



OPPORTUNITY

10

SCOPE TRANSITIONAL

UNCERTAINTIES

Technology, Values

MEGATRENDS

Advanced Health and Nutrition

TRENDS

HealthTech
Longevity & Vitality
Mental Health
Mobilising Innovation
Neuroscience

SECTORS IMPACTED

Chemicals & Petrochemicals
Communication Technologies & Systems
Consumer Goods, Services & Retail
Cyber & Information Security
Data Science, AI & Machine Learning
Digital Goods & Services
Health & Healthcare
Immersive Technologies
Insurance & Reinsurance
Materials & Biotechnology
Art, Media & Entertainment
Professional Services

What if treatment for depression was drug-free? ^L

PULSE OVER PILLS

Advances in neuroscience, neuromodulation technologies, miniaturisation, advanced computing, and advanced machine intelligence bring new, affordable, and drug-free treatments for depression.



^L Medical opinions may vary and this may not be the case in every situation for every individual.



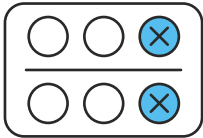
WHY IT MATTERS TODAY

Since 1990, mental health disorders have increased by 48%.³⁴⁸ The World Health Organization estimates that 280 million people around the world suffer from depression.³⁴⁹ Despite the prevalence of depression and available treatments, many sufferers remain undiagnosed or inadequately treated.³⁵⁰

Around

30%

of those receiving treatment for depression have an inadequate response to at least two antidepressants



While enhancing existing therapies and combining them with cost-effective, non-pharmacological methods is crucial for bridging the treatment gap,³⁵¹ in some cases it could be an inadequate response to treatment.³⁵² One definition of what an inadequate response may be is a lack of impact despite the use of at least two antidepressants; around 30% of people with depression fit this criteria.³⁵³

Globally, some \$3.7 billion is allocated annually to mental health research, accounting for an estimated 7% of the total global health research funding, but over half of this investment (56%) is directed towards basic research as opposed to clinical or applied research.³⁵⁴

Exploring drug-free approaches through Transcranial Direct Current Stimulation (tDCS) have been trialled in patients with depression for several years.³⁵⁵ Its positive effects have been noted in several small trials; however, its clinical application remains limited, partly because of the lack of a clear model or understanding of the mechanism by which it alters brain function in depression,³⁵⁶ with limited peer-reviewed publications³⁵⁷ and mixed results.³⁵⁸

Flow Neuroscience, for example, recently announced results from clinical trials that showed treatment via the tDCS headset it is developing was twice as effective as the most commonly prescribed antidepressants.³⁵⁹ Similarly, transcranial magnetic stimulation (TMS) has been found to reduce treatment time and achieve a rapid reduction in depressive symptoms.³⁶⁰ The UCLA TMS Clinical and Research Service reports that two-thirds of patients get substantially better after treatment.³⁶¹ Nevertheless, one study was halted, in spite of there being a significant decrease in depression scales over time, because of a build-up of adverse events, notably skin lesions warranting further research.³⁶²



Clinical trials have demonstrated that, in some cases, treatment with a tDCS headset was

twice as effective as the most commonly prescribed antidepressants



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Advances in neuroscience, combined with miniaturisation, advanced computing, and advanced machine intelligence lead to the design of an effective closed-loop system to autonomously deliver drug-free neuromodulation for depression. Materials science enables future solutions to be comfortable and compatible for application in real settings.

Through tDCS, neuromodulation based on an electric current³⁶³ or magnetic stimulation³⁶⁴ targets the physical areas of the brain – left, right, or medial areas of the prefrontal cortex – that are involved in emotion regulation.³⁶⁵ With immediate feedback, therapies are delivered as and where needed to deliver optimum effects.

tDCS may one day allow people struggling with depression, including those who do not adequately respond to antidepressants,³⁶⁶ to treat or reduce symptoms without the use of pharmaceuticals.³⁶⁷ Investment in making tDCS more accessible and affordable mobilises this innovation into regions that have a shortage of mental health services, as part of broader mental health policies.

BENEFITS

Better treatment and fewer side effects from pills. Innovative, non-invasive, affordable, and possibly portable devices offer targeted treatment for depression, enhancing patient autonomy and potentially reducing the number of untreated cases.

RISKS

Treatments targeting the physical determinants of depression in the brain could have unforeseen immediate and long-term effects, some of which may be irreversible. Varying effects and inconsistent results warrant further investigation, research, and clinical trials, limiting expected impact. Treatment may initially be too costly limiting accessibility.



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