

BRAIN ACTIVITY CHANGED BY LIGHT

Do you, or someone you know, perform a particular task or ritual routinely or repetitively? Maybe hand washing, or repeatedly checking that you have turned off the iron or stove. Or maybe you avoid doorways or shaking hands. These are some of the more common behaviours that people with obsessive-compulsive disorder (OCD) routinely do, and many sufferers report doing these things over and over just to “tick them off the list.” But this is more than just a quirk. OCD, which affects about 3% of the population, is also accompanied by what psychologists call intrusive thoughts, or impulses, and anxiety. And what can make OCD even more disruptive to daily life is that most sufferers are aware that their behaviours are not right, which creates additional anxiety. Unfortunately, treatment of OCD has proven difficult.

What I find interesting about OCD is that it seems to be an abnormal amplification of normal behaviours – it’s good to wash hands, it’s good to be sure that the stove is turned off – and when we don’t do these behaviours, there can be bad consequences. So, it’s a bit like the balance within the brain has become just a little askew. About five years ago Neuroscience research located the place in the brain where the signals for OCD originate. To do this, Neuroscientists observed the brain with a technique that allowed them to see what brain circuits became active differently between OCD-affected compared to non-OCD subjects¹. Once these circuits had been identified the door was opened to experiments, reported just this week², in which Neuroscientists attempted to ‘normalise’ the activity of these circuits and reverse OCD.

To do this the researchers used mice with a gene mutation that causes them to groom themselves obsessively, a behaviour that is very similar to OCD in humans. Then the scientists did something truly amazing – they genetically modified the mouse brain cells so that neural activity could be controlled by light, a technique called optogenetics. Then, to control the brain cells with light, fibre optics were implanted into the brains of the mice in just the place where that previous research had found the OCD neural circuits. Sounds pretty futuristic, I know. But it gets better. When the light was shone on the OCD circuits in the compulsively grooming mice, the brain activity was changed to more normal patterns, and the compulsive grooming went away.

Although optogenetics is not ready for use in humans, it is probably not far off. The technique appears relatively safe, and already devices are implanted into peoples’ brains to control and correct brain activity, for example in Parkinson’s disease. I, for one, would opt for this treatment rather than a lifetime of drugs.

REFERENCES:

1. Chamberlain SR et al (2008) Orbitofrontal Dysfunction in Patients with Obsessive-Compulsive Disorder and Their Unaffected Relatives. *Science* 321, pp. 421-422.
2. Burguiere E et al (2013) Optogenetic Stimulation of Lateral Orbitofronto-Striatal Pathway Suppresses Compulsive Behaviors. *Science* 340, pp. 1243-1246.