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A System for Assessing Neuropsychiatric Brain States Using Neural and Behavioral Biomarkers

Stanford researchers have developed a system that assesses altered mental states in both human and animal subjects using neural biomarkers, allowing for repeatable cross-species studies of potential treatments for psychiatric and neurological disorders. Conducting studies of psychiatric interventions in animal subjects is difficult, as animals cannot respond to the questionnaires typically used to evaluate treatment efficacy in human subjects. To address that gap, the researchers' new system uses electroencephalography (EEG) measurements to identify distinct biomarkers, and changes to those biomarkers, for various conditions, enabling the assessment of treatments for those conditions.

In tests, the researchers were able to identify biomarkers associated with the aversive reaction to a stimulus (a puff of air directed at the eye), and then watch to see how administering ketamine changed those biomarkers. Similar trials could assess the use of other therapeutic compounds for a range of conditions involving emotional or aversive reactions.

The system could be used for assessing treatment responses in a wide range of conditions including schizophrenia, dissociation, autism, depression, anxiety, obsessive compulsive disorder, posttraumatic stress disorder, and attention deficit disorder. Further, their system could potentially also work with a variety of brain imaging technologies in addition to EEG, including functional ultrasound and functional magnetic resonance imaging (fMRI).

Stage of Development
This biomarker has been used in both animal models (mice) and humans (in the clinic at Stanford) as a read-out of ketamine-induced dissociation.

Applications

- Screening platform for therapeutics
- Measurement system or device in an endpoint in clinical trials
- Diagnostic platform for clinical use

Advantages

- Biomarker is similarly modulated in psychiatric states across animal models and humans
- This biomarker may uniquely increase the likelihood of therapeutic success and provide a more objective means of quantifying outcomes in patients

Publications

- Kauvar, I., Richman, E. B., Liu, T. X., Li, C., Vesuna, S., Chibukhchyan, A., Yamada, L., Fogarty, A., Solomon, E., Choi, E. Y., Mortazavi, L., Chau Loo Kung, G., Mukunda, P., Raja, C., Gil-Hernández, D., Patron, K., Zhang, X., Brawer, J., Wrobel, S., Lusk, Z., … Deisseroth, K. (2025). Conserved brain-wide emergence of emotional response from sensory experience in humans and mice. Science 388(6750), eadt3971.

Patents

- Published Application: WO2026178278

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