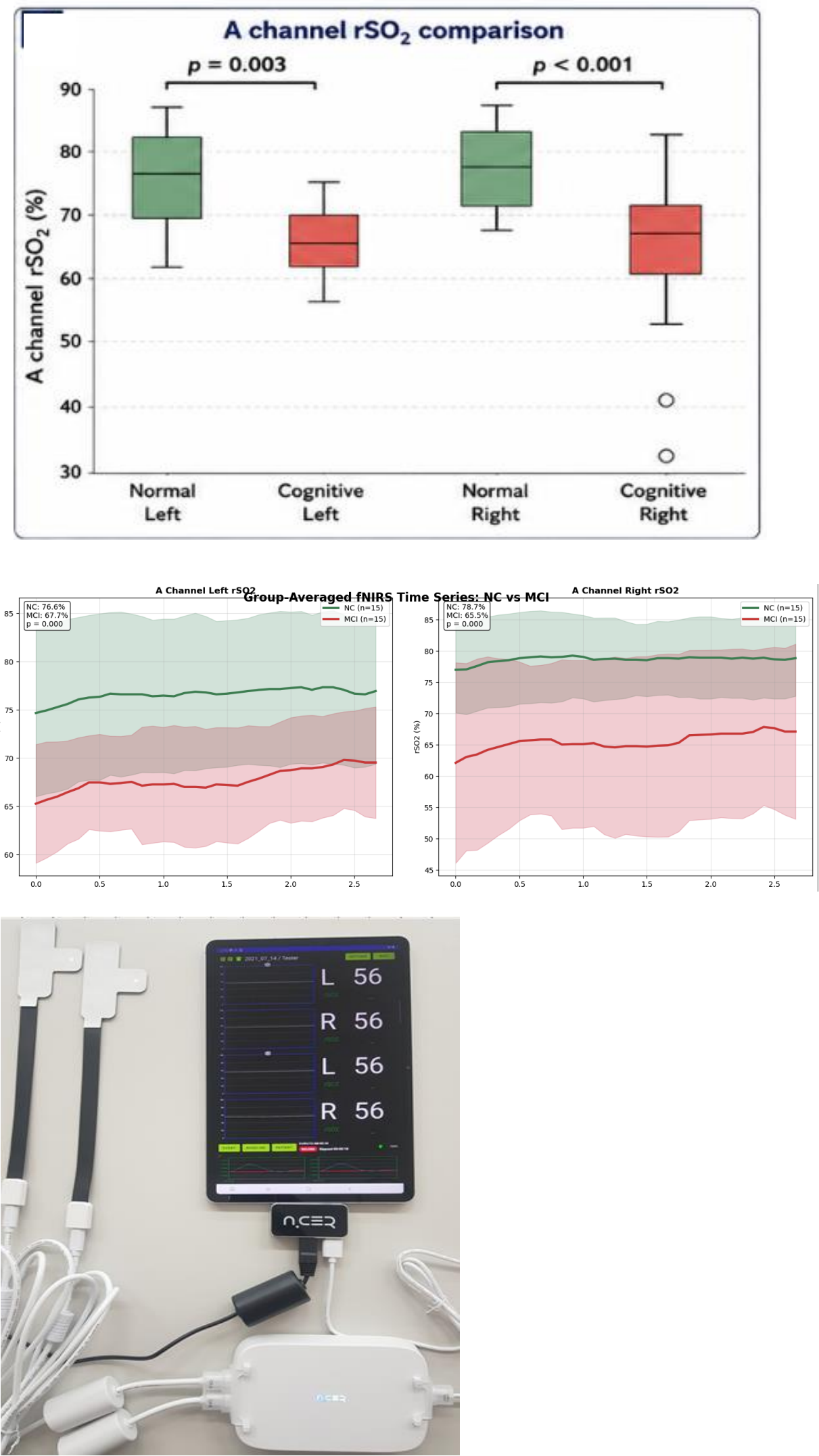


Comparison Of Brain Activity In Normal And Cognitively Impaired Subjects Using Functional Near-infrared Spectroscopy

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Cerebral oxygenation was significantly reduced in MCI.
Hemodynamic variability was lower in MCI than in controls
Functional connectivity was disrupted in MCI.
fNIRS detected characteristic physiological differences associated with cognitive impairment.

