanding on glucose metabolism (Jensen, 1998).

From this brief review it can be seen that scientists working to understand intelligence from a biological perspective are looking at individual differences in a number of brain systems and relating these differences to psychometric measures of intelligence. The research is correlational and does not account for complex, simultaneous processes in multiple systems. At this time the studies are not longitudinal and do not take developmental trajectories into consideration. While brain wave complexity may be characteristic of greater intelligence, is it present at birth and stable over time?

Systems Approaches. Two approaches that attempt to consider both the internal and external worlds of individuals are Gardner's (1983) theory of multiple intelligences and Sternberg's (1990) triarchic theory. Howard Gardner defines intelligence as "... the ability

to solve problems, or create products, that are valued within one or more cultural settings ..." (p. x). Within his theory Gardner attempts to capture both the neurobiological basis of intelligence and the culture that allows its expression.

Gardner argues for the existence of seven, relatively autonomous, capabilities. The seven are: linguistic, musical, logical-mathematical, spatial, body kinesthetic, and personal. The personal intelligence includes knowledge of self (intrapersonal) and others (interpersonal). The theory of multiple intelligences draws heavily from observations of brain damaged and exceptional individuals, such as prodigies and idiot savants. In these populations high to superior ability in one area does not necessarily correspond with high to superior ability in all areas. Gardiner (1983) gives the example of Obadiah, an institutionalized child, who was able to add, subtract, multiply, and divide by the age of six.

Sternberg's (1990) triarchic theory has three subtheories that describe the nature of intelligent thought. The first subtheory deals with the internal mechanisms of intelligence. The individual uses metacomponents (high order executive processes) to plan, monitor, and evaluate performance. The performance components are the processes that execute the instructions of the metacomponents. The knowledge acquisition components are used to learn how to do a particular function.

The second subtheory addresses the role of experience in intelligent thought. The more experience an individual has with a class of problems, the more automated that person's responses will be. This, in turn, leaves more resources available to deal with other processing demands. Attempts to measure intelligence are most productive either

when the task or situation is relatively novel or measurement is made of the speed of automatization.

The third aspect of intelligent thought lies in the relationship of the individual to the external world. Sternberg proposes that individuals align themselves to their environments in several manners. They may attempt to adapt to the environment as it exists, or shape the environment to suit their needs. If neither adaptation nor shaping is effective alone or in combination, then the individual may choose to select a different environment (Sternberg, 1990).

Sternberg's theory discusses the components of intelligence and allows for cross-cultural flexibility. Like Gardner, he acknowledges that intelligence has a biological basis, but Sternberg's presentation has strong cognitive and ecological overtones. Both of these models attempt to elucidate a broader understanding of intelligent thought, but neither model is particularly concerned with a meaningful measurement of individual differences. Given the comprehensive nature of the systems orientation to intelligence, it is unlikely that such measurement techniques will be soon developed.

Psychometric Approaches. In 1904 Alfred Binet was asked to devise a test for the Paris school system. The goal of this instrument was to identify students who would not benefit from education. Binet regarded judgment, comprehension, and reason to be essential elements of intelligence. The instrument he developed in collaboration with Simon included verbal content in addition to sensory and perceptual tasks (Anastasi, 1988).

The success of that instrument led to numerous translations and adaptations. In 1916, Louis Terman brought the test to Stanford University for revision. It was the

Stanford-Binet (1916) that introduced the concept of intelligence quotient (IQ), a ratio of mental age to chronological age (Anastasi, 1988). Although this ratio approach was later discarded in favor of within-group norms, the term "IQ" has remained in use.

Psychometric approaches to intelligence differ from the previously mentioned theories in several important ways. Unlike the other approaches, theory developed subsequent to assessment. As the tests became more sophisticated researchers began to explore the underlying factors. Charles Spearman (1927) was the first to suggest a two-factor theory of intelligence. From the correlation matrices for various tests of mental abilities he noted that there was a general factor that was common to various tests of intelligence and specific factors that were unique to the activity at hand (Jensen, 1998).

Louis Thurstone (1938) used the technique of factor analysis in a slightly different manner and concluded that intellect is best described by seven primary mental abilities. These abilities are: verbal comprehension, verbal fluency, number, spatial visualization, reasoning, memory, and perceptual speed. Vernon, a contemporary of Spearman and Thurstone, proposed a hierarchical theory of intelligence. Vernon claimed that a general factor of intelligence is supported by the two factors of verbal-educational and kinesthetic-mechanical. These two factors were in turn supported by other layers of abilities (Gardner & Clark, 1992).

Jonathan Horn and Raymond Cattell (1966) took a slightly different approach. They maintained that there are two kinds of intelligence. The first type, fluid intelligence, is based in neurological differences and is uninfluenced by culture. The second type, crystallized intelligence, is greatly influenced by culture and educational opportunities. Fluid intelligence is thought to peak at around age 20 and decline gradually afterwards.

The loss is offset by the steady increase in crystallized intelligence throughout adulthood (Sternberg, 1990).

While some theorists examined the factors and debated the meanings and correlations, others began to explore the usefulness of intelligence testing as a method for predicting future outcomes. School performance is one area that intelligence tests predict reasonably well. The correlation of IQ scores to both grades and tests of achievement is about .50. Intelligence test scores also correlate about .55 with number of years spent in education (Neisser et al., 1996).

Success in school and more years of education are related to occupation status. The higher status jobs in western society typically require advanced degrees and specialized training. Acceptance to such programs is often a function of scores on high stakes achievement tests such as the GRE or LSAT (which correlate with IQ test scores).

