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Intellectual Resemblance Among Adoptive and Biological Relatives: The Texas Adoption Project

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Intellectual and personality measures were available from unwed mothers who gave their children up for adoption at birth. The same or similar measures have been obtained from 300 sets of adoptive parents and all of their adopted and natural children in the Texas Adoption Project. The sample characteristics are discussed in detail, and the basic findings for IQ are presented. Initial analyses of the data on IQ suggest moderate heritabilities. Emphasis is placed on the preliminary nature of these findings.

KEY WORDS: intelligence; heritability; adoption; cognitive abilities.

INTRODUCTION

The adoption method is one of the most powerful techniques for estimating the relative importance of genetic and environmental influences in intellectual development. Parents who rear their own children provide them with both genes and environment. Consequently, parent-child resemblance in IQ could be due to shared genes, shared environment, or a combination of the two. Adoptive parents provide only the environment for their adoptive children, and any resemblance between these parents and children can only be due to environmental factors. Since the biological parents of children given up for adoption provide their children only with genes, any resemblance between members of these parent-child pairs must be due to the genes they have in common.

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In theory, the adoption method can achieve a clear separation of genetic and environmental influences and allow for the direct measurement of their respective effects. In practice, however, there are a number of common threats to the validity of adoption designs. Delayed separation of biological parents from their adopted-away children and matching of biological and adoptive parents on certain chacteristics (selective placement) both build in an unwanted correlation between genetic and environmental factors which can bias heritability estimates (Wender *et al.*, 1973; Mednick and Hutchings, 1977). Delayed separation of biological parents from their adopted-away children is of special concern if there is reason to believe that the early years are particularly important for the development of the trait under study. Previous adoption work (Skodak and Skeels, 1949) suggests a substantial role for early environment (0–2 years) in increasing the average IQ of adopted children. This evidence argues in favor of setting birth as the required time for separation if the internal validity of the adoption design is to be preserved. None of the previously reported adoption studies in the area of intelligence meets this admittedly stringent criterion. Leahy (1935) and Skodak and Skeels (1949) used adopted children separated from their biological mothers as late as 6 months after birth while Burks (1928) and Scarr and Weinberg (1977, 1978) included some children separated at 12 months. The average age at adoption was 59 months in the Freeman *et al.* (1928) study.

Selective placement seems to be an integral part of every adoption agency's operating procedures. Most agencies try to find the right "match" between adoptive child and adopting parents. From the standpoint of preserving the validity of adoption designs, it is best if selective placement is based on traits unrelated to the trait of interest—in our case, intelligence. However, it is doubtful if selection of adoptive parents is ever entirely free of socioeconomic or other trait-relevant considerations, and the only satisfactory way of measuring selective placement and its effects would involve the calculation of the actual IQ resemblance between biological and adoptive parents. This requires test scores on both sets of parents, and no previously published adoption study has made adequate provisions for gathering these data. Burks (1928), Leahy (1935), and Scarr and Weinberg (1977, 1978) had no IQ data on biological parents of the adoptees while Skodak and Skeels (1949) and Snygg (1938) had biological mothers' IQs but no scores on the adoptive parents. Freeman *et al.* (1928) had IQ scores on adoptive parents but only on about 3% of the biological parents.

The major effect of selective placement is to raise correlations between parents (both adopted and biological) and the adopted children. We believe that the best way to make allowance for this is by adding a path for selective placement in a path analysis of the IQ correlations (Loehlin, 1978).

TEXAS ADOPTION PROJECT

The Texas Adoption Project was begun in 1973 soon after the discovery of an adoption agency that had routinely administered over 1000 IQ and personality tests to the unwed mothers in their care. The agency administered these tests in order to provide their clients with occupational and educational counseling. The test data were also used to provide adoptive parents with some general information concerning the background of their adoptive children.

Our plan was to locate as many of the children of the tested unwed (biological) mothers as possible and test them along with their adoptive parents, adopted siblings, and any natural children of the adoptive parents. In spite of the fact that IQ data on the biological fathers were not available, the successful implementation of this plan would result in the most extensive data yet gathered in an adoption format. Relative to previous adoption work, the particular strengths of the study would include (1) a substantially larger sample size with a resulting decrease in standard errors, (2) IQ data from both adoptive parents and biological mothers, (3) test scores on both natural and adopted children reared in the same family, and (4) the capability of combining different sources of data (biological parent with adoptive and natural children, related and unrelated children reared together, etc.) in a comprehensive path analysis that maximizes the amount of information that enters into estimates of genetic and environmental influences.

An unwed mother from the adoption agency was eligible to be included in our sample of biological mothers only if an IQ score was available for her in the files and she had been tested between 1963 and 1971. The first date was chosen because it marked the beginning of a period of relatively thorough testing of the unwed mothers with the same IQ test. The later date was chosen because only a few of the children born after 1971 would reach a testable age during our period of testing in 1973–1975.

For the years 1963–1971 a total of 1848 women gave their children up for adoption through this agency. A search of the files for this period showed that 1304 of these women had been given the Revised Beta Examination and 210 women were given the Wechsler Adult Intelligence Scale (WAIS) or the Wechsler Intelligence Scale for Children (WISC). Approximately 65% of the women given the WAIS or WISC were also tested with Beta, so that our final list of eligible unwed mothers came to 1381. Starting with this list, our sampling procedure began by having an agency employee find the mailing address of the parents who adopted the children of these tested unwed mothers. The next step was to contact the adoptive parents by mail and ask if they would allow one of our field representatives to visit their home and explain the study. These field representatives were a former director and former social worker for the agency, both of whom had been involved with the placement of most of the adoptive children with their adoptive parents. In order to reduce the logistical problems in subsequent testing we concentrated on contacting adoptive parents residing in or near the larger population centers of the state. Some residents of smaller towns were also contacted and visited if the travel plans of our field representatives permitted. If the parents agreed to have their entire family tested, the names and phone numbers were given to a licensed psychologist in their area for scheduling of the tests. All contact with the adoptive families was through adoption agency employees or the psychologists. The authors of this report received information and test results on the adoptive families and unwed mothers by code number only.

With the procedure outlined above we expected to be able to obtain test information from at least 442 adoptive families. This expectation was based on the assumption that we would be able to contact and secure the cooperation of the same proportion of adoptive parents as responded to a previous survey conducted by the agency. In 1966 questionnaires were sent to all parents who adopted children through the agency between 1953 and 1965. Of these questionnaires, 76% were returned to the agency. Seventy percent of the respondents were still residing in the state, with 60% of these residents living in communities of 100,000 or more population. Since we were primarily interested in contacting state residents in the larger population centers, we expected to be able to secure the cooperation of about 32% ($0.76 \times 0.70 \times 0.60$) of the 1381 parents on our list. This calculation yielded our expected number of 442 families. A total of 416 families were interviewed and agreed to be tested, but available funds restricted actual testing to 300 families.[2]

A few families we had not originally planned to contact ended up being tested because they heard of the study and called to volunteer. Another factor adding slightly to the number of families tested was the fortuitous correspondence of a family's place of residence with the travel plans of our field representatives.

