

DAFTAR PUSTAKA

1. Abhang, P.A., Gawali, B.W. and Mehrotra, S.C. (2016) Introduction to EEG- and speech-based emotion recognition.
2. Al-Qazzaz, N.K. et al. (2014) 'Role of EEG as biomarker in the early detection and classification of dementia', Scientific World Journal. Hindawi Publishing Corporation. Available at: <https://doi.org/10.1155/2014/906038>.
3. Alwhaibi, R.M. et al. (2021) 'Impact of somatosensory training on neural and functional recovery of lower extremity in patients with chronic stroke: A single blind controlled randomized trial', International Journal of Environmental Research and Public Health, 18(2), pp. 1–10. Available at: <https://doi.org/10.3390/ijerph18020583>.
4. American Heart Association/American Stroke Association (2013) 'An Updated Definition of Stroke for the 21st Century', Stroke, 44, pp. 2064–2089.
5. Antonia Pradhea, T. et al. (2024) 714 Gangguan Kognitif Pasca-Stroke-Tinjauan Sistematis. Available at: www.freepik.com.
6. Asmedi, A. et al. (2022) 'Quantitative EEG Correlates with NIHSS and MoCA for Assessing the Initial Stroke Severity in Acute Ischemic Stroke Patients', Open Access Macedonian Journal of Medical Sciences, 10(B), pp. 599–605. Available at: <https://doi.org/10.3889/oamjms.2022.8483>.
7. Baraka, A., Meda, J. and Nyundo, A. (2023) 'Predictors of post-stroke cognitive impairment at three-month following first episode of stroke among patients attended at tertiary hospitals in Dodoma, central Tanzania: A protocol of a prospective longitudinal observational study metadata', PLoS ONE, 18(3 March). Available at: <https://doi.org/10.1371/journal.pone.0273200>.
8. Bentes, C. et al. (2018) 'Quantitative EEG and functional outcome following acute ischemic stroke', Clinical Neurophysiology, 129(8), pp. 1680–1687. Available at: <https://doi.org/10.1016/j.clinph.2018.05.021>.
9. Boehme, A.K., Esenwa, C. and Elkind, M.S.V. (2017) 'Stroke Risk Factors, Genetics, and Prevention', Circulation Research. Lippincott Williams and Wilkins, pp. 472–495. Available at: <https://doi.org/10.1161/CIRCRESAHA.116.308398>.
10. Budiman, J., Thobari, J.A. and Pinzon, R.T. (2022) 'Prediction score for post-stroke cognitive impairment (PSCI) after acute ischemic stroke', Journal of the Medical Sciences (Berkala Ilmu Kedokteran), 54(3). Available at: <https://doi.org/10.19106/jmedsci005403202204>.
11. Buskila, Y., Bellot-Saez, A. and Morley, J.W. (2019) 'Generating Brain Waves, the Power of Astrocytes', Frontiers in Neuroscience. Frontiers Media S.A. Available at: <https://doi.org/10.3389/fnins.2019.01125>.
12. Caplan dan Liebskind (2016) Pathology, anatomy, and pathophysiology of stroke.
13. Demos, J.N.. (2019) Getting started with neurofeedback. W.W. Norton.
14. Elendu, C. et al. (2023) 'Stroke and cognitive impairment: understanding the connection and managing symptoms', Annals of Medicine & Surgery, 85(12), pp. 6057–6066. Available at: <https://doi.org/10.1097/ms9.0000000000001441>.
15. Feigin, V.L. et al. (2022) 'World Stroke Organization (WSO): Global Stroke Fact Sheet 2022', International Journal of Stroke. SAGE Publications Inc., pp. 18–29. Available at: <https://doi.org/10.1177/17474930211065917>.
16. Fonseca, L.C. et al. (2011) Alzheimer's disease Relationship between cognitive aspects and power and coherence EEG measures, Arq Neuropsiquiatr.
17. Harahap, H.S. (2020) 'ASPEK IMUNOLOGI PERAN HOMOSISTEIN DALAM PATOGENESIS GANGGUAN KOGNITIF PASCA STROKE', Jurnal Kedokteran, (3), pp. 175–183.
18. Khaku, A.S., Tadi, P., 2023. Cerebrovascular Disease. StatPearls

19. Langa, K.M. and Levine, D.A. (2014) 'The diagnosis and management of mild cognitive impairment: A clinical review', *JAMA - Journal of the American Medical Association*. American Medical Association, pp. 2551–2561. Available at: <https://doi.org/10.1001/jama.2014.13806>.
20. 'Laporan Riskesdas 2018 Nasional' (no date).
21. Luthfiana, A. (2019) Pemeriksaan Indeks Memori, MMSE (Mini Mental State Examination) dan MoCA-Ina (Montreal Cognitive Assessment Versi Indonesia) Pada Karyawan Universitas Yarsi Examination of Memory Index, MMSE (Mini Mental State Examination) and MoCA-Ina (Montreal Cognitive Assessment Indonesian Version) at Yarsi University Employees, *JURNAL KEDOKTERAN YARSI*.
22