While psychometric tests of intelligence offer a methodology for exploring individual differences and relating those differences to future outcomes, they do have some drawbacks. The behavior sampled is limited. Abilities such as musical, interpersonal, and body kinesthetic are not considered on these measures. IQ tests fall short of their moniker to the degree that intelligence can be characterized by behavior not captured in these time and modality limited measures.

Determinants of Intelligence

Heredity. The relative contribution of nature and nurture to human intelligence has been a hotly debated topic for many years. Much of the discussion has centered around adoption studies of monozygotic (MZ) and dizygotic (DZ) twins. The typical paradigm is to compare IQ test scores across varying levels of environmental and genetic relatedness.

IQ comparisons are made of MZ twins reared together or apart, DZ twins reared together or apart, biological siblings reared together or apart, and adopted siblings reared together.

Scarr (1997) reports that identical twins from the same household have IQ test correlations of approximately .86. Identical twins reared apart have a correlation of about .76. Fraternal twins have correlations in the neighborhood of .55 if reared together, or .35 if reared apart. Biological siblings are about .47 or .24, respectively. The IQ correlation of .02 for adopted siblings is considerably lower.

The data are used by Scarr to support the claim that intelligence is basically an inherited trait. Social class differences in opportunities are not seen as significant except in cases of abuse, neglect, or cultural difference. She states that "...in any one generation adults in different social class groups are not genetically equal, nor do children from different social class groups, on average, have equal intellectual potential" (Scarr, 1997, pp. 31-2).

This position receives support from Loehlin, Horn and Willerman (1997), whose work with the Texas Adoption Project, led them to conclude that adopted children have IQs that are more similar to their birth mother's than they are to their adopted parents'. Testing was done at two times that were separated by ten years. Results indicated that there was a marked decrease in the effect of family environment at the second testing, but the correlation with the birth mother remained stable. They concluded that familial resemblance in intelligence is the result of genetics, not environment.

Citing studies of IQ similarities found in MZ twins reared apart, Bouchard (1997) unequivocally states "...that genetic factors are the predominant source of variation in adult measured intelligence in modern Western societies" (p. 153). Bouchard believes that

children inherit different potential levels of intelligence from their parents. Environment may influence the extend to which the potential is developed but, given an average environment, its influence is not significant.

While the scientists working to establish the primacy of genetic factors for individual differences in intelligence have amassed considerable evidence from the studies of twins, this is but one type of research paradigm. Their arguments might carry more credence if these researchers were to produce evidence from divergent approaches to the problem or, better still, able to cite specific genes as carriers markers of intelligence. Intelligence is a complex phenomenon that involves many brain systems. It would seem that the underlying genetic code, and the influences on its development, are not well understood at this time.

Environment. Perhaps the strongest attack on the aforementioned behavior-genetic theory of intelligence comes from the camp of evolutionary biologists. Wahlsten and Gottlieb (1997) state: "Unfortunately, *the adoption method cannot separate the effects of heredity and environment* because of the long-term importance of shared prenatal environment" (p. 167). Environmental influences that affect genetic expression of intelligence are both maternal and external (Daniels, Devlin, & Roeder, 1997). For humans, the maternal environment is the prenatal developmental period. The external environment includes all the other physical and social influences that come into action after the child is born.

The maternal environment is the first environment of note. Babies are subjected to the activity levels and consumption habits of their mothers. In the prenatal period the sensory environment begins to shape the developing nervous system. This is especially

true for tactile and auditory senses. The basic structures of the brain are formed by the fourth month of gestation. Twins share this prenatal environment and its particular mix of events.

Wahlsten's (1997) discussion of the malleability of intelligence makes an important distinction between genotype and phenotype. He points out that genotype is a potential whose expression as a phenotype is often dependent on environmental influences. An often cited example of this phenomenon is the condition of phenylketonuria (PKU). This condition of severe mental retardation is caused by a single recessive gene that creates a metabolic problem. Young children with this condition who are fed a special diet that reduces the amount of phenylalanine in their system do not develop retardation (Plomin, 1997). Although the genotype for retardation is present, environmental influences prevent its expression as a phenotype. In a similar fashion, it is possible that environments may serve to constrain, or bolster, other genetic influences on intelligence.

Socioeconomic Status

The concept of socioeconomic status is tied to the organization of social classes in American society. As a democratic society we espouse the principle of equality, referring to equality before the law. Although social classes are not recognized by law, their existence is a given. Mayer (1955) states: "Social differentiation is a universal characteristic of human societies because it is essential for their maintenance and survival. Some division of functions, some mode of specializing and dividing labor, is necessary in all societies, human or animal" (p. 3).

Modern systems of stratification are based on economic, social, and political variables. The economic variable considers the amount and source of income. The

income is generally based on the occupation of an individual, the compensation over a period of time, and the amount of assets held by that individual (Mayer, 1955). A person with considerable assets may not be working, but could still have high economic status.

The social variable relates to the amount of personal prestige, or deference, granted to an individual (Mayer, 1955). People tend to associate with others like themselves. This leads to similarities in behavior and opinion that is characteristic of a social level. Different classes tend to display varying skills, attitudes, and customs. Their children are socialized into that particular mix of values and carry on their traditions. Although economic circumstances may allow individuals to shift classes, it is not until they acculturate that they are accepted as a member of that class. Often this process takes generations.

