

INTELLIGENCE: THE ROLE OF HEREDITY AND ENVIRONMENT

Whether one's intelligence is largely dependent upon heredity—genetic materials and codes inherited from one's parents or is chiefly designed by one's life experiences or environmental factors has been a controversial issue. While geneticists in this debate attach all importance to heredity, the environmentalists give all credit to environment. In support of their viewpoints, both of them put forward the following experimental evidence.

Evidence in Support of the Role of Heredity

Family resemblance studies. Bouchard and McGue (1981) reported a study based on the computation of coefficients of correlation and their comparison. The results of their studies can be summarised as follows:

Identical twins	0.86
Parents and children	0.56
Brothers and sisters	0.53
Half siblings	0.31
Cousins	0.15

Through this study they tried to establish that the closer the kinship or blood relationship between individuals, the more similar their I.Q. scores tend to be, leading to the conclusion that similarity from the point of view of heredity potential increases the probability of the intelligence potential being similar.

A similar conclusion has been arrived at by Teasdale and Owen (1984) through their comparative study of intelligence scores of full siblings, half siblings and individuals who were unrelated but reared together, and apart. This study demonstrates a very high correlation in the I.Q. scores of full siblings, whether they were raised together or apart in comparison to half siblings and unrelated individuals who demonstrated comparatively less correlation and no correlation respectively.

Further evidence of this theory of blood relationship and family resemblance may be seen in the studies reported by Jencks (1972) and Munsinger (1978). These studies demonstrate a positive correlation ranging from .40 to .50 between adopted children and their real parents in contrast to a very small correlation of +.10 to +.20 between the adopted children and adopted parents, leading to the conclusion that people closer to each other from the point of view of heredity potential have comparable I.Q.

Twins studies. Twins are said to be genetically more closely related than normal siblings and among twins also, identical twins (having exactly the same genes) are said to be even closer in terms of heredity potential than fraternal twins (having different sets of genes). Many studies involving the separation of twins at birth and their rearing in different environments have been carried out.

In one such study, Wilson (1975) tried to test I.Q. of over 100 pairs of twins on the Wechsler scales at ages 4, 5 and 16 and found a strong correlation between the I.Q. scores of identical twins in comparison to the scores of fraternal twins.

In another study Bouchard and his colleagues (1984, 1987) located a number of identical twins (who were separated from their parents only a few days after their birth and reared in different homes) and subjected them to intelligence tests. This study demonstrated a very high correlation in the I.Q. scores of identical twins reared apart to almost the same degree as found in the case of identical twins reared together. Moreover, twins reared apart are found to resemble each other in other aspects of human personality—physical appearance, interests, aptitudes, habits and mannerism, etc. also.

In the light of the findings of such studies, psychologists like Arthur Jensen have taken a firm stand that heredity decides everything about the observed differences in human intelligence. Through a study of 1200 California school children in which blacks on the average were found to score 16 points lower on I.Q. tests than whites, he tried to establish that genetic factors are strongly responsible for measured differences in intelligence.

Evidences in Support of the Role of Environment

Family resemblance studies. Many studies have indicated that the individuals (having same degree of blood relationship or family relationship) have more comparable I.Q. if they happen to be reared in the same environment in comparison

to those raised apart and in different environments. The results of two such studies, Study 1: Loehlin, Lindzey and Spuhler (1975), and Study 2: Bouchard and McGue (1981) are given below:

<i>Modes of relationship and rearing</i>	<i>Coefficient of correlation</i>	
	<i>Study 1</i>	<i>Study 2</i>
Identical twins (reared together)	0.88	0.85
Identical twins (reared apart)	0.75	0.67
Siblings (reared together)	0.49	0.45
Siblings (reared apart)	0.46	0.24

Studies of environmental deprivation or enrichment. The adverse effects of environmental deprivation and positive, favourable effects of environmental enrichment upon the children's intellectual development have been demonstrated in many studies.

In one of his studies Gottfried (1984) concluded that if the children are subjected to certain forms of environmental stimulation early in life, their intellectual development gets adversely affected. Similar conclusions were drawn in another study conducted by Sherman and Key (1932) in an unprivileged remote hilly area of U.S.A. to the effect that lack of language training and school experience accounted for the very poor scores of the children in the standardized intelligence tests.

