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ABSTRACT

Intellectually gifted children from diverse ethnic and cultural backgrounds as well as varying levels of risk were evaluated to determine the effect of risk on gifted children when intelligence level has been controlled. Each of 7,323 children from six ethnic backgrounds had achieved a standardized intelligence test score (Wechsler Intelligence Scale for Children - Revised [WISC-R] or Raven's Standard Progressive Matrices) at least two standard deviations above the mean. Areas of risk evaluated in a case study approach included cultural, economic, emotional, environmental, health and language factors. Although each child in the sample demonstrated high intellectual potential, differences were found only between groups defined by level of risk. Higher degrees of risk were found for disadvantaged students on several measures of aptitude, achievement, and verbal intelligence. Implications and limitations of these findings for assessment of giftedness, identification of potential gifted underachievers, and development of gifted curricula are discussed. (PB)

CHAPTER 3

Evaluation of Risk Factors in Selecting Children for Gifted Programs

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Part 1: Gifted Children at Risk: Evidence of an Association between Low Test Scores and Risk Factors

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Part 2: Intelligence, Aptitude, and Achievement in Gifted Children With and Without Language Risk

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The authors express their appreciation to the San Diego City Schools, to Gifted and Talented Education (GATE) Administrator David Hermanson, and to the following school psychologists: Will Boggess, Marcia Dorne, Eva Jarosz, Dimaris Michalek, Lorraine Rouse, Ben Sy, and Daniel Williams.

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Part 1:

Gifted Children at Risk: Evidence of an Association between Low Test Scores and Risk Factors

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Abstract

Intellectually gifted children from diverse ethnic and cultural backgrounds as well as varying levels of risk were evaluated to determine the effect of risk on gifted children when intelligence level has been controlled. Each of the 7,323 children from six ethnic backgrounds had achieved a standardized intelligence test score (Wechsler Intelligences Scale for Children - Revised or Raven's Standard Progressive Matrices) at least two standard deviations above the mean. Six areas of risk evaluated in a case study approach included cultural, economic, emotional, environmental, health and language factors. Although each child in the sample had demonstrated high intellectual potential, differences were found between groups defined on level of risk: no risk, low risk (one and only one area of risk), and high risk (more than one area of risk). High risk gifted children were found to be disadvantaged relative to those at low or no risk in all measures of both aptitude and achievement, as assessed with the Developing Cognitive Abilities Test and the Comprehensive Test of Basic Skills. Furthermore, those at high risk demonstrated lower WISC-R Verbal IQ scores than children at lower levels of risk. Implications and limitations of these findings for assessment of giftedness, identification of potential gifted underachievers, and development of gifted curriculum are discussed.

Gifted Children at Risk: Evidence of an Association between Low Test Scores and Risk Factors

Since the 1960's, much has been written about gifted children at risk. One focus of this literature is the failure to identify gifted children at risk, presumably because of the use of standardized tests as criterion measures. Criticism has repeatedly been leveled at the use of standardized tests in any child considered to be at risk because of ethnic or cultural background (Cronbach, 1984; Sullivan, 1973; Sattler, 1982), socioeconomic disadvantage (Fetterman, 1986; Harty, Adkins, & Sherwood, 1984; Shaw, 1986), health or handicapping condition (Pledgie, 1982), or differences in language (Sattler, 1982). Other investigators have noted the difficulty in the identification of giftedness in children with these risk factors (Albrecht & Rost, 1983; Bruch, 1971; Harty, et al., 1984). However, less attention has been given to children who, despite risk factors, perform at high levels on standardized tests of intellectual potential and so are recognized gifted. Passow (1989) suggested that priority areas of research in the education of high-ability children should include not only the need to identify and nurture giftedness in "disadvantaged" populations, but also explication of what is needed to transform potential into performance in the gifted. We hypothesize that intellectually gifted children at risk show patterns of disadvantage on tests of potential and achievement when compared to intellectually gifted children not at risk, and submit that these patterns may prove useful in the development of educational programs designed to unlock potential in gifted children at risk.

Several factors have been shown to be associated with underachievement in children. Included in emotional factors are such stresses as parental conflict due to the absence of a parent, or child maltreatment. Zilli (1971) found that underachievers tend to come from broken homes. Wallerstein (1985) found that children from single parent homes have a higher rate of absenteeism as well as lower academic competence at school entry, and suggested that they may be burdened by too much responsibility for care of themselves and of younger siblings. However, the effects of emotional factors may be confounded with the effects of socioeconomic status, particularly in single-parent homes.

Low socioeconomic status has consistently been found to correlate negatively with identification for gifted programs (Fetterman, 1986; Harty, et al., 1984; Shaklee, 1992; Shaw, 1986). A 1983 (Albrecht & Rost) survey of San Diego gifted and talented classrooms using zip code as an indicator of socioeconomic status revealed that children from neighborhoods with higher housing prices were more likely to be identified gifted and to participate in gifted and talented programs. Pirozzo (1982) pointed out that socioeconomic status is a major difference between potentially gifted underachievers and gifted children whose achievement matches their potential. One weakness of many studies that attempt to look at socioeconomic status is that socioeconomic status is often confounded with ethnic or cultural background, and with poor health.

Nichols and Anderson (1973) attempted to control for differences in socioeconomic status between African-American and White 7-year-old children to yield a clearer indication of ethnic differences between these two groups by matching on SES, geographic location, and provision of prenatal care. These authors found that differences in IQ were reduced to approximately five points, in favor of White children, rather than the 15-point advantage often cited. In contrast to the approach of most investigators to examine deficits, Bruch (1971) reported the intellectual strengths found in intelligence test performance in gifted African-American children in the southeast. These strengths included practical problem-solving, memory operations, and visual and auditory figural content.

It has been well documented that low socioeconomic status affects the health of children and their mothers. African-Americans, in particular, have a higher rate of premature birth and abnormalities in pregnancy than do Whites (Wiener & Milton, 1970). Because of multiple risk factors in their environments, migrant children and homeless children are characteristic of those described by Haney (1963) as, "The most educationally deprived group of children in the Nation" (p. 101). Given the inconsistencies in their educational experience as well as the demands placed on them to care for their siblings, it seems unlikely that the potential of such gifted children could be fully expressed (Frasier, 1979 & 1982). As Laslow & Nelson (1974) pointed out, cultural differences, emotional problems, and physical disabilities are more likely to occur in children from lower socioeconomic households.

