Sibling Resemblance in Mental Ability: A Review

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Empirical evidence on sibling resemblance in intelligence published since 1915 in the United States and Europe, including more than 27,000 sibling pairs, is reviewed. The results of these investigations are presented in tables showing the date, investigator, test, sample size, and correlations found for each specific study. Collectively, the results are highly consistent with the polygenic hypothesis and the conclusion that genetic factors are the major source of individual differences in intelligence. The most likely estimate of the sibling correlation for IQ in the population is +0.49.

INTRODUCTION

The polygenic theory of intelligence accounts for the increasing test score correlations between relatives as their degree of genetic relationship increases. This article reviews specifically the empirical evidence on the correlation between siblings in measured intelligence, based on virtually all the studies of sibling resemblance in intelligence published since 1915 in the United States and Europe, including more than 27,000 sibling pairs.

THEORETICAL BACKGROUND

One aim of the genetic analysis of mental ability is to partition the test score (phenotypic) variance V_p, according to Jensen (1969), as follows:

$$V_p = V_g + V_{am} + V_d + V_i + V_E + 2\text{Cov}_{HE} + V_I + V_e$$

where V_p = the phenotypic variance
         V_g = variance due to additive gene effects
      V_{am} = variance due to assortative mating
         V_d = variance due to dominance deviation (interaction between
                  genes at the same loci)
         V_i = variance due to interactions among genes at different loci
                  (epistasis)
         V_E = variance due to environmental factors
  2Cov_{HE} = covariance between heredity and environment
         V_I = variance due to interactions between genes and environ-
                  ment
         V_e = error variance (test unreliability)

The polygenic model posits a number of genes which have small, similar, and cumulative effects in producing individual differences. An individual's genotypic value is conceived as the sum of these effects over all loci involved in the trait. Some of the genetic variance may arise from combinations of genes whose effects are not additive. Interactions between genes at the same loci, dominance deviations, contribute to the overall genetic variance. Complete dominance implies that the genetic value of the heterozygote at a given locus equals that of the dominant homozygote. Interactions among genes at different loci, called epistasis, may also contribute to genetic variance (V_i). This usually small effect cannot easily be separated from the other components (Falconer, 1960). Both dominance and epistatic deviations decrease the resemblance between relatives, except identical twins, who share *all* of their genetic effects in common.

If parental mating is not random but assortative with respect to intelligence, as appears to be the case (Jensen, 1978), genetic variance is increased by an amount, V_{am}, related to the degree of assortative mating, particularly the genetic correlation between mates on the trait in question. Under random mating, the genetic variance *within* families is equal to the genetic variance *between* families. Positive assortative mating increases the *between* family variance, which has the effect of raising the correlation between siblings. Positive assortative mating also tends to decrease within family variance.

The variance due to environmental factors V_E is defined simply as the variation not accounted for by genetic factors, excluding the covariance between heredity and environment (2Cov_{HE}), the variance due to interactions between genes and environment (V_I), and errors of measurement or unreliability. In many studies, error variance or test unreliability (V_e) is not distinguished from the environmental variance. In a few studies, however,

kinship correlations are corrected for attenuation by dividing them by the test's reliability coefficient.

Heritability, h^2, is the proportion of phenotypic variance attributable to genetic factors. So-called broad heritability ($h_B{}^2$) includes *all* genetic components. It is the total genetic variance, whereas narrow heritability ($h_N{}^2$) refers to that part of the genetic variance which accounts for the genetic resemblance between parents and offspring, and is called additive genetic variance. Heritability is a characteristic of a particular population rather than of all populations in general or of any one individual. The heritability of a given trait may vary depending on the characteristics of the population.

Jensen (personal communication) gives the following formula for the phenotypic correlation between full siblings. It takes into account the effects of assortative mating, dominance, and common environment. It assumes negligible epistatic effects, no covariance between heredity and environment, equilibrium in the population, and the basing of assortative mating on phenotype.

$$r_{FS} = \tfrac{1}{2}h_N{}^2(1 + r_{PP}\,h_N{}^2) + \tfrac{1}{4}(h_B{}^2 - h_N{}^2) + r_{ee'}(r_{XX'} - h_B{}^2)$$

where r_{FS} = the phenotypic correlation between full siblings
$\quad\ \ h_N{}^2$ = the narrow heritability of the trait
$\quad\ \ r_{PP'}$ = the phenotypic correlation between parents with assortative mating
$\quad\ \ h_B{}^2$ = the broad heritability of the trait
$\quad\ \ r_{ee'}$ = the environmental correlation between siblings
$\quad\ \ r_{XX'}$ = the average reliability of tests

