

The nature of our nurture

genes x environment = human behaviour

Key contributor: **Professor Richie Poulton**, Director, Dunedin Multidisciplinary Health and Development Research Unit.

WHY IS IT THAT TWO PEOPLE who experience the same adversity can differ so markedly in their response? The answer to this question is a complex interplay between nature and nurture, or more technically a gene-environment interaction. To understand why people turn out the way they do (in terms of physical disease or behavioural outcomes) information about their genetic makeup needs to be carefully considered alongside information about what has happened to them during their lives.

Professor Richie Poulton and his team of researchers from the Dunedin Multidisciplinary Health and Development Study have made several key findings that reveal the way that genes and the environment work together. Their research confirms the importance of considering and managing factors within a patient's lifestyle and background that may contribute to their medical problem. Conversely, a negative environment or a risk identified in family history, does not necessarily mean that a negative outcome is certain. This is an area in which GPs can make a significant difference.

Life stress and depression

The Dunedin Study researchers have discovered that a variation in the serotonin transporter gene interacts with

life stress to predict depression.¹ What this means is that people who have the short version of this gene are more likely to develop depression if they are exposed to stressful life events, than those who have the long version and who are more resilient. Ultimately this may lead to the development of new and hopefully more effective treatments for depression.

Childhood maltreatment and violence

The researchers have also discovered that adult violence and antisocial behaviour in males can be predicted by an interaction between childhood maltreatment and a variation in the gene that produces the enzyme monoamine oxidase.² What this means is that badly treated boys with this gene variation, are more likely to become violent adults than boys who are also badly treated, but do not have this gene variation.

Adolescent cannabis use and psychosis

The third finding by the team was that the development of psychosis following use of cannabis during adolescence is linked to a variation in the catechol-O-methyltransferase (COMT) gene, which helps control the action of dopamine.³ What this means is that teenagers who use cannabis

and who also carry this gene variation, are more likely to develop illnesses such as schizophrenia as adults. This finding was unique in that it involved an additional factor – age of exposure. Cannabis use in adulthood did not elevate the risk for developing psychosis, even in the presence of the COMT gene variation.

Breast feeding and IQ

More recently, the Dunedin Study team reported that the association between breastfeeding and children's IQ depends, in part, on the baby's genotype in a gene called FADS2.⁴ This gene influences how the body processes fatty acids consumed through diet. For over 100 years IQ has been at the heart of scientific and public debates about nature versus nurture. This finding clearly shows that genes may work via the environment to shape IQ.

Evidence that nature and nurture work together drives several nails into the coffin of the often bitter and largely obsolete nature-versus-nurture debate. Clearly, genes are not a blueprint or deterministic; rather they help to shape how our bodies and brains respond to our environment.

It is perhaps ironic then that this cutting-edge genetic research goes full circle to emphasise the importance of the environment. "In all the studies described above, the genes by themselves told us nothing. It was only when we looked at the genes working in association with environmental influences that we were able to predict outcomes. This justifies attempts to manipulate the environment to create better outcomes."

Modifying the environment in a positive way remains the key for influencing how people's lives turn out. This is particularly important when we cannot rely on pharmaceuticals for treating behaviours such as violence and aggression. Effectively tinkering with genes to achieve desired outcomes remains a long way off. Right now, however, that is not necessary. The environment is where the action is.

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"The Dunedin study"

The Dunedin Multidisciplinary Health and Development study is a longitudinal study of over 1000 infants that have been followed for the past thirty-six years. Three new generational studies now exist, involving the parents and children of original study members. More than 1000 publications have been produced from the study since it started. The work of the Dunedin Study has influenced family, child and public health policies in New Zealand and around the world and continues to do so. Their research about depression was rated as the second most important worldwide scientific breakthrough in 2003. Many of the findings are relevant for clinicians, parents, families and others who are making decisions about health and well-being of their patients and family.

References

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