On the other hand, some eligible families were not approached because of a variety of factors, including change of address, scheduling difficulties, or distance from a testing site. An additional factor reducing the number of families tested was the small proportion of parents adopting in 1971 whose adopted child had reached our minimum age of 3 for IQ testing. Most of our contacts with adoptive parents were initiated in 1973 and 1974, and

[2] The study population is overwhelmingly Caucasian. Less than 2% of the families are nonwhite.

more than two-thirds of the adopted children from 1971 were not eligible for testing at that time. These families were dropped from the study.

Table I gives the number of women admitted to the agency, by year, between 1963 and 1971, and also shows how many of these women each year completed their agreement with the agency and gave their children up for adoption. The number of mothers given at least one IQ test (the potential unwed mother population for our study) is also shown in the table. These figures can be compared to the adjacent column giving the number of tested unwed mothers who became part of our sample of unwed mothers when the adoptive parents of their children agreed to participate in the study. These data indicate that our sample of unwed mothers is composed of roughly proportional numbers of the unwed mothers tested each year. The only major exception to this comes from 1971, when most of the adopted-away children of the unwed mothers were too young to test. The last column of Table I shows the number of families who had agreed to participate in the study, but, for the reasons mentioned previously, were not tested. Again, our sample of unwed mothers has not been biased in favor of any year group of tested unwed mothers by our not being able to test 116 families.

Table I. Selection of Subjects for the Study

Year[a]	Number of unwed mothers admitted	Number of children adopted during year	Unwed mother population[b]	Unwed mother sample[c]	Number of participating families not tested
1963	197	163	99	27	3
1964	198	161	155	33	8
1965	203	182	88	44	10
1966	221	204	153	33	14
1967	222	193	122	45	16
1968	253	202	91[e]	43	16
1969	322	268	213	76	23
1970	296	254	260	51	19
1971	234	221	200	11	7
1972	[d]	[d]	[d]	1	—
Total	2146	1848	1381	364	116

[a] April of previous year through March of the year noted.
[b] Number of unwed mothers given an IQ test. These figures are approximate.
[c] Number of tested mothers in final sample because adoptive parents of their children agreed to participate in the study.
[d] Figures not available.
[e] Underestimate because of unavailability of some files.

The sample of unwed mothers was ascertained indirectly through the decision of their children's adoptive parents to participate in the study. This raises a question about the representativeness of our sample of unwed mothers. Table II shows average IQs, by years, for two groups: first, 343 unwed mothers included in the sample and second, for a larger group of 572 unwed mothers from the agency files who were eligible for inclusion in the sample but who did not enter the study (because the family who adopted their child was not contacted or tested). The unwed mothers in the sample average slightly higher than those not, but the difference is less than one IQ point. There appears to be some year-to-year variation in the average IQ of women entering the agency that shows up in both the sample and nonsample mothers, but there is no overall temporal trend (r of Beta IQ with year is 0.06 and −0.01 for the sample and nonsample mothers, respectively). With respect to IQ, then, the unwed mothers included in the sample appear to be quite representative of the population of women tested in the agency during this period.

The above-average intellectual level of this population is probably best explained by the fact that the agency asked the parents of the unwed mothers to contribute significant amounts of money to offset the cost of caring for their daughters. While this was not a requirement for admission, the overall effect of the request for money was probably to reduce the number of lower socioeconomic class girls referred to the agency. In the

Table II. Beta IQs for Unwed Mothers in the Sample and Not in the Sample, by Years

	In the sample			Not in the sample		
Year	N^a	Mean	SD	N	Mean	SD
1963	25	104.6	11.28	68	105.6	8.65
1964	32	109.6	7.55	82	108.8	7.69
1965	30	109.6	5.42	41	111.0	7.24
1966	31	107.2	9.91	60	106.9	13.28
1967	43	110.5	7.34	66	109.0	9.19
1968	43	108.5	10.48	75	108.1	9.49
1969	76	109.0	8.64	92	107.8	11.56
1970	51	109.5	8.06	68	108.3	8.91
1971	11	106.0	7.31	16^b	100.6	13.10
1972	1	113.0	0	4^b	111.5	8.10
Total	343	108.7	8.67	572	107.9	9.95

[a] N's less than in Table I because not all unwed mothers received the Beta.

[b] Most unwed mothers in these years were excluded because of child's age, and IQs were not recorded.

mid-1960s referrals from pastors, doctors, and social workers accounted for about 80% of the admissions to the home. As indicated by the fact that one religious denomination accounted for about half of all admissions and over 80% of adoptive placements in 1966, the role of the pastors probably needs to be emphasized.

The 22 different psychologists who tested the 300 adopted families were all licensed by the state of Texas and were in private practice. Two of the psychologists tested a large number of the families; one tested 114 and the other tested 62 of the 300 families. The latter psychologist worked in a group practice and, as often as not, tested only some of the family members and not the entire family herself. Each of the other psychologists tested only a small portion of the remaining families.

The psychologist who tested 114 of the adoptive families had earlier been responsible for testing many of the unwed mothers. It is not clear how many of the unwed mothers he tested himself because clerical help was often employed to administer and score the group intelligence and personality tests. When he tested the adoptive family members, the history of the unwed mother for a particular adopted child was rarely known to him. Preliminary analyses of his test data do not reveal any striking departures from those of the other psychologists, and we have no reason to believe that our findings were materially affected by this confound.

All of our psychologists knew they were participating in an adoption study, but they were instructed not to inquire about the adopted or natural status of the children. It is possible that this information was occasionally volunteered by the adoptive parents, but we have no reason to suppose that this would introduce a major bias into the study.

How do our adoption study design and sample fare with respect to the threats to validity mentioned in the introduction? All of the adopted children in this study were permanently separated from their biological mothers within the week following birth. Most of the unwed mothers never saw their children after delivery. As evidenced by a significant correlation between biological mother's and adoptive parents' IQs, selective placement was practiced by the agency, but the available data will allow for an assessment of the effect of this practice on estimates of the relative influence of heredity and environment on IQ.

With respect to the generalizability of the data, our sample of unwed mothers, adoptive parents, and children is significantly above average in intelligence; this leaves open the possibility that our results might not generalize to the general population or to lower-IQ groups. However, since the other two adoption studies with IQ scores on biological parents (Snygg, 1938; Skodak and Skeels, 1949) had samples with below-average IQs, the generalizability to these groups could be tested.

Another possible source of bias might be that adoptive parents with problem adopted children might decline to participate in the study, thereby elevating means for the adopted children who were studied. It seems just as likely, however, that the parents of problem children would want their children to be tested, and this might increase their desire to participate in the study. We did get a number of requests to send test data to school counselors. Without more information on the nonparticipating families, we can only point out the possibility of both positive and negative bias of this sort.

INTERVIEW AND TESTING

Our field representatives visited the homes of the adoptive parents in order to explain the study and secure their cooperation for future testing. If the parents agreed to participate in the project, the mother was asked to submit to a brief interview and complete a series of questionnaires. In the interview the mother was asked for the age, sex, and grade in school for all of the adopted and natural children in her family, plus age, education, occupation, and total family income for the parents. The mother then rated each of her children on 24 bipolar personality dimensions which were written to match the traits measured by Cattell's series of personality questionnaires (Cattell, 1973). Following this, each mother indicated her knowledge of the socioeconomic, physical, and mental characteristics of her adopted child's (children's) biological parents by answering a 21-item interview schedule covering the aforementioned categories. Finally, a 71-item inventory was used in an attempt to assess the quality of rearing and intellectual stimulation provided the child. Unfortunately, the instrument provided unsuitable to detect environmental differences in this generally favorable range—there was very little variance in the inventory responses either between or within families.

