



Supplementary Figure 1 (S1). Patch-type EEG device and a disposable sheet with electrodes

EEG device (HARU) and electrode sheet in the worn state (top left). The sheet is connected to the device using a plug connector. The Haru sensor can be easily attached to the user's forehead without any binding method. Stretchable electrode sheet (bottom). Positions of electrodes (top right). The 3-channel EEG (ChZ: center, ChR: right, ChL: left) were positioned on the forehead, while the reference electrode was designed to be attached to the mastoid process with its conductor cable detached from the sheet.

Supplementary Table 1 (S2). Specifications of the HARU-1 device

Specification	Data
Sensor size	102.9 mm × 38.24 mm × 27.5 mm
Sensor weight	27g
Battery	200mAh (Li-ion)
Operating time	12 hr
Signal resolution	24 bit (22 nV / LSB)
Sampling rate	250Hz
Input referred noise	1 μVpp (70Hz BW)
CMRR	-110 dB
Input bias current	300 pA
Communication standard	BLE 4.x (IEEE 802.15.1)
Communication distance	Max. 20m

Supplementary Table 2 (S3). Sheet Specifications

Specification	Data
Sheet size	50.0mm × 155.22mm × 50 μm
Sheet weight	Less than 1.0g
Resistance	300Ω
Moisture permeability	2700 g/m ² /day
Stretchability	200%

Supplementary Table 3 (S4). Subgroup sizes, age distributions, and p-value for age-adjusted classification analyses

Classification Type	Classification Task	N (HV)	N (Patients)	Mean Age $\pm$ SD (HV)	Mean Age $\pm$ SD (Patients)	p-value
Severity-Based classification	HV vs MCI	40	40	71.75 $\pm$ 4.79	74.90 $\pm$ 10.09	0.08
	HV vs mild dementia	43	43	72.74 $\pm$ 5.60	75.74 $\pm$ 9.25	0.07
	HV vs moderate dementia	19	19	71.58 $\pm$ 5.53	75.11 $\pm$ 9.72	0.18
Diagnosis-Based classification	HV vs AD	47	47	70.04 $\pm$ 5.56	72.38 $\pm$ 10.92	0.19
	HV vs LBD	29	29	75.00 $\pm$ 4.50	78.31 $\pm$ 8.44	0.07
	HV vs iNPH	20	20	74.90 $\pm$ 5.25	77.75 $\pm$ 4.61	0.08
	HV vs non-specific MCI	6	6	69.00 $\pm$ 4.86	75.33 $\pm$ 11.09	0.24

MCI: Patients with mild cognitive impairment

AD: Patients with Alzheimer's disease

LBD: Patients with Lewy body disease

iNPH: Patients with idiopathic normal pressure hydrocephalus

HV: Healthy volunteers

SD: Standard deviation