

To What Extent is Human Behavior Genetically Determined?

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Research has revealed that almost every human body cells possess the same DNA sequence. Despite this fact, these cells get specialized to perform different functions. Some cells become cardiac cells and others nerve cells, carrying out their distinct functions. This is because the environment affects gene expression [1]. Let's suppose the twins reside in a different environment. They prepare a same dish. However, they taste it differently depending on the tastiness of individual appetizers, desserts and casseroles, which may be similar. Likewise, only genes can't determine physical traits like height, blood pressure, etc. The combined interaction of multiple related genes with environment is supposed to determine a particular trait.

Many people think that a trait is solely determined by a gene. This is genetic determinism, a false belief that once had a serious consequence in the world history. For instance, the mass murder of Jewish people was committed solely because the Nazis believed that the Jewish people were inferior who could again give rise to future generation of inferior/poor quality. Eugenics promotes population judged to be superior to improve their genetic ability [2]. The degree to which a behavior could be genetically determined is really unpredictable. The same genotype leads to similar or different phenotypes based on gene-environment interactions as nature and nurture are the two sides of a coin [3]. An example of this gene-environment interaction involves human intelligence. Genes trigger protein activity controlling energy metabolism and neuronal transmission speed which play roles in intelligence. Geneticists have traced intelligence genes to X chromosomes. So, children probably inherit intelligence from their mother as they have two X chromosomes [4]. In 1987, James Flynn reported a rise in IQ scores

of contemporary children. This drew attention towards exploring the real cause of this rise in IQ scores. One probable reason could be due to new genetic mutations, but this is almost impossible since that kind of evolutionary change takes hundreds of years. It could be because children today are better nourished and better educated. Therefore, the environment definitely plays a major role in brain development and IQ increment, but only through the activities of the genes by encoding amino acids that favor energy metabolism thereby increasing memory [2].

The protein made by the gene ALDH-2 helps metabolize alcohol. When this gene doesn't function properly, a person become nauseous in response to drinking. It has been found that 50 percent of Asian people have an ineffective ALDH-2 allele. Overall, Asian immigrants to America drink much less alcohol than their children brought up in a culture that places greater emphasis on alcohol, despite being genetically similar. Hence, gene-environment interaction is supposed to affect alcohol consumption and metabolism at different rates under different conditions [5].

Does growing up under same roof, sharing same kitchen, same physical environment, and having similar experiences make you turn out like your siblings? No, it doesn't because of the non-shared environmental factors, which constitute a huge portion in anyone's life thereby creating more impact in human behavior than genes. Sometimes the similar genetic conditions and environmental factors shared by siblings also lead to different phenotypes. This is developmental noise [6]. An extra dollop of minerals is taken up by one cell, while a molecule of vitamin fails to reach the cell next door. These kinds of minute variations cause cells to develop and func-

tion differently despite having the same function, genotype, and external environment eventually creating observable differences in the whole organism.

In gist, both gene and environmental factors interact and function together to create the people we ultimately become. If genes singly have control over phenotypic behaviors, there will be many James Watson and Crick in the world.

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