The present study attempted to examine a range of identified risk factors as well as level of risk for children who attained standardized intelligence test scores that were at least two standard deviations above the mean. Therefore, despite varying levels of risk, each of these children had demonstrated high academic potential and had been identified intellectually gifted. The sample was selected from a large, diverse sample of children who had been referred and evaluated for giftedness. Six areas of risk were examined: cultural, economic, emotional, environmental, health, and language. Cultural risk included cultural values and beliefs that differ from those of the dominant culture, or limited experience in the dominant culture. Economic risk included parental unemployment or low household income. Emotional risk encompassed such factors as death of a parent or sibling, child abuse, psychiatric illness in the nuclear family, or extended parental absences due to military service. Environmental risk included transiency (three or more school moves) and excessive absences from school that were due to specific factors not related to another risk factor (e.g., absences due to home responsibilities such as child care or working to help support the family). Health risk included vision, speech, or hearing deficits requiring designated instructional service, motor problems requiring adaptive physical education, or chronic diseases such as asthma. Language risk included English as a second language or lack of fluency in English.

For the purposes of this study, three levels of risk were defined. Children at no risk were those who had no identified risk factors. Those at low risk were children who had identified risk in one of the six areas previously described. High risk children were those who had been identified as having risk in at least two of the areas defined. For the purposes of this study, level of risk was defined by number of areas of risk, rather than by absolute numbers of individual risk variables within the areas. For example, a child who had asthma as well as a hearing deficit would, by definition, be at low risk since both risk factors fall in the one area of health risk.

Since these risk areas have been shown to be associated with lower achievement in children, we hypothesized that, even among children identified intellectually gifted based on intelligence test scores, differences would be found in aptitude and achievement test scores as a function of level of risk in the child's background.

Method

Subjects

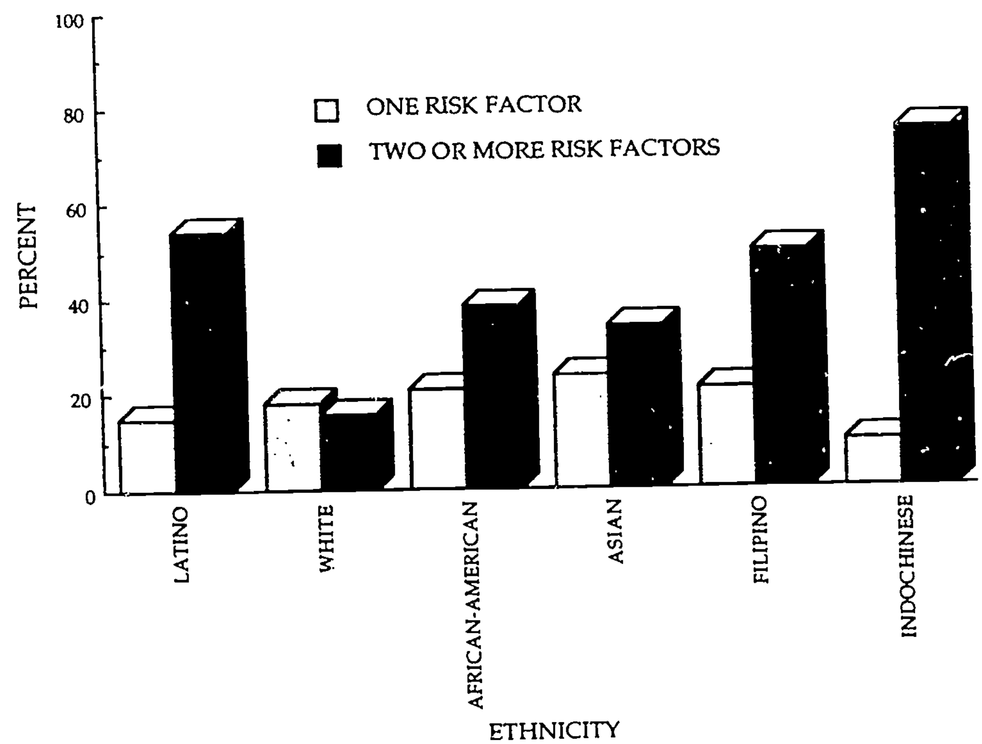
The sample was drawn from the 11,074 children who had been referred for giftedness testing in the San Diego City School System between 1984 and 1991. Of these referred children, 1,107 were Latino/Hispanic; 7,751 were White; 855 were African-American; 393 were Asian; 390 were Indochinese; and 578 were Filipino. Fifty-one percent were male. The majority of the children were in the second (4,276), third (2,473), or fourth (1,248) grade. The remainder were in the first (187), fifth (993), sixth (962), seventh (392), eight (276), or ninth (192) grade. Information on grade level was not available for 75 children.

For the purposes of this study, a sample of all children who achieved a WISC-R Full Scale IQ score of at least 130 or a Raven IQ equivalent of 130 was selected. Thus, we isolated the group of high IQ scoring children. A total of 7,323 children met this criterion. Of these, 464 were Latino/Hispanic, 5750 White, 366 African-American, 279 Asian, 303 Filipino, and 161 Indochinese. Fifty-four percent were male.

Procedure

Each subject was referred for giftedness testing by a parent or teacher, or through central nomination of high-achieving children. Each was then either individually tested with the Wechsler Intelligence Scale for Children - Revised (WISC-R) or group tested with the Raven Standard Progressive Matrices Test, and group tested with the Developing Cognitive Abilities Test (DCAT). The DCAT, an aptitude test designed to predict academic achievement, provides estimates of potential for verbal, quantitative, and spatial abilities. Reliability coefficients for the composite score are in the low .90's, while those for the verbal, quantitative, and spatial scores range from the mid .70's to the mid .80's. The WISC-R or Raven and DCAT were used in conjunction with the child's scores on the Comprehensive Test of Basic Skills (CTBS), a standardized achievement test. A school psychologist then conducted a case study analysis of each child and determined, through a self-report questionnaire sent to the home and to the child's teacher, whether the child had any one of six risk factors: language, cultural, economic, emotional, health, and environmental. In the high IQ sample, 4,303 children had no identified risk factors; 1,340 had one; and 1,680 had more than one. The distribution of level of risk varied across ethnic background. Figure 1 illustrates the percentage of children at risk (one risk factor versus more than one) for each ethnic group. The majority of white children had no identified risk factors, whereas the majority of Latino, African-American, Asian, Filipino, and Indochinese children had at least one. Seventy-five percent of Indochinese children had two or more risk factors, placing them at high risk for failure to achieve their potential.

