IT'S IN MY DNA

Genes that code for personalities

It's in my DNA. We have all heard this saying used to emphasise a passion for a particular interest or to convey the innateness of a personal characteristic, however, it may surprise you to learn just how true this expression really is. For a long time, the prevailing belief was that personalities were shaped by the environment, comprising of family and the wider society, with genetics playing a trivial role. Despite this, there is now abundant evidence that genes have a substantial impact on our characters. The type of person we are may be written in our DNA from the day we are born.

WHAT MAKES A PERSONALITY?

A personality is the patterns of thoughts, feelings and behaviours of an individual. The five-factor model (abbreviated to OCEAN) is the most widely used model that breaks this down. The model states that each trait depicts a spectrum that individuals can exist at any point on, shaping a unique personality.

THE FIVE-FACTOR MODEL

O ***penness to experience***
HIGH- creative
LOW- close-minded

C ***onscientiousness***
HIGH- goal-oriented
LOW- procrastinates

E ***xtraversion***
HIGH- enjoys socialising
LOW- favours solitude

A ***greeableness***
HIGH- empathetic
LOW- indifferent to other's feelings

N ***euroticism***
HIGH- anxious, self-doubtful , stressed
LOW- emotionally stable

THE GENETIC CODE

Genes are found in almost every single cell in the body collectively known as the genetic code. They are named this way as they are an encryption that is translated into a protein which then has a direct, vital function in bodily processes. In fact, virtually every process occurring in the body requires the assistance of various proteins; this includes those for structural support (e.g., for cells), hormones, enzymes and immune defences (antibodies). However, beyond the requirement for proteins to support the body's daily functioning, they also have an effect on the way we think, feel and behave- our personality.

GENES INVOLLVED IN PERSONALITY

IT IS NOW ESTIMATED THAT 30-60% OF PERSONALITY IS DOWN TO GENES

Specific genes have been identified that have links to certain personality types. To name a few...

KATANIN-LIKE 2

The gene katanin-like 2 (*KATNAL2*) has been linked to conscientiousness in various studies. This gene is involved in brain development and protein synthesis.

SEROTONIN TRANSPORTER

Individuals with the short allele variant of the serotonin transporter gene (*5HTT*), may have lower serotonin levels which cause a higher neuroticism score.

CLOCK

The *CLOCK* gene is associated with agreeableness. This gene encodes a protein involved in the circadian rhythm which has a great effect on behaviour, cognition and emotion.

ZINC FINGER PROTEIN 180

People with the G allele of the zinc finger protein 180 gene (*ZNF180*) tend to be more open to experience. However, the reason for this is unknown.

DOPAMINE RECEPTOR D4

A variation in the dopamine receptor D4 (*DRD4*) gene causes inadequate dopamine transmission which may lead to individuals with this variant to seek additional stimulation through extraversion.

NOTE:
In a process known as epigenetic modification, in early development, environmental factors (e.g., stress, nutrition) produce reactions in neurones which can change how genes are encoded. This means the environment can alter genetics.

THE IMPORTANCE

Akin to other topics in the nature vs. nurture debate, it is determined that both the environment and genetics have an impact on personality. However, the minor role that genetics were thought to have played can now be replaced with an appreciation for its considerable contribution of 30-60%. It is important to recognise that genes are significant in the formation of our personality. It can support the diagnosis and treatment of mental health disorders but even on a simpler level, we can understand ourselves better and make positive changes to our behaviour in a way that acknowledges the cause of it. These can be changes that affect ourselves and others including self-doubt, focus, compassion and being open to new experiences. Instead of wondering why we possess certain qualities and lack others, we can accept it may be partially down to genetics and take the necessary steps to change these traits with patience. After all, it is difficult to change what's in your DNA.

FURTHER READING

Chmielewski, M. S., Morgan, T. A. "Five-Factor Model of Personality". Encyclopedia of Behavioural Medicine (2013): 803-804. https://doi.org/10.1007/978-1-4419-1005-9_1226

Digman, J. M. "Personality Structure: Emergence of the Five-Factor Model". Annual Review of Psychology 41.1 (1990):417-440.

Golimbet, V. E., Alfimova, M. V., Gritsenko, I. K., & Ebstein, R. P. "Relationship Between Dopamine System Genes and Extraversion and Novelty Seeking." Neuroscience and Behavioral Physiology 37.6 (2007): 601-606. https://doi.org/10.1007/s11055-007-0058-8

Harvard University. "Gene-Environment Interaction: Epigenetics and Child Development." Center on the Developing Child at Harvard University. (2015) https://developingchild.harvard.edu/science/deep-dives/gene-environment-interaction/

Hoerter, J. E., & Ellis, S. R. "Biochemistry, Protein Synthesis." StatPearls Publishing. (2019).https://www.ncbi.nlm.nih.gov/books/NBK545161/

Juhasz, G., Chase, D., Pegg, E., Downey, D., Toth, Z. G., Stones, K., Platt, H., Mekli, K., Payton, A., Elliott, R., Anderson, I. M., & Deakin, J. W. "CNR1 Gene is Associated with High Neuroticism and Low Agreeableness and Interacts with Recent Negative Life Events to Predict Current Depressive Symptoms." Neuropsychopharmacology 34.8 (2009): 2019-2027. https://doi.org/10.1038/npp.2009.19

LaPelusa, A., & Kaushik, R. "Physiology, Proteins." StatPearls Publishing. (2020) https://www.ncbi.nlm.nih.gov/books/NBK555990/

Munafò, M. R., Clark, T. G., Roberts, K. H., & Johnstone, E. C. "Neuroticism Mediates the Association of the Serotonin Transporter Gene with Lifetime Major Depression." Neuropsychobiology: 53.1 (2006): 1-8. https://doi.org/10.1159/000089915

Sanchez-Roige, S., Gray, J. C., MacKillop, J., Chen, C.-H., & Palmer, A. A. "The Genetics of Human Personality." Genes, Brain and Behavior, 17.3 (2017) https://doi.org/10.1111/gbb.12439

Terracciano, A., Sanna, S., Uda, M., Deiana, B., Usala, G., Busonero, F., Maschio, A., Scally, M., Patriciu, N., Chen, W.-M. ., Distel, M. A., Slagboom, E. P., Boomsma, D. I., Villafuerte, S., Śliwerska, E., Burmeister, M., Amin, N., Janssens, A. C. J. W., van Duijn, C. M., & Schlessinger, D. "Genome-Wide Association Scan for Five Major Dimensions of Personality." Molecular Psychiatry 15.6 (2010): 647-656. https://doi.org/10.1038/mp.2008.113

Widiger, T. A., & Crego, C. "The Five Factor Model of Personality Structure: An Update." World Psychiatry 18.3 (2019): 271-272. https://doi.org/10.1002/wps.20658