The third dimension is the power structure, or political variable. This refers to the extent that an individual or group can control the behavior or life chances of others. Mayer (1955) defines life chances as the "...chance to obtain certain values and opportunities which are of primary importance to life and survival" (p. 23). Things like access to quality health care and education are considered life chances. Economic position is closely related to power, with greater power to those with greater resources.

As an industrial society, American class structure is stratified in most part by occupational prestige and income. Early studies by sociologists attempted to study class identification in small towns where people were asked to make status judgments about other citizens. Two simpler methods of measuring SES were later developed. Hollingshead developed his measure (Hollingshead's Two Factor Index of Social Position) from a combination of occupation and education while Duncan developed scales

(Duncan's Socioeconomic Index) from weightings of education and income (Gilbert & Kahl, 1982).

Kerbo (1991) point out that the use of occupation as a determinant for class structure presents some difficulties. Classes rank occupations in differing fashions. There is more agreement on the upper and lower levels, but things are less clear in the middle. To that confusion is added the more recent technological advancements and career opportunities. As occupational status becomes a less reliable indicator, the use of educational level as a sorting device is more appealing.

Those who are in the positions of upper America train for them in college and professional school. It has become exceedingly difficult to achieve such jobs through experience alone. Thus many see the college degree as a sorting device of special importance... (Gilbert & Kahl, 1982, p. 81).

The lower classes lack education and opportunities for meaningful work. They often have menial jobs that are unstable, or no work at all.

Impact of Poverty on Intelligence

Both the maternal and external environments of poor children place them at risk developmentally. Substandard nutrition combined with little, or no, prenatal care are frequently cited correlates for the low birth weight and preterm deliveries of many poor women (McLoyd, 1998; Klerman, 1991). Prenatal exposure to substances such as alcohol, illegal drugs, and cigarette smoke have all been implicated in reduced scores on intelligence tests (Neisser et al., 1996; McLoyd, 1998). Low income families have a greater incidence of engaging in such unhealthful practices (Klerman, 1991).

The external environments of poor children also introduce some significant stressors for cognitive development. Elevated blood levels of lead have been associated

with cognitive deficits (Baghurst et al., 1992; Needleman et al., 1990) and poverty (McLoyd, 1998). The poor are less likely to utilize personal health services. This has important implications for the general health of their children, who are at greater risk for disease, accidents, and chronic illness (Huston, 1991).

Duncan, Yeung, Brooks-Gunn, and Smith (1998) found that achievement and ability outcomes are strongly related to family income, particularly in early childhood. They speculated that persistent poverty during early childhood places the child at a disadvantage in school readiness skills, setting the stage for academic difficulties. Studies of ethnic differences in scores on IQ tests have indicated that SES differences account for more than half of the discrepancy (Suzuki & Valencia, 1997; Brooks-Gunn, Klebanov, & Duncan, 1996).

Language Development

Language is "a systematic means of communicating ideas or feelings by the use of conventionalized signs, gestures, marks, or especially articulate vocal sound" (Webster's Seventh New Collegiate Dictionary, 1965, p. 474). Language ability, unlike speech, is not dependent on the ability to hear. American Sign Language (ASL) is an example of a language that is based on hand movements, or visual cueing. Although ASL cannot be heard, it contains the syntax and semantics that characterize language. It produces language independently of the mechanics of speech. The following discussion will center on the expressive and receptive aspects of language.

Human language is supported by its own neural underpinnings. The two most commonly cited are Wernicke's area and Broca's area. Wernicke's area has been implicated as critical to the semantic processing of language. It is located near the

junction of hearing, vision, and touch. Insult to Wernicke's area of the brain results in problems with both speech comprehension and production. People with Wernicke's aphasia are able to produce fluent but meaningless speech. (Carlson, 1991).

Broca's area is critical to the syntax, or grammar, of language. Its location on the frontal lobe has it appropriately placed with areas used for planning, sequencing, and logic. Insult to this area results in slow, laborious, and non-fluent speech. These people are unable to use grammatical information. They are able to produce the words that carry meaning, but they are unable to functionally connect the words. Noticeably absent are verbs. The function words such as verbs and modifiers are housed in Broca's area while the content words such as nouns come from Wernicke's area.

Both of these areas are vital to the normal development of language. In language learning there are some critical periods which seem to correspond with brain development. Bruer (1999) cites studies of ASL users as evidence for a critical period in grammar acquisition. Deaf children born of deaf parents acquire ASL as a native language. Their mastery of grammar is better than that of children who learn ASL when they are 4 to 6 years of age. Both groups considerably outperform individuals who learn after the age of 12.

Studies done by Helen Neville using evoked response potentials (ERP) to monitor the firing of neurons have found that English speaking adults all register a distinct pattern when engaged in grammatical processing. This pattern is not present in young children. It emerges somewhere around 11 years of age and becomes quite clear by age 16 (Bruer, 1999). From these studies it appears that the critical period for grammar acquisition closes around puberty with consolidation of function in Broca's area.

There does not appear to be a critical period for semantics, or vocabulary, acquisition. The only limiting factor is exposure to new words. The number and kinds of new words encountered varies from child to child and social group to social group. Anthropological studies have differentiated cultures in terms of high and low context. In a high context culture communication is focused around interpersonal interactions and shared realities. It tends to be concrete and often nonverbal.

Communication in low context cultures is mostly verbal, highly individualized, and explicit. It is used for prediction and planning, versus maintaining interactions (Westby & Rouse, 1994). This demand for verbalization places a premium on the acquisition of vocabulary. Children in high context cultures are more reliant on nonverbal communication and less likely to value expansive vocabularies. This is a continuum of both high and low contexts both across and within cultures. Much of school work (and IQ testing) is currently based in low context culture.