Our selection of tests for administration to each member of the adoptive family was guided by two basic considerations: the adoptive parent data should match the data available on the unwed mothers and there should be as much continuity as possible between the measures given the adoptive parents and their children. Since most of the unwed mothers took the Revised Beta Examiniation and the Minnesota Multiphasic Personality Inventory (MMPI), we decided that each adoptive parent should be given the same tests. In addition, however, each adoptive parent was also given the Wechsler Adult Intelligence Scale (WAIS) and Cattell's Sixteen Personality Factor Questionnaire (16PF)(Cattell, 1973). The WAIS was selected in order to provide continuity with the Wechsler Intelligence Scale for Children (WISC) that was administered to all 5- to 16-year-old children.

Children above the age of 16 were given the WAIS while those 3 or 4 years of age were given the Stanford-Binet (1960). Children below the age of 3 were not tested. The 16PF was used for the adoptive parents in order to provide continuity with the Cattell scales (Cattell, 1973) that were used to measure personality in the children. The 8- to 12-year-olds took the Children's Personality Questionnaire (CPQ) while children between 13 and 18 were given the High School Personality Questionnaire (HSPQ). Children over 18 took the 16PF, while those below 8 were not administered any personality tests, receiving only the mother's rating.

All but a few families were tested in the office of the psychologists, where a team of examiners tried to complete the testing of an entire family within a morning or an afternoon session. If the entire family could not be present, separate appointments were made until the family had been given all the required tests. Each adoptive parent was administered the Revised Beta and the WAIS in the office. If time allowed, the parents were also asked to complete the MMPI and the 16PF while at the psychologist's office. Frequently, however, these tests were completed at home later and mailed to the psychologist. All children were given their IQ tests in the office and, in addition, all 8- to 12-year-olds took their personality tests under the supervision of the psychologist. Children taking the HSPQ or 16PF could complete it at the office or at home.

RESULTS

The final sample consisted of 300 adoptive families, containing 297 fathers, 297 mothers, and a total of 636 children—469 adopted and 167 biological children of the parents. In addition, there were IQ test scores available for 364 biological mothers of the adopted children.

The 181 families containing only adopted children accounted for 60% of the families and two-thirds (315) of all the adopted children in the study. The 119 mixed families contained the remaining one-third (154) of the adopted children and an approximately equal number of biological children (167). Biological children preceded adopted children in the mixed families about as often as the reverse: in 57 of the families an adopted child came first in the family, in the remaining 62 families a biological child did. Table A in the Appendix gives a detailed distribution of families by the number of adoptive and biological children they contained.

The 364 unwed mothers accounted for 366 of the adopted children in the study—two had twins, both adopted as pairs. The remaining 103 adopted children included 90 who were placed by this agency, but whose mothers were not administered IQ tests, and 13 children placed by other adoption agencies.

Most of the adoptive parents were in their 30s and 40s when they were tested. The median age of the mothers was 37.5, and the fathers averaged 3 years older. There was no substantial difference in parental ages between those families who did or did not have biological children in addition to adopted children. The unwed mothers of the adopted children were mostly young, averaging around age 19½ when they were tested at the time of their stay in the Home. Appendix Tables B and C provide age distributions for the adoptive parents and unwed mothers.

Table III shows that the biological children in the study families were on the average a little older than the adopted children. The median age of the former was about 10 years, of the latter about 8. This difference reflects the fact that the sample was selected from adoptions during a fixed period, the years 1963–1971. This places an upper age limit for the bulk of the adopted children at about 14 (the few older adopted children were from earlier adoptions not covered by the study). No similar age ceiling is imposed on the biological children already present in these families at the time the adoption took place.

Neither the adopted nor the biological children's age distributions differed materially by sex. There were somewhat more boys than girls among the adopted children (about 54% males). With these sample sizes, this could be a result of chance ($z = 1.62$, $p = 0.11$, two-tailed, assuming equal numbers of male and female births). If not, it might reflect a greater tendency for mothers to choose to keep their child if it were a girl. (For approximately 15% of the mothers admitted to the Home during this period, the child was not adopted. In nearly all cases, this means that the

Table III. Age at Testing of Adopted and Biological Children in All-Adopted and Mixed Families

	All-adopted families		Adopted in mixed families		Biological in mixed families	
Age	Boys	Girls	Boys	Girls	Boys	Girls
3–5	45	40	20	24	19	16
6–8	70	45	20	26	18	20
9–11	44	39	26	25	15	14
12–14	14	11	8	4	16	12
15–17	3	1	1	—	12	11
18–20	1	2	—	—	6	4
21–23	—	—	—	—	—	—
24–26	—	—	—	—	1	—
Total	177	138	75	79	87	77
Median	7.5	7.6	8.5	8.0	10.0	9.4

Table IV. IQs of Adoptive Parents and Unwed Mothers

	Mean	SD	*N*
Adoptive father			
WAIS VIQ	115.9	11.72	294
WAIS PIQ	112.4	11.85	294
WAIS IQ	115.2	11.12	294
Beta IQ	115.2	7.52	297
Adoptive mothers			
WAIS VIQ	112.7	10.85	294
WAIS PIQ	110.9	10.95	293
WAIS IQ	112.6	10.37	293
Beta IQ	112.4	7.68	295
Unwed mothers			
Wechsler VIQ	105.3	11.81	53
Wechsler PIQ	106.3	11.75	53
Wechsler IQ	106.3	11.60	53
Beta IQ	108.7	8.67	343

mother elected to keep the child. Fewer than 1% of all children were unplaceable because of serious physical problems.)

Table IV gives IQ means and standard deviations for the adoptive parents and the unwed mothers. All three groups averaged well above the standardization population mean of 100, especially the adoptive parents. There is restriction of variability, as shown by the Wechsler standard deviations of 10–12 IQ points, compared to the standardization population value of 15. The Beta test appears to show an even more drastic restriction, to 7 or 8 points from a nominal 15, but this is probably due more to limitations of the test than to a genuinely greater restriction in the abilities it measures (see below).

The means in Table IV suggest that the adoptive parents were more strongly selected for verbal than for performance IQ, while for the subset of 53 unwed mothers who received Wechsler tests the difference was in the opposite direction (although it is not statistically dependable). The adoptive fathers have somewhat higher average IQs (by 2–3 IQ points) than the adoptive mothers. They are also slightly more variable, although this difference is of doubtful statistical significance.

There were no striking differences in IQ means or standard deviations between the parents in all-adopted families and those in mixed families. Such slight tendencies as there were favored the adoptive parents in mixed families and the unwed mothers in all-adopted families. Appendix Table D provides the details.

IQ tests were available for 364 unwed mothers: 311 got the Beta only, 21 got a Wechsler test only, and 32 got both. (Most of the mothers receiving

Wechslers were given the WAIS, but some of the younger mothers got WISCs. Three mothers received the earlier Wechsler-Bellevue scale.) Means for the unwed mothers tested on various combinations of Beta and Wechsler test are included in Appendix Table E.

The abilities measured by the Beta appear to be closely similar to those measured by the Wechsler performance scales. Table V shows the intercorrelations of Beta IQ and WAIS verbal, performance, and full-scale IQs for the adoptive parents, who received both tests. It will be observed that for both sexes the correlation of Beta IQ and WAIS performance IQ is nearly as high as the respective test reliabilities permit.