A survey of recent evidence yields the following estimates of the parameters needed for this equation. The studies in which these estimates were found are not specifically concerned with the examination of sibling correlations. In his book *The Structure and Measurement of Intelligence* (1979), Eysenck reports estimates of $h_N{}^2 = 0.50$ (average of 0.47 and 0.52) and $h_B{}^2 = 0.69$. Jensen (1978), in a review of all the assortative mating coefficients for mental ability found in the literature, reports the weighted mean correlation between parents as 0.42. Loehlin and Nichols (1976) report the environmental correlation between siblings for general ability as 0.69, based on evidence involving twins. This is most likely an upper limit for the estimation of $r_{ee'}$ for nontwin siblings. The average reliability for the mental tests used to assess the similarity between siblings appears to be 0.90. It should be noted that these are not the only values to be found in the literature for these parameters but they are representative and well substantiated.

The predicted correlation between siblings in mental ability based on the above estimates is 0.49.

METHODOLOGY

The studies reviewed here measured the resemblance between siblings in intelligence in terms of correlation coefficients.

Interpretation of the correlations used in these studies are affected by three assumptions: (1) the relationship to be measured should be linear, (2) there should be no outliers in the sample, and (3) there should be no truncation of the range of possible scores. The first two assumptions are the most easily met. Restriction of range, however, is a frequent and often more serious problem. The subjects within a particular study are often very similar, sharing common backgrounds and experiences which can limit the variation in test scores. When variation in scores is restricted, the correlation coefficient underestimates the true correlation.

The correlation coefficient estimated on small samples can be quite unstable, so the number of sibling pairs in the sample should be reasonably large if it is intended to generalize to the population.

Three types of correlation coefficients are found in the sibling literature: the product-moment correlation (Pearson r, or *inter*class correlation), the double-entry product-moment method, and the *intra*class correlation. The often used product-moment correlation assumes that the two correlated variables, X and Y, can be unequivocally assigned to two distinct classes of variables, e.g., height and weight. In the case of sibling correlations, however, we usually wish to know the correlation between siblings *in general*, and not the correlation between any particular classification of the siblings, such as younger vs. older or male vs. female. Therefore, the Pearson product-moment correlation is unsuited to estimating the correlation in general between siblings, because each particular assignment of the siblings to the X and Y categories will yield a somewhat different r than will other assignments. To get around this problem, Pearson proposed the double entry method for computing the product-moment correlation. Each pair of siblings, called A and B, are entered into the computations twice, first with A assigned to X and B to Y, and then with B assigned to X and A to Y. It is useless, however, when there are more than two siblings per family.

The intraclass correlation is the most appropriate method when there is no reason for assigning one member of the pair to one group (X's) and the second to another (Y's). The intraclass correlation r_i is derived from the analysis of variance (see Haggard, 1958). It is the only suitable method for obtaining sibling correlations when there are more than two siblings per family.

The intraclass correlation closely approximates the double-entry product-moment correlation, especially as the sample size increases.

A few studies report correlation coefficients that are "corrected for attenuation," that is, the correlation is adjusted in terms of the reliability of the measuring instrument.

A few studies that involved measuring the intelligence of siblings neglected to report any kind of correlation. However, some studies provide tables of sibling differences. A correlation based on sibling differences (r_d) can be computed according to the following formula (Jensen, 1973, p. 162):

$$r_d = 1 - (|\bar{d}|/|\bar{d}_p|)^2$$

where $|\bar{d}|$ = mean absolute difference between siblings

$|\bar{d}_p|$ = mean absolute difference between all possible paired comparisons in the general population

An estimate of $|\bar{d}_p|$ can be made from 1.13σ. (The population σ for IQ is 15.) However, correlations derived by this method are not reported in this review.

A sampling problem may have affected some of the studies in this review. A few of the children officially classified as siblings could be half-siblings. A few may even be completely unrelated. There is no precise information on the frequency with which extramarital half-siblings are passed off as full siblings. It is also possible that adopted children and children from prior marriages may have been erroneously classified as siblings. Such misclassifications would, of course, lower the observed correlation between nominal siblings. One method to control for half-sibs is to obtain the correlation between siblings on some physical trait, such as height or fingerprints, in addition to the intelligence measure. The value of $r = 0.50$ between siblings on height and fingerprints is well established, and if the correlation between siblings deviated significantly from the expected value, some admixture of nonauthentic full siblings in the sample would be suspected.