Impact of SES on Language Development

Living in poverty also has an impact on the language development of children. Hart and Risley (1995) compared the language use of high and low SES children. They found that the children used language functions the same way (querying, requesting, and describing), but differed considerably in the amount of conversation they participated in. The high SES children talked more, and with a richer vocabulary. A comparison of the vocabulary growth rates of the two groups indicated that the poor children had a much flatter growth curve. Future projections of the developmental trajectories indicated an increasing gap between the groups.

These findings led the researchers to do an in-depth study of 42 children from upper, middle, and low SES groups. These children were studied in their homes, once a month, for two and a half years. Hart and Risley (1995) found that the high SES parents spoke to their baby almost twice as frequently as the poorest parents. They also used more encouragement, and less discouragement than the low SES parents. Hart and Risley concluded:

The socioeconomic status of the children's families could account for 42% of the variance in the children's rate of vocabulary growth ($r=.65$), 40% of the variance in their vocabulary use ($r=.63$), and 29% of the variance in their IQ test scores ($r=.54$) when they were 3 years old. (pp. 158)

The aforementioned correlations were based on the full scale score of the Stanford-Binet Intelligence Scale.

Conversational goals are thought to differ among the classes. Middle class mothers are more likely to encourage conversational interaction with their children, while working class mothers used language to teach basic skills and direct behavior (Bernstein & Henderson, 1973; Henderson, 1973). Different conversational goals may to some extent explain why high SES mothers speak more frequently, and with a more advanced level of vocabulary and syntax, to their children (Hoff-Ginsberg, 1991).

In a study of environmental risk factors that correlate highly with SES, it was found that socioeconomic status accounted for 35% of the variance on verbal IQ scores, as measured by the verbal scale of the Wechsler Primary and Preschool Scales of Intelligence (Sameroff, Seifer, Barocas, Zax, & Greenspan, 1987). In this study the correlation of SES with verbal ability appears to be stronger than the correlation of SES

with overall intelligence. This suggests that the performance IQ score may not be as dependent upon SES.

Perceptual Development

Perceptual development is something of a catchall term for a number of sensory processes. Touch, smell, taste, hearing, vision, and the vestibular senses (balance and motion) all fall under this classification. Research in these areas face some obstacles. Most of the sensory systems are fairly well developed at birth but infants are not able to communicate their experiences. Animal studies have helped to understand potentially critical periods in the development of vision and hearing.

Visual development begins prenatally around the fourth week and remains a work in progress at birth. At birth, infants have poor acuity, little sensitivity to contrast, muted color apperception, and focus capability of 7 to 30 inches. They see better at the periphery and cannot discern three dimensions. Beginning at approximately 2 months the cerebral cortex assumes most of the visual tasks from the subcortical circuits. This brings about a period of rapid development. By the end of the first year a baby's vision is similar to that of an adult (Eliot, 1999).

Deprivation studies done with kittens and monkeys have indicated that normal vision input is all that is required to achieve normal vision. Normal conditions for vision are balanced and simultaneous activity along the visual pathways of both eyes (Bruer, 1999). Research at this time only speaks to the problems caused by deprivation, not to the possible advantages of increased stimulation.

Like the visual system, the auditory system is not totally developed at birth. Infants are insensitive to low levels of noise and high frequencies. With normal amounts

and types of sound input, hearing develops in predictable ways. Auditory development is refined over time. Some aspects are not refined until the onset of puberty. Unfortunately, there are a number of pre- and post-natal events that can impair hearing. Hearing deficits can lead to difficulties with both receptive and expressive language, impeding the normal language development process (Eliot, 1999).

Impact of SES on Perceptual Development

As noted earlier, the children of poverty are exposed to a greater number of prenatal and environmental risk factors. These factors may serve to depress both verbal and performance IQ scores, but the development of perceptual reasoning may be less influenced by parental interaction. Unlike language, perceptual learning develops from the interaction of the sensory modalities with the environment. It has been suggested that environmental learning is not taught (Koupernik, MacKeith, & Francis-Williams, 1975; Colombo, 1993; Eliot, 1987), but may be aided by exposure to games, toys, and objects for manipulation (Bloom, Davis, & Hess, 1965).

This suggests that exposure to enriched environments may hasten the development of perceptual learning. Children with better access to materials may be quicker to grasp the properties of objects, but eventually the other children will catch up as time and experience narrows the gap.

Wechsler Intelligence Scale for Children - Third Edition

The WISC-III is an individually administered measure of cognitive ability in the psychometric tradition. It is based on David Wechsler's belief in intelligence as a global capacity that may be measured through various means. The subtests are measuring different expressions of the same underlying ability, not different abilities. Wechsler was

aware that intelligent behavior is impacted by factors other than cognitive ability. Zachary (1990, p.279) cites Wechsler's words;

The point here is not that personality traits can be discovered in psychometric performance, or, what needs no special argument, that personality and abnormal conditions influence intelligence test findings, but that personality traits *enter into* the effectiveness of intelligent behavior, and, hence, into any global concept of intelligence itself (Wechsler, 1943).

In spite the of conviction that intelligence is a global capacity, the Wechsler scales are by nature hierarchical. The Wechsler scales have been subjected to factor analytic studies to determine the number and composition of underlying variables. The top level, or global ability, is reflected in the full scale score. This is supported by the verbal and performance scales. The verbal and performance scales represent two major underlying factors that are found to exist in every age level and across numerous clinical and non clinical samples (Wechsler, 1991).