Figure 1. Percentage at each positive level of risk (one risk factor versus two or more) for each ethnic background.



Results

Table 1 shows the correlation among the various risk factors. Due to the large number of subjects, most correlations are statistically significant. Notably high correlations were found between Cultural and Language risk, Economic and Environmental risk, Economic and Emotional risk, and Emotional and Environmental risk.

Table 1
Risk factor correlations (Pearson r)

	Cultural	Economic	Emotional	Environmental	Health	Language
Cultural	1.00	.21**	.05**	.18**	-.02*	.61**
Economic		1.00	.40**	.30**	.08**	.15**
Emotional			1.00	.30**	.16**	.05**
Environmental				1.00	.09**	.15**
Health					1.00	-.01
Language						1.00

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

For all subsequent analyses, Level of Risk has been defined as No (no risk factors), Low (one risk factor, and High (more than one risk factor).

For those children who had been given the WISC-R, data were analyzed in a 3 (Risk Level: No, Low, High) X 2 (IQ Score: Verbal, Performance) mixed repeated measures ANOVA with repeated measures on IQ score. Significant main effects were found for Risk Level, $F(2, 5881) = 3.21, p < .05$, and for IQ Score $F(1, 5881) = 292.65, p < .001$. There was also a significant Risk Level by IQ Score interaction $F(2, 5881) = 11.21, p < .001$. Given the number of subjects, observed power at the .001 level ranged from .992 to 1.000. Table 2 shows the means and standard deviations for the WISC-R data.

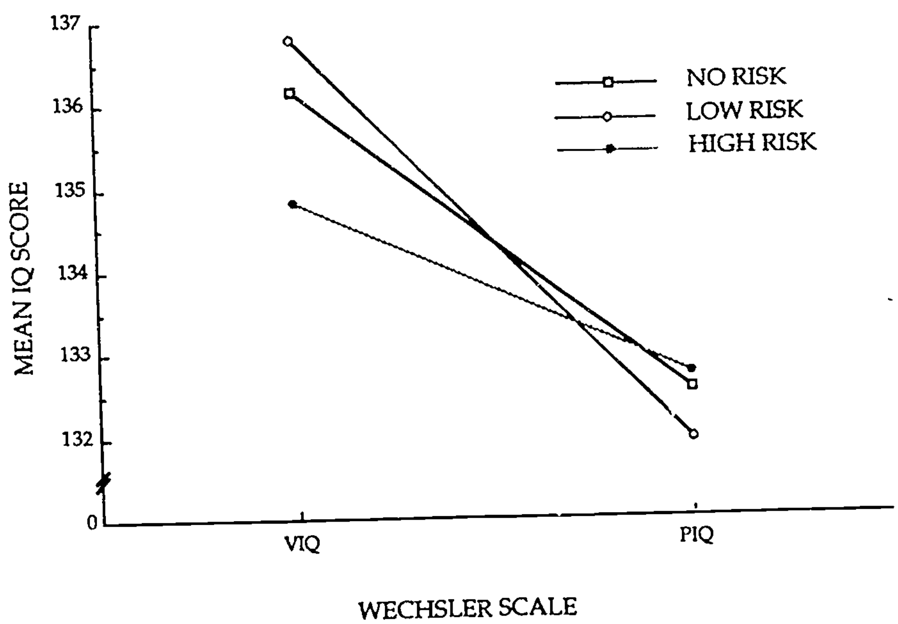
Table 2

WISC-R IQ scores: descriptive statistics for three levels of risk.

	No Risk (n= 3964)		Low Risk (n = 974)		High Risk (n = 946)		Marginals (n = 5884)	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
VIQ	136.15	(8.63)	136.78	(8.87)	134.83	(9.10)	136.04	(8.76)
PIQ	132.55	(9.05)	131.95	(9.21)	132.75	(9.34)	132.48	(9.12)
Marginals	134.15	(8.84)	134.65	(9.04)	133.79	(9.22)		

The significant interaction revealed that high risk children were particularly impaired in Verbal IQ. Post-hoc Newman-Keuls comparisons revealed that high risk children had significantly ($p < .05$) lower VIQ than no risk and low risk children, and that low risk children had higher VIQ than those with no risk at all. No significant differences were found in PIQ. For ease of interpretation, the interaction is displayed in Figure 2.

Figure 2. The interaction between level of risk and WISC-R IQ.



To examine the relationship between risk and specific Wechsler subtests, the data were analyzed in a 3 (Risk Level) X 8 (Subtest) mixed repeated measures ANOVA with repeated measures on the subtest scores. These analyses were based on the eight subtests routinely administered by the GATE department in this district (see Table 3).

Table 3

WISC-R subtest scores: descriptive statistics for three levels of risk.

Subtest	Entire Sample (n=5611)	No Risk (n=3804)	Low Risk (n=917)	High Risk (n=890)
Information	14.63 (2.10)	14.70 (2.08)	14.67 (2.08)	14.34 (2.19)
Similarities	16.76 (2.03)	16.75 (2.02)	16.91 (2.01)	16.63 (2.08)
Arithmetic	14.88 (2.19)	14.89 (2.20)	14.85 (2.23)	14.85 (2.10)
Vocabulary	15.78 (2.19)	15.83 (2.13)	15.94 (2.20)	15.39 (2.35)
Picture Completion	13.97 (2.21)	13.90 (2.21)	14.02 (2.19)	14.17 (2.21)
Picture Arrangement	14.85 (2.55)	14.90 (2.55)	14.82 (2.52)	14.65 (2.53)
Block Design	15.26 (2.51)	15.32 (2.49)	15.02 (2.55)	15.26 (2.56)
Object Assembly	14.51 (2.55)	14.59 (2.54)	14.36 (2.52)	14.33 (2.56)

There was a significant main effect for Risk Level, $F(2,5608) = 70.47, p < .001$, as well as a significant Subtest effect, $F(7, 39256) = 555.00, p < .001$. In general, children at high risk had lower scores than those at no risk, and the highest scaled scores were in Similarities for all groups while the lowest were in Picture Completion. Also significant was the Risk Level X Subtest interaction, $F(14, 39256) = 5.91, p < .001$. Post-hoc Newman-Keuls analyses revealed that children at high risk were significantly ($p < .05$) disadvantaged in Information and Vocabulary relative to the other two risk levels. However, children at high risk had significantly ($p < .05$) higher scores than those at no risk on one subtest: Picture Completion. Other significant differences included lower scores for high risk children relative to low risk children on Similarities and relative to no risk children on Picture Arrangement. Although these differences are statistically significant, as can be seen in Table 3, they represent very small differences in scaled scores and should be interpreted with caution.