The restriction in variability of the Beta IQs appears to be in large part a function of a ceiling effect. The highest Beta IQs in the sample go only up to about 130, while the Wechsler performance IQs go up to about 145. On a joint scatterplot for adoptive mothers, the regression of Beta IQ on PIQ appears linear up to a PIQ of about 115, leveling out markedly thereafter as the upper ends of the vertical arrays are curtailed by the ceiling on the Beta.

The reliabilities shown for the WAIS in Table V are substantially lower than those given in the WAIS manual (Wechsler, 1955). This is in part attributable to the restriction of range in this population. Corrected to the variance of the standardization population, the reliabilities in Table V become 0.90, 0.94, and 0.92 for fathers and 0.90, 0.84, and 0.93 for mothers. Wechsler (1955) quotes reliabilities somewhat higher than these, but they appear to have been obtained by a different method. Internal-consistency reliabilities calculated from the scale intercorrelations for the two closest age samples in the standardization population are 0.91, 0.86, and 0.93 for verbal, preformance, and full-scale IQ. These are very similar

Table V. Intercorrelations and Reliabilities of Wechsler and Beta IQs[a]

	Correlations				Reliabilities			
	VIQ-PIQ	VIQ-Beta	PIQ-Beta	FSIQ Beta	VIQ	PIQ	FSIQ	Beta
Adoptive fathers	0.57	0.55	0.74	0.71	0.83	0.74	0.86	0.76
Adoptive mothers	0.60	0.61	0.73	0.73	0.82	0.70	0.85	0.78
Unwed mothers	0.67				0.70	0.74	0.83	0.70
Sons	0.44				0.75	0.66	0.78	
Daughters	0.44				0.78	0.55	0.77	

[a] *N*'s 293-297 for adoptive parents; 53 for unwed mothers' Wechsler and 343 for Beta; 298 for sons and 257 for daughters. Wechsler-Beta correlations for unwed mothers were omitted—too few cases. Reliabilities are based on intercorrelations of subtests (scaled scores); 6 verbal scales, except for 5 for unwed mothers; 5 performance scales; 10 or 11 total Wechsler scales; 6 Beta subscales.

to the corrected reliabilities reported above; i.e., the restriction in range in our sample fully accounts for the difference in reliabilities.

The reliabilities of 0.55–0.78 for the children in Table V are also lower than those given in the WISC manual (Wechsler, 1949). But again these were obtained in a different way. Internal consistency reliabilities estimated from the subscale intercorrelations given in the WISC manual for the 7½- and 10½-year age groups are 0.85, 0.72, and 0.87 for verbal, performance, and full-scale IQs. Correcting the Table V reliabilities for the restriction of range in our sample yields values for the sons of 0.84, 0.75, and 0.87 and for the daughters of 0.85, 0.74, and 0.88. Thus the values in the present sample are in good agreement with each other and with the standardization population, once the differences in standard deviation are taken into account.

In calculating reliabilities, and in other contexts in the study, the different Wechsler tests have been treated as though they were one test. The WAIS and the WISC (and the Wechsler-Bellevue) have subscales with the same names and similar content, although they are administered in somewhat different orders. There is one partial exception, in that the subtest named "Coding" on the WISC replaces that named "Digit Symbol" on the WAIS, but they appear to tap similar functions, and we have treated them as versions of the same scale. Minor differences between the tests in numbers of items and scoring are taken care of by using the scaled scores throughout (originally standardized to a nominal mean of 10 and standard deviation of 3 for all the tests); the Wechsler IQs were also all orginially scaled to a uniform mean (100) and standard deviation (15).

A more difficult issue of comparability is raised by the Stanford-Binet IQ. It is nominally based on a mean of 100 and a standard deviation of 16, but the standardization populations of the Binet and WISC seem to have differed appreciably. Our Stanford-Binet IQs were obtained using the 1960 norms, which tend to give rather high IQs relative to the WISC in the range of our sample (e.g., Estes, 1965; Sattler, 1974). In order to make the Wechsler and Binet IQs more comparable for the present study, distributions of WISC IQs for 5- and 6-year-olds were compared with the Binet IQs for 3- and 4-year-olds. In general, it appeared that adjusting all the Binet IQs downward by approximately the difference in the means, 7 points, would render the distributions roughly comparable. There was no reasons to suspect any true discontinuity between these ages in our sample, so this correction was made, and subsequent references to Binet IQs will be to these adjusted scores. IQ distributions before and after the adjustment are shown in Appendix Table F.

The IQs of the children by test are as shown in Table VI. The large majority of the children's IQs derive from the WISC: 75% for the biological

Table VI. IQs of Children, by Test[a]

	Adopted children			Biological children		
	Mean	SD	N	Mean	SD	N
All children						
WAIS	111.0	8.69	5	112.9	8.60	22
WISC	111.9	11.39	405	111.2	11.55	123
S-B	109.2	13.22	59	113.8	11.18	19

[a] WAIS given to children aged 16 or older, WISC to children aged 5–15, Stanford-Binet to children aged 3 and 4—with one or two exceptions at borderline ages. S-B IQs adjusted (see text).

children, 86% for the adopted children. In general, the two Wechsler tests appear to have comparable mean IQs, although the number of the children in the age range for the WAIS is rather small. The Stanford-Binet IQs have of course been adjusted for overall comparability of mean with nearby ages on the WISC. There were no notable differences in these data between all-adopted and mixed families, or between the sexes, except, possibly, for a lower mean on the Stanford-Binet for adopted sons. Appendix Table G gives a detailed breakdown.

Table VII shows combined IQ means and standard deviations for biological and adopted children. Shown are figures for WISC or WAIS verbal and performance IQs, and a total IQ—either WISC or WAIS full-scale IQ or Stanford-Binet IQ, depending on age. There appear to be very little in the way of systematic mean differences between the groups on any measure. These results were generally consistent across the sexes and in all-adopted and mixed families, except for a possible slight favoring of the mixed families on performance IQ. A detailed breakdown is presented in Appendix Table H.

Tables VIII and IX present the parent-child correlations for both adoptive and biological parent-child pairs. Table VIII gives correlations for the parent and child tests that have the largest numbers and are most similar in content: the parents' Revised Beta IQ, a performance IQ test, against the

Table VII. IQs of Adopted and Biological Children

	Adopted children			Biological children		
	Mean	SD	N	Mean	SD	N
WISC/WAIS VIQ	110.1	12.08	410	109.2	12.70	145
WISC/WAIS PIQ	111.6	12.00	410	111.9	12.54	145
WISC/WAIS/S-B IQ	111.5	11.62	469	111.7	11.14	164

Table VIII. Correlation of Parent's Beta IQ with Child's IQ Tests[a]

	Child test			
	Wechsler performance IQ		Wechsler or Binet total IQ	
Correlational pairing	*r*	*N*	*r*	*N*
Adoptive father and				
biological child	0.29	144	0.28	163
adopted child	0.12	405	0.14	462
Adoptive mother and				
biological child	0.21	143	0.20	162
adopted child	0.15	401	0.17	459
Unwed mother and				
her child	0.28	297	0.31	345
other adopted child in same family	0.15	202	0.19	233
biological child in same family	0.06	143	0.08	161

[a] *N*'s refer to the number of pairings (= the number of children)—the same parent may enter more than one pairing. In the case of twins, the second twin was excluded from the unwed mother–other child comparisons.

children's Wechsler performance IQ. Also shown are the correlations of parents' Beta IQ with children's total IQ, for Wechslers and Stanford-Binets combined. The adoptive fathers consistently resemble their biological children more than their adoptive children. For the adoptive mothers, the difference is in the same direction, but smaller. The unwed mothers also tend to be more highly correlated with their genetic offspring than with either the other adopted or the natural children in the homes into which their infants were placed.