The verbal scale is a measure of linguistic familiarity and fluidity. The questions and answers are orally given. The subtest names, Information, Similarities, Arithmetic, Vocabulary, Comprehension, and Digit Span, are suggestive of the kinds of material covered. In his Handbook of Psychological Assessment, Groth-Marnat (1990) present a table of interpretive rationales for high and low scores on the Wechsler Scales. He suggests that background factors for the verbal scale include: "natural endowment, richness of early environment, extent of schooling, cultural opportunities, and interests" (p. 450).

The performance scale of the WISC-III has less, although still some, verbal involvement. The tasks require quick, accurate visual assessment of the materials along with some motor skill. The subtests are Picture Completion, Coding, Picture

Arrangement, Block Design, Object Assembly, Symbol Search, and Mazes. Many of the subtest are timed, with bonus points awarded for fast, correct responses. From the background factors of "natural endowment, rate of motor activity, persistence, visual-motor organization, and alertness" (p. 451) suggested by Groth-Marnat (1990) it can be seen that social class mores may be less of an influence.

The WISC-III uses parental education level as a basis for determining SES. Parental educational attainment is highly related to social class and is a frequently used indicator of environmental quality. Rowe, Jacobson, and Van den Oord (1999) state that parental education "is associated with the availability of intellectual stimulation and financial resources within the family" (p.1153).

Kaufman (1993) reviewed the WISC-III for the Journal of School Psychology. He characterized the standardization as "immaculate" and approved of the switch to parental education for determining SES. Kaufman notes that the use of occupation can lead to problems both with categorization and with the range of dissimilar careers falling into the same grouping. For instance, file clerks and bank executives were both categorized as 2 in the former format.

Parent education level, while strongly related to occupation and income, may be the better predictor of environmental opportunities afforded to children. For instance, graduate students did not traditionally earn high levels of income. Their children, however, would most likely be exposed to enriched verbal environments. Eliot (1999) suggests that parental education has a stronger correlation with child IQ and academic performance than family income.

Research Question

A consistent finding is that children from low SES families do not score as well as children from high SES families on measures of intelligence and various measures of language capabilities. This study was undertaken to explore between-group differences on the WISC-III verbal, performance, and full scale scores. It is hypothesized that the language capabilities of the low SES children are less developed than their visual, perceptual abilities and this would be reflected in lower VIQ scores relative to PIQ scores for this group. A similar verbal-performance discrepancy was not expected to be characteristic of the other SES samples.

Also of interest is whether the differences between the groups become more pronounced over time. The Hart and Risley (1995) study of vocabulary growth rates found flatter growth curves for poorer children. This suggests that the difference between the scores of high and low SES children on the VIQ may become greater over time. In comparison, the PIQ should show less discrepancy among the older groups of children since developmental maturation should equalize possible initial differences favoring high SES children due to an enriched environment.

METHOD

Subjects

This study used data from individual subjects who were assessed as part of the standardization sample of the WISC-III. The original sample consists of 2,200 children ranging in age from 6 to 16. There are 100 males and 100 females in each of the 11 age groupings. The sample was also stratified on race/ethnicity, geographic region, and parental education. Data gathered in 1988 by the United States Bureau of the Census was used to establish representative proportions on the aforementioned variables. This was true not only for the individual variables, but also for the variables in combination, thus the sample maintained representative race/ethnic proportions within all of the other stratification categories (Wechsler, 1991).

Parental education was used as the measure of socioeconomic status. There are five levels of parental education; 8th grade or less, 9th through 11th grade, completion of high school, 1-3 years of college or technical school, and 4 or more years of college. If both parents lived with the child then the average of their years in school was used, if only one parent was at home then that parent's educational level was used.

The verbal, performance, and full scale scores of two hundred children in each of three age groups (7, 11, and 15 years) were used ($n = 600$). The study grouped children on four levels of parental educational; 11th grade or less ($n=104$), 12 years of education ($n=226$), 1 to 3 years of post secondary education ($n=157$), and 4 or more years of college ($n=113$).

Measure

The WISC-III is an individually administered battery of subtests that measures cognitive functioning. Scores from specific subtests are combined to produce Verbal and Performance Scales. A general measure of intelligence, the Full Scale IQ, is derived from the Verbal and Performance scores. The mean reliability estimates for the three scales of interest are .95 for the Verbal Scale, .91 for the Performance Scale, and .96 for the Full Scale. The mean stability coefficients are .94 for the Verbal Scale, .87 for the Performance Scale, and .94 for the Full Scale.

Procedure

Data for the standardization sample of the WISC-III is the property of the Psychological Corporation of San Antonio, Texas. The Psychological Corporation asks that a university approved research proposal be submitted along with a letter from a major professor endorsing the research.

The University of Rhode Island agreed that this research is exempt from Institutional Review Board audit. The data is archival and the identities of the subjects are unknown to the researcher. A copy of the approved proposal and a letter from Dr. Janet Kulberg was forwarded to the Psychological Corporation for review.

The Legal Affairs department of the Psychological Corporation requested additional information in terms of data description and another letter from the major professor assuring her direct supervision and data security. After reviewing these materials, the Psychological Corporation approved the project and sent a licensing agreement for signature. The agreement, which expires on October 31, 2000, allows the

use of the data solely for this dissertation. A copy of the dissertation, along with the data, must be sent to the Psychological Corporation.