INTRODUCTION	RESULTS		CONCLUSIONS	REFERENCES
Early detection of Mild Cognitive Impairment (MCI) is crucial for timely intervention. Functional near-infrared spectroscopy (fNIRS) has emerged as a promising non-invasive tool to monitor cerebral oxygenation. This study aimed to evaluate the clinical utility of fNIRS as a non-invasive monitoring tool by comparing cerebral hemodynamics, heart rate variability (HRV), and functional connectivity between Cognitively Normal (CN) and MCI groups.	The MCI group exhibited significantly lower rSO₂ levels across all measured channels compared to the CN group (e.g., Left Hemisphere: CN 65.8±6.2% vs. MCI 58.4±7.1%, p=0.003, d=1.12). Furthermore, the MCI group showed 22-37% higher signal variability in rSO₂ compared to the CN group, suggesting impaired hemodynamic stability. Advanced HRF analysis revealed reduced HbO amplitudes and a lower number of activated channels in the MCI group. Regarding HRV, the Root Mean Square of Successive Differences (RMSSD) was significantly higher in the CN group (p=0.033), indicating better autonomic regulation. Lastly, functional connectivity analysis showed stronger inter-hemispheric correlations and more robust network connectivity in the CN group compared to the MCI group.		Older adults with MCI demonstrate characteristic differences in cerebral hemodynamics and functional connectivity as measured by fNIRS compared to cognitively normal participants. These physiological markers, particularly rSO₂ levels and hemodynamic variability, suggest the potential for clinical utility of fNIRS as an objective, non-invasive tool to aid as biomarkers for the early screening and longitudinal monitoring of cognitive decline.	Burns A, Iliffe S. Dementia. BMJ 2009;338:b75. Jang JW, Park JH, Kim S, Lee SH, Lee SH, Kim YJ. Prevalence and incidence of dementia in South Korea: a nationwide analysis of the National Health Insurance Service senior cohort. J Clin Neurol 2021;17:249-256 Choi H, Kim HJ, Kim KH, Oh S, Kim SH. The consideration about usefulness of mass screening for dementia. Dement Neurocogn Disord 2014;13:117-120. Scheltens P, De Strooper B, Kivipelto M, Holstege H, Chételat G, Teunissen CE, et al. Alzheimer's disease. Lancet 2021;397:1577-1590 Jack CR Jr, Bennett DA, Blennow K, Carrillo MC, Dunn B, Haeberlein SB, et al. NIA-AA research framework: toward a biological definition of Alzheimer's disease. Alzheimers Dement 2018;14:539-562 Pereira JB, Janelidze S, Ossenkoppele R, Kivitsberg H, Brinkmalm A, Mattsson-Carligen N, et al. Untangling the association of amyloid-β and tau with synaptic and axonal loss in Alzheimer's disease. Brain 2021;144:310-324. Jack CR Jr, Knopman DS, Jagust WJ, Petersen RC, Weiner MW, Aisen PS, et al. Tracking pathophysiological processes in Alzheimer's disease: an updated hypothetical model of dynamic biomarkers. Lancet Neurol 2013;12:207-216 Jack CR Jr, Wiste HJ, Weigand SD, Rocca WA, Knopman DS, Mielke MM, et al. Age-specific population frequencies of cerebral β-amyloidosis and neurodegeneration among people with normal cognitive function aged 50-89 years: a cross-sectional study. Lancet Neurol 2014;13:997-1005. Butters E, Srinivasan S, O'Brien JT, Su L, Bale G. A promising tool to explore functional impairment in neurodegeneration: A systematic review of near-infrared spectroscopy in dementia. Ageing Res Rev. 2023 Sep;90:101992.
METHODS				CONTACT
We enrolled 30 participants (MCI=15, CN=15) and measured regional cerebral oxygen saturation (rSO₂) and hemoglobin (HbO, HbR) concentrations using fNIRS during a resting state. Heart rate variability (HRV) was simultaneously assessed via photoplethysmography (PPG). Data analysis included the Hemodynamic Response Function (HRF), frequency-domain analysis of rSO₂ variability, and inter-hemispheric functional connectivity. Independent t-tests and Cohen's d were used to evaluate group differences.				polariswon@ncerebro.com hoowon@chosun.ac.kr orchis333@gmail.com NCER GARD광주치매코호트연구단 CHOSUN UNIVERSITY HOSPITAL ALZHEIMER'S ASSOCIATION AAIC26