Table IX shows the correlations for the parents' verbal, performance, and full-scale IQs with the corresponding Wechsler IQs of their children. Note that the number of unwed mothers for whom Wechsler tests were available is considerably smaller than for the Beta in the preceding table. The adoptive fathers show a consistent pattern of higher correlations for the genetic than for the adoptive pairings. The adoptive mother-child correlations show a similar difference for the verbal but not for the performance measure. The unwed mothers consistently correlate more highly with their own child than with the other children in the families into which their child was adopted.

Analogous correlations for the samples subdivided by sex and by all-adopted or mixed families are given in Appendix Tables I and J. In these smaller samples, the correlations vary considerably, and there are some apparent deviations from the general trends. An overall χ^2 test based on a

Table IX. Parent-Child IQ Correlations for Corresponding Wechsler Tests[a]

	Verbal IQ		Performance IQ		Full-scale IQ[b]	
	r	N	r	N	r	N
Adoptive father and						
biological child	0.36	144	0.38	144	0.42	162
adopted child	0.14	403	0.13	403	0.17	457
Adoptive mother and						
biological child	0.27	143	0.16	143	0.23	162
adopted child	0.15	400	0.17	398	0.19	455
Unwed mother and						
her child	0.34	53	0.25	53	0.32	53
other adopted child in same family	−0.07	40	0.15	40	0.07	40
biological child in same family	0.19	28	0.13	28	0.11	31

[a] See footnote *a* of Table VIII regarding *N*'s.
[b] Includes 19 biological and 44 adopted children with Binet IQs.

path model to be described later suggests that the deviations in Table I may be regarded as sampling fluctuations.[3] The same is probably true for Table J, but a fuller analysis of these data will be made in a subsequent report.

IQ correlations among siblings are given in Table X. These correlations were calculated in the manner of intraclass correlations from the mean squares within and between families. The sums of squares within families were calculated via pair differences. For the correlations in the first two rows, all the pairs in the relevant category were used, and the correlations are equivalent to ordinary intraclass correlations. For the correlations in the third row, only pairings of a biological and adopted child were used; thus the r's are interclass correlations, although not Pearson r's, since the between-class differences are not taken out (this should not make much practical difference, however, since the differences are small). Finally, the correlations among all unrelated children in the last row include all pairings

[3] The difficulties inherent in interpreting the obtained differences in correlations for these smaller samples can be illustrated by making a few power calculations. As shown in Table I of the Appendix, our sample of adopted children divides into subsamples of about 200 sons and 200 daughters. If the real difference between correlations for fathers with sons and mothers with daughters in the population is 0.2, these sample sizes would yield a power of only 0.51 with α set at 0.05 (Cohen, 1977). We would be able to correctly reject a hypothesis of no difference between the correlations only half of the time. If the real difference in correlations was as small as 0.1, power would shrink to 0.17. Because of the even smaller number of biological children in our study, our ability to detect sex differences in the biological child–adoptive parent correlations is even worse. For this group, if the real population difference in correlations is 0.2, $\alpha = 0.05$, and with samples of about 72 males and 72 females, the power is only 0.22. Obviously, then, with these sample sizes, it is difficult to separate real sex differences from sampling fluctuations.

among adopted children and between adopted and biological children. The number of families on which each correlation is based may be obtained as $df_b + 1$; the number of individuals, as $df_w + df_b + 1$.

It should be noted that the different rows of Table X are based on partially distinct and partially overlapping subsets of families. Thus, for example, a family with one biological and one adopted child would enter into the correlations in the third and fourth rows but not into the others, while a family with four children, two adopted and two biological, would enter into the correlations in every row.

According to Table X, genetically related children in a family are more similar in performance IQ than genetically unrelated children, but this is not the case for verbal IQ. Unfortunately, the number of families with more than one biological child is rather small, and the apparent verbal-performance difference depends heavily on this group.

Finally, Table XI shows the IQ correlations between spouses in the adoptive families, and between the adoptive parents and the unwed mother. The spouse correlations for verbal and full-scale IQ are about 0.31, and for performance measures (Wechsler performance IQ and Beta IQ) about 0.24. While this difference is not statistically significant, it is in the same direction as that reported in other studies (e.g., Johnson *et al.*, 1976). The correlations between the unwed mothers and the adoptive parents, which reflect the selective placement of children in adoptive families, center at about 0.20 for mothers and 0.15 for fathers. One additional correlation of interest, not shown in Table XI, is that between the Beta IQs of two or more unwed mothers whose infants were placed in the same home. The intraclass correlation based on 132 unwed mothers whose children were placed in 65 homes is 0.07.

Table X. IQ Correlations Among Biological and Adoptive Siblings[a]

	Verbal IQ		Performance IQ		Wechsler or Binet IQ	
Correlational pairing	r	df_w/df_b	r	df_w/df_b	r	df_w/df_b
Among biological children	0.14	40/35	0.33	40/35	0.35	46/39
Among adopted children	0.19	132/121	0.05	132/121	0.22	167/150
Between biological and adopted	0.21	159/97	0.24	159/97	0.29	197/116
All unrelated children	0.21	266/195	0.18	266/195	0.26	330/235

[a] r = intraclass or interclass correlations (see text). df_w = degrees of freedom within families = $\Sigma(n_i - 1)$, where n_i is the number of children in family i entering into the correlations. df_b = degrees of freedom between families = number of families entering into the correlation -1. For twins, only the first member of the pair was included.

Table XI. IQ Correlations of Unwed Mothers and Adoptive Parents

	Adoptive mothers, adoptive fathers		Unwed mothers, adoptive mothers		Unwed mothers, adoptive fathers	
	r	*N*	*r*	*N*[a]	*r*	*N*[a]
Beta IQ	0.24	292	0.14	337	0.11	339
Wechsler verbal IQ	0.31	289	0.25	52	0.19	52
Wechsler performance IQ	0.24	288	0.18	51	0.15	52
Wechsler IQ	0.31	288	0.21	51	0.22	52
Beta IQ with WAIS PIQ[b]	0.22	289	0.19	335	0.16	336
Beta IQ with WAIS IQ[b]	0.22	289	0.23	335	0.20	336

[a] *N* = number of unwed mothers. If there is more than one adopted child in a family, an adoptive parent may enter two or more pairings.
[b] Unwed mother's Beta with adoptive parent's WAIS. For adoptive parents, average of correlations both ways.

DISCUSSION

It is useful to compare the IQ correlations obtained in our study to corresponding correlations in other recent studies. The studies in Table XII are for biologically related family members and have in common IQ correlations based on individually administered tests, mean IQs that are above average, and some restrictions in IQ variance. The correlations from the Williams (1975), Kuse (1977), and Scarr and Weinberg (1978) studies are derived from families having only natural children. The Scarr and Weinberg (1977) correlations and the correlations in the present study are derived from families having adopted children as well.