EMPIRICAL INVESTIGATIONS

A chronological summary of most of the sibling studies in the literature appears in Table I, with the date of the study, investigator, intelligence measure, sample size (number of pairs), and the sibling correlation. Many of the earlier studies computed the inappropriate single-entry product-moment correlation coefficient. Those that are specifically known to have used the double-entry product-moment or intraclass correlation are so indicated. The sibling studies in Table I exclude studies of fraternal twins.

Although the various studies are quite different, it is instructive to combine the 63 correlations based on a total of 27,818 sibling pairs. The median value is 0.45. The overall mean correlation, derived from the N-weighted average of the individual z-transformed correlations, is 0.49. The overall mean correlation, based on an unweighted average of the individual z-transformed correlations, is also 0.49. The weighted mean for those correlations based only on the Stanford-Binet IQ is 0.46 ($N = 6219$). The mean correlation of the 1761 pairs measured on the Otis test is 0.48. The studies using only the double-entry or intraclass method yield a weighted average correlation of 0.44.

Table I. Sibling Correlations on Intelligence Tests[a]

Date	Investigator	Tests	N	r
1915	Dexter	Dearborn and National	800	0.53
1918	Pintner	Pintner mental indices	180	0.22*
1919	Gordon[a]	Stanford-Binet	91	0.53
1919	Gordon[b]	Stanford-Binet	216	D0.54[a]
1921	Rensch	Terman group and Stanford-Binet	365	0.45
1924	Hart	Army Alpha, National, and Stanford-Binet	252	0.45
1924	Hart	Stanford-Binet	147	0.46
1924	Hart	Stanford-Binet	219	0.40
1924	Madsen	Stanford-Binet	63	0.63
1925	Hildreth	Stanford-Binet	1028	0.42[b]
1928	Davis	Dearborn group (Series I and II)	320	0.41
1928	Davis	Haggerty Intelligence Exam	320	0.42
1928	Davis	Dearborn group (Series I and II)	106	0.52
1928	Davis	Haggerty Intelligence Exam	106	0.43
1928	Freeman et al.	Stanford Binet and International group mental test (nonverbal)	125	D0.25
1928	Jones	Stanford-Binet and Army Alpha	828	D0.49
1928	Thorndike	I.E.R. Sel., Rel., Gen., Org.	823	D0.73*
1928	Willoughby	Battery of 11 verbal and nonverbal tests	140	0.42
1929	McFadden	Stanford-Binet	31	0.82
1929	McFadden	Stanford-Binet	95	0.74*
1931	Conrad	Stanford-Binet and Army Alpha	788	0.49
1931	Sims	Otis	203	D0.40
1932	Burks	Stanford-Binet	34	0.45
1932	Burks	Terman group	32	0.67
1932	Burks	Terman group	52	0.61
1933	Finch	Stanford-Binet and Terman group	359	0.49
1933	Finch	Terman group	199	0.49
1933	Finch	Kuhlman revision of Stanford-Binet.	465	0.34*
1933	Outhit	Stanford-Binet and Army Alpha	63	0.60[c]
1933	Stocks and Karn	Stanford-Binet and Teacher ratings	70	0.90*
1934	Koch and Stroud	Haggerty Intelligence Exam	162	0.63
1935	Pintner and Forlano	Pintner Rapid Survey (A)	137	D0.23*
1936	Richardson	Stanford-Binet	202	0.49
1937	Matthews et al.	Otis (Advanced and Primary)	276	I0.30*
1937	Newman et al.	Stanford-Binet	47	0.37

