Neurofeedback follows principles of other biofeedback methods. After 10 sessions of neurofeedback training, a significant reduction was found in cognitive deficits, anxiety and depression scales. Noticeable improvements were observed in memory and neurological functioning, and the patient no longer exhibited addictive behaviour. There has been a growing interest in the use of neurofeedback training for attention deficit hyperactivity disorder (ADHD). A recent meta-analysis was performed by Micoulaud-Franchi and colleagues that investigated EEG-NF associated effects on overall ADHD symptoms as well as inattention and hyperactivity/impulsivity dimensions of the disorder using both unblinded (parent assessment) and blinded (teacher assessment) assessments.

Major findings from the meta-analysis by Micoulaud-Franchi et al. include the following: EEG-NF improves ADHD total score on a parent-assessment scale and inattention and hyperactivity/impulsivity dimensions on a parent-assessment scale and inattention dimension on a teacher-assessment scale, albeit with a smaller effect size, respectively. These results corroborate previous reports that EEG-NF is associated with improvements in measurements of ADHD symptom severity. The presence of different effect sizes depending on the blinding of the assessment indicates that future studies should include blinded assessments. In addition, effects of EEG-NF were greater for the inattention dimension of ADHD than the hyperactivity dimension, similar to previous studies. Micoulaud-Franchi and colleagues confirmed the efficacy of EEG-NF for unblinded assessment of ADHD symptoms.

MECHANISM
Possible explanations as to how self-regulation of brain activity achieved using neurofeedback may benefit ADHD, depression and other mental disorders involve direct and indirect action. Self-regulation may address primary abnormalities such as specific hyper- or hypoactive areas of the brain. Multiple reports have described electrical dysregulation in patients suffering from depression and neurofeedback therapy aimed at correcting the abnormal activity has improved symptoms. Neurofeedback may also activate or suppress circuits that are not primarily abnormal but whose alteration produces clinical benefits. There are many well-known examples of this indirect effect. Monoamine reuptake inhibitors benefit many patients with depression by increasing serotoninergic and noradrenergic neurotransmission, not by correcting a monoaminergic deficit. Similarly, surgical lesions and DBS in target regions of convergence between brain stem and basal ganglia pathways are often because there are primary abnormalities in these pathways. Thus, clinical benefit may be achieved using neurofeedback techniques through self-regulation training that activates compensatory circuitry for particular cognitive processes or inhibits circuitry that contributes to the patient's pathology.

MAGNETIC RESONANCE
Functional magnetic resonance imaging (fMRI) was invented more than 20 years ago, and since then, fMRI has been a central technique in cognitive and clinical neuroscience. The strengths of fMRI include its spatial resolution, fMRI technology have provided major contributions to the understanding of brain correlates of psychopathology and the effects of genetic factors on cognitive and affective networks. Interest in a potential therapeutic application of fMRI-based neurofeedback (fMRI-NF) has peaked recently. The future of neurofeedback technology may involve fMRI, as applying imaging principles as EEG-NF feedback is captured via real-time analysis of the time course of blood oxygenation level-dependent (BOLD) signals (see Figure 1), which indicate neuronal activity. The BOLD signals are interpreted by a computer, which relays visual feedback to the patient. Instead of wearing a sensor-embedded cap for EEG-NF, patients need to be inside an MRI machine. There are several advantages of fMRI-NF, including higher localization accuracy and better access to deep brain structures.