Parent-child correlations are reasonably consistent across the five studies, except for the low father-child correlation in the Kuse (1977) study. The sibling correlations show very little variability from study to study. It would appear, then, that the correlations among biologically related family members in the present study do not differ systematically from those obtained in other recent studies.

The Scarr and Weinberg (1977) study is particularly apposite for drawing comparisons with the present findings. Both studies include families that have adopted as well as natural children of their own. Their study is composed entirely of transracial adoptees entering adoptive homes during the first year of life—ours contains only a very small number of nonwhite adoptees. Adoptive parent IQs are decidedly above average in both studies (mean IQ 120 in Scarr and Weinberg and 114 in the present study).

Scarr and Weinberg (1977) obtained correlations of 0.23 and 0.15 for adoptive mother–adopted child and adoptive father–adopted child. The corresponding correlations in our study are 0.19 and 0.17. Thus, with respect to the adoptive parent–adopted child correlations, our results are quite comparable to theirs.

Both studies obtain higher correlations for unrelated children reared together than for unrelated parents and children. Scarr and Weinberg (1977) obtained a correlation for unrelated children reared together of 0.33, and our correlation was 0.26. Ordinary biological sibling correlations for the two studies were 0.42 and 0.35, respectively. These figures are probably best explained by a combination of genetic and common environmental factors.

As mentioned earlier, the chief purpose of this article is to describe the sample of the Texas Adoption Study and to report the basic data on IQ. In subsequent articles we propose to examine the fit of various heredity-environment models to these data, and to relate them to other kinds of information available on our sample, such as education, occupation, and measures of personality characteristics. We also plan to explore the data in more internal detail, both at the level of the individual Wechsler and Beta subscales and at the level of subgroupings of our sample (e.g., by age and family constellation). Thus we do not wish at this time to draw final conclusions from these data concerning the important issues on which they bear—the respective roles of the genes and the environment in shaping the development of intellectual abilities. However, it seems appropriate to indicate in a general way some of the broad implications of our data for IQ heritability estimates. For adults we will focus on the data for Beta IQ—since this test is available for most of the adults in our sample and in particular for many more of the unwed mothers than are the Wechsler tests. For children, we will use either Wechsler performance IQ—probably the most nearly equivalent measure to the Beta—or Wechsler/Binet total IQ, which yields the largest sample sizes.

In principle, data such as ours provide two separate routes to estimating heritability. One stems from differences between group means and one from correlations among individuals.

Table XII. IQ Correlations Among Biologically Related Family Members in Recent Studies

Study	Father-child	*N*	Mother-child	*N*	Siblings	*N*
Williams (1975)	0.43	57	0.36	67	—	—
Kuse (1977)	0.12	161	0.27	161	0.35	102[a]
Scarr and Weinberg (1977)	0.39	102	0.34	100	0.42	107
Scarr and Weinberg (1978)	0.40	270	0.41	270	0.35	168
Present study	0.42	162	0.23	162	0.35	47[a]

[a] Degrees of freedom within families.

The first of these two methods depends on an average difference between adoptive and biological parents in the genes affecting IQ. It is most simply carried out in families having both natural and adopted children. Both groups of children have the same environment, but they differ in their genetic potential. To the extent that the genes influence IQ, this difference should emerge as an average difference in the children's IQs in the two groups.

This method is, unfortunately, not a powerful one with the present data, since the mean Beta IQ of adoptive parents in mixed families (114.5) differs by only about 6 points from the mean Beta IQ of the biological mothers of their adopted children (108.3), and we do not know the IQs of the biological fathers. Insofar as the method is applicable at all, however, it suggests a heritability of IQ that is close to zero—the two groups of children show little or no difference in average IQ. This result is inconsistent with that from a correlational analysis, to be reported below, so that a second look at the assumptions underlying it is in order. Two major possibilities suggest themselves. One is that there may in fact be little difference in the genetic potential of the adoptive and biological parents. The other is that the assumption about equality of children's environments may be wrong.

Could there really be no genetic difference between the two sets of parents? (It will be recalled that the observed difference between the means of adoptive parents and biological mothers is about 6 IQ points.) One possibility might be that the biological fathers of the adopted children were in fact a good deal higher in genetic potential than the unwed mothers, offsetting the difference from the adoptive parents. We doubt that this is the explanation. The putative biological fathers do have a slightly higher level of education than the unwed mothers, but this probably mainly reflects an age difference (they average about 3 years older). Another possibility is that the genetic potential of both adoptive and biological parents is about the same but that the adoptive parents represent a group that has systematically been favored environmentally and the unwed mothers a group that has a relatively less favorable environmental history, hence the phenotypic difference between them. A third possiblity is that concomitant personality difficulties might be depressing the IQ scores of many of the unwed mothers (Horn and Turner, 1976). A fourth possibility is inadequate age standardization of the tests. Any of these last three seems to us to have some plausibility as an explanation of a lack of difference between the children's mean IQs.

Finally, there is the possibility that the environments of the two groups of children are in fact not entirely comparable: that adoptive parents tend to give extra attention to their adopted children in an effort to compensate for real or fancied genetic disadvantages. Only a small effect of this kind—2 or 3 IQ points—would render the data on means fully consistent with that from the correlational analysis.

The correlational data of Tables VIII–XI bear on the same question of genetic environmental influences on IQ, but they approach it not via group means but rather by way of the individual resemblances of particular children to particular biological or adoptive parents. As suggested in our table-by-table summaries, these data are complex, and the present article will not contain a full analysis of them. However, we can ask whether, allowing for sampling error, our data can be fitted by an existing model of heredity-environment relationships. We have taken as the model those equations from Table VI of Loehlin (1978) for which there are data in the present study. We have chosen to use an existing model developed in another context rather than to elaborate a model to fit the details of this study. This is to permit us to obtain a quick and economical overview of the genetic implications of the correlational data. A fuller treatment will be undertaken in a subsequent article. The model is essentially a series of equations, each of which expresses an observed empirical correlation as a function of five parameters: h, the effect on IQ of genotype; c, the effect on IQ of the environment common to the children in a family; d, the effect of genetic dominance on IQ; and two parameters f and x (discussed further below) which describe the transmission of environmental effects between generations. In addition, the model incorporates two derived gene-environment correlations a and b, the empirical correlation between spouses (assortative mating), the observed correlation between the adoptive parents and the unwed mother (selective placement), and the test reliabilities. The equations of the model represent a modification of the path analysis equations of Rao *et al.* (1976) to incorporate phenotypic assortative mating, genetic dominance, and phenotypic selective placement. The relevant equations are those for parent and natural offspring living together (POT), parent and unrelated adopted children living together (PUT), parent and natural offspring living apart (POA), natural siblings living together (OOT), and natural and unrelated adopted children living together (OUT). In each section of Appendix Table H there are four empirical correlations that are examples of POT (father-son, father-daughter, mother-son, mother-daughter), eight correlations that are examples of PUT (same pairings with adopted children, separately for all-adopted and mixed families), and two correlations that represent POA (unwed mother with her son and her daughter). In Table X there is one each of OOT (natural siblings) and OUT (natural and adopted child). With these and the empirical correlations for assortative mating and selective placement from Table XI we can, first, see how well the model fits the data as a whole and, second, obtain estimates of the genetic and environmental parameters. This is a weighted fit, so that correlations based on larger samples count more heavily.

