

## **Physiology of starvation: it's effects on Psychological functioning in Anorexia Nervosa**

### **Stress response and the Autonomic Nervous System in AN**

The autonomic nervous system (ANS) is largely an unconscious automatic regulating system. It is made up of two major components, the sympathetic nervous system (SNS) and the parasympathetic nervous system (PNS). The SNS is associated with a physiological state supporting mobilization behaviours and activity including the 'fight-or-flight' response. This is central to fear and the stress response. The PNS is associated with a very different physiological state supporting rest, recovery and social communication behaviours (e.g. engaging facial expressions, calm responses, listening). The PNS inhibits the sympathetic nervous system to achieve a balance. The Autonomic Nervous System, if functioning well, supports automatic responses in response to circumstances: with activity or threat-protection responses when needed; and calm communicating responses when needed.

There is evidence that among people who develop AN, there is dominance of SNS activity and insufficient PNS activity. Hence generating a greater sense of threat, increased vigilance and activity, and less calmness, rest and socializing. For example patients with AN have persistently raised cortisol levels, one of the central markers of a stress response. It has therefore been proposed that starvation and over-activity, may in fact represent maladaptive physiological mechanisms for regulating a dysfunctional autonomic nervous system, in other words physiological mechanisms for reducing stress, fear and anxiety. These are some of the ways this may happen:

- in persistent starvation energy is conserved by reducing heart rate, blood pressure and body temperature - these are all effects working in the opposite direction to the SNS stress response
- intermittent low blood sugar due to fasting, may also result in a temporary but rewarding experience of numbness or detachment
- protein deficiency in persistent starvation can cause myelin sheath damage with damage to peripheral nerves and reduced bodily sensory feedback, and adding to a desired experience of numbness.

- It is possible that intense food restriction produces a short-term reduction in the body's ability to make Cortisol, again potentially dampening the stress response.
- Adaptation to a persistently reduced body temperature (as occurs in starvation) has been shown to reduce SNS activity and stimulate PNS activity.
- High levels of exercise can also directly increase PNS activity which may also account in part for the drive for over-activity in AN patients.

### **Effects of starvation on Psychological Functioning**

In short, it is possible that weight loss and over-exercise, temporarily alter the balance in the autonomic nervous system, and reflect a maladaptive drive to counteract an excessive stress response, providing relief from anxiety, fear and uncomfortable physical feelings.

Therefore although over-activity and food restriction are behaviours that can cause harm physically and psychologically in various ways, it may be that in people with Anorexia Nervosa, whilst they are actively losing weight into a state of starvation and whilst they are over-exercising, they experience a short-term numbness or reduction in anxiety, that is rewarding.

Unfortunately, this effect is not sustained without continual weight loss or continual over-activity. The physiology of the body can only adapt so far to starvation and the lack of fuel. Bodily tissues are being damaged and bodily systems are no longer working effectively enough. Signals of bodily damage and stress result in a sustained physiological response to the threat of starvation and increase the stress response again. This leads to various effects such as increased anxiety, restlessness, disrupted sleep - in essence all signals from the body to the mind to say 'I'm in danger I need more food'. Unfortunately this increase in anxiety and stress usually leads to increased efforts to lose weight and exercise, despite there no longer being any short-term reward from this.

A further psychological effect of this level of starvation and increased anxiety and fear, is of hypervigilance towards perceived threats. This is reflected in greater rigidity and inflexibility of thinking, and greater resistance of others efforts to help them eat more.