Table I.   Continued

1938	Cattell and Wilson	Cattell Scales 0, I, II, III	199	D0.77*
1939	Pintner et al.	Pintner Rapid Survey (A)	378	D0.38
1940	Conrad and Jones	Stanford-Binet and Army Alpha	777	D0.49
1940	Roberts	Otis (Advanced)	1163	I0.53
1942	McNemar	Stanford-Binet	384	D0.53
1944	Thorndike	I.E. R. Sel., Rel., Gen., Org.	812	D0.43
1944	Thorndike	I.E.R. Sel., Rel., Gen., Org.	486	D0.40
1954	Tabah and Sutter	Test mosaique de Gille (French group test)	1244	I0.45
1956	Schoonover	Stanford-Binet	59	0.71
1960	Maxwell and Pilliner	Stanford-Binet	1036	I0.45
1961	Alstrom	Swedish Wechsler-Bellevue	212	0.52
1962	Higgens et al.	Various tests	1694	D0.52
1966	Huntley	Vocabulary tests from Terman-Merrill, WISC, and Ravens Mill Hill	108	0.58
1966	Spreen and Anderson	WISC	24	0.29
1969	Record et al.	Verbal Reasoning Tests	5054	0.55*
1970	McCall	Stanford-Binet (90%) WISC (6%) and Merrill-Palmer (4%)	100	0.55
1970	Nichols	4-year Stanford-Binet[1]	1100	I0.52
1970	Nichols	4-year Stanford-Binet[2]	970	I0.37*
1972	Olive	Otis (Quick-Scoring 1954)	199	0.45
1973	Jensen	Lorge-Thorndike Primary[1]	277[d]	I0.44
1973	Jensen	Lorge-Thorndike Verbal[1]	707[d]	I0.38*
1973	Jensen	Lorge-Thorndike Nonverbal[1]	709[d]	I0.39
1973	Jensen	Lorge-Thorndike Primary[2]	162[d]	I0.43
1973	Jensen	Lorge-Thorndike Verbal[2]	346[d]	I0.36
1973	Jensen	Lorge-Thorndike Nonverbal[2]	359[d]	I0.34*
1974	Fuller and Shuman[1]	Stanford-Binet	32[e]	I0.13
1977	Scarr and Weinberg	WAIS, WISC, and Stanford-Binet	107	I0.42
1977	Wilson	WISC	56	I0.46
1978	Matarazzo et al.	WAIS	10	D0.31
1979	DeFries et al.	Fifteen cognitive abilities	216[d]	I0.25*

[a] D, Double-entry product-moment correlation; I, intraclass correlation. (Others are single-entry product-moment or unknown.) *, Significantly ($p < 0.05$) different from mean $r = 0.49$. (a) All possible pairs, as determined by Elderton (1923). (b) Recalculated by Finch (1933), originally reported as $r = 0.63$. (c) Siblings paired according to serial position, brother–sister pairs; correlation has been reported by Thorndike (1944) and Nichols (1970) to be 0.67. (d) N, Number of families. (e) Normal (unaffected) siblings of PKU children. (1) White siblings only. (2) Black siblings only.

In an attempt to discern whether all of the studies could be considered to have been sampled from the same universe of siblings, with a true mean correlation of 0.49 (i.e., the weighted mean of all 63 correlations), each individual correlation was tested to see if it was significantly different from 0.49. The risk of a type I error for the family of 63 planned comparisons was fixed at 0.05 (see Marascuilo, 1971, pp. 450–455). Only 13 out of the 63 correlations were found to be significantly different from the overall mean

correlation of 0.49. These correlations are indicated in Table I by an asterisk.

No distinctive trend or pattern is found when the correlations are examined across the seven decades of investigations. The weighted average correlations for the first five decades vary only slightly, between 0.46 and 0.51. The weighted average sibling correlation for the studies reported in the 1960s is 0.53 (N = 8128). For those studies reported in the 1970s the weighted average correlation is 0.41 (N = 5350).

As mentioned earlier, a correlation coefficient is a relatively unstable measure when sample sizes are small. When we compare (a) the absolute difference of every correlation from the mean of 0.49 to (b) the sample size of the study, we find a negative correlation r_{ab} of -0.22 ($p < 0.10$), which indicates that the larger the sample size the smaller is the deviation of the particular r from the overall mean correlation.

Several of the individual studies warrant discussion. Hildreth (1925) provided an excellent summary of the previous studies of sibling intelligence and achievement. Her own results were based on Stanford-Binet (1916) scores of 1028 pairs of siblings. She reported a product-moment correlation of 0.68 and a partial correlation that controlled for age of 0.42.

Sims's (1931) article compared the correlation based on Otis test scores of 203 sibling pairs with that of 203 pairs of unrelated adopted children reared together having the same age and home background and from the same school as the siblings. Sims's double-entry correlations are 0.40 for the siblings and 0.29 for the unrelated pairs. Sims attributed the unusually high correlation of the unrelated pairs to common environmental effects, but selective placement by adoption agencies might also have contributed to the correlation.