RESULTS

The descriptive statistics reported in Table 1 are suggestive of differences between groups based on parental educational attainment. Seven year olds of parents that did not complete high school attained a mean full scale IQ (FSIQ) score of 87.97. Their mean verbal IQ (VIQ) was 88.17 and the performance IQ (PIQ) mean was 90.31. If the parents had completed high school the average FSIQ for seven year olds is 98.39, VIQ $\bar{M}$ = 98.25, and PIQ $\bar{M}$ = 99.13. Seven year olds whose parent had thirteen to fifteen years of education had FSIQ $\bar{M}$ = 103.48, VIQ $\bar{M}$ = 102.54, and PIQ $\bar{M}$ = 104.16. If the parental education was equal to, or exceeded, sixteen years than the average FSIQ for seven year olds rose to 109.53, VIQ $\bar{M}$ = 109.71, and PIQ $\bar{M}$ = 107.76.

Table 1

Means and Standard Deviations of WISC-III Full Scale, Verbal, and Performance IQ Scores of Children in Three Age Groups from Families with Four Levels of Parental Education

Parental Education	Age of Child	No.	FSIQ		VIQ		PIQ	
			Mean	SD	Mean	SD	Mean	SD
≤ 11 yr.	7	36	87.97	9.84	88.17	10.74	90.31	12.43
	11	33	89.76	11.42	88.58	12.54	93.06	11.81
	15	35	87.46	15.26	88.06	13.27	89.17	16.75
12 yr.	7	76	98.39	12.55	98.25	12.45	99.13	13.79
	11	76	97.72	13.05	98.61	13.55	97.36	13.33
	15	74	98.62	16.48	99.64	15.50	98.11	16.56
13 - 15 yr.	7	50	103.48	12.33	102.54	12.21	104.16	15.84
	11	55	102.91	11.05	102.40	10.52	103.04	13.46
	15	52	103.75	15.28	103.79	13.48	103.37	17.63
≥16 yr.	7	38	109.53	13.84	109.71	13.52	107.76	14.03
	11	36	112.42	12.38	113.61	12.97	109.06	12.71
	15	39	111.00	11.69	112.08	12.02	108.13	11.73

A similar trend was noted in the data for the eleven year olds. Children of high school dropouts attained a FSIQ $\underline{M}$ = 89.76, VIQ $\underline{M}$ = 88.58, and PIQ $\underline{M}$ = 93.06. If the parents received a high school education then the FSIQ $\underline{M}$ = 97.72, VIQ $\underline{M}$ = 98.61, and PIQ $\underline{M}$ = 97.36. Thirteen to fifteen years of parental education led to FSIQ $\underline{M}$ = 102.91, VIQ $\underline{M}$ = 102.40, and PIQ $\underline{M}$ = 103.04. Children of college graduates attained FSIQ $\underline{M}$ = 112.42, VIQ $\underline{M}$ = 113.61, and PIQ $\underline{M}$ = 107.76.

Fifteen year old children from families with less than a high school education achieved an average FSIQ $\underline{M}$ = 87.46, VIQ $\underline{M}$ = 88.06, and PIQ $\underline{M}$ = 89.17. Children of high school graduates attained FSIQ $\underline{M}$ = 98.62, VIQ $\underline{M}$ = 99.64, and PIQ $\underline{M}$ = 98.11. If the parents had thirteen to fifteen years of education then FSIQ $\underline{M}$ = 103.75, VIQ $\underline{M}$ = 103.79, and PIQ $\underline{M}$ = 103.37. College graduate parents had children with FSIQ $\underline{M}$ = 111.00, VIQ $\underline{M}$ = 112.08, and PIQ $\underline{M}$ = 108.13.

Full Scale IQ, Verbal IQ, and Performance IQ are measures taken on the same individual and are therefore correlated. Thus, in order to determine overall differences among the correlated scores by age and parent education level, a repeated measures factorial ANOVA was performed. The independent variables were the three levels of age (7, 11, and 15 years), the four levels of parental education (≤ 11 yr., 12 yr., 13-15 yr., and $16 \leq$ yr.), and the age by parent education level interaction. The correlated dependent measures, FSIQ, VIQ, and PIQ were treated in the model as repeated measures.

The results for the within subjects by between subjects interactions for parent education level were significant, Wilks' Lambda=.78, $p < .0001$. The result of the similar test for age were not statistically significant, Wilks' Lambda=.99, $p > .5$, as was the test for parent education level by age interaction, Wilks' Lambda=.99, $p > .5$. These results

indicated that there were significant differences between the three IQ scores for parent education level, but not for age. Therefore, in subsequent analyses, age was collapsed into a single category, and only differences in scores by parent education level were investigated. Table 2 presents the means and standard deviations for the collapsed data set with four levels of parental education.

