

Racial-Group Differences in IQ in the Minnesota Transracial Adoption Study: A Reply to Levin and Lynn

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The etiology of racial differences in intelligence and achievement is one of the most heated areas of social science research. In this article, we respond to criticisms by Levin and Lynn of our 1992 follow-up study of IQ and achievement in a sample of transracial adoptees and their families, in particular to their assertion that our results provide strong support for a genetic etiology underlying racial differences in measured intelligence. In that follow-up, as well as in publications from the original study (Scarr & Weinberg, 1976, 1977), we argued for beneficial effects on transracial adoptees' IQs and achievements due to being raised in white, upper-middle-class homes.

In this article, we address a number of issues raised in Levin's and Lynn's critiques, including the magnitude of adoptee racial-group differences in IQ and achievement, the inclusion of white and Asian/Indian adoptee groups in such analyses, the confounding of important early environmental influences with race differences, the confusion of within-group and between-group influences on IQ, the regional U.S. differences in African-American norms for IQ and achievement, the effects of renormed IQ tests on adoptee group differences, and the nature of the available evidence regarding a genetic hypothesis for racial differences in intelligence. We argue that, contrary to Levin's and Lynn's assertions, results from the Minnesota Transracial Adoption Study provide little or no conclusive evidence for genetic influences underlying racial differences in intelligence and achievement.

Racial-group differences in intelligence and achievement are often observed but seldom explained to anyone's satisfaction. A variety of etiological speculations have been offered to explain such differences. These have included *environmental* factors, such as the pervasive effects of poverty (Jensen, 1977), institutional racism (Jencks, 1992), and limited access to aspects of the mainstream culture

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indexed by IQ tests (Scarr & Weinberg, 1976; Weinberg, Scarr, & Waldman, 1992), and *genetic* factors. Regardless of the true etiological influences underlying racial-group differences in IQ (and authors' differing positions thereon), results of a number of studies suggest that U.S. whites score on average approximately 1 standard deviation (i.e., about 15 points) higher than African-Americans on IQ tests (see reviews by Brody, 1992; Loehlin, Lindzey, & Spuhler, 1975).

During the 1970s, we (Scarr & Weinberg, 1976, 1977) began the Minnesota Transracial Adoption Study to examine the malleability of intelligence and achievement among black and interracial adopted children as a function of an extreme environmental intervention, namely being raised in white, upper-middle-class homes. In our original report from this study (Scarr & Weinberg, 1976) we demonstrated that, as a function of this rearing environment, black and interracial adoptees showed higher IQ and school achievement than one would expect if they had been raised in the black community. We further argued that these increases in IQ and achievement were predominantly a function of growing up in a culture relevant to the tests and the schools (e.g., pp. 726, 737) and that such malleability was evidence against genetically based limits on intellectual potential in blacks relative to white (p. 727). In 1992 we (Weinberg et al., 1992) published a 10-year follow-up of results for IQ and achievement in these adoptees and claimed that the benefits of the rearing environment seen in childhood were largely maintained when the adoptees were adolescents and young adults.

In this article, we respond to comments by Levin and Lynn on our 1992 article. Their comments are an occasion to highlight and expand upon aspects of that report, to present new data and analyses that bear on the comments and criticisms that Levin and Lynn raise, and to critically evaluate their assertion that results of the Minnesota Transracial Adoption Study support a predominantly genetic etiology for racial differences in intelligence and achievement.

TERMINOLOGY

Levin begins his commentary by attempting to clarify and characterize various positions on the etiology of racial differences in intelligence that researchers hold. Specifically, Levin proposes a *hereditarianism–environmentalism* continuum, characterized at the extreme poles by the views that all between-race IQ differences are due to genetic between-race differences or to environmental between-race differences, respectively. We find this terminology problematic in several respects.

First, Levin's terms are, in our opinion, anachronistic caricatures that do not do justice to the more representative and complex positions that researchers actually hold on this issue. Although Levin (1994) suggests that the extreme position of environmentalism is advocated in "the popular and semitechnical polemical literature" (p. 14), he fails to cite any representative data on the views

of established scholars of IQ and individual and group differences. Such data do in fact exist. In their book, *The IQ Controversy: The Media and Public Policy*, Snyderman and Rothman (1988) surveyed a large number of such scholars regarding a variety of issues in intelligence testing. One of these issues concerned the etiology of black–white average group differences in IQ. Of those researchers who felt confident in expressing an opinion on this issue given the available research, 52% thought that these black–white IQ differences reflected at least some genetic influence, whereas only 15% believed these differences to be entirely environmentally based, and only 1% believed them to be entirely genetically based (cited in Seligman, 1992). These views are not well characterized by the terms *hereditarianism* or *environmentalism*, although they may be represented by their position on an hereditarianism–environmentalism continuum.

