Commentary Article

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Neural Prosthetics: Advancements and Ethical Consideration in Brain-Computer Interfaces

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Neural prosthetics employ different signals, such as chemical or electrical signals from the human nervous system, for stimulating or restoring the capabilities of injured people or different disease conditions (1). They are artificial extensions of the body that repair or fortify the human nervous system after various injuries or diseases (2).

From ancient times, the study of neural systems has been a subject of fascination. Significant progress has been made in our understanding of neural systems, from the ancient understanding of the role of the brain in the body to today's research on artificial intelligence. Three main types of neural systems have been identified today: sensory, motor, and associative (3). These systems work together to let us perceive, process, and react to the world around us.

The approach helps patients with various diseases, and implanting neural chips in the brain, is encouraging. These chips can monitor brain activity and relax symptoms such as tremors, seizures, and depression (4, 5). However, before widespread implementation, there is a need to address ethical concerns and potential risks.

Keywords: Brain-Computer Interfaces, Cognition, Ethics, Enhancement, Neural Prosthetics.

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In the future, these devices will help people with epilepsy, treatment-resistant depression, chronic pain, Alzheimer's disease, post-traumatic stress disorder, traumatic brain injury, speech problems, and other injuries. They comprise electronic implants and mechanical actuators capable of releasing chemicals, e.g., neurotransmitters or drugs, in a small volume of biological tissue (6).
Prosthetics, or neural chips, are devices implanted in the brain to regulate brain activity. These devices have been developed to help patients with various diseases, including Parkinson's disease, epilepsy, and depression (7). The benefits of neural implants are enormous, yet there are also challenges before their practical application.

Researchers have examined some flexible thin-film polymers. Moreover, in the employed prosthetics, the microelectrodes have some neural interfaces in the polymer (8). This makes possible better movement or healthy and functional tissue in the damaged area or organ. Conducting polymers that have been examined for different pharmaceutical purposes are now employed for neural prosthetics and neural interfaces (9). These polymers are capable of various applications such as therapeutic drug delivery, neural simulation, recording an also regeneration.

The Human Neural Prosthetics Program at the University of Pittsburgh explores using brain-computer interfaces to improve the lives of patients with motor disabilities. In one study, quadriplegic

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patients were implanted with a custom-designed ECoG grid for up to 30 days. The first subject obtained consistent three-dimensional cursor control using a 3D visual environment. He was also able to control a robotic arm successfully (10).

The ability to regulate brain activity is a major advantage of neural chips. It may help to reduce tremors and other symptoms associated with Parkinson's disease (11). By regulating the brain's electrical activity, neural chips may also be used to treat epilepsy. Furthermore, by stimulating certain areas of the brain, neural chips have been used to treat depression.

The ability to assist patients with spinal cord injuries is another benefit of neural chips. Patients can gain control of their limbs by inserting a chip into the brain and connecting it to an electric field in the spine. It is still in its early days, but this technology can change how we heal spinal cord injuries.

Considering various pharmaceutical applications of microfluidic chips such as drug screening, drug and toxicity testing, pharmacokinetics, and pharmaceutical testing (12), the same applications and potentials could be imagined for neural prosthetics soon.

However, the challenges associated with using neural chips are also present (13). The risk of infection is one of the major challenges. There is a risk that these devices may become infected, leading to serious complications, because they are implanted in the brain. Moreover, there is a risk that the devices could malfunction or be refused by the body (14).

The issue of informed consent is also an ethical issue. The risks and benefits of the procedure must be thoroughly communicated to patients who have received neurosurgical implants so they can make an informed decision on whether this is appropriate. Furthermore, clear guidance should ensure that patients are not forced to receive these devices.

Finally, neural chips hold great promise for revolutionizing the treatment of various diseases and injuries. However, using this technology has encountered difficulties, and health care still has significant potential. The Neuralink project is an example of developing these devices that could increase their availability and reduce the risks (15). However, Ethical concerns should be addressed, and patients should be fully informed and can opt out of receiving such devices. Neural chips can heal patients with congenital disorders and develop healthy brains to learn languages and other skills with careful consideration and development.

Conflict of Interest

The authors declare no conflict of interest.

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