Psychology Lisa Flavell Outcome 2

Genes play a significant role in the development of behaviour. Discuss.

The debate concerning the influence of genes on human behaviour has been on-going for centuries. The nature vs. nurture (or heredity Vs. environment) debates are one of the longest running, and most controversial, both inside and outside psychology. It is concerned with some of the most fundamental questions a human being could ask, such as 'Why are we they way we are?' and 'why do we develop as we do?' Historically this debate has been fought from extreme perspectives, arguing that it is either nature (an individuals heredity genetical make up), or nurture (the environmental influences upon an individual) that determine a person's behaviour. However in modern psychology is has generally been accepted that these are impossible positions to take. It is neither true to say that development is caused either by genetic factors or by environmental ones, but instead a constant interaction between the two. This topic is generally researched by examining individual's intelligence, for example, by comparing the results of tests on both monozygotic (MZ) and Dizygotic twins, brought up in shared and non - shared environments. Most researchers now agree that both heredity and environment contribute to intelligence, heredity and environment interact in various ways and that extremely poor, as well as enriched environment can interfere with the realisation of a person's intelligence, regardless of his or her heredity. Although there are many problems in investigating this topic, these basic assumptions suggest that genes infact do play a very significant role in the development of behaviour. The question, however, now becomes 'how much does either contribute?'

The nature/ nurture debate dates back as far as the seventeenth century. With philosophical thinkers such as the John Locke, who believed that at birth the human mind is tabula rasa, a 'blank slate' that is gradually filled with experience. On the other hand, the French philosopher Rene Descartes, was a seventeenth century nativist who believed that knowledge of the world was largely innate or inborn and that nature (heredity) determined certain abilities and capacities. Popular in the eighteenth century was the philosophy of Jean-Jacques Rousseau who claimed that children should be free to develop as nature dictates. However towards the beginning of the nineteenth century the heredity

thesis was more dominant but then again the dominant opinion swung to the environmental perspective by the middle of the century.

The Canadian psychologist, D. O. Hebb in 1949[1] argued that there was too much misunderstanding on the subject because two separate facts had not been recognised. Firstly, that because we have the biological ability to form cell assemblies that allow us to store memories and solve problems, we therefore have the innate ability to form cell assemblies. However the second fact is that although we have this ability, we may not necessarily be able to do so to the fullest extent, depending on the environment that may either help or hinder development. He saw, rather, that a better question to ask would be 'do behavioural differences occur because people differ in genotypes or because they differ in terms of experience'. He argued that human behaviour and characteristics are an interaction of both nature and nurture, in every case. He gives, for example, the case of Phenylketonuria (PKU), which is a genetic disorder that occurs when an individual receives a particular pair of genes at conception. Most people have a pair of genes that successfully control the breakdown of the protein, phenylalaline. However PKU sufferers have genes that break the phenylalaline down into a substance that is poisonous to the developing nervous system, the result is mental retardation. However Hebbs points out that although someone may try and argue that this is an example of genetic factors controlling intelligence, if the disorder is detected at an early stage and the child is raised on a phenylalaline – free diet, they can develop normally and have a normal IQ. This shows that the effects of genetics are dependant upon the environment and that intelligence is a result of an interaction of both genetic and environmental factors.

The nineteenth century Austrian monk, Gregor Mendel[2] has been extremely influential in the field of research in this topic. Using flowering pea plants Mendel discovered that certain traits are more dominant than others. He crossed red-flowering plants with white flowering plants and found that they produced only red flowering plants, yet when he crossed the second generation of red-flowering plants with white flowering ones, he found that 25% of the resulting flowers where white-flowering. These basic findings have helped develop the laws of inheritance of which the study of genetics is based.

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[1] Source 1: Hardy, M., and Heyes, S. (1996) pg232

[2] Source 2: Dobson, C, B., Hardy, M., etc (1981) pg 217

However both sides have their supporters. Sir Cyril Burt was a passionate supporter of genetics being the origin for intelligence. He in fact went as far as to attribute 80% of intelligence to heredity and 20% of the environment. Although Burt is strongly associated with the genetic school he did however recognise the influence of environmental factors. However if we are to believe that genes play a more significant ro le in the development of behaviour, it can be argued that we should therefore expect the following to be true: similar behaviour for similar genotypes, the IQ of an individual should remain constant throughout their lifetime, experience will have no impact upon behaviour and finally that any attempts to change behaviour shall fail.