The equations and solution procedure were as in Loehlin (1978), except that measurement error has been incorporated into the model in the form of a path from each true-score IQ to measured IQ, whose value is the square root of the reliability of that IQ taken from Table V. (As in Table V, reliabilities are differentiated by sex, but not by adopted and natural children, or by mixed and all-adopted status of family—the latter were examined but the differences appeared to be negligible). The five equations used are indeterminate with respect to two parameters, f and x, which represent two different modes of environmental transmission from the childhood environment of the parental generation to that in the child generation. The first, f, represents a direct transmission of environment across generations (as might be the case, for example, in the transmission of social class); the second, x, represents transmission via the parent's IQ (as when the child's intellectual development is stimulated by an intelligent parent or retarded by a dull one). The equations were solved with these two paths alternatively set to zero. It will be seen that here, as in the earlier application of these equations (Loehlin, 1978), estimates of the other parameters of the model are fairly insensitive to which of these two modes of environmental transmission is postulated. Other assumptions were made as in the earlier article: the parameters were assumed the same in both generations, and assortative mating for the unwed parents was set at half the level of that for the adoptive parents.

Table XIII shows the results of this analysis for adult Beta IQ correlated with child's Wechsler performance IQ or with child's full-scale IQ from the Wechsler or Stanford-Binet.

As the bottom rows of Table XIII suggest, the fit of the model to the data was reasonably good for adult Betas and child PIQs, and considerably less good when full-scale IQs were used for the children (which adds the 3- and 4-year-olds with Stanford-Binets). The probability values in the table should not be taken too literally, since these χ^2's are probably on the low side, because of nonindependence of the various correlations (Rao *et al.*, 1977). The parameter estimates, however, should not be much affected. The implied estimates of narrow heritability, h^2, range from 0.45 to 0.53; these are the estimates for broad heritability as well, since genetic dominance is estimated as essentially zero. (It should be noted that our data provide at best a weak test of the presence or absence of dominance, since this estimate with these equations depends critically on the correlation for natural siblings, and there are relatively few families in our sample with more than one

Table XIII. Genetic and Environmental Parameters Estimated from Fitting Path Model to Correlations of Adult's Beta IQs with Child PIQ or WAIS/WISC/Binet IQ

	Adult Beta–child PIQ		Adult Beta–child IQ	
Parameter[a]	$x = 0$	$f = 0$	$x = 0$	$f = 0$
h	0.730	0.709	0.692	0.671
c	0.541	0.507	0.519	0.485
d	0.000	0.000	0.000	0.000
f	0.192	0	0.230	0
x	0	0.112	0	0.129
a	0.031	0.112	0.036	0.124
b	0.028	0.029	0.030	0.032
χ^2	9.03	8.75	21.62	21.10
df[b]	12	12	12	12
p	0.50–0.70	0.70–0.80	0.02–0.05	0.02–0.05

[a] Paths: h = additive genotype to IQ, c = environment to IQ, d = dominance deviations to IQ, f = parent childhood environment to child's environment, x = parent IQ to child's environment. Correlations between environment and additive genotype: a = natural children, b = adopted children.

[b] Degrees of freedom = number of empirical correlations (16) less number of parameters fitted in the solution (4: h, c, d, and f or x).

natural child.) Other authors have reviewed evidence suggesting directional dominance for IQ—e.g., Jinks and Fulker (1970). The estimates of common family environment, c^2, range from 0.24 to 0.29 across the four solutions, and those for gene-environment correlation cluster around 0.03 for adopted children and range from 0.03 to 0.12 for natural children. This gene-environment correlation is that labeled as "passive" by Plomin *et al.* (1977), namely, the correlation between genes and environments resulting from parents transmitting both to their children. These data do not permit distinguishing "active" and "reactive" types of gene-environment correlation from the direct effects of environment and genes. The estimates of gene-environment correlation are a little larger for the model in which parental IQ directly affects the child's environment ($f = 0$), but they are not very large in either.

If, for the first solution in Table XIII, we set the genetic parameters h and d equal to zero, the χ^2 becomes 26.57. This represents a highly significant worsening of fit ($p < 0.001$) when the difference is tested as a χ^2 with 2 df. Thus we may reject the hypothesis of no genetic effects, if the rest of the model is correct. If, on the other hand, we set the environmental path c to zero (which makes f irrelevant as well), the χ^2 is 16.20. This also represents a significant deterioration of fit ($0.02 < p < 0.05$) although the fit is still not a bad one in absolute terms. Thus we have some evidence for retaining the environmental paths in the model as well.

Lest anyone should be tempted to take any of these numbers as representing final truth, let us be explicit about their limitations. First, the sample is a selected one, phenotypically. Estimation of the relative degrees of environmental and genetic restriction must underlie any generalization to the total population. Second, the model we have used assumes that selective placement was based on true IQ phenotype. This can hardly be correct. The agency could have used measured IQ phenotype for the biological mothers, since they had IQ test scores for them, but they had no IQ test on the adoptive parents. For a path model, assumptions about the actual basis of matching are important. Similar considerations apply to the assortative mating of both the adoptive and the unwed parents. We have some educational and economic data on these families, which can potentially be incorporated into more complete and realistic models. Third, this discussion has been largely focused on general intelligence, especially as measured by nonverbal tests. There are some verbal/performance differences in the correlational tables which merit fuller analysis. Fourth, a good deal of additonal information is available on the subjects of the study—Wechsler and Beta subscales, personality measures, birth information for the adopted children, family configuration data, handedness, family histories of the unwed mothers—which will surely serve to deepen our eventual understanding of the bare correlations and means reported in this article.

Much, then, remains to be done. But even at this stage it seems evident that some alternatives can be pretty well ruled out: a simple polygenic model featuring an extremely high heritability of IQ would seem very difficult to reconcile with these data, as would an environmental model based solely on the association of IQ with economic privilege. However, many other options remain open to be assessed in future analyses.

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APPENDIX

Table A. Numbers of Adopted and Biological Children in the Families of the Texas Adoption Study

Family configuration	Number of families	Number of adopted children	Number of biological children
2 adopted children	106	212	—
1 adopted child	61	61	—
1 adopted, 1 biological	52	52	52
1 adopted, 2 biological	29	29	58
2 adopted, 1 biological	23	46	23
3 adopted children	14	42	—
2 adopted, 2 biological	8	16	16
1 adopted, 3 biological	4	4	12
3 adopted, 1 biological	2	6	2
1 adopted, 4 biological	1	1	4
Total	300	469	167

Table B. Ages at Testing of Adoptive Mothers and Fathers in All-Adopted and Mixed Families

	Mothers		Father	
Age	All-adopted families	Mixed families	All-adopted families	Mixed families
25–29	5	4	—	—
30–34	51	30	24	16
35–39	68	49	57	41
40–44	37	23	57	44
45–49	16	11	32	14
50–54	1	1	7	3
55–59	—	—	—	—
60–64	—	—	1	—
Total	178	118	178	118
Median	37.7	37.3	40.7	40.3

Table C. Age at Testing of Unwed Mothers Whose Children Were Placed in All-Adopted or Mixed Families

