



# Eating Disorders & Neurobiology

## Science and Eating Disorders

Eating disorders are severe mental illnesses with the potential for serious medical consequences. Our current knowledge, thanks to a growing body of scientific evidence, is helping us to better understand the neurobiology of these disorders: how they develop and how we can best support people to recover.

People with eating disorders and their loved ones may wonder how the disorder developed or blame themselves. Science can help dispel harmful myths and improve our understanding of the complexity of eating disorders. Through research we have come to understand that there is no single cause of eating disorders—for example, you don't have to have other psychological problems or trauma. However, it is common for eating disorders to develop after a period of caloric restriction or inadequate nutritional intake (intentionally or through stress/illness).

## The Role of Genetics in Eating Disorders

Mood, personality, anxiety and impulse regulation, as well as appetite, body weight and metabolism have a strong genetic basis (i.e., are heritable). On average, about half the risk of developing an eating disorder comes from genetic influence, but this risk differs from person to person. People with higher heritability need only a slightly toxic environment for an eating disorder to manifest itself, while in a protected environment, may not go on to develop an eating disorder.

Consider an orchid and a dandelion - an orchid needs an optimal environment to flourish, whereas a dandelion survives in spite of environmental challenges. Similarly, people with a genetic vulnerability to developing an eating disorder can thrive in positive environments but are more vulnerable to harmful environments, such as those that might trigger weight loss or stress.

“Epigenetics” is the study of biological mechanisms that cause our underlying genetic predispositions to be “switched on” or “switched off”. In certain environments, especially where there is a lot of stress and/or inadequate nutrition, the risk is higher — the genes might get “switched on”. As international eating disorders expert Professor Cynthia Bulik explains: “Genes load the gun, environment pulls the trigger”.

## The Gene-Environment Interaction

Western culture places a high value on thinness and muscularity and many people engage in dieting or excessive exercise to become thinner or more muscular. For some, these behaviours are only minimally harmful. For those who carry the genetic risk, these environmental influences can trigger their genes to “switch on” and result in an eating disorder. In another scenario, two individuals might get ill with a stomach bug resulting in modest weight loss. One person may naturally regain the lost weight with no long-term consequences, while in the other, the development of an eating disorder may be triggered. Thus, inadequate nutrition serves as the catalyst for the expression of an underlying genetic vulnerability.

## How Eating Disorders Affect the Brain

Some people worry that eating disorders are caused by a chemical imbalance in the brain, but there is no evidence for this. However, research has shown that brain activity can be affected by even modest dieting, and a young person's developing brain is particularly vulnerable. When a person is malnourished, their brain is not adequately fueled, and this may mean they struggle to make decisions, solve problems and regulate their emotions. (See our handout on *Starvation Syndrome*). They may also experience perceptual disturbances in the way they see themselves; for example, looking in the mirror and see themselves as much larger than they actually are. Also, although eating disorders aren't caused by a chemical imbalance in the brain, restricted eating, malnourishment, and excessive weight loss can result in problematic changes to our brain chemistry. For example, the brain produces less serotonin, which results in increased symptoms of depression.



## What Does All This Mean For Recovery?

The good news is that the effects of starvation can be reversed with adequate re-nourishment. Brain-imaging studies show that brain activity in people with eating disorders can change. The brain, like a muscle, is constantly changing and adapting as a result of our environment and how it is used, or “exercised”. It can be “exercised” through learning and practicing new ways of thinking and interacting with others. With practice, people with improved eating disorders show brain activity that looks more like that of people who had never had an eating disorder.

However the brain needs to be adequately nourished in order to make these challenging changes. A starved brain won't function optimally so the first priority in treatment is nutritional rehabilitation. This can be challenging, as increasing food intake can be scary for someone with an eating disorder. Also the brain tends to “lag behind” the body in terms of recovery and it can take time for people recovering from an eating disorder for their brain to “catch up”, when they regain their capacity for abstract reasoning and rational thinking.

A particular challenge we face is that our society remains a potentially triggering environment, with images of unachievable bodies and inaccurate and conflicting messages about diets and exercise ever present. Therapy not only needs to address the person's genetic vulnerabilities, but also to help them develop skills to manage environmental influences (e.g., managing stress and avoiding dieting).

Recovery from an eating disorder *is* possible. With adequate re-nourishment and learning, the brain and body can return to healthy functioning. Adequate nutritional intake and supportive environments will promote thriving across all life domains.