Percentile scores for the DCAT were converted to z-scores and then analyzed in a 3 (Risk Level) X 3 (DCAT Score: Verbal, Spatial, Quantitative) mixed repeated measures ANOVA with repeated measures on DCAT scores. There was a significant main effect for Risk Level, $F(2, 2592) = 44.47, p < .001$. This effect showed that children at high risk had lower scores, summed across the three subtests, than those at no or low risk. The significant main effect for DCAT score, $F(2, 5184) = 18.74$ $p < .001$ demonstrated that Verbal scores tended to be higher than Quantitative scores, which were higher than Spatial scores. The significant DCAT score by Risk Level interaction, $F(4, 5184) = 4.59, p < .001$, revealed that for those at high risk, Quantitative scores were highest, followed by Verbal and then Spatial scores, whereas for those at no or low risk Verbal scores were higher than Quantitative. Post-hoc Newman-Keuls comparisons demonstrated significant ($p < .05$) disadvantage for children at high risk relative to those at low and no risk in all three DCAT scores (see Table 4).

Table 4

DCAT scores: descriptive statistics for three levels of risk.

		Total (n=2595)	No Risk (n=987)	Low Risk (n=704)	High Risk (n=904)
Verbal:	percentile (*SD*)	85.58 (15.09)	87.85 (12.50)	87.49 (12.98)	81.61 (18.12)
	z-score (*SD*)	1.35 (0.76)	1.46 (0.72)	1.42 (0.71)	1.16 (0.81)
Quantitative:	percentile (*SD*)	84.99 (16.30)	86.02 (14.46)	85.97 (15.18)	83.09 (18.70)
	z-score (*SD*)	1.28 (0.74)	1.32 (0.69)	1.32 (0.71)	1.21 (0.80)
Spatial:	percentile (*SD*)	83.82 (17.46)	85.59 (15.18)	85.00 (16.27)	80.97 (20.13)
	z-score (*SD*)	1.23 (0.78)	1.31 (0.73)	1.28 (0.75)	1.10 (0.83)

Achievement scores, as measured by the CTBS, were analyzed in a 3 (Risk Level) X 3 (CTBS Score: Total Language, Total Reading, Total Math) mixed repeated measures ANOVA with repeated measures on the CTBS scores. Again, there was a significant main effect for Risk Level , $F(2, 1616) = 20.45, p < .001$. This result again showed that children at high risk achieved lower scores, summed across the three areas of achievement, than did those at low or no risk. There was also a significant main effect for CTBS score, $F(2, 3232) = 221.61, p < .001$, with significantly higher Total Math scores than Total Language, and significantly higher Total Language than Total Reading. The interaction of CTBS score and Risk Level, $F(4, 3232) = 2.81, p < .05$, indicated that children at low risk achieved scores equivalent to or lower than those at no risk in Total Reading and Total Math, but slightly higher than those at no risk in Total Language. Post-hoc Newman-Keuls comparisons revealed that those at high risk were again significantly ($p < .05$) disadvantaged relative to those at low or no risk . The disadvantage was apparent for all three CTBS scores (See Table 5).

Table 5

CTBS stanine scores: descriptive statistics for three levels of risk.

		Total (n=1619)	No Risk (n=662)	Low Risk (n=388)	High Risk (n=569)
Total Language	*M* (*SD*)	7.65 (1.14)	7.74 (1.07)	7.78 (1.06)	7.46 (1.24)
Total Reading	*M* (*SD*)	7.43 (1.19)	7.56 (1.06)	7.56 (1.16)	7.19 (1.31)
Total Math	*M* (*SD*)	8.16 (1.09)	8.22 (1.07)	8.20 (1.07)	8.07 (1.12)

Discussion

The present study compared intellectually gifted children at three levels of identified risk: no risk, low risk (one area of risk) and high risk (two or more areas of risk). These children were evaluated in six areas of risk: cultural, economic, emotional, environmental, health, and language. Every child in the study had been referred as potentially gifted and had subsequently achieved either a WISC-R Full Scale IQ score of at least 130, or a Raven Standard Progressive Matrices score at least two standard deviations above the mean. Therefore IQ was tightly controlled. Every child in the study had demonstrated high intellectual potential despite the presence of varying levels of risk for failure to fully express that potential. This design allowed us to evaluate the effect of risk without confounding IQ.

The data support our hypothesis of a different pattern of scores in children at risk. This pattern is characterized by depressed verbal abilities. In general, children at high risk were found to be disadvantaged relative to those at low or no risk in all measures of both aptitude and achievement. Furthermore, those at high risk demonstrated lower WISC-R Verbal IQ than those at lower levels of risk. The disadvantage in Verbal IQ was particularly evident in the Information and Vocabulary subtests. Thus our findings support the hypothesis that high levels of risk negatively impact expression of a gifted child's intellectual potential.

These data are not surprising. Low scores on Information and Vocabulary have long been known to be associated with risk factors such as poor reading ability, environmental deprivation, and emotional problems (Guertin, Ladd, Frank, Rabin, & Hiesler, 1971; Lewandowski & Saccuzzo, 1976; Saccuzzo & Lewandowski, 1976). The present study is unique in showing that Information and Vocabulary are depressed even while IQ is controlled and even for intellectually gifted children.

The consistency of the low scores on Information and Vocabulary for children at risk across a variety of studies strongly points to the possible diagnostic significance of these subtests. Certainly, when evaluating for giftedness, practitioners should be alert to the presence of risk factors whenever these scores are depressed.

Other findings from the study should be interpreted more cautiously. The finding of relatively high scores on Picture Completion needs to be considered in light of the standards promulgated by Lewandowski & Saccuzzo (1976). As these investigators noted, in order for a specific test sign to have reliable diagnostic significance, a number of methodological standards must be met. These include control of all major relevant variables, sufficient power, and cross-validation.

The present study, while meeting the standards for control and power, did not include a cross-validation. Thus, before we accept the diagnostic significance of the Picture Completion subtest as a marker of risk, it would be important that the present findings be cross-validated on an independent sample.

