

Meanwhile in an Anorexic Mind

It is lunchtime. All your colleagues are about to go to a canteen. They are changing their clothes and taking money. Everyone is looking forward to a nice time spent together while dining. Everyone except for you. You are nervous – at first slightly, but then your anxiety increases. Your body is trembling. Suddenly, carrying a plastic tray seems to be the hardest thing in your life and the whole canteen feels like an incredibly hostile space. Those countless odours! That frightening number of good and bad choices! You freeze in place unable to move. ‘Just pick up any of these meals,’ your colleague encourages you. As if you needed a painful reminder of how odd you are. You simply cannot choose. Why? Because you are facing anorexia nervosa.

Eating disorders are reported as the most life-threatening mental illnesses, directly causing 10,200 deaths each year – which corresponds to one death every 52 minutes.¹ Especially anorexia nervosa (AN) has the highest mortality rate (5.9 % on average,² with most of the patients dying of suicide) of all psychiatric disorders including depression. Despite these alarming statistics, the treatment of anorexia including psychological, psychiatric and nutritional support exhibits unsatisfactory results and recovered patients are still prone to easy relapse.

Although anorexia nervosa is a serious mental illness, the general public shows little awareness of what it really means to struggle with this disorder. Patients are then perceived as young perfectionist women starving themselves to become top models (but the number of male patients increases), and advising them to eat more food seems to be a brilliant strategy to treat them (despite the fact that food intake is driven by many neurobiological and neuropsychological factors). This oversimplified perception is far from the reality and discourages sufferers from sharing their feelings with their surroundings, which could increase the risk of fatal consequences. Prompt recognition of the onset of anorexia, well-organised support and patient care can save the life of one’s beloved, classmate or colleague.

To be fair, understanding eating disorders is really challenging even for experts. Anorexia nervosa has been strictly regarded as a psychiatric disorder for many years, but recent findings in neurobiology, neuropsychology and

genetics have unveiled the underlying pathophysiology of this illness and brought a new approach to the study of its mechanism. Anorexic patients have been found to suffer from many metabolic abnormalities. Experts used to suggest that the metabolic changes are mainly caused by undernutrition, but new genetic studies have revealed the possibility that the occurrence of metabolic abnormalities themselves may contribute to the development of the disorder.³ The molecular mechanism of anorexia nervosa has attracted scientific attention worldwide, but there are still many unanswered questions. How can metabolic abnormalities affect reward processes? How is the chronicity of the disorder developed? And, most importantly, how can we effectively help patients to overcome anorexia?

You are still unable to move forwards. Everyone around is simply choosing a meal as if it were the easiest thing in the world. You feel ashamed of your inability to deal with this ‘common’ situation, but you are forced by others to go on. You are looking for the slimmest person around. Hopefully, you will be able to stay slim despite eating if you adopt his or her eating habits ...

Eating is the most essential motivated behaviour crucial for survival, and food intake is driven by interactions between specific brain areas and molecules (peptides, hormones) produced in the digestive tract. The motivation to eat is modulated by both homeostatic factors, with sensors linked to

the energy needs of the body, and non-homeostatic factors, including experience, stress, biological rhythms and, importantly, habits.³

The release of molecules in the digestive tract must be fine-tuned to provide properly timed interactions within brain areas. The body is ready for food intake about one hour before an anticipated meal. There are two main hormones involved in the preparation of the body for food: the pancreatic hormone insulin, which is released a few minutes before a meal to enable the body to cope with the expected glucose load, and ghrelin, produced by the stomach, which initiates feeding behaviour and increases our sensitivity to smell and taste. Ghrelin also allows us to achieve satiety; its systemic concentration is then reduced to signal the body that eating should be stopped. After a meal, insulin and the fatty hormone leptin are released to reduce food intake by modulating specific neurons.⁴

All of these physiological processes are dysregulated during acute or remitted anorexia, and the automatic relation to food (trusting one's hunger cues, having specific appetite) is thus impaired.