To examine the first point, that there should be similar behaviour for similar genotypes, we must first consider the very basics of genetics. Genetics refers to what is typically thought of as inheritance, that is, differences in genetic material (which are chromosomes and genes) that are transmitted from generation to generation. So what are genes? Genes are the basic unit of hereditary transmission. They consist of large molecules of DNA (deoxyribonucleic acid), which are extremely complex chains comprising in a ladder like, double helix structure (discovered by Watson & Crick in 1953)[3]. These genes occur in pairs and are situated on the chromosomes, found within the nuclei of l iving cells. A normal human being will have 23 pairs of chromosomes, with one member of each pair belonging to a parent. The genes that we inherit are known as the genotype and are involved in the development of a particular trait, while the phenotype is the actual trait itself as it develops within the organism, in other words, the directly observable characteristics. When observing a person's behaviour, it is the phenotype genes you are actually viewing.

It should therefore be the case, if genes play a more significant role in behaviour, that individuals with similar genotypes will have similar behaviour traits (or phenotypes). It is believed that the closer the familial relationship between two people, the greater on average is their genotypic similarity. It can therefore be fair to claim that two children who are brought up within the same family will experience more similar environments than two children brought up in different families (generally). Thus, siblings will usually resemble each other geno typically more than cousins. Siblings do, however, share more similar environments, so if they are more similar in intelligence, it is still extremely difficult to

[3] Source 3: Gross,r., McIlveen,R., Coolican, H., Clamp, A., and Russell, J., (2000) pg 640

decide whether the genetic or the environmental influence is more important.

However, based on the generalisation that the closer the genetic relationship, the greater the correspondence pf psychological characteristics, the correlation procedure has become the main method of investigation the contribution of intelligence by genetic factors . Jenson (1973)[4] provided useful research that revealed a lack of correspondence on intelligence between people who were in no way related at a –0.01 correlation. Between foster parents and children there was a correlation on 0.20. The correlation of aunts , uncles, nieces and nephews reached 0.34, while between actual parents and their children the correlation was 0.50. For siblings however, this relationship increased to 0.55. It should be noted here that in terms or correlation coefficients, a high positive correlation indicates a reasonable similarity of intelligence with a low or negative correlation indicating little or no similarity. Although these figures do suggest a possible genetic link with intelligence, further critical analysis could suggest an environmental rather than a genetic explanation.

Data available from twin studies, however, has been particularly useful in providing evidence to support the genetics case. As the psychologist Francis Galton first pointed out, there are two kinds of twins. Monozygotic (MZ) twins develop from the same fertilized egg, which splits to produce two individuals with essentially identical genotypes, (identical twins). Dizygotic (DZ) twins derive from two separate fertilised ova, thus their genotypes are no more similar than any two ordinary siblings, however, since they share the same age, their environments are likely to be more similar.

The leading psychologist, Sir Cyril Burt[5], studied genetics and intelligence during the 1940's and 50's and was mainly resp onsible for weakening the environmentalist point of view at that time. He compared sets of separated MZ twins with DZ twins reared together. The group tests yielded correlation results of 0.77 for the separated MZ twins and 0.55 for DZ twins raised together, successfully weakening environmentalist viewpoint. Furthermore, Burt carried out further study were the correlation separated MZ twins increased to 0.87, and DZ twins

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[4] Source 2: Dobson, C., Hardy, M., etc (1981) pg 219

[5] Source 2: Dobson, C., Hardy, M., etc (1981) pg 219

together reduced to 0.45. This research provides significant support for the genetic argument however, it was discovered that Burt falsified a number of of his figures to support his theory of inherited intelligence. It is now generally accepted that any heritability estimation produced from Burt's results must be re-evaluated.

While Burt concluded from his studies that 80% of the differences betweens IQs of people in Britain were due to inherited factors and only 20% were due to environmental differences, re-evaluative studies by H.H Newman, F.N Freeman, K.J Holzinger (1928)[6] produced heritability estimates of about 50%. Also Bouchard and McGue (1981)[7] produced significant results that showed a correlation of 0.86 with MZ twins reared together, 0.72 for MZ twins reared apart and for DZ twins reared together, a correlation of 0.60. Many of these results achieve significant evidence to suggest that MZ twins are likely to have similar IQ ratings therefore genetic inheritability has a highly significant effect upon intelligence.

Another particularly supportive study to the genetics perspective, was conducted by Shields (1962)[8] who found MZ twins who had been separated at a young age, also MZ twins raised in the same household and for comparative purposes fraternal twins were also studied. The results showed that for MZ twins, there was a correlation with intelligence scores of 0.77, and with non-separated MZ twins a 0.76 correlation. This result suggests that there is practically no effect of separation on MZ twins, with respect to intelligence. On the other hand, DZ twins raised apart showed a correlation of only 0.57. Shields has however also been criticised as the results were produced by an unsatisfactory 'pooling' method, with only four pairs of twins raised apart and three raised together.