From the standpoint of the education of children at risk, a number of factors should be considered. First, despite their high IQ's, these children have a relatively depressed vocabulary. Teachers of gifted children at risk might, therefore, concentrate on enriching the vocabularies of these children. The low score on the Information subtest may have several implications. It could be that these children do not have the same opportunity to acquire everyday factual information as do children not at risk. Alternatively, these children, due to such factors as economic disadvantage and environmental distress, do not have the same interest in acquiring factual information as do more advantaged children. It would seem important that teachers of the high risk gifted attempt to bring relevance to the educational process for these children.

The results show a surprisingly high concentration of risk for Latino, African-American, and Filipino children. Practically 80 percent of the Latino, 60 percent of the African-American, and 70 percent of the Filipino children had at least one risk factor. These findings reveal that individuals from these groups, even though gifted, have a high potential for risk. Even more surprising was the finding that nearly 80 percent Indochinese had two or more risk factors. Educators working with these populations need to be sensitized to the high level of adversity these children face. It should be emphasized that these children, in spite of their adversity, still managed to score two standard deviations above the mean on a standardized IQ test. Children within these groups who are not as intellectually capable clearly are far more vulnerable to the varieties of risk that they must deal with on a daily basis.

There were some important correlations among the various areas of risk. The strong association between cultural and language risk is not surprising. Children who come from nonEnglish-speaking homes, more often than not, come from a different culture. Another important area of association was found among environmental, economic, and emotional risk. Although cause–effect relationships cannot be discerned from these data, it is easy to see how these risk factors are associated. Teachers need to be alert to the association among these three areas of risk.

The sample for this study was drawn from a population of children referred as potentially gifted. Therefore, it does not constitute a truly random sample of children two standard deviations above the mean in intelligence test scores. However, the sample does accurately represent children who have been identified and certified gifted based on attainment of standardized intelligence test scores two standard deviations above the mean in a diverse school district that has come extremely close to achieving ethnic and cultural equity in its gifted education program. It represents children who have demonstrated their intellectual potential in an objective manner, despite varying levels of risk. Therefore, this sample powerfully illustrates the impact of risk factors on the expression of potential for gifted children.

Part 2:

Intelligence, Aptitude, and Achievement in Gifted Children With and Without Language Risk

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* This research was funded by Grant R206A00569, U.S. Department of Education, Jacob Javits Gifted and Talented Discretionary Grant.

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Abstract

Test patterns and the role of risk factors were investigated for a large sample (5004) of children from an ethnically diverse school district. All children had IQ equivalents of 130 or greater on a major standardized intelligence test. Children with no risk factors were compared to children with a language/culture risk factor, and to a two-risk group of children with a language/cultural risk factor plus an additional risk factor. Children with language/culture risk showed their highest scores on nonverbal tests, including quantitative aptitude and mathematics achievement, but had significantly ($p < .05$) depressed scores, compared to the no risk group, in all verbal subtest areas. The data support Cummins' subtractive hypothesis, which states that bilingualism hinders the expression of a child's abilities until the child is completely competent in both languages.

Intelligence, Aptitude, and Achievement in Gifted Children
With and Without Language Risk

Numerous studies support the hypothesis that being bilingual enhances a person's performance on a variety of cognitive tests (Ben-Zeev, 1977; Cummins, 1976, 1978, 1981, 1986, 1989; Cummins & Gulutsan, 1974; Dash & Misahra, 1988; Diaz, 1983; Feldman & Shen, 1971; Gallegos & Franco, 1985; Hakuta, 1987; Hakuta & Diaz, 1985; Hakuta & Garcia, 1989; Ianco-Worrall, 1972; Landry, 1974; Lindholm, 1991; Peal & Lambert, 1962; Zentella, 1981). In all of these studies bilingualism has been defined as adding a second language to an already well-developed language, or acquiring a second language to replace the first language. Cummins' (1976) threshold hypothesis best explains the enhanced performance of bilingual individuals by suggesting that once an unspecified threshold point of fluency in both languages is reached, the languages complement each other and add to the bilingual person's ability to perceive the environment from multiple cultural viewpoints. Theoretically, those who are developing bilingually are constantly monitoring and controlling two symbol systems that could possibly interfere with each other. Additionally, comparing two languages may increase a person's ability to work with abstract ideas, such as language or quantitative tasks, that are commonly referred to as "metacomponential abilities" (Dash & Mishra, 1988; Reynolds, 1991). Until a threshold point of bilingualism is reached, however, the process of learning and being evaluated in a second language can only be subtractive, thus hindering the complete expression of one's abilities.

Often, for minority language children in the American school system, neither English or the native language is adequately developed because native speakers of another language are immersed into classrooms where only English is spoken. The child's primary language is not used in the classroom; thus English is used only in a formal setting. The result is that children do not identify with either language and often speak a combination of the two; for example, "spanglish" for bilingual Spanish/ English speaking children (Cauce & Jacobson, 1980). Teachers may erroneously assume that if a student is proficient in conversational English with peers, he or she is also English proficient in the classroom. Classroom proficiency, however, requires more than simply having an understanding of the language (Cummins, 1981). Cummins (1981) points out that parents may be encouraged by teachers or peers to speak to their children in English to help them obtain proficiency. However, since the parents are often not fluent, the child is at best exposed to poor English. At worst, parents may be uncomfortable speaking in a foreign language and consequently may not communicate with their children as much. Thus, having a native language other than English is a risk factor in American classrooms.

There is a cultural component coupled with any language risk factor a child may bring into the school system. A theory by Vygotsky (1962) states that language is initially used as a form of social communication and eventually evolves into a way of ordering thoughts and working with abstract symbol systems. In essence, speech and thought are not the same thing. Speech is simply one form of a symbolic thought process that humans use to communicate ideas (Ben-Zeev, 1977; Peal & Lambert, 1962; Vygotsky, 1962). Each society is in fact limited by its language because it can only express those thoughts, feelings, and experiences that the language has words to express. Therefore, learning a language is a socialization process that affects how one perceives the environment (Vygotsky, 1962). One's perception of the environment is often referred to as a cognitive set. Theoretically, a person who is bilingual may have a broader cognitive set, plus more cultural viewpoints from which to view any new experience, and thus may accumulate more crystallized intelligence (Cattell, 1963).

Becoming bilingual may also act as a disadvantage for children in terms of the testing measures traditionally used to assess intelligence (e.g., the WISC-R, WISC-III, or the Stanford-Binet Intelligence Scales) because most of the evaluations are performed in English, the minority language child's second language. The measures are additionally biased in favor of the Anglo American cognitive set and culture upon which they were based (Bernal, 1974; Melesky, 1985). As a result, poor scores are often obtained, and may be interpreted as a learning disability or lack of subject knowledge, instead of a demonstration of the level of second language fluency and cultural assimilation the child has attained (Ascher, 1990; Cummins, 1982; Ortiz, 1991).