Matthews *et al.* (1937) were the first to report an intraclass correlation for sibs: r = 0.30 based on 276 pairs of scores on the primary and advanced Otis intelligence tests. Roberts (1940) reported an intraclass correlation of 0.53 for a large sample of sibs (N = 1163) who took the advanced Otis test.

The study by Maxwell and Pilliner (1960) is part of a follow-up of the 1947 Scottish Mental Survey. It is important for several reasons. First, it is a sample chosen from the entire population of 11-year-olds in Scotland by a random procedure (those born on the first day of even-numbered months). Second, each sib was tested near his eleventh birthday (rather than cross-sectionally and thus at different ages), as in most of the other studies. Stanford-Binet IQs were obtained from 1036 sibs of 654 of the original study children. The intraclass correlation is 0.45.

Record *et al.* (1969), in England, provide the largest sibling intelligence study in the literature, showing a correlation of 0.55 based on 5054 pairs. As in the Maxwell study, each sibling was tested at age 11. The tests used,

however, were limited to two verbal reasoning tests included in an exam taken by all English children at age 11.

Nichols (1970) and Jensen (1973) both report sibling intraclass correlations separately for blacks and whites. Nichols found the correlation between sibs on the Stanford-Binet test for 4-year-olds to be higher for 1100 white (r = 0.52) children than for 970 black children (r = 0.37). On the other hand, Jensen's sibling correlations on the Lorge-Thorndike IQ tests show very small race differences (L-T Primary: 277 whites r = 0.44, 162 blacks r = 0.43; L-T Verbal: 707 whites r = 0.38, 346 blacks r = 0.36; L-T Nonverbal: 709 whites r = 0.39, 359 blacks r = 0.34).

EFFECT OF AGE DIFFERENCE

A number of investigations indicate that the sibling correlation is not dependent on the age difference between siblings. Pintner *et al.* (1939), for example, reported the sibling correlations at four ranges of age differences based on scores of the Pintner Rapid Survey, using the double-entry correlation. No consistent and meaningful pattern is apparent. They report correlations of 0.48, 0.35, 0.46, and 0.22 for age differences in months of 0–18, 19–24, 25–34, and 35 and up, respectively. The sibling correlations do not decrease as the difference in age increases. There is a significant difference between the r = 0.48 associated with an age difference of 0–18 months and the r = 0.22 associated with the 35 months and up difference in age range, but not for any of the other possible comparisons of the four correlations reported. The studies of Finch (1933), Pintner and Forlano (1935), and McNemar (1942) also fail to provide convincing evidence that the sibling correlation is dependent on the age difference between siblings.

McCall (1970) examined the intelligence quotient pattern over age. In a longitudinal study conducted by the Fels Research Institution in which IQ tests were administered every 6 months from 3½ to 6 years, then every year until age 13, McCall reported that "these data suggest that relatively simple trends in IQ over age occur in a large number of normal children. Furthermore, although the general level of IQ appears to show heritability, the pattern of IQ change over age possesses far less heritability" (p. 647). There was no difference in the pattern of IQ change over age for siblings and unrelated pairs.

SAME-SEX AND OPPOSITE-SEX SIBLINGS

Many studies report sibling correlations separately for like- and opposite-sex pairs, as summarized in Table II. Willoughby (1928) and Elderton (1923) both failed to report the number of pairs on which their

Table II. Sibling Correlations on Intelligence Tests Like- and Opposite-Sex Pairs[a]

