

Supplementary Material

Effects of Neurofeedback Training Combined with Transcranial Direct Current Stimulation on Motor Imagery: A Randomized Controlled Trial

1 **Shun Sawai** ^{1,2}, **Shin Murata** ^{1,3}, **Shoya Fujikawa** ³, **Ryosuke Yamamoto** ⁴, **Keisuke Shima** ⁵,
 2 **Hideki Nakano** ^{1,3*}

3 ¹ Graduate School of Health Sciences, Kyoto Tachibana University, Kyoto, Japan

4 ² Department of Rehabilitation, Kyoto Kuno Hospital, Kyoto, Japan

5 ³ Department of Physical Therapy, Faculty of Health Sciences, Kyoto Tachibana University, Kyoto,
 6 Japan

7 ⁴ Department of Rehabilitation, Tesseikai Neurosurgical Hospital, Shijonawate, Japan

8 ⁵ Graduate School of Environment and Information Sciences, Yokohama National University,
 9 Yokohama, Japan

10 *** Correspondence:**

11 Hideki Nakano

12 nakano-h@tachibana-u.ac.jp

13 **1 Supplementary Table**

14 **Supplementary Table S1.** Demographic data of each group

	All participants (n=20)	NFB group (n=10)	NFB + tDCS group (n=10)	p-value
Age (years)	20.20 ± 0.70	20.40 ± 0.70	20.00 ± 0.67	0.21
Height (cm)	172.65 ± 6.77	173.70 ± 4.50	171.60 ± 8.60	0.51
Body weight (kg)	63.00 ± 8.52	64.40 ± 5.42	61.60 ± 10.93	0.48

Mean ± SD; NFB, neurofeedback; tDCS, transcranial direct current stimulation

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17 2 Supplementary Text

18 2.1 EEG Processing

19 EEG data were analyzed using Microsoft Visual Studio (Microsoft Corp., Redmond, WA, USA).
 20 First, a spatial Laplacian filter (Nunez et al., 1994) was used to reduce artifacts, such as eye blink,
 21 facial muscle activity, and channel noise. The filtered EEG $y'_l(t)$ for the time t obtained from the
 22 electrode l is denoted by the following equation (1) using the pre-filtered EEG $y_l(t)$, electrodes
 23 surrounding the electrode n_l , and the total number of surrounding electrodes N :

$$24 \quad y'_l(t) = y_l(t) - \frac{1}{N} \sum_{n_l=1}^N y_{n_l}(t) \quad (1)$$

25 After filtering, the EEG was divided into frequencies using filter banks, and the root mean square at
 26 each frequency was calculated. The power of each frequency band in the recorded EEG was
 27 calculated by the above process, and event-related desynchronization (ERD) was evaluated based on
 28 this data. We calculated the ERD $E(t)$ at a time t based on the following equation using the resting
 29 μ -wave activity R_{rest} and μ -wave activity $R_{image}(t)$ during the imagery task (Pfurtscheller and
 30 Lopes da Silva, 1999):

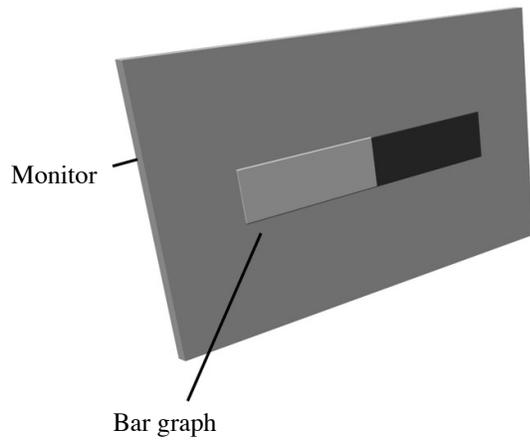
$$31 \quad E(t) = \frac{R_{rest} - R_{image}(t)}{R_{rest}} \quad (2)$$

32 Here, ERD indicates a decrease in the μ -wave activity during MI than that in the resting state.
 33 Therefore, $E(t)$ values range from $-\infty$ to 1, with ERD ranging between 0 and 1.

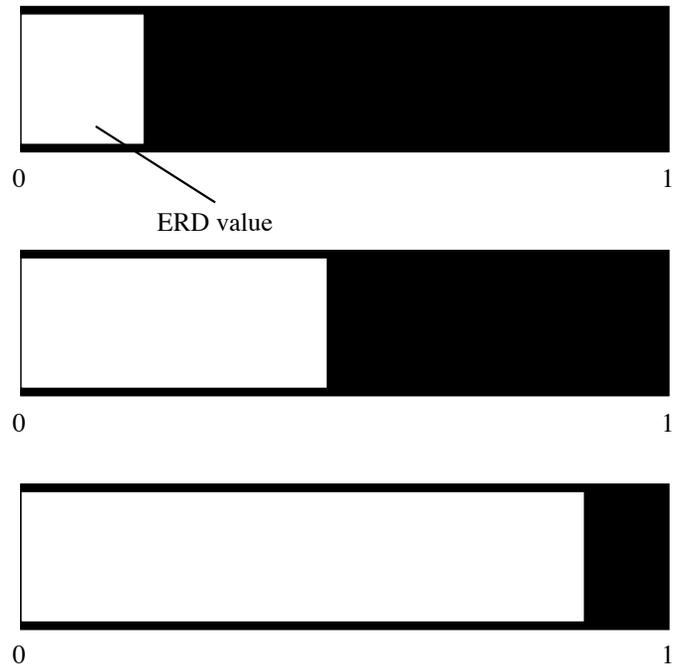
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35 2.2 NFB Procedure

36 ERD calculated by the above method was visually fed to the participants in real time. A bar graph
 37 was projected on the monitor, and the ERD was expressed by an increase or decrease of the graph
 38 (Figure S1).



(A)



(B)

39

40 **Supplementary Figure S1. Visual feedback of ERD**

41 (A) A bar graph is projected on the monitor to provide a visual feedback of ERD. (B) The white area
42 on the graph represents ERD, and the graph expands to the right with increasing ERD

43 ERD: event-related desynchronization