The present study evaluated a large sample of gifted children who had either no risk factors, a language/culture risk factor, or language/culture and an additional risk factor. Their aptitude and achievement scores were examined and compared in order to answer a number of basic questions pertaining to children with language as a risk factor. We hypothesized that there would be a different pattern of test scores as a function of risk level for children with language risk. Since the bilingual children in this study were not fully competent in both languages, Cummins' subtractive hypothesis would be operative and result in relatively impaired performance.

Method

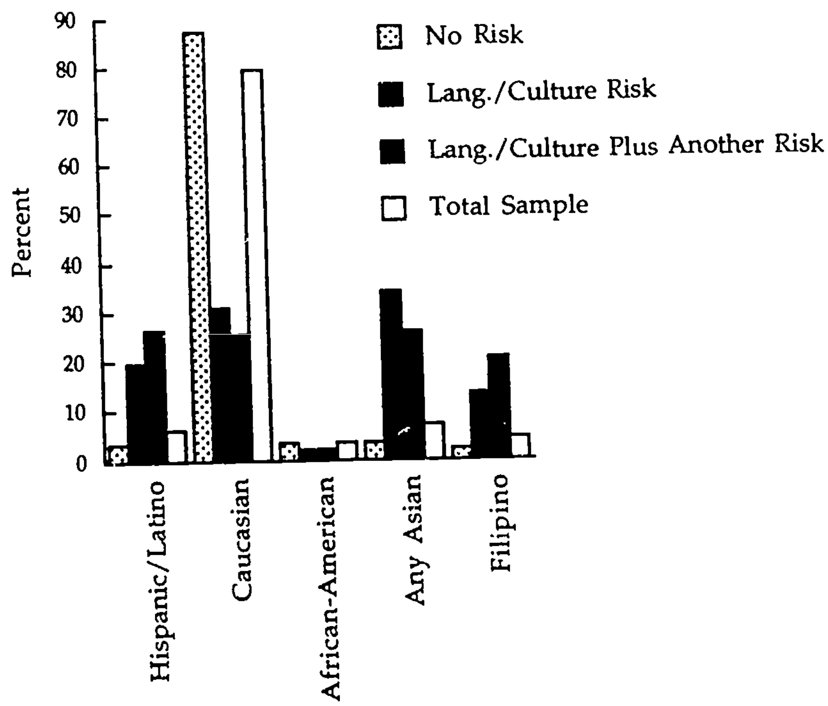
Subjects

The subjects consisted of 5004 children who had been certified as gifted based on high intellectual functioning (i.e., IQ equivalent ≥ 130) in the San Diego City School district between 1984 and 1990. IQ was measured with either the Weschler Intelligence Scale for Children-Revised or the Raven Standard Progressive Matrices Test. This was an ethnically diverse sample consisting of 295 Latino/Hispanic, 3985 Caucasian, 170 African-American, 350 Asian, and 204 Filipino children. Of these, 2,362 (47.2 percent) were female, 2,642 (52.8 percent) male. Children were distributed by grade as follows: 146 first, 2218 second, 1085 third, 535 fourth, 382 fifth, 347 sixth, 143 seventh, 73 eighth, 61 ninth, and 14 unknown.

The sample was divided into three groups based on risk: no risk, a language/culture risk, or two risks (a language/culture risk factor coupled with one additional risk factor). Figure 1 shows the percentage of children at various levels of risk. Of the sample of 5004 children, 655 (13.0 percent) had language/culture as a risk factor. Of these 655 children, 71 (10.8 percent) had an economic risk factor, 91 (13.9 percent) had an environmental risk factor, 88 (13.4 percent) had emotional risk factor, and 31 (4.7 percent) had a health risk factor.

Figure 1: Percentage of children with no risk, a language/ culture risk, or two risks, compared to their percentages in the sample as a whole.

Figure 1 shows the percentage of children with no risk, a language/ culture risk, or two risks compared to their percentages in the sample as a whole. While Latino/ Hispanics represented about 6% of the total gifted sample, this group comprised about 23% of the children at language/ cultural risk.



Procedure:

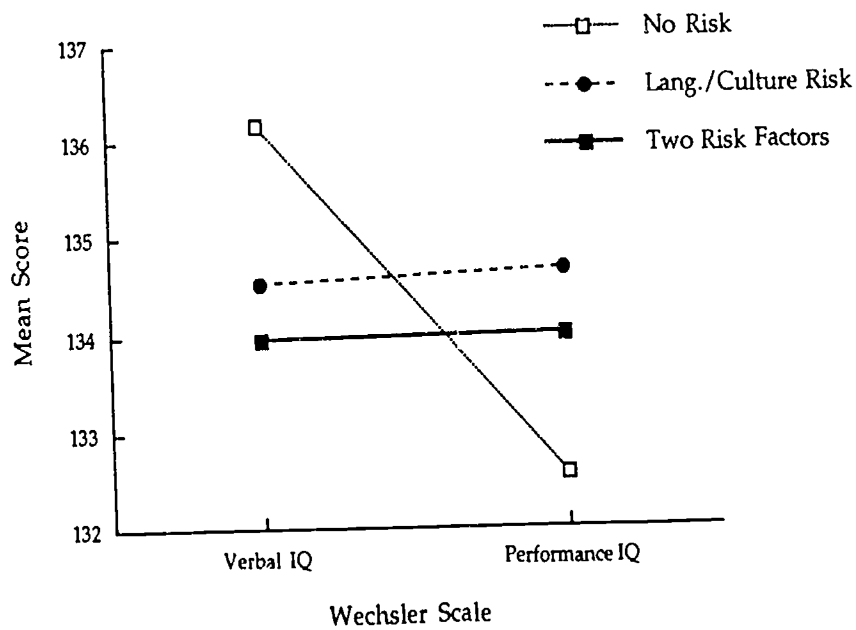
Each subject was referred for giftedness testing at San Diego City Schools by a parent, teacher, or through central nominations. Each was then individually evaluated with either the Wechsler Intelligence Scale for Children - Revised (WISC-R), or the standard form of the Raven Progressive Matrices (RPM) Test. In addition, each child was given the Developing Cognitive Abilities Test (DCAT). The DCAT is an aptitude test designed to predict academic achievement in verbal, quantitative, and spatial domains. To determine qualification for giftedness, a school psychologist then conducted a case study evaluation of each child using information from the individual evaluation, the Comprehensive Test of Basic Skills (CTBS; a standardized achievement test), and a consideration of risk. Risk was determined through a self-report questionnaire sent to the home and/or through a questionnaire completed by the teacher about the child. The five categories of risk were: language/culture (e.g. primary language other than English spoken in the home), economic (e.g. low income), emotional (e.g. death, divorce, seeking psychological services), health (e.g. physical disability, asthma), and environmental (e.g. frequent moves, academically unenriched home environment).

