Brain responses of Sever motor and intellectual disabilities (SMID)

Kaori Tamura, Chihiro Karube, Takaaki Mizuba, Mayumi Matsufuji, Sachio Takashima, Keiji Iramina, Member, IEEE

Abstract—Sever motor and intellectual disabilities (SMID) patients can’t express their feelings with languages. In this study, we tried to investigate the brain response to hearing subject’s own name of healthy people and one patient with SMID by analyzing EEG. The results of time frequency analysis showed the inter trial coherence of a patient with SMID at theta oscillation was higher in response to SON specifically.

I. INTRODUCTION

“Severe motor and intellectual disabilities” (SMID) is a term used to describe a heterogeneous group of disorders with severe physical disabilities and profound mental retardation. The SMID children can show expressions of their feelings, but are unable to use speech to communicate with others. In order to support of understanding SMID people’s responses, we focused on their brain activities. In previous study, we estimated a passive oddball paradigm including subject’s own name and measured brain responses of hearing one’s name. Then, we analyzed by Inter-trial coherence (ITC) to detect phase-locking activities in response to their own name.

II. METHODS

One patient with SMID (S1) participated in this study and her diagnostic are shown in Table 1. S1 lied on a reclining wheelchair instead of sitting on a chair and listened to the stimuli through the earphones. The sound intensity was 65 dB. The stimuli set included three words: the Subject’s own name (SON) and two control words. The two control words were Japanese nouns with the same the number of syllables as SON. These three words were delivered in a random series with the same probabilities (33%) for their presentation. S1 was presented with two consecutive blocks of 120 stimuli. Stimulus onset asynchrony was 5 s. EEGs were recorded using 22-channels according to the International 10-20 system and referenced to averaged electrodes. EEGs were recorded using Neurofax (NIHON KOHDEN). The sampling rate was 500 Hz. A 0.08-300 Hz bandpass analog filter was applied.

A 0.1-50 bandpass digital filter (Butterworth, 6th order) was applied and some epochs containing artifacts were rejected. Morlet wavelet transform (MWT) was used to compute these measures of single-trial EEG responses. Then, Inter-trial coherence (ITC) were calculated using the EEGLab package [1]. ITC was defined by

\[ ITC(f, t) = \frac{1}{n} \sum_{k=1}^{n} F_k(f, t) \]  

For n trials, \( F_k(f, t) \) is the spectral estimate of trial k at frequency f and time t.

III. RESULTS AND DISCUSSION

TABLE I. STATUS OF THE SUBJECT WITH SMID

<table>
<thead>
<tr>
<th>Age at measure (years)</th>
<th>Age at injured (years)</th>
<th>Gender</th>
<th>Diagnostic</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>13</td>
<td>3</td>
<td>Female</td>
</tr>
</tbody>
</table>

![Figure 1. ITC of Theta oscillation at Fz electrode.](image)

Fig. 1 showed the ITC of theta at Fz. The ITC in response to SON were higher than that in response to control words. It has been reported that theta oscillation theta activities have a relevance to some cognitive functions, including sustained attention (for example, [2]). Our result suggested that the subject’s own name induced her attention more strongly than ordinary words.

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REFERENCES


Kaori Tamura, Chihiro Karube, Takaaki Mizuba and Keiji Iramina are with the Graduate school of System Life Sciences, Kyushu University, 1-1-3 Maidashi Higashiku Fukuokashi, Japan (corresponding author to provide phone: 092-642-6608; e-mail: tamura@bie.inf.kyushu-u.ac.jp).

Mayumi Matsufuji and Sachio Takashima is with the Yanagawa Institute for Developmental Disabilities, Yanagawa, 284-2, Kamimiyana-machi, Yanagawa,Fukuoka, Japan.