Second, whatever researchers' beliefs are regarding the etiology of racial-group differences in IQ, terms such as *hereditarianism* and *environmentalism* do not do justice to what is likely to be the true state of affairs in nature regarding the etiology of racial-group differences in IQ. We think that it is exceedingly implausible that these differences are either entirely genetically based or entirely environmentally based. The true causes of racial-group differences in IQ, or in any other characteristic, are likely to be too complex to be captured by locating them on a single hereditarianism–environmentalism dimension. Furthermore, such terms represent a qualitative shorthand for issues that are explicitly quantitative and should be expressed as such (Loehlin, 1992). We feel that terms such as *hereditarianism* and *environmentalism* blur important quantitative differences rather than increase their clarity.

OMISSION OF WHITE AND ASIAN/INDIAN ADOPTees FROM ANALYSES

Both Levin and Lynn rely heavily in their comments on comparisons between black and white adoptees. This is especially pronounced in their estimation of mean differences for IQ and achievement among the four offspring groups—biological offspring of the adoptive parents (hereafter referred to as the biological offspring), adoptees with two white birth parents (white adoptees), adoptees with one black and one white birth parent (interracial adoptees), and adoptees with two black birth parents (black adoptees)—which they see as relevant to testing hypotheses regarding the etiology of racial-group differences in IQ. In addition, Lynn chides us in his comment for not including the white adoptees in all analyses and implies that this calls into question the relation between the quality of adoptive rearing environment and IQ in the black and interracial adoptees.

In our follow-up paper (Weinberg et al., 1992), we limited the presentation of data on the white adoptees to their means and standard deviations on IQ and achievement measures for the simple reason that only 16 white adoptees had both childhood and adolescent IQ data. Given that the estimation of correlations and

regression coefficients is less precise than the estimation of means, we excluded white adoptees from correlational and regression analyses relating adoptees' IQs to variations in adoptive experiences and placements and to aspects of their adoptive homes.

In this context, both Levin and Lynn themselves make an interesting omission in their commentaries. Theories emphasizing a predominantly genetic etiology for racial group differences in IQ (e.g., Lynn, 1987; Rushton, 1988) not only rely on comparisons between groups of African and European descent, but also include groups of Asian descent, hypothesized to score higher than the others on IQ tests. Levin and Lynn should compare the average IQs not only of the black, interracial, and white adoptees, but also of the Asian/Indian adoptees. Specifically, genetic theories for racial-group differences in IQ would predict not only a sizable black-white average group difference for IQ, as both Levin and Lynn emphasize, but also that the Asian/Indian adoptees' mean IQ would be equivalent to or greater than the white adoptees' mean IQ. It is to these adoptee group comparisons that we now turn.

ESTIMATING THE MAGNITUDE OF ADOPTEE RACIAL GROUP DIFFERENCES IN IQ AND ACHIEVEMENT

As both Levin¹ and Lynn emphatically point out, the four offspring groups of European and African descent are ordered according to the predictions of a genetic theory of racial differences in IQ (viz., biological offspring > white adoptees > interracial adoptees > black adoptees). Furthermore, this is true for IQ measured during both childhood and late adolescence/early adulthood. Does this not, then, furnish compelling evidence to support genetic theories of racial differences in IQ? We do not think so.

An examination of the IQ means for the Asian/Indian adoptee group does considerable damage to such a theory. Instead of being equal to or greater than the means for white adoptees, the IQ means for the Asian/Indian adoptees (101