Results

WISC-R Verbal IQ (VIQ) and Performance IQ (PIQ) were analyzed in a 3 (Risk Level) X 2 (IQ Score) mixed repeated measures ANOVA with repeated measures on IQ Score. The significant main effect for IQ Score, $F(1, 4338) = 5.71, p < .05$, indicated that VIQ ($M = 136.02, SD = 8.72$) was significantly higher than PIQ ($M = 132.72, SD = 9.02$).

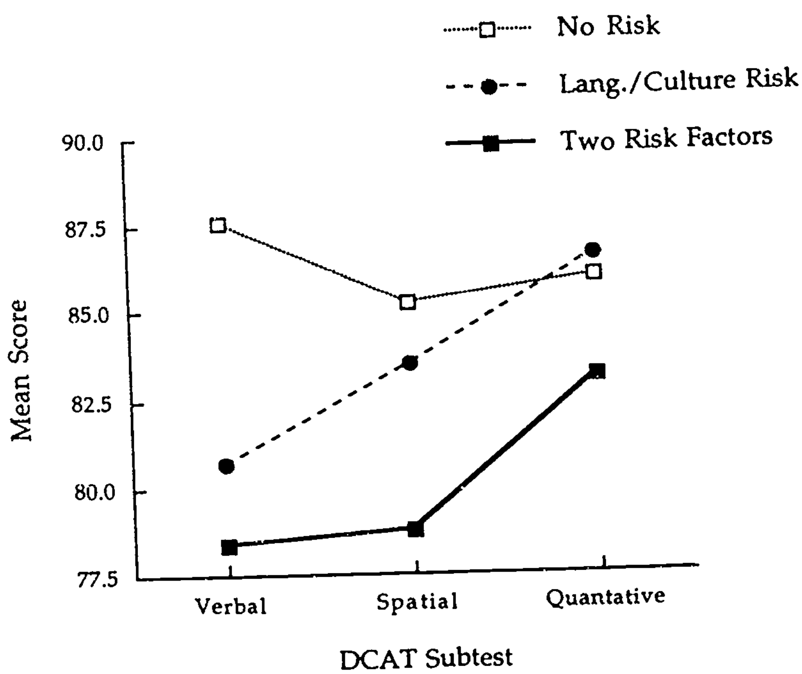
These results are qualified, however, by a significant Risk X IQ Score interaction, $F(2, 4338) = 14.10, p < 001$,illustrated in Figure 2. As confirmed by Newman Keul's post-hoc multiple comparisons, children with no risk had significantly higher VIQ scores ($M = 136.17, SD = 8.61$) than children with only a Language / Culture risk factor ($M = 134.52, SD = 10.10; p < .05$) or children with two risk factors ($M = 133.94, SD = 9.09; p < .05$). The PIQ scores, however, evidenced a reverse pattern in that PIQ scores were significantly lower ($p < .05$) for children with no risk factors ($M = 132.56, SD = 9.05$) than children with only a language/culture risk factor ($M = 134.67, SD = 8.89$). Lastly, a significant difference between VIQ and PIQ ($p < .05$) was found for children with no risk factors.

Figure 2: Risk level by WISC- R IQ score interaction.



Data for the DCAT were originally collected as percentile scores. These scores were converted to Z-scores and analyzed in a 3 (Risk Level) X 3 (DCAT Score: Verbal, Spatial, Quantitative) repeated measures ANOVA with repeated measures on DCAT Score. For ease of comprehension means, standard deviations, and figures are reported in Table 1 in terms of percentiles. There were significant main effects for Risk Level, $F(2, 1340) = 20.78, p < .001$, and DCAT Score, $F(2, 2680) = 7.44, p < .001$. Newman Keul's post-hoc comparisons showed significant differences between no risk children and those with a language/culture risk ($p < .01$) or a two risks ($p < .01$). Comparisons for the main effect of DCAT scores indicated that the spatial subtest scores were significantly lower ($p < .05$) than both the verbal and quantitative subtests.

Figure 3: Risk level by DCAT subtest score interaction.



The Risk X DCAT Score interaction was also significant, $F(6, 2680) = 9.09, p < .001$. Figure 3 illustrates this effect. As confirmed by Newman-Keuls post hoc multiple comparisons, children with two risks were impaired on all three DCAT measures of academic aptitude relative to children with no risk factors ($p < .05$). Additionally, those with only language/culture risk were significantly lower in verbal and spatial aptitude than the no risk group ($p < .05$). Lastly, the language/culture risk group scored significantly higher in spatial aptitude ($p < .05$) than those with two ris.cs.

Table 1
Means and Standard Deviations of Z-Scores and Percentiles for the DCAT

	DCAT Verbal		DCAT Spatial		DCAT Quantative		Marginals	
	Z (*SD*)	Percentile (*SD*)	Z (*SD*)	Percentile (*SD*)	Z (*SD*)	Percentile (*SD*)	Z (*SD*)	Percentile (*SD*)
No Risk*	1.39 (0.78)	87.56 (12.90)	1.23 (0.76)	85.20 (15.87)	1.28 (0.70)	85.95 (14.69)	1.30 (0.73)	86.24 (14.48)
Lang/Cult Risk**	0.97 (0.81)	80.71 (18.43)	1.03 (0.86)	83.50 (18.05)	1.24 (0.77)	86.57 (15.72)	1.08 (0.81)	83.58 (17.40)
Lang/Cult + Another Risk***	0.89 (0.88)	78.37 (20.65)	0.88 (0.89)	78.72 (21.80)	1.14 (0.79)	83.11 (20.44)	0.97 (0.85)	80.09 (20.96)
Marginals	1.35 (0.78)	85.57 (15.21)	1.25 (0.77)	84.24 (17.06)	1.32 (0.73)	85.71 (15.61)		

* $n = 1331$
** $n = 305$
*** $n = 329$

For those with no risk factors, verbal scores were significantly higher than spatial (p <.01) and quantitative scores. Children with a language/culture risk factor demonstrated the same pattern as children with two risk factors in that verbal scores for both groups were significantly depressed compared to their quantitative scores ($p < .05$). Additionally, for the group with two risk factors, quantitative scores were significantly higher than spatial scores.