Mother's age	Child placed in: All-adopted families	Mixed families
13–14	5	3
15–19	145	64
20–24	72	49
25–29	12	7
30–34	3	2
36–38	0	2
Total	237	127
Median	19.2	19.7

Table D. IQs of Adoptive Parents and Unwed Mothers, All-Adopted and Mixed Families

	All-adopted families			Mixed families		
	Mean	SD	N	Mean	SD	N
Adoptive fathers						
WAIS VIQ	115.9	11.15	177	116.0	12.58	117
WAIS PIQ	112.3	11.95	177	115.3	11.74	117
WAIS IQ	115.2	10.77	177	115.3	11.67	117
Beta IQ	114.6	7.65	179	116.1	7.27	118
Adoptive mothers						
WAIS VIQ	112.9	10.98	177	112.4	10.68	117
WAIS PIQ	110.4	11.06	176	111.6	10.79	117
WAIS IQ	112.5	10.63	176	112.7	10.01	117
Beta IQ	112.1	8.01	178	112.8	7.16	117
Unwed mothers						
Wechsler VIQ	107.2	11.42	30	102.9	12.10	23
Wechsler PIQ	107.5	11.32	30	104.7	12.37	23
Wechsler IQ	108.0	11.24	30	104.1	11.93	23
Beta IQ	109.0	8.85	226	108.3	8.34	117

Table E. IQs of Unwed Mother, by Test

Test received	*N*	Beta IQ	Wechsler IQ
Beta only	311	109.0	—
WAIS only	14	—	105.3
WISC only	6	—	100.3
W–B only	1	—	121.0
Beta and WAIS	28	106.2	107.6
Beta and WISC	2	103.0	99.5
Beta and W–B	2	110.5	112.0

Table F. Frequency Distributions of WISC IQs for 5- and 6-Year-Old Children and Binet IQs for 3- and 4-Year-Old Children Before and After Adjustment of Binet IQs

IQ	WISC	Binet	Adjusted Binet[a]
60–69	0	0	1
70–79	2	1	0
80–89	7	0	2
90–99	24	7	13
100–109	52	9	19
110–119	42	27	26
120–129	34	21	13
130–139	8	11	4
140–149	1	2	0
Total	170	78	78
Mean IQ	110.0	117.3	110.3
SD	12.36	12.84	12.84

[a] 7 points subtracted from IQ (see text).

Table G. Wechsler and Stanford-Binet IQs by Sex and Type of Adopted Family[a]

	All-adopted families			Mixed families		
	Mean	SD	*N*	Mean	SD	*N*
Sons						
WAIS	111.7	7.02	3	—	—	0
WISC	112.3	11.95	150	111.9	10.86	69
S-B	108.3	15.84	24	103.0	13.52	6
Daughters						
WAIS	110.0	14.14	2	—	—	0
WISC	112.0	11.06	116	110.7	11.35	70
S-B	112.9	9.60	20	107.4	11.97	9

[a] WAIS given to children aged 16 or older, WISC to children aged 5–15, Stanford-Binet to children aged 3 and 4—with one or two exceptions at borderline ages. S–B IQs adjusted (see text).

Table H. IQs of Adopted and Biological Children in All-Adopted and Mixed Families by Sex

	Adopted children, all-adopted families			Adopted children, mixed families			Biological children, mixed families		
	Mean	SD	*N*	Mean	SD	*N*	Mean	SD	*N*
Sons									
WISC/WAIS VIQ	111.9	12.19	153	109.1	10.58	69	111.0	12.77	76
WISC/WAIS PIQ	110.4	12.60	153	113.0	12.46	69	111.3	13.36	76
WISC/WAIS/S–B IQ	111.8	12.50	177	111.2	11.26	75	112.6	11.25	87
Daughters									
WISC/WAIS VIQ	110.1	12.72	118	107.0	11.57	70	107.1	12.40	69
WISC/WAIS PIQ	111.9	10.91	118	112.6	11.93	70	112.4	11.64	69
WISC/WAIS/S–B IQ	112.1	10.82	138	110.3	11.39	79	110.7	11.00	77

Table I (Appendix). Correlation of Parents' Beta IQ with Sons' and Daughters' IQ Tests by Type of Adopted Family[a]

	Wechsler performance IQ				Wechsler full-scale or Binet IQ			
	Sons		Daughters		Sons		Daughters	
Correlational pairing	*r*	*N*	*r*	*N*	*r*	*N*	*r*	*N*
Adoptive father and								
biological child	0.26	75	0.32	69	0.23	86	0.34	77
adopted child, all	0.18	219	0.04	186	0.25	248	−0.00	214
adopted child, all-adopted families	0.18	151	0.04	177	0.28	174	−0.04	136
adopted child, mixed families	0.13	68	0.04	69	0.17	74	0.06	78
Adopted mother and								
biological child	0.22	75	0.19	68	0.08	86	0.32	76
adopted child, all	0.24	217	0.05	184	0.22	247	0.10	212
adopted child, all-adopted families	0.21	150	0.02	114	0.21	174	0.07	134
adopted child, mixed families	0.30	67	0.08	70	0.28	73	0.17	78
Unwed mother and								
her child	0.31	161	0.22	136	0.35	185	0.27	160
other adopted child in same family	0.12	115	0.21	87	0.21	128	0.18	105
biological child in same family	−0.15	77	0.28	66	−0.05	88	0.21	73

[a] *N*'s refer to the number of pairings (= the number of children)—the same parent may enter more than one pairing. In the case of twins, the second twin was excluded from the unwed mother–other child comparisons.

Table J. Parent-Child Correlations for Corresponding Wechsler Tests by Type of Adopted Family[a]

	Verbal IQ				Performance IQ				Full-scale IQ[b]			
	Sons		Daughters		Sons		Daughters		Sons		Daughters	
Correlational pairing	*r*	*N*	*r*	*N*	*r*	*N*	*r*	*N*	*r*	*N*	*r*	*N*
Adoptive father and												
biological child	0.37	75	0.34	69	0.33	75	0.47	69	0.39	85	0.46	77
adopted child, all	0.17	217	0.09	186	0.18	217	0.06	186	0.22	244	0.10	213
adopted child, all adopted-families	0.16	149	0.03	117	0.14	149	0.05	117	0.19	171	0.06	135
adopted child, mixed families	0.20	68	0.22	69	0.31	68	0.09	69	0.31	73	0.16	78
Adoptive mother and												
biological child	0.22	75	0.31	68	0.11	75	0.23	68	0.10	86	0.35	76
adopted child, all	0.10	216	0.19	184	0.23	215	0.09	183	0.19	244	0.20	211
adopted child, all-adopted families	0.01	149	0.22	114	0.20	148	0.08	113	0.15	171	0.19	133
adopted child, mixed families	0.34	67	0.14	70	0.27	67	0.11	70	0.28	73	0.23	78
Unwed mother and												
her child	0.33	29	0.30	24	0.32	29	0.08	24	0.34	29	0.23	24
other adopted child in same family	−0.09	22	−0.02	18	−0.02	22	0.37	18	−0.03	22	0.17	18
biological child in same family	−0.06	13	0.44	15	0.05	13	0.17	15	−0.26	15	0.34	16

[a] See footnote *a* of Table I regarding *N*'s.

[b] Includes 19 biological and 44 adopted children with Binet IQs.