¹Levin devotes a fair amount of space in his commentary to recalculating effect sizes (i.e., the difference in two group means divided by an estimate of their pooled standard deviation, typically symbolized by *d*) for IQ between the adoptee groups. In these comparisons for IQ, Levin uses an estimate of the standard deviation that he derives by pooling data for all four adoptee groups. In contrast, in our effect-size estimates we pooled the standard deviations only for those groups that were being compared in a particular contrast. Levin's approach to deriving a pooled standard deviation implicitly assumes that the variances across the four adoptee groups are homogeneous. In order to investigate this assumption, we performed the Levene test (Appelbaum, 1989; Levene, 1960), a statistically robust method for estimating group differences in variance, for both childhood and adolescent IQ. Based on the results of these tests, the assumption of homogeneity of variance across the four groups appears to be tenable. The difference in Levin's and our approach to estimating the pooled standard deviation, which resulted in larger effect sizes in Levin's commentary than in our follow-up paper, represents legitimate statistical alternatives. We felt that pooling standard deviations for only those groups involved in a particular contrast was simpler and, hence, preferable.

during childhood and 96 during late adolescence/early adulthood; see Weinberg et al., 1992, Table 2) lie between those for the interracial and the black adoptee groups. It is difficult to reconcile this result with the predictions of genetic theories for racial differences in IQ.

ADOPTEE GROUP DIFFERENCES FOR IQ ARE CONFOUNDED BY GROUP DIFFERENCES IN EARLY ADOPTIVE PLACEMENT EXPERIENCES

The most damning evidence against many of the points raised by Levin and Lynn emerges from a consideration of the influence of early adoptive experiences on adoptees' childhood and adolescent IQ and from adoptee group differences in such experiences. Much of this evidence was presented in the original report of the study (Scarr & Weinberg, 1976), as well as in the follow-up paper (Weinberg et al., 1992). Race was so thoroughly confounded with differences in early experience that we reported regression analyses with two different orders of entry for the biological and social variables! It is difficult to imagine that Levin and Lynn missed the import of this confound.

Levin's and Lynn's commentaries rest largely on comparisons among adoptee group IQ means. The validity of such group comparisons is predicated on their being unbiased. The attribution of differences in childhood and adolescent IQ to differences in race per se, or (following Levin and Lynn) to genetic differences among racial groups, is legitimate only so long as the adoptee groups do not differ on other variables that themselves are causally related to IQ. Such was clearly not the case.

Both Levin and Lynn repeatedly emphasize that the rank ordering of adoptee-group means strongly supports a genetic explanation for racial group differences in IQ. They go further, in fact, to say that "this result is inexplicable in terms of environmental theory but is precisely what would be expected from genetic theory" (Lynn, 1994, p. 24) and "the hypothesis that best fits the data, rather, is that genetic variation between the races explains about 70% of the intelligence difference" (Levin, 1994, p. 17). Nonetheless, Levin acknowledges the importance of early adoptive experiences as potential environmental influences on IQ, but dismisses them because "time of adoption explained only 7% to 17% of the variance in adoptee test scores" (p. 16).

Given the importance of early adoptive experiences as potential confounders of adoptee-group differences in IQ, we present adoptee-group differences in early adoptive experiences in Table 1 and the relation of childhood and adolescent IQ to early adoptive experiences in Table 2.

A number of important findings represented in these tables deserve emphasis. First, the rank ordering of the white, interracial, and black adoptee groups on three of the four early adoptive experience measures exactly parallels their rank ordering for IQ. The white adoptee group had fewer and better quality preadop-

TABLE 1
Adoptee-Group Differences in Early Adoptive Experiences

Adoptive Experience Variable	White Adoptees	Interracial Adoptees	Black Adoptees	Asian/Indian Adoptees	η^2
Quality of Placement					
<i>M</i>	3.57	3.33	3.04	3.50	.11
<i>SD</i>	0.75	0.48	0.44	0.52	
<i>n</i>	21	63	27	12	
Number of Placements					
<i>M</i>	0.57	0.78	1.19	0.75	.05
<i>SD</i>	1.08	0.87	0.74	0.97	
<i>n</i>	21	63	27	12	
Time in Adoptive Home					
<i>M</i>	101.87	60.79	42.17	63.81	.36
<i>SD</i>	36.45	16.76	17.73	38.19	
<i>n</i>	23	67	29	21	
Age at Placement					
<i>M</i>	17.57	8.99	32.31	60.71	.27
<i>SD</i>	32.23	11.25	33.09	56.87	
<i>n</i>	23	67	29	21	

Note. η^2 represents the percentage of variance in the adoptive experience variable accounted for by adoptee-group differences. Adoptee-group samples sizes differ due to missing data.