Data for CTBS Scores were analyzed in a 3 (Risk Level) X 3 (CTBS Score: Total Language, Total Reading, Total Math) repeated measures ANOVA with repeated measures on CTBS Score. As with the previous ANOVA's, there were significant main effects for Risk Level, F (2, 879) = 9.44, $p < .001$, and CTBS Score, F (2, 1758) = 103.16, $p < .001$. The Risk Level by CTBS Score interaction was also significant, F (4, 1758) =3.49, $p < .01$.

The main effect for Risk Level showed that children with no risk factors ($M = 7.89$, $SD = 1.05$) performed at a significantly higher level ($p < .05$) than those with two risk factors ($M = 7.56$, $SD = 1.21$). The main effect for CTBS showed that CTBS Total Math Scores ($M = 8.25$, $SD = 1.05$) were significantly higher ($p < .01$) than both Total Reading ($M = 7.52$, $SD = 1.08$) and Total Language scores ($M = 7.68$, $SD = 1.10$).

Figure 4: Risk level by CTBS subtest score interaction.

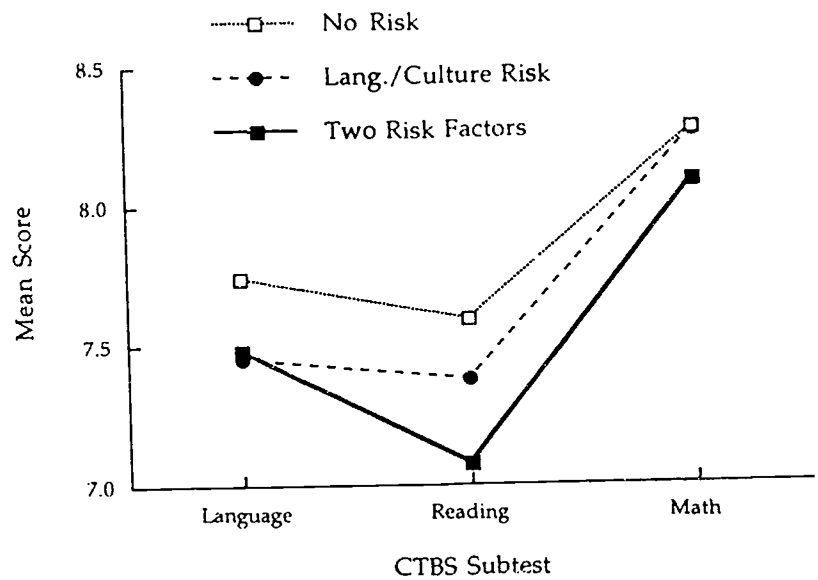


Figure 4 illustrates the Risk Level X CTBS Score interaction. As confirmed by Newman-Keuls post hoc multiple comparisons, both language (M = 7.45, SD = 1.20) and reading subtest scores (M = 7.38, SD = 1.08) were significantly (p < .05) depressed for the language/culture risk factor group when compared to the no risk group (language: M = 7.74, SD = 1.07; reading: M = 7.59, SD = 1.05). Children with two risk factors had significantly (p < .05) reduced scores in all three areas of achievement (language: M = 7.48, SD = 1.19; reading: M = 7.07, SD = 1.36; math: M = 8.08, SD = 1.08) when compared to the no risk group (math: M = 8.27, SD = 1.05). Children in the no risk group and the two risk group differed significantly in all three areas of achievement (p < .01). Math achievement was the highest, followed by language, then reading achievement scores. For children in the language/culture group, math scores were significantly higher than the language and reading scores (p < .01).

Discussion

We evaluated a large sample of gifted children across three levels of risk: no risk, language/ culture risk only, and two risk factors (as evidenced by a language/culture risk plus one additional risk factor). The children were compared in terms of their pattern of intelligence test scores (i.e., for the VIQ and PIQ of the WISC-R), academic aptitude (DCAT), and academic achievement (CTBS).

Children with only language/culture as a risk factor consistently showed disadvantage, when compared to children with no risk, in verbal domains as opposed to nonverbal. These children showed slightly lower Verbal IQ scores and slightly higher Performance IQ scores than the no risk group. They additionally demonstrated their highest aptitude and achievement scores in the quantitative/math area, while performing below the no risk group in areas of verbal aptitude, language achievement, and reading achievement. From these data, it appears that children who are in the process of becoming bilingual demonstrate their giftedness through performance based tasks, such as quantitative/math type skills, in order to compensate for their verbal disadvantage. This finding is consistent with the theory that children in the process of becoming bilingual practice working with abstract symbol systems because they must switch language codes depending upon the given situation (Dash & Mishra, 1988; Reynolds, 1991). Consequently, these children have an advantage in the quantitative/math area, since the study of these subjects is simply another abstract symbol system.

Children with two risk factors demonstrated the same pattern of test scores as the language/culture risk children. The results are more devastating for the high risk group, however, because their scores were even more depressed compared to the no risk children.

Overall, the data indicate that language/culture acts as a significant risk factor for those children evaluated for gifted education. Because of limited English skills when tested, these children may often be excluded from programs in which they would excel if they were competent in classroom English. These data support Cummin's (1976) subtractive hypothesis that while these children are becoming competent in English, their bilingualism hinders the complete expression of their abilities. The language/culture risk children who were certified gifted with the WISC-R in this sample might actually be expected to show improvements in their IQ scores once English proficiency is obtained, given the generally high Performance IQs. There may be an even larger number of children who have been excluded from gifted education because their Performance IQs could not compensate for their current level of Verbal IQ performance, when verbal tests such as the WISC-R are used as the criterion for giftedness.

Children who are not native English speakers in the U.S. are often at a disadvantage in the educational system because of their lack of verbal proficiency. Present data indicate, however, that the strengths of these children can be found in nonverbal areas. The data also highlight the special needs and vulnerabilities that children with language risk have in all areas of verbal ability. Are these strengths and weaknesses only indicative of an English language deficiency, or are there additional variables, perhaps involving cultural discrepancies, that account for the language/culture risk group's patterns of test results? Once fluency is obtained in English for these at risk children, do their test patterns more closely resemble these of no risk children? Further research is needed to shed light on these questions.