You are under extreme stress, but you need to cope with it. You pick exactly the same meal as the slim guy. You feel safe. It is not a typical diet meal that you have expected. Why did he choose it? Because of its taste? Does he find it rewarding? If he does, why don't you? Why does eating scare you? Why does fasting give you the most pleasurable feelings you have ever experienced?

Anorexia nervosa strongly manifests itself as a disorder of reward processes. Both of the hormones mentioned above – insulin and ghrelin – are involved not only in feeding processes but also in the reward circuits releasing dopamine. Dopamine is a neuromodulator that plays several important roles in cells. It is well-known as the 'chemical of pleasure'. More importantly, however, it is

involved in motivational salience – a cognitive process that turns an organism towards achieving the anticipated outcome or away from it. Why is then fasting so rewarding?

In anorexia nervosa, the precisely tuned release of such active molecules as insulin and ghrelin and their interactions with receptors located in a specific area of the brain are dysregulated. Insulin, responsible for the reinforcement of the behaviour that promotes further food consumption and reward-learning processes, is down-regulated in anorexic patients. Together with the presence of fasting insulin in plasma and an increase in insulin sensitivity, this may contribute to their demotivation to eat.⁵

Moreover, the concentration of ghrelin is increased in anorexia. Ghrelin is directly involved in dopamine release and food-choice reward. Weight loss, most often the first step in anorexia nervosa, is associated with an increase in ghrelin plasma concentration.⁶ Since ghrelin is involved in dopamine release in reward-related circuits, it is hypothesised that it can reinforce anorexic behaviour.³

You are still in the canteen, obsessed with that slim guy's body shape. He looks better than you. Is he thinner? Probably not. He looks healthier. Happier. You have to lose five pounds. Why is it so important? Actually, you do not remember.

Although anorexia sufferers find self-starvation adorable, they pay a heavy price for it. Undernutrition causes many health defects, including cardiovascular issues, insomnia, fatigue, amenorrhea (the absence of menstrual periods), infertility, depression, self-harm, and other emotional dysregulations. People with an automatic and healthy relationship to food do not understand why their loved ones continue to engage in this maladaptive behaviour despite the adverse consequences.

In fact, an initial phase of reward seeking in the weight loss is experienced as pleasurable and extremely rewarding for anorexia nervosa

patients due to the dysregulation of dopamine circuits controlling reward and decision-making behaviour by both biological and psychological factors. These dysregulations cause the positive reinforcement of self-starvation and excessive exercise. Once the decision-making processes become impaired, patients tend to develop inflexible, habitual (stimulus–response) behaviour instead of goal-oriented (action–outcome) choices.⁷ The release of dopamine originating in reward seeking and decision making in addition to the dysregulated metabolic sensors results in the preservation of the core features of anorexia nervosa such as self-starvation and excessive exercise, which become habits. Habit-based behaviour is then rigid, acquired through external stimuli, without a conscious effort; and it is independent of the rewarding value of the outcomes.³ For this reason, people struggling with anorexia nervosa are not aware of the health risks of their behaviour until it is too late. The tendency towards rigid,

habitual behaviour also partly explains their compulsivity and obsession with respect to food intake.³ A change in maladaptive habits seems to be the initial step in the treatment of anorexia nervosa.

You sit down with your colleagues and start eating. They are staring at you. One or two comments how rare it is to see you eating. You want to run away, away from them, away from this horrible place, away from yourself. But you have not. You wish for recovery. You need to develop new, healthier habits. You desire dopamine release because you are spending time with your friends instead of starving. Each step is hard, each stumbling seems like falling. But you cannot fall. You know the statistics, and somewhere deep inside under the metabolic abnormalities, your obsession with thinness and excessively adorable self-starvation, somewhere under all of this, you know that in the next 52 minutes, it could be your turn.

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