There are nevertheless still problems with twin studies. According to Gross (1992) and Eysenck (1996)[9] MZ twins are more likely than DZ twins to be treated the same way, because of their physical similarity, this then means that both environmental and genetic similarity are greater in MZ twins than DZ twins. So therefore the greater the

[6] Source 1: Hardy, M., Heyes, S., (1996) pg 237
[7] Source 1: Hardy, M., Heyes, S., (1996) pg 237
[8] Source 2: Dobson, C, B., Hardy, M., etc (1981) pg 220
[9] Source 4: Gross, R., (2003) pgs 600 - 601

similarity in intelligence could be the result of heredity or environmental factors or even both. Also the apparent fact that most correlations generally fall below 1 anyway, suggests that because there is not evidence of exact similarity between the twins, other factors must therefore also influence behaviour or specifically intelligence. Specific criticism has come from Gross (1992) of the Shields (1962) study, who pointed out that although Shields classified separation as living separately for five years prior to the study, twenty-seven of the forty pairs of twins who were apparently separated actually lived in a branch of the same family, for example with grandparents, etc. Gross also raised criticisms over the selection of twins to participate in a study. Gross notes that in the Newman et. Al (1928) study, the criterion that was used to determine if twins were acceptable for the study were based on if they looked the same and if they answered the same.

If it is to be believed that genes play a more significant role in the development of behaviour, then it should be true that a person's IQ should always remain constant. There has been evidence from studies to suggest however that this is not the case. Pollitt and Gorman (1994)[10] gave children in developing countries a quantity of high quality nutritional supplements during infancy and early childhood, it was later found that their IQ and vocabulary scores were considerably higher than those of non-supplemented children. Also Heber et al (1968)[11] conducted a study call 'The Milwaukee Project'. Heber et al began a programme with forty poor black families, commencing with the birth of their babies and continuing until their children started school at the age of six. Twenty of the women were given job training and sent to school (the 'experimental group') and twenty were not helped in any way (the 'control group'). When the children were starting school, the 'experimental group' children has an average IQ score of 120.7, while the 'control group' had an average score of just 87.2 By the age of ten these were 194 compared with 86 for the 'control group'. Educationally the experimental group were significant superior also. It was found that in later years, after the program had ended, that both groups decreased in performance. These results contradict the notion of the genetics argument, that as the environment has no influence over IQ, which is inherited genetically, an individuals IQ shall therefore remain constant over time. Rather they suggest that the

[10] Source 4: Gross, R., (2003) pg 603
[11] Source 4: Gross, R., (2003) pg 603

environment has a significant effect upon cognitive performance and ability, including IQ stages.

For genes to play a more significant role, then any experience will have no impact on behaviour at all. Rutter et al (1998)[12] conducted a study on Romanian orphans. Rutter et al studied a large sample of one hundred and eleven institutionalised Romanian children adopted into English families within twenty-four months of birth. The children had experienced extreme privation physically and psychologically. Compared with forty-two English adoptees, the Romanian children showed developmental deficiencies in weight, height and head circumference. They also showed deficits in reaching developmental milestones. All the same, it was found that by the age of four, the Romanian children showed considerable physical and developmental catch-up. Those adopted before six months had a clear advantage over the children adopted later. This study provides significant evidence to challenge the genetics argument.

Finally, it should also be true that any attempts to change, either by increase or decrease, should fail. We can examine this by considering environmental enrichment programmes and there success or failure rate. Skeels and Dye (1939)[13] followed up a group of children removed from orphanage into more stimulating and friendly environments. After twenty years it was found that those raised by foster parents showed significant improvements in their IQ's whereas those raised in the orphanage had dropped-out of high school, still institutionalised or not self-supporting, suggesting that environmental enrichment can have beneficial effects upon individual IQ and behaviour. Many other studies and research has supported this finding, so much so that in light of which political action has been taken. For example President Johnson (1908-1973) in 1965, as part of his 'war against poverty', initiated a number of intervention programmes (enrichment programmes), based on the assumption that intelligence could be increased by special training.

With much consideration to research it can now answered that yes, genes do play a significant role in the development of behaviour, however is cannot be said that genes play a more significant role. Research and studies upon Monozygotic and Dizygotic twins has offered significant support to the genetic argument however if genes do determine the development of behaviour then it would be true that, firstly, an

[12] Source 4: Gross, R., (2003) pg 603
[13] Source 4: Gross R., (2003) pg 603

individuals IQ would always remain constant over time and neither increase and decrease however studies previously considered provide evidence to suggest that this is not the case. Secondly, it would also mean that any experience could have no impact or affect upon behaviour, this suggestion has also been widely discredited, as there is much evidence to imply otherwise. Finally, if genes are the sole determinant of behaviour then any attempts to change behaviour should fail, yet evidence of success rates of environment enrichment programmes prove otherwise. It is generally now accepted by psychologists worldwide that behaviour cannot be determined by either genetic or environmental factors but instead a continuous interaction between the two. As Hebb[14] pointed out in 1949, an egg cannot survive without its environment, take it away and the egg would die but without its genetic base, the egg would not have existed in the first place.

[14] Source 5: Heyes, N., (2000) pg 18

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