However, when the children were provided with favourable environmental situations in the form of appropriate adoptive homes, better schooling, and learning facilities, etc., the results were quite encouraging in terms of intellectual development. A well known adoption study (Schiff et al., 1978) conducted in France is a good example. In this study, the investigators compared the I.Q. scores of the children who had been adopted by parents belonging to higher socio-economic class with those of their siblings, who had not been adopted. The average score of the adopted children was 111 in comparison to the average score of 95 of their siblings (brothers and sisters) raised by their biological parents. The privileged environment may thus be said to be responsible for raising the average I.Q. score by 16 points.

Family structure and birth order studies. The environmental influences related to the composition and structure of the family even to the extent of the birth order of the child has been found to affect his intellectual growth. There have been many studies, e.g. those conducted by Belmont and Marolla (1973), and Robert Zajonc (1983), to demonstrate that (a) children from large families tend to have lower I.Q. scores than children from small families, and (b) later-born children usually score lower than early-born children.

Zajonc (1976, 1986) proposed the confluence theory to explain the difference in intelligence on account of order of birth. According to this theory one's intellectual development is dependent upon the intellectual environment available in one's family. A first-born child enjoys the benefit of the company of two parents—a relatively advantaged intellectual environment compared to the

second-born child in whose case the attention of the parents is divided between the two. The first-born also has the initial advantage of a better intellectual environment in living only with adults rather than with both, adults and with their younger siblings. Consequently, in the matter of intellectual development, the second child is bound to suffer. Such effects become more apparent in the third-borns and continue to multiply as the number of children in the family increases.

Apart from the above mentioned considerations, the other things related to the family environment like education of the parents, economic and social status of the family, nutrition, physical and social surroundings of the home, etc., are also found to contribute significantly to the intellectual growth of the children. Enough experimental evidence has been put forward by geneticists and environmentalists to support their respective view points. Prem Pasricha (1963) has made a very interesting observation regarding these experiments. According to her:

It is quite customary for the psychologists wedded to either side, viz. heredity and environment, to perform experiments and quote findings in favour of either of the factors. It has also been found that the findings of these experiments can be interpreted either way and can be easily made to support the opposite view. When analysed in an objective manner, it indicates clearly that the two are so closely interwoven that it is difficult to separate the effect of one from that of the other.

Let us discuss why it is difficult to conduct actual experiments for the study of the impact of pure heredity or environment on the growth and development of intelligence.

To accurately study the impact of environment on intellectual development we have to have subjects with the same heredity. After keeping them in different environments, comparisons can be made. Conversely, for studying the impact of heredity, the environmental factors need to be identical and individuals belonging to different hereditary stock and brought up in exactly the same environments may be compared for this purpose.

The following difficulties arise while conducting these studies:

1. It is impossible to get individuals having the same heredity. Even identical twins are not supposed to have exactly the same genes and therefore, the same hereditary characteristics.
2. If we assume that identical twins at the time of conception, belong to approximately similar hereditary stock, then the question arises: Is it possible to experiment upon them from the moment of conception? Starting from the time of fertilization and division of the ovum, can these twins be exposed to different types of environment for studying the impact of environmental differences? This is obviously not possible and only after their birth—approximately nine months after their conception—is the pair available for experimentation. We cannot rule out the environmental effects inside the womb of the mother. Nor can these effects as a common influence upon the pair be ruled out. It may happen that one of the twins gets a major share of nourishment and is favoured by the inner environment in one way or the other while the other is to some extent neglected. It is, thus, difficult to ensure exactly identical heredity even in identical twins.

3. Further, the environmental influences cannot be identically controlled; hence it is very difficult to provide exactly the same environment for different individuals. Even the mother cannot show equal amount of love and affection to all her children. There are individual differences and as a result one individual may be favoured in comparison to another. In the same foster home or orphanage, the various individuals are subjected to different environmental conditions depending upon their own nature as well as the attitude of the officials and the people in charge.

The main reason for the failure to specifically control the hereditary or environmental factors is that the influence of both these factors on the growth of the individual's intelligence is inseparable. Right from the time of conception, the two factors are so intimately intermingled and interwoven that it is difficult to say whether the differences in intellectual capacities of different individuals are due to the genes or due to the environmental influences. It is obvious, therefore, that the claims of both geneticists and environmentalists are one-sided and exaggerated. However, there is no gainsaying the fact that a person's intellectual development at a particular age is the sum of what he inherited from his parents and his experiences as a result of interaction with the environmental situations. Since we cannot control or modify the hereditary factors, we need to direct all our efforts and resources towards providing the most conducive environmental situations for the proper intellectual development of the children in our charge.