TABLE 2
The Relation of Childhood and Adolescent IQ to Early Adoptive Experiences

Adoptive Experience Variable	Childhood IQ					Late Adolescent IQ				
	<i>r</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>
Quality of Placement	.46	< .001	6.99	2.89	.017	.34	< .001	6.54	2.96	.029
Number of Placements	-.40	< .001	-1.23	2.01	.541	-.26	.003	-0.35	2.06	.864
Time in Adoptive Home	.37	< .001	0.13	0.05	.004	.19	.024	0.05	0.05	.277
Age at Placement	-.36	< .001	-0.12	0.05	.021	-.15	.068	-0.02	0.05	.721
<i>R</i> ²	.32					.13				
<i>N</i>	106					106				

Note. *r* refers to the zero-order Pearson correlation between childhood or late adolescent IQ and an adoptive experience variable; *b* refers to the unstandardized partial regression coefficient for the relation between childhood or late adolescent IQ and an adoptive experience variable; *SE* refers to the standard error of the unstandardized partial regression coefficient for the relation between childhood or late adolescent IQ and an adoptive experience variable; *p* refers to the significance of the correlation or the unstandardized partial regression coefficient for the relation between childhood or late adolescent IQ and an adoptive experience variable; *R*² refers to the percentage of variance in childhood or adolescent IQ accounted for by all four adoptive experience variables.

tive placements and were in their adoptive homes longer than the interracial adoptee group, who in turn had fewer and better quality preadoptive placements and were in their adoptive homes longer than the black adoptee group. The interracial adoptees were placed earlier than the white adoptees, who, in turn, were placed earlier than the black adoptees. The adoptee-group comparisons for all four of the adoptive experience variables were significant and explained a moderate to large percentage of IQ variance. Similar results were obtained when the Asian/Indian adoptive group was added to the analyses. In addition, with the exception of age at placement, the Asian/Indian adoptee group was most similar to the interracial adoptee group on the adoptive experience variables, roughly paralleling their rank ordering on the IQ variables.

Second, contrary to Levin's dismissal of the relation between early adoptive experiences and IQ, the four adoptive experience variables together explain a substantial and significant percentage of the variance in IQ, during both childhood (32%) and late adolescence (13%).² As we highlighted in our follow-up paper, early adoptive experiences appear to have substantial effects on IQ during childhood and, surprisingly, appear to have continued moderate effects on IQ even into late adolescence and early adulthood. In addition, in Table 2 the relations between the early adoptive experiences and IQ are presented for all adoptee groups combined (*viz.*, white, interracial, black, Asian/Indian), in order to address Lynn's concern regarding such findings being limited only to the black and interracial adoptees. Although Lynn asked for these correlations separately by adoptee group, the number of adoptees with data on both IQ and the adoptive experience variables (*i.e.*, 13 white adoptees, 7 Asian/Indian adoptees) was too small to estimate these correlations reliably. The correlations in Table 2 are similar to those in Table 3 in Weinberg et al. (1992), demonstrating that inclusion of the white and Asian/Indian adoptees does not materially alter the relations between early adoptive experiences and IQ.

Given the adoptee-group differences in early adoptive experiences and the relation of these, in turn, to both childhood and adolescent IQ, a sensible next step is to examine adoptee-group differences in IQ after controlling for the effects of early adoptive experiences. Analyses of covariance revealed only a statistical trend for differences among white, interracial, and black adoptee groups at both time points³: for childhood IQ, $F(2, 74) = 2.93$, $p = .060$, $\eta^2 = .07$; for adolescent IQ, $F(2, 74) = 2.82$, $p = .066$, $\eta^2 = .07$. Adoptee-group differences

²The regression analyses predicting childhood and adolescent IQ from the early adoptive experience variables were conducted using all adoptees, including 18 transracial adoptees who were not classifiable as black or interracial due to missing data on one birth parent's race. Very similar results were obtained when only the 88 adoptees that were classifiable into the four adoptee groups were included in the analyses, as early adoptive experiences explained 34% of the variance in childhood IQ and 13% of the variance in adolescent IQ.

³For comparability with our follow-up paper and the commentaries, these analyses were conducted only for those subjects with IQ data at both time points.

accounted for 29% of the IQ variance in childhood and 14% of the IQ variance in adolescence before partialing out the confounding effects of early adoptive experiences from the relation between race and IQ. After partialing, differences among the three adoptee groups accounted for substantially less variance in IQ: 22% less during childhood and 7% less in adolescence.

