

Circadian desynchrony: Can obesity be treated with electricity?

What causes obesity? It's certainly multifactorial. There are conflicting reports in the news this week that the driver could be [economics](#) or a [variety of family-related factors](#), including low [vitamin D](#) levels during a mother's pregnancy, and short breastfeeding duration.

Overall, more than 500 million [people worldwide](#) are identified as obese (greater than 10 percent of the world's adult population) and about 1.5 billion who are overweight. Treatments for obesity include diet, exercise, education, gastric banding, stomach stapling and various other conventional and alternative therapies.

Simply stated, if calories consumed are fewer than the calories expended, the rest is basic thermodynamics. There are certainly genetic and medical conditions which make individuals have different metabolic rates, different levels of certain hunger and satiety hormones (such as [leptin](#) and [ghrelin](#)), and different exposures to activity and food choices which are in-part personal, regional, and cultural.

There have been [proposals](#) that the very presence of our ability to harness electricity for artificial lighting, computers, smartphones, tablets, etc. has been a cause of obesity. Why? The premise is called *circadian desynchrony*, where our metabolic functions (which are intended to repeat on a cycle of about one day) are interrupted by the fact that we short-circuit them by fooling our bodies into always thinking that it's daytime (by, for example, computer screens glowing in front of our eyes at all hours of the day or night. This has been [proposed](#) as being due to light from the 'blue' end of the spectrum being preferentially emitted by laptops, smartphones, and tablets – this [bluish light](#) seems to have a differentially-greater effect on our [circadian alertness](#) than light from other parts of the spectrum). This affects levels of [hormones](#) and indirectly [eicosanoids](#), which are sensitively linked with how our bodies estimate day or night. This effect is so robust it is being evaluated for [optogenetic](#) technologies to influence sleep and wakefulness, and waking vigilance.

New technologies

While diet/exercise and surgery represent the two polar opposites of the weight loss spectrum, the makers of a recently FDA approved device consider that their apparatus “would fit nicely between the two [ends of the spectrum].” The device is FDA-approved for those who are severely obese (defined as a body mass index (BMI) between 35 and 45) as well as having a concomitant weight-related health condition. There are [other devices](#) as well which either work in similar ways, either blocking the vagus nerve and delay gastric emptying or altering muscular contraction to change how to stomach empties.

The electrical stimulation technology works essentially by being fitted around the vagus nerve branch connected to the stomach and modulating nerve impulses that travel between the stomach and the brain, altering the motility of the stomach and the psychosomatic aspects of hunger linked to stomach sensations. In fact, some emotional feelings like fear and anxiety [have been found](#) to be in part malleable with vagus nerve blocking. Such neuromodulation has already been used in epilepsy and cluster headaches, and could be pursued further in the depression and anxiety spaces.

Although it seems so far in limited trials to be most apt at modest weight loss (~9 percent, which is about 50 percent greater than the weight loss experienced by the placebo group), there are significant numbers of potential surgery candidates in the general public who do not pursue that option because of fear or anxiety around the procedures. Depending on the mid- to longer-term results in the general public, this technology may represent a modality for future refinement, and also represents an option which is durable and could be almost completely reversible, should the user so choose.

Clearly, electricity and technology aren't in and of themselves the culprits in obesity, but how we harness them to help or heal is directly within our control.

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