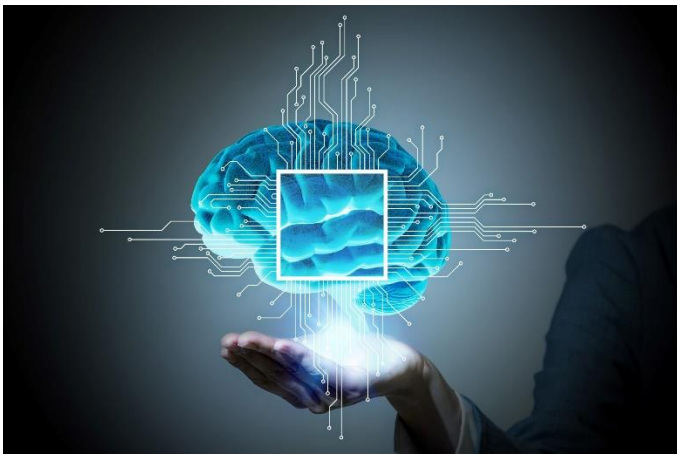
Study Finds Neural Implants Face Ethical Hurdles

Researchers conducted multiple focus group sessions with developers of artificial intelligence (AI)-driven neural implants. While these technologies represent some of the most exciting, useful, and cutting-edge medical research of the current decade, their utility raises ethical challenges that must be overcome before their implementation becomes 'mainstream.' The study focuses on design aspects, current challenges faced during clinical trials, and the overall impacts of these technologies on their users (patients) and society.



The present study identifies three main realms of empirical literature where substantial progress needs to be made: 1. Concisely defining the aims, uncertainties, and deployment hurdles faced by the application in question; 2. Improvements in model accuracy and reliability, and 3. User privacy. Finally, the paper discusses potential mitigation measures that may hasten this process and allow for implementing this promising field sooner rather than later.

AI-Driven Neural Implants

Colloquially known as 'brain implants, ' neural implants are surgically placed inside a patient's body. These brain-computer interfaces (BCIs) are programmed to communicate with or hack the brain's neurons with little or no side effects. They are intended to rehabilitate patients suffering from neurological disabilities (vision, speech, and hearing).

Despite their relative novelty, neural implants for cognitive enhancement or restoration and patient rehabilitation are some of the fastest-growing areas of clinical research in the world today and form the ideal conflux between neurological sciences and nanotechnology. Recent advances in machine learning (ML) and signal processing technologies have further strengthened research in the field, highlighting the significant long-term quality of life (QoL) improvements these scientific advancements can provide. Already, scientists and AI developers are involved in designing and testing AI-driven cochlear implants (AI-CI), AI-driven visual neural implants (AI-VNI), and AI-driven implanted speech-brain-computer-interface (AI-speech-BCI) to mitigate hearing, vision, and speech disabilities, respectively.

Unfortunately, the pace of these technological advancements has far exceeded that of ethical- and user-centric, non-medical discussion, raising strong concerns about AI's safety and user privacy-protective design and implementation. Since researchers involved in the design, trial, and review of the tools present the best focal group within which to discuss these challenges and

brainstorm mitigation measures, the present study provides a platform for this discourse. It collates these results into potentially deployable mitigation recommendations.

Study

The present study is a qualitative analysis that aims to explore diverse perspectives from current and past experts in neurotechnology, particularly those presently involved in the development of Cis, VNIs, and speech-BCIs. Participants for the study were selected based on their expertise in neurological-associated academic research, rehabilitation, product design and marketing, and social and psychological experts. Selected participants who provided written consent (N = 22) were enrolled in the study, of which 19 provided complete information (presence in all required FG sessions) and were included in the qualitative synthesis.

Each focal group (FG) was semi-structured, comprised 9-12 participants, and was conducted for an average of 88 minutes. While introduced briefly, discussion topics were not rigidly defined, allowing developers to provide their experience-based perspectives on the field's challenges and potential mitigation measures. Data analyses were carried out thematically for each of the three broad issues identified during the FGs.

Results and Conclusion

The present study identified three main themes during the three FGs – 1. Design aspects, 2. Challenges to keep in mind during clinical trials, 3. Overall impacts (particularly privacy and morality) on users and society.

Respondents highlighted the need for future AI-driven technologies to significantly outperform the "gold standards" of today's neurological rehabilitation implementations (e.g., hearing aids). This involves improvements in user-friendliness (ease of use) and performance before these technologies provide society-perceivable benefits, in turn bolstering their adoption. The reliability and accuracy of these novel technologies were further brought into the discussion, with respondents agreeing that these devices must be designed from the ground up with user safety and device reliability in mind.

Most of these challenges require additional clinical trials to answer and address. Unfortunately, clinical trials involving these surgically implanted, invasive devices present challenges of their own – 1. Surgical risks must account for invasive brain surgery and the tradeoffs between accuracy and generalizability, 2. Participants must be carefully selected after explicit informed consent based on their clinical symptoms, sociodemographic, and medical histories, and 3. Post-trail abandonment may be much more detrimental for the patient on early trial discontinuation due to the semi/permanent nature of the implants and their location of installment (patient's brain).

Finally, societal data revealed that respondents are concerned not only with ethical and moral considerations of these technologies to their users but also to society as a whole – the implementation of audio-enhancing implants may allow patients to unintentionally eavesdrop on individuals in their surroundings, thereby compromising the privacy of their neighbors, and by extension society. Given the irreplaceable role of society's approval in the success of this (and all) novel venture, ensuring that people (both users and their neighbors) retain their perception of safety and privacy is essential.

Source:

https://www.news-medical.net/news/20240407/Neural-implants-face-ethical-hurdles-study-finds.aspx