Table 2

Means and Standard Deviations of WISC-III Full Scale, Verbal, and Performance IQ Scores of Children from Families with Four Levels of Parental Education

Parental Education Level	≤ 11 yr.	12 yr.	13-15 yr.	≥ 16 yr.
	n=104	n=226	n=157	n=113
<u>Scale</u>				
FSIQ				
M	88.37	98.24	103.37	110.96
SD	12.30	14.05	12.90	12.61
VIQ				
M	88.26	98.82	102.90	111.77
SD	12.09	13.83	12.04	12.83
PIQ				
M	90.80	98.20	103.50	108.30
SD	13.82	14.56	15.60	12.75

Again there appeared to be a systematic trend of increasing IQ scores corresponding to increasing levels of parental education. Children of parents who did not complete high school have the lowest average scores on all three measures (FSIQ $\underline{M}$ = 88.37, VIQ $\underline{M}$ = 88.26, and PIQ $\underline{M}$ = 90.80). If the parents finished twelve years of education the scores rose to FSIQ $\underline{M}$ = 98.24, VIQ $\underline{M}$ = 98.82, and PIQ $\underline{M}$ = 98.20. Children of parents with thirteen to fifteen years of education attained FSIQ $\underline{M}$ = 103.37,

VIQ $\bar{M}$ = 102.90, and PIQ $\bar{M}$ = 103.50. And finally, the children of college graduates achieved the highest scores of FSIQ $\bar{M}$ = 110.96, VIQ $\bar{M}$ = 111.77, and PIQ $\bar{M}$ = 108.30.

As already noted, the three IQ measures are highly correlated (VIQ/PIQ r = .66, VIQ/FSIQ r = .92, PIQ/FSIQ r = .90) so dependent t-tests for each of the four groups was used to investigate differences between the scale scores. Results are shown in Table 3.

Table 3.

Differences in IQ Test Scale Scores of Children from Families with Four Levels of Parental Education

Parental Education	Source	Difference in Means	Std. Error	t
≤ 11 yr.	VIQ - PIQ	-2.54	1.22	-2.09*
	VIQ - FSIQ	-0.11	0.60	-0.18
	PIQ - FSIQ	2.43	0.63	3.84**
12 yr.	VIQ - PIQ	0.62	0.78	0.80
	VIQ - FSIQ	0.58	0.38	1.53
	PIQ - FSIQ	-0.04	0.42	-0.11
13-15 yr.	VIQ - PIQ	-0.60	1.14	-0.52
	VIQ - FSIQ	-0.46	0.57	-0.82
	PIQ - FSIQ	0.13	0.59	0.23
≥ 16 yr.	VIQ - PIQ	3.47	1.04	3.33**
	VIQ - FSIQ	0.81	0.50	1.64
	PIQ - FSIQ	-2.65	0.57	-4.66**

* $p < .05$, ** $p < .01$

Children in the second and third groups of parental education (12 to 15 years of formal schooling) did not evidence statistically significant differences between any of the three scales. In fact, their average scores were less than one point difference across the scales. This was not the case for the lowest and highest levels of parental education.

Children of parents who failed to complete high school and children of parents who at least completed college had verbal scores that differed significantly from their performance scores, but not from their full scale scores. Those whose parents failed to complete high school attained verbal and full scale scores that were lower than their performance scale scores. The pattern is reversed for children of parents receiving 16 or more years of education. Their verbal and full scale scores exceeded the performance scale scores. In both cases the difference exceeded two points.

DISCUSSION

Age Related Differences in IQ

The results of this analysis did not support developmental trends in verbal, performance, or full scale scores as measured by the WISC-III. Children from the three age groups did not differ by reason of age, or the interaction of age with parent education attainment. One possible explanation for this lack of a finding is that the data are cross sectional rather than longitudinal, but given the relative stability of IQ scores over time it is likely that a longitudinal study would offer a similar conclusion.

The ages of the subjects in this study may contribute to this lack of differences. The range is restricted in that all of the subjects have already passed the critical, and early, developmental periods for both language and perceptual abilities. Techniques to answer the question of group differences present at birth are not yet developed. At this time developmental scientists are studying the general capabilities of young infants. As these understandings become more refined they may turn their attention to the question of individual differences. It does, however, appear that differences that are present by school age are maintained into adolescence.

SES Differences in IQ

Contrary to expectations, children grouped by parental education level attained significantly different scores on full scale, verbal, and performance IQ scores. An interesting finding was that differences exist between the middle two levels of SES. It was thought that these children would be the most similar in life experiences and score attainment. By number they represent the "average" American. The scores of both groups were the closest to the test mean of 100, but apparently subtle differences do exist.

One may argue that while the discrepancies are statistically significant they probably do not translate into meaningful differences in educational and vocational opportunities for these children.

This cannot be said for the of the differences between the average scores of children from the lowest and highest parental education groups. The 22.59 point discrepancy found between their mean full scale IQ scores is highly likely to translate into meaningful differences in life's circumstances and opportunities. Understanding the sources of this variance may provide clues to potential intervention strategies.

The traditional discourse on SES differences takes place on several fronts. One front argues that social class differences in IQ are genetically based (Scarr, 1999; Loehlin et al., 1999; Eysenck, 1998). From studies of twins and siblings, reared together and apart, they conclude that the greatest predictor of intelligence is genetic. While the implication is that environmental interventions cannot produce significant long term gains for children, it must be remembered that heritability estimates range anywhere from .50 to .75 (Neisser et al., 1996), leaving considerable room for environmental influences.

Another possible explanation for SES differences may have to do with the cultural context of the groups. One end of the continuum, high context, may be represented by the low SES children. Their home experiences are grounded in the here and now of human relationships. Communication tends to be non verbal and, when verbal, it is concrete. These children are uncomfortable and unfamiliar with the highly individualized and verbal methodology of IQ assessment. Low SES children are deprived in a multitude of ways (Duncan et al., 1998; Brookes-Gunn et al., 1996; Duncan, 1991; McLoyd, 1998) while high SES children have the advantage of enriched environments.