Similar results were obtained when the Asian/Indian adoptees were included in the analyses, with the exception that the adoptee-group difference was significant for childhood IQ: for childhood IQ, $F(3, 80) = 3.73, p = .015, \eta^2 = .12$; for adolescent IQ, $F(3, 80) = 2.58, p = .059, \eta^2 = .09$. Once again, the percentage of IQ variance accounted for by adoptee-group differences was diminished after partialing: by 18% during childhood (from 30% to 12%) and by 4% in adolescence (from 13% to 9%).

A number of authors (e.g., Loehlin et al., 1975) have posited that the most plausible candidates for environmental variables that cause *between-group* differences in IQ are those that are related to *within-group* differences in IQ. Hence, it may be implausible to expect differences in early adoptive experiences to account for *between-group* differences in IQ, unless they are related to individual differences in IQ *within* each adoptee group. To address this issue, we repeated the analyses of covariance just discussed but examined the effects of the early adoptive experience variables after controlling for adoptee-group differences in IQ. This is a stringent test of the relation between the early adoptive experience variables and IQ, for not only is it examining this relation within adoptee groups, but it is also removing any effects of early adoptive experiences on IQ that are due to being in one racial group or another. For example, complex causal pathways such as black adoptees relative to white adoptees having more and lower quality preadoptive placements that may exert detrimental effects on intellectual development would be removed by controlling for adoptee-group differences in IQ.

Analyses of covariance suggested that the early adoptive experience variables were related to IQ even after controlling for IQ differences among the four adoptee groups: for childhood IQ, $F(4, 80) = 4.33, p = .003, \eta^2 = .18$; for adolescent IQ, $F(4, 80) = 2.09, p = .090, \eta^2 = .09$. Early adoptive experiences accounted for 37% of the IQ variance in childhood and 14% of the IQ variance in adolescence before partialing out adoptee-group differences in IQ. After partialing, the early adoptive experience variables accounted for substantially less variance in IQ—19% less during childhood and 5% less in adolescence—suggesting that there was considerable overlap between adoptee-group membership and early adoptive experiences in explaining IQ variance at both time points. Similar results were obtained when these analyses of covariance were conducted for only the white, interracial, and black adoptee groups: for childhood IQ, $F(4, 74) = 4.75, p = .002, \eta^2 = .20$; for adolescent IQ, $F(4, 74) = 1.30, p = .277, \eta^2 = .07$, except that the relation between early adoptive experiences and adolescent IQ was now nonsignificant instead of a statistical trend.

It is important to emphasize that results of the first set of covariance analyses

discussed in no way *prove* that the observed racial-group differences in IQ are due in large part to group differences in early adoptive experiences, but the results are *consistent* with such a hypothesis. The results also are consistent with the hypothesis that, for whatever reasons, being white, interracial, black, or Asian/Indian causes adopted children to have vastly differing early life experiences that exert strong influences on their intellectual development.

As we have stressed repeatedly, however, it is impossible to draw strong inferences from these data regarding environmental effects, because the adoptive experience variables are confounded with differences among birth parents in race and educational level. In both the original and the follow-up papers, we emphasized that these results are consistent with a number of different causal models. The results are *not* consistent with Levin's and Lynn's perspectives, however, unless one is willing to assume that the genetic differences purported to cause IQ differences among the adoptee groups also cause differences in early adoptive experiences, or that such differences in early adoptive experiences have no causal effects on IQ. We find these assumptions tenuous.

CONFUSION OF WITHIN-GROUP AND BETWEEN-GROUP HERITABILITY STATISTICS

We think that there is some danger of confusion inherent in Levin's (1994) terminological analogy of H^2 , which he uses "to denote the proportion of the variance between races in IQ that is explained by between-race genetic variation" (p. 13), with h^2 , commonly used in the behavior genetics literature to symbolize "the proportion of variance between individuals [*within a single population*] in IQ explained by genetic variation" (p. 13, emphasis added). Indeed, our fear is borne out, as Levin proceeds to blur the important distinction between within-group and between-group heritability statistics. On page 17 of his commentary, Levin presents a set of chimerical and misleading mathematical arguments whose object is to demonstrate the close correspondence of H^2 estimated from our transracial adoption study data to h^2 estimated from twin studies of IQ.⁴ This attempt simply does not wash.

