

脳波解読による認知機能評価システムの開発

Development of an EEG-based Cognitive Assessment.

本研究では、注意のレベルを反映する脳波成分（事象関連電位）を指標とした認知機能評価システムの試作開発を行う。2年目の本年度は臨床応用を前提にした実証実験を開始する予定である
 In this study, we have developed an EEG-based cognitive assessment system, especially focusing on the EEG component (event-related potential, ERP) that reflects the attention level. In the second year our next step would be the clinical researches in the hospital.

Original Needs: Communication Aid

Communication is like "playing catch" of messages

Totally Locked-in State (TLS)

- Neurological diseases (e.g. ALS)
- Stroke
- Head trauma or Cervical cord damage

Severe motor disability by a disease or an accident → makes it impossible to talk or write

Patients with severe motor deficits need communication aid without any body action.

Methods: Cognitive Tasks.

Task Difficulty →

"Single" "Oddball" "Selection"

We used 3 cognitive tasks with different levels of difficulties.

Original Seeds: "Neurocommunicator"®

(1) Presentation of candidates of messages

(2) EEG recording by a compact/wireless device

(3) High-speed and high accuracy decoding

(4) Expression of the decoded message via the avatar

Raw EEG data

Pattern recognition of the Event-Related Potential (ERP)

We have developing the Neurocommunicator, an EEG-based communication aid.

Results: Individual difference of the ERP

● Example of ERP of a Subject

"Single" "Oddball" "Selection"

● Accuracy of Decoding

(N=10)

"Normal" Subjects

"Suspicious" Subject

The system may detect a symptom of mild cognitive impairment (MCI).

Application: Cognitive Assessment

High? Cognitive Function

Low?

It is difficult to test cognitive functions of patients with motor deficits...

We focused on the ERP as a biomarker of the cognitive function.

Ongoing project: "Neurotrainer"

Concept of neurofeedback game "Neurotrainer" in order to improve the cognitive function, which is based on the real-time analysis of the ERP.

Nontarget Nontarget ... Target

Hit

Miss

Users Candidates

- Patients with motor deficits.
- Senior people
- Children (including ADHD)
- Performer (e.g. athlete)

This neurofeedback game is designated to improve the cognitive function.