

*The influence of heredity and environment on intelligence (adapted) – M.W. Eysenck*

Some accounts of individual differences in intelligence suggest they depend on heredity. In other words, it could be that our level of intelligence depends mainly on the genes that we inherit from our parents. Another possibility is that individual differences in intelligence depend on the environment. According to this view, some individuals are more intelligent than others because they have had more favourable environmental conditions, such as good teaching, supportive family and friends, and so on. This is commonly known as the *nature versus nurture* debate and has been the subject of discussion and controversy amongst psychologists for many years.

**Twin studies**

Some of the most important work on the origins of intelligence has made use of twins. Identical twins have the same heredity, meaning that they inherit the same genes. Fraternal (non-identical) twins share 50% of their genes, and thus are no more similar in their heredity than ordinary brothers and sisters. If heredity is important in producing individual differences in intelligence, we would then expect to find that identical twins are more similar in intelligence than are fraternal twins. If environment is the only important factor in determining intelligence, it might then be reasonable to predict that identical twins would be no more similar in intelligence than fraternal twins.

The degree of similarity in intelligence shown by pairs of twins is usually reported in the form of correlations. A correlation of + 1.0 would mean that both twins in a pair obtain exactly the same IQ (Intelligence Quotient). This is based on performance across all of the sub-tests included in an intelligence test and considered to provide an overall measure of intellectual ability. A correlation of 0, however, would mean that there was no relationship at all between the IQs of the twins. Bouchard and McGue (1981) reviewed over 100 twin studies and found that the average correlation for identical twins was +0.86, whereas it was +0.60 for fraternal twins. Thus, identical twins are more alike in intelligence than are fraternal twins, and this suggests that heredity plays a part in determining individual differences in intelligence. A problem in interpreting these findings, however, is the possibility that identical twins tend to have more similar environments than do fraternal twins, since in this case, the higher correlation for identical twins might be due to environmental factors rather than to heredity. Identical twins spend much more time together than do fraternal twins, and their parents are much more likely to treat them exactly the same (Loehlin and Nichols, 1976).

Further evidence comes from the rather small number of identical twins who were separated in early life and then brought up apart. Such twins are very important because they have the same heredity but grow up in a dissimilar environment. If heredity is of major importance, such twins should have very similar measured intelligence, whereas if environment is of most importance there should be little or no similarity in intelligence. The average correlation for identical twins brought up apart is +0.72 (Bouchard and McGue, 1981). This finding suggests that heredity is of major importance, but any claim for the significance of heredity should be

qualified because many identical twins brought up apart are reared in different branches of the same family, and many of the pairs spent the first few years of their lives together before being separated. It seems likely then that some of the general similarity in IQ within identical twin pairs brought up apart is due to the fact that they experienced similar environments.

Bouchard, Lykken, McGue, Segal and Tellegen (1990) conducted further research on identical twins brought up apart. They studied more than 40 adult twin pairs who had been separated at a mean age of 5.1 months, and who had spent on average 9.2 months together during their lives. In spite of the fact that these twin pairs had been separated in infancy, their IQs correlated at +0.75. Bouchard *et al.* also found that the similarity in IQ of identical twins brought up apart depended very little on their age at separation or on the total amount of contact with each other they had experienced.

### **Adoption studies**

Adoption studies provide another way of assessing the relative importance of heredity and environment in determining individual differences in intelligence. If heredity is more important than environment, then adopted children's IQs will be more similar to those of their biological parents than their adoptive parents, but the opposite pattern will be found if environment is more important. The evidence indicates that the IQs of adopted children are more similar to those of their biological parents than of their adoptive parents, suggesting that heredity may be more important than environment in determining individual differences in intelligence. However, it is often hard to interpret the findings from adoption studies because of the importance of selective placement: adoption agencies often have a policy of trying to place infants in homes with similar educational and social backgrounds to those of their biological parents. As a result, some of the similarity in IQ between adopted children and their biological mothers may occur because they are living in an environment that resembles the home environment.

However, Caron and Dwyne (1989) carried out an important study on adopted children, which had the great advantage that there was little or no evidence of selective placement. The socio-economic status of the biological parents had a major impact on the adopted children's IQ, and the same was true of the socio-economic status of the adoptive parents. Favourable heredity or favourable environment both led to significant increases in the children's level of intelligence, and the effects of heredity and environment were thus of comparable importance.

### **Environmental factors**

There is very strong evidence that environmental factors can have a large effect on intelligence if the environment is sufficiently extreme. For example, Wheeler (1942) studied the members of an isolated community in Tennessee in the United States. This community gradually became more integrated into society as schools and roads were built, and communications with the outside world developed. The IQs of the members of this community increased by 0.1 on average during the time that these environmental changes were occurring. In contrast,

canal-boat children in England who received almost no schooling showed a steady decrease in IQ as their years of isolation from society increased (Gordon, 1923).

Sameroff, Seifer, Baldwin, and Baldwin (1993) tried to identify some of the main environmental factors influencing children's IQ. They carried out a long-term study following hundreds of children and testing their IQs at the ages of 4 and 13. They found 10 environmental factors which jointly accounted for 49% of individual differences in IQ. These factors were as follows:

- The mother has a history of mental illness.
- The mother did not go to high (secondary) school.
- The mother has severe anxiety.
- The mother has rigid attitudes and values about her child's development.
- There were few positive interactions between mother and child during infancy.
- The head of the household has a semi-skilled job.
- The father does not live with the family.
- The child belongs to a minority group.
- The family suffered 20 or more stressful events during the child's first 4 years of life.

The main limitation of the study by Sameroff et al. (1993) is that it is not clear whether all of the 10 factors were causally related to children's IQ. For example, consider their evidence that the mother not going to high school and the head of the household having a semi-skilled job were associated with low IQ in the children. It is possible that genetic factors play a part in producing these environmental factors *and* in leading to low IQ in children.

The entire discussion about the relative importance of heredity and environment in determining intelligence is complicated still further by the fact that the significance of these two factors is not fixed. The environments experienced by children within Western societies are probably more similar than those experienced by children in some other societies. For example, nearly all children in the United Kingdom receive at least eleven or twelve years of schooling, whereas large percentages of children in some other societies receive none at all. This is clearly important to the nature versus nurture debate because the more similar the environments are for individuals within a society, the greater will be the apparent impact of heredity in determining individual differences in intelligence.

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