Although methods for examining the equivalence of group and individual differences *within a single population* have recently been elaborated (Turkheimer, 1991), and the comparability of the relations between environmental variables and developmental outcomes across different ethnic groups has recently been demonstrated (Rowe, Vazsonyi, & Flannery, 1994), the fact remains that within-population estimates of genetic and environmental influences on individual differences in IQ do not necessarily speak to the role of such influences in

⁴In his efforts to demonstrate such a correspondence, Levin actually makes the mistake of squaring the percentage of black-white intelligence differences that he proposes are due to genetic racial differences (70%) in order to coincide with an estimated h^2 for IQ of 50%. This quantity should not be squared, as it is already expressed as a percentage of variance.

causing between-population differences in IQ. This point has been highlighted frequently in the previous literature on racial differences in IQ (e.g., Loehlin et al., 1975), and we are not aware of any new developments that would diminish its relevance to this issue.

THE ROLE OF SECULAR TRENDS IN INTELLIGENCE IN ADOPTEE-GROUP DIFFERENCES IN IQ

A number of recent reviews have documented dramatic secular increases in the IQs of Americans and individuals living in other economically well-developed countries from the 1930s (Flynn, 1984) to the present (Teasdale & Owen, 1989). Although well-documented, the causes thought to underlie this secular increase are still in dispute but include improvements in nutrition (Lynn, 1990) and education (Teasdale & Owen, 1989) and increases in test sophistication (Flynn, 1984).

In his commentary Lynn takes us to task for not correcting adoptees' IQs for secular increases occurring since publication of the IQ test norms and uses this to assert that adoption into white upper-middle-class families did not raise the IQs of adoptees as we had contended. We felt that a first presentation of the follow-up data from this study was most appropriately made using the unadjusted IQ data. Due to the fact that IQ declined for most individuals in the study, we felt that a test, albeit indirect, of the continued benefits of the rearing environment on IQ would be afforded by comparing IQ decline in the transracial adoptees to that in the biological offspring. The groups did not differ in IQ decline, leading us to the conclusion that IQ gains in the adoptees were largely maintained at follow-up.

Although we agree with Lynn that IQ scores should be adjusted for secular increases, we think that such corrections should be made at the individual level by taking into account both the particular IQ test on which the individual was assessed and the time elapsed between the year of the testing and the year of the test's norming. Adjusting IQ scores at the group level, as Lynn did in his commentary, is problematic, for this obscures the fact that different IQ tests, each with different norming dates, were used to assess individuals in the adoptee groups. We also believe that Lynn was too dismissive of the statistical test of the group difference in IQ decline, given that the two measurement periods were the same for all groups. In a subsequent paper, we intend to reexamine adoptee-group differences in IQ adjusted for secular increases particular to each IQ measure, using conversions to a common IQ metric provided by Flynn (1984).

ARE ALL THE CHILDREN IN LAKE WOBEGON REALLY ABOVE AVERAGE?

Lynn also questions our conclusion that the adoptive rearing environment raised adoptees' IQ and academic achievement because we did not correct for U.S.

regional differences in IQ and achievement among African-Americans. As we reported (Scarr & Weinberg, 1976), 68 of the adoptees were born outside of Minnesota. Lynn is correct in stating that most adoptees were born in the North Central and Northeast regions of the U.S. A number of studies (e.g., Kaufman & Doppelt, 1976) have documented higher IQ and achievement in African-American children living in the North Central and Northeast regions of the U.S. than in other parts of the country. The reasons for the regional differences in African-Americans' IQ and achievement are not clear and could include advantageous environmental influences on IQ in the North Central and Northeast relative to other regions of the U.S., as well as differential migration of individuals that might lead to genetic population differences that, in turn, could influence IQ. These differing possibilities make it especially important to correct for the effects of regional variation in IQ at the individual level in conducting reanalyses of adoptee-group differences, which we will present in a subsequent paper.

As we also documented, the mean educational level of the white biological mothers of the interracial adoptees was average for the North Central region of the U.S., whereas the mean for black biological fathers of the transracial adoptees was slightly above average and the mean for black biological mothers was a year below the average of black women in this area of the country. Individuals' IQ scores are, of course, better predicted by information on their birth parents than by information on the average characteristics of the populations from which the birth parents come.