At the other end of the continuum is the high SES children from low context cultures. They are accustomed to individualized, highly verbal interactions. Ambiguity is resolved through conversation. For these children the assessment situation, like school, is comfortable. Between these end positions lie the middle SES groups. The families with some post secondary experience may use more of the verbalizations typical of low context while the high school graduates are skewed more toward the high context values.

Beyond the implications of the cultural context is the realities of daily existence. High SES children are exposed early, and often, to the rigors of verbal communication, while poor children receive much less in both the quantity and quality of language exposure (Hart & Risley, 1995; Hoff-Ginsberg, 1991).

This restricted access to language may impede the development of reasoning skills. Vygotsky felt that speech and language were the scaffolding of intelligence (Grigorenko & Kornilova, 1997). The ability to analyze and synthesize information is dependent upon the tools of thought. Language is the primary tool of thought. It only stands to reason that children who do not develop language abilities to their fullest potential may not be developing their intelligence to its fullest potential.

Within Group Differences in IQ Measures

It was found that the groups differed in how the WISC-III scaled scores compared to each other. The middle two groups (parental educational attainment from 12 to 15 years) displayed fairly uniform development on all three measures. For these groups verbal comprehension and perceptual organization were comparable skills and neither demonstrated greater similarity to the full scale score.

Children of parents who failed to complete high school and children of parents who had college, or better, education attained verbal scores that differed significantly from their performance scores, but not from their full scale scores. This indicates that the groups display uneven development of their cognitive abilities and, in both cases, the verbal scale score is most like the full scale score. What distinguishes the groups is the direction of the impact.

In the case of children of high school dropouts, verbal comprehension lagged behind perceptual organization. Both the verbal scale score and the full scale score fell into the low average classification of WISC-III scores. The performance scale score met (although barely) the criteria for average.

The profile for children of college graduates are similar in that the verbal and full scale scores were not significantly different while the performance scale score was. In this case the children demonstrated stronger verbal skills. The performance scale score met the WISC-III classification of average while the verbal and full scale scores were high average.

The pattern of differences found in the extreme groups matched what was expected. Low SES children did have more difficulty with tasks of verbal comprehension. In contrast, the high SES children excelled in the verbal domain. A whole constellation of factors may work independently, or in concert, to explain this result.

One possible explanation, already noted, may be the cultural context that these children live in. To the extent that their environment does not demand much in the way of verbal interactions and abstract thinking then they are unlikely to develop these skills. Conversely, the high SES children from low context cultures may be particularly adept

and experienced with the verbal demands of IQ testing. For them verbal ability is a practiced and valued skill.

While it may be argued that IQ tests are measuring abilities not valued by members of high context cultures in a manner that is foreign to their children, the relationship of IQ to years of schooling and an occupational status is strong (Neisser et al., 1996). Social class mobility in this society is assumed to be predicated upon equality of access to education (Robinson, 1981; Kerbo, 1991). If low SES children are not encouraged and supported in educational attainment, then their chances for upward mobility are curtailed.

The problem of SES differences in verbal ability may be strongly related to the conditions for language development. Poor children are subjected, both pre- and post-natal, to many more environmental risk factors. The chances of actualizing their potential, whatever that might be, are greatly reduced by the circumstances under which they live. Improvements in nutrition, living conditions, and health care could result in some cognitive gains. Improvement in the physical conditions alone may not be sufficient to improve verbal ability.

The conversational milieu is a critical component of language development. Studies of language development have indicated a critical period for syntax, but not for semantics (Bruer, 1999; Eliot, 1999). Throughout the life span it appears that vocabulary growth is limited only by meaningful exposure to new words. The work of Hart and Risley (1995) indicates that high SES parents talk considerably more to their children and use a greater variety of words and word forms. This was reflected in a faster rate of vocabulary growth for their children.

The results of this study support the findings of Hart and Risley. Early language learning appears to set the stage for future accomplishments in verbal comprehension. In this study the high SES children did significantly better on the verbal scales of the WISC-III. This led to higher full scale scores than would have been predicted. Conversely, the low SES children had their greatest difficulty with the verbal scale, and that also was reflected in their full scale scores.

Are IQ Discrepancies Between SES Groups the Result of Verbal Scale Differences? This question must be answered in the negative. The four SES groups used in this study differed on all three WISC-III scales. The middle two groups evidenced no significant differences between scale scores. As already noted, for the lowest and highest SES groups the verbal scale scores did influence the full scale IQ scores.

Future Directions

This study could be expanded in several directions. One direction would be to explore the subtests that contribute to the observed SES differences to see if profiles emerge for either group. Both the highest and lowest SES groups scored outside the average classification on the verbal scale. Do high and low SES groups display unique profiles of verbal abilities? Do strengths in one group correspond to weaknesses in another? Answers to these questions could inform directions for intervention.

Consistent with the work of Hart and Risley, this study supports the existence of significant differences in the verbal abilities of high and low SES children. Hart and Risley believe differences in early language experiences pave the way for discrepancies in later abilities. Early verbal training, such as that which is done by high SES parents, may set the stage for positive educational and social outcomes.

Since it was found that SES groups differed significantly in the sheer amount of language exposure children received (Hart & Risley, 1995), a likely point of intervention is to train low SES parents to talk more to their infants. It is possible that as these parents talk more to their children they will naturally broaden their conversational goals.

Bernstein (1973) found working class mothers to converse with their children only in directive and instructive contexts. If these parents were to view conversation as a manner of interacting and demonstrating affection, they may feel more comfortable engaging their children verbally. Increasing the quantity and quality of language in the home could lead to gains in childrens' verbal abilities.

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