Date	Investigator	Tests Used	Pair	N	r
1921	Rench	Terman group and Stanford-Binet	S-S	19	0.28
			S-S	82	0.51
			B-B	17	0.33
			B-B	105	0.40
			B-S	164	0.34
1923	Elderton (Drinkwater data)	Stanford-Binet and Binet-Simon	S-S	?	0.49
			B-B	?	0.38
			B-S	?	0.53
1928	Davis	Dearborn group test (orphans)	S-S	117	0.41
			B-B	112	0.48
			B-S	167	0.44
1928	Davis	Haggerty Intelligence Exams (orphans)	S-S	117	0.33
			B-B	112	0.55
			B-S	167	0.45
1928	Davis	Dearborn group test (public school)	S-S	44	0.29
			B-B	30	0.61
			B-S	54	0.50
1928	Davis	Haggerty Intelligence Exams (public school)	S-S	44	0.39
			B-B	30	0.24
			B-S	54	0.58
1928	Willoughby	Battery of 11 verbal and nonverbal tests (total of 280 sibs)	S-S	?	0.45
			B-B	?	0.44
			B-S	?	0.36
1931	Conrad	Stanford-Binet	S-S and B-B	159	0.47
			B-S	153	0.53
1931	Conrad	Army Alpha	S-S and B-B	178	0.40
			B-S	144	0.55
1931	Conrad	Stanford-Binet and Army Alpha	S-S and B-B	72	0.48
			B-S	82	0.44
1933	Outhit	Stanford Binet and Army Alpha	B-S	63	0.60
1935	Pintner and Forlano	Pintner Rapid Survey (A)	S-S	35	D0.29
			B-B	41	D0.21
			B-S	51	D0.16
1940	Conrad and Jones	Stanford-Binet and Army Alpha	S-S	185	D0.51
			B-B	218	D0.39
			S-B	374	D0.54
1969	Record et al.	Verbal Reasoning Tests	S-S	1298	0.55
			B-B	1231	0.55
			B-S	1307	0.53
			S-B	1218	0.57
1970	Nichols	4-year Stanford-Binet[(1)]	S-S and B-B	530	I0.56
			B-S	570	I0.48
1970	Nichols	4-year Stanford-Binet[(2)]	S-S and B-B	450	I0.39
			B-S	520	I0.35
1972	Olive	Otis (Quick Scoring) contains 12 twins)	S-S	74	0.57
			B-B	51	0.27
			B-S	86	0.44
1979	DeFries et al.	Fifteen cognitive abilities	S-S	125[(a)]	I0.16
			B-B	114[(a)]	I0.26
			B-S	216[(a)]	I0.25

[a] D, Double-entry product-moment; I, intraclass. (Others are single-entry product-moment or unknown.) (1) White siblings only. (2) Black siblings only. (a) N, Number of families. S-S, Sister–sister; B-B, brother–brother; B-S, brother–sister (opposite sex regardless of direction); S-B, sister–brother.

Table III. Weighted Average Sibling Correlations
Separately by Sex

Combination	N	r
Sister–sister	2140	0.49
Brother–brother	2061	0.49
All like sex	5590	0.49
Opposite sex	5390	0.49

correlations are based. Their data are presented here only for completeness, but they have not been figured into any of the summary statistics.

Weighted mean correlations based on Fisher's z transformation were computed for the different sex combinations, as seen in Table III. There is no apparent difference in the relationship between siblings regarding intelligence that can be attributed to differences in sex. As was stated by Conrad and Jones (1940), "It is clear that the environmental similarities presumably associated with similarity of sex have failed to exert any differential effect on intelligence resemblance in the present sample" (p. 137).

MISCELLANEOUS STUDIES

A few unique investigations should be mentioned. Freeman et al. (1928) report a double-entry correlation of 0.25 ($N = 125$) between full siblings *raised apart*, based on the Stanford-Binet and the International Group Mental Test (nonverbal). These siblings were separated not at birth but at an average age of 5 years 4 months. The tests were administered after the siblings had been separated for an average of 7 years 4 months.

Nichols and Broman (1974) reported sibling correlations based on 8-month Bayley mental scores. Infant "intelligence tests" are really measures of coordination and motor development rather than tests of intelligence. Nichols and Broman report a sibling intraclass correlation of 0.22 based on 4347 pairs. This result is not reported in any of the present tables and is not included in any of the summary statistics.

Because of the questionable authenticity of the kinship data reported by Sir Cyril Burt (see Hearnshaw, 1979), his studies are not included in the main body of this report and do not figure into any of the summary statistics. For a complete summary of the kinship correlations reported by Burt, see Jensen (1974). The unit-weighted averages of Burt's purported sibling correlations are 0.53 for siblings reared together and 0.48 for siblings reared apart.

The investigations reported here span more than 60 years of research in which intelligence was measured with a wide variety of tests. Yet collec-

tively the sibling correlations they have yielded are highly consistent with the polygenic hypothesis and the conclusion that genetic factors are the major source of individual differences in intelligence. The empirical evidence is in agreement with the theoretical prediction. The most likely estimate of the sibling correlation for IQ in the population is +0.49.

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