THE NATURE OF HYPOTHESES AND EVIDENCE REGARDING RACIAL-GROUP DIFFERENCES IN IQ

In this section, we briefly summarize some of the points made earlier and evaluate more generally Levin's and Lynn's claims that results from the transracial adoption study best support a genetic etiology for racial differences in IQ. First, we do not agree that results from the Minnesota Transracial Adoption Study fail to demonstrate beneficial effects of adoptive rearing environments on adoptees' IQ and achievement. We maintain that such effects were clear in the original paper when the adoptees were children and that evidence from the follow-up study showed beneficial effects when the adoptees were in late adolescence/early adulthood. We also acknowledge that the evidence for this claim in adolescence was indirect and needs to be reevaluated using more direct adoptee-group comparisons after adjusting adoptees' IQs for secular changes and regional differences in intelligence.

Second, in evaluating our follow-up results, Levin and Lynn both ignore crucial data that were in fact presented in papers from the follow-up and the original studies. Both authors fail to mention the IQ data for the Asian/Indian adoptee group, although these data bear importantly on the etiology of racial differences in IQ. Levin and Lynn also fail to adequately consider the relations

between early adoptive experiences and childhood and adolescent IQ. Despite their dismissive attitude regarding the effects of such influences, early adoptive experiences explained a substantial percentage of variance in IQ during childhood and a moderate percentage during adolescence. Most importantly, the adoptee groups differed substantially on the early adoptive experience measures in ways that paralleled their differences on the IQ measures. This is in stark contrast to Levin's (1994) statement that the white and black adoptees differed by about 1 standard deviation in adolescent IQ despite being "raised from birth in the same (unusually favorable) environments" (p. 16). These findings do significant damage to Levin's and Lynn's hypotheses regarding a predominantly genetic etiology for racial group differences in IQ.

Third, in judging the effectiveness of adoptive rearing environments for raising transracial adoptees' IQ and achievement, it is natural to compare their means to the appropriate population means. There is an inherent asymmetry involved in such comparisons, though, that must be recognized. Whereas positive rearing environment effects are suggested when the adoptee means are greater than the relevant population means, the absence of such effects is not necessarily suggested when the adoptee means are equal to or less than the relevant population means. This is because there is a fundamental difference between the adoptees and the children in the relevant populations reared by their birth parents. Simply by virtue of being adoptees, children are likely to have early life experiences (e.g., a number of preadoptive placements that may be of less than optimal quality, relatively late placement into the adoptive home) that could exert deleterious effects on their IQ and achievements. As we have demonstrated earlier, black and interracial adoptees are more likely to have such experiences than are white adoptees. It is therefore possible for adoptive rearing environments to have beneficial effects on adoptees' IQ and achievement but also for these effects to be countervailed by negative early adoptive experiences. This poses a formidable problem for the comparison of adoptee means to the means of children in their relevant populations.

Fourth, Lynn and Levin ignore completely the fact that transracial adoptees are socially classified as minority group members, despite their white adoptive families. In schools, neighborhoods, and communities, these adolescents and young adults are not considered members of the dominant culture. Effects of racism were not directly measured in this study, but the IQ and achievement results are consistent with racially based environmental effects in the order of group means and in the correlations with birth parents' racial characteristics.

Fifth, Levin and Lynn rely on a peculiar kind of logic to assert the importance of genetic influences on racial differences in IQ. Rather than offering any positive evidence indicative of genetic influences underlying the adoptee-group differences, Levin and Lynn attempt to gather a lot of negative evidence regarding environmental influences on adoptee-group differences. Indeed, Lynn (1994) states "If it [the adoptive rearing environment] failed to raise the IQs of black

children, the result would indicate the importance of genetic factors" (p. 26). The result could also indicate the effects of other environmental influences such as the pervasive effects of racism in American life.

One cannot demonstrate the validity of a scientific hypothesis by default. For example, if the results of several studies indicated the failure of environmental interventions to raise the IQs of children with fetal alcohol syndrome, we would not take this as evidence for a genetic etiology of fetal alcohol syndrome. The same caution should apply in investigations of the etiology of racial-group IQ differences, a point that has been emphasized in the past (e.g., Mackenzie, 1984).

Finally, we believe that there is evidence in the Minnesota Transracial Adoption Study for the malleability of IQ and achievement when children are reared in a culture that is especially relevant to the tests and schools. As children, socially classified black adoptees, with two black birth parents or one, scored about 10 points above black children reared in the black community. As adolescents, they still outscored their social counterparts in the black community. Even clearer results were found for academic achievement. On school-administered tests, the adolescent and young adult transracial adoptees scored at the average for the white population and far above their counterparts in the black community. Their grades and class ranks were correspondingly higher than those of black students in general. We see these results as evidence for the benefits of rearing environments provided by the adoptive families.

