



Original Investigation | Neurology

Brain-computer interface in healthcare (BCI): Application for people with late-stage ALS: A special communication

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Key Points

Question:

How can brain-computer interface (BCI) technology aid individuals with late-stage ALS in overcoming communication and interaction challenges?

Findings:

Alternative communication technologies often fail for advanced ALS patients due to reliance on residual motor activity. BCI enables direct brain-to-device communication, bypassing peripheral nerves and muscles. BCI uses cortical activity detected by electrodes, translating signals into actions like cursor movements or speech.

Meaning:

BCI offers a promising solution for enhancing autonomy in late-stage ALS patients. Challenges in usability, technical limitations, and ethical concerns must be addressed to optimize its effectiveness.

Abstract

Importance:

The combination brain-technology has long intrigued researchers ‘interest and hasn't remained a mere thought but has become a reality. Recent advancements in neurology and engineering have opened up prospects for restoring and enhancing human physical and psychic potentials, hence their quality of life.

Objective:

Healthy people interact with the outside physical environment through peripheral nerves and muscles. Individuals diagnosed with amyotrophic lateral sclerosis (ALS) frequently develop speech and communication problems in the course of their disease and there a lack of curative treatment options. Added, the alternative communication (AAC) technologies, thought very useful, are often ineffective for individuals with advanced ALS, because these devices depend on residual and reliable motor activity on the brain. Therefore, these patients progressively lose the ability to control external devices, thus requiring assistance from healthy people that may not always be available. This underscores the need for adaptive and autonomous assistive technologies tailored to CMD patients, which could provide more consistent support and alleviate the demands on caregivers.

Challenged by the limitation and the incapacity, scientists and researchers have developed a brain-computer interface technology (BCI) that enables direct communication between the brain and external computing devices independently of the peripheral nerves or muscles augmenting human capabilities in interacting with the physical environment.

The basic strategy of a brain-computer interface involves recording cortical activity with the use of an interface comprising an array of electrodes that detect and convey electrical activity from the brain. Output signals are translated with the use of advanced computational algorithms into sentences, sounds, or motor actions such as cursor movements.

Conclusions and Relevance:

BCI technology is progressing towards providing a more responsive and precise link between the brain and machines. Yet, several factors have to be resolved for achieving the ultimate goal. The challenges and obstacles in the field of BCI) encompass issues related to usability, technical limitations, and ethical concerns.

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