CONCLUSIONS

Although it is not possible to reach definitive conclusions regarding the follow-up IQ test performance of transracial adoptive family members and a complete review of studies pertinent to the etiology of race differences in IQ is beyond the scope of this reply, we will conclude by summarizing the etiological positions that can be held, given the evidence from this study, and by integrating these results with those of other studies.

A number of positions may be held regarding the etiology of racial differences in IQ, but two are most pertinent to Levin's and Lynn's comments and our reply. The first position, advocated by Levin and Lynn, proposes that racial differences in IQ are predominantly genetically based, as suggested by the mean IQ differences among the black, interracial, and white adoptee groups in this study. The second position, which we feel is more consistent with both our data and those of other studies, proposes that racial differences in IQ are predominantly environmentally based, as suggested by the adoptee-group differences in IQ paralleling the group differences in early adoptive experiences, the relation of early adoptive experiences to both childhood and adolescent IQ, and the IQs of the Asian/Indian group falling between those of the interracial and black adoptee groups rather than at or above the level of the white adoptees. Other more complex positions

involving genotype-environment correlation (e.g., Loehlin & DeFries, 1987) and genotype-environment interaction (e.g., Waldman, Weinberg, & Scarr, 1990) for IQ may be held but are beyond the scope of this reply. It is also worth noting that the relation of early adoptive experiences to IQ may have limited generalizability to the general population, of which adoptees comprise only a small fraction. Although the early adoptive experiences important in this study may have some analogues for children in the general population (e.g., multiple caretakers, poor pre- and perinatal care, parents largely absent from the home for extended periods), any generalizability must be demonstrated and not presumed.

Although a number of positions may be held given the present data, we do not agree with Lynn (1994) that the follow-up study of the transracial adoptive family members "has provided important new evidence differentiating the environmental and genetic hypotheses, and the results provide strong support for the genetic position" (pp. 26-27). Our findings do not speak directly to genetic and environmental etiologies of racial differences in IQ, both because of confounding between racial background and adoptive experiences and because the results of interventions are not necessarily informative regarding causes as they exist in nature. We believe that transracial adoption studies may be quite effective at demonstrating malleability of IQ and achievement in adoptees due to the effects of adoptive rearing environment. Nonetheless, we are much less optimistic regarding the ability of such designs to disentangle genetic and environmental influences on racial differences in IQ. Surely it is as important to understand what a study cannot demonstrate or resolve as it is to appreciate its novel and important findings.

It also is useful to consider how the present results compare with those of some other studies that are informative, though not conclusive, regarding the etiology of racial differences in IQ. In another transracial adoption study, Moore (1986) found that black adoptees' IQs were higher if they were raised by white, rather than black, adoptive parents and that the group difference was related to differences in mother-child interactional style surrounding cognitive tasks. Although the two groups differed in their composition of black and interracial adoptees, the differences in mean IQ between the black and interracial adoptees within each group were nonsignificant. Combining across both groups, the mean IQ of interracial adoptees was 5.1 points higher than for black adoptees, whereas the mean IQ difference between the adoptive groups was 13.5 points.

More direct tests of a genetic etiology for racial differences in IQ are provided by racial admixture and racial crossing designs (Loehlin et al., 1975; Mackenzie, 1984). Studies of racial admixture and its relation to IQ (e.g., Scarr, Pakstis, Katz, & Barker, 1977) have been conducted in which the degree of African and European ancestry estimated from blood markers has been related to IQ in African-Americans. These studies have shown near-zero correlations between degree of African or European ancestry and IQ. Studies comparing mean IQ in mixed-race children with mean IQ for black and white children also have been conducted. In a German study of the IQs of children of unwed white mothers (Eyferth, 1961, as cited in Mack-

enzie, 1984), the mean IQ of children with black fathers did not differ from the mean IQ of children with white fathers (96.5 vs. 97.2). Although studies of both types have their methodological shortcomings and are in need of replication, results from these studies provide no support for a genetic etiology for racial differences in IQ. Levin and Lynn ignore the findings of such previous studies in their arguments for a genetic etiology for racial differences in intelligence. We feel that the balance of evidence, although not conclusive, favors a predominantly environmental etiology underlying racial differences in intelligence and that the burden of proof is on researchers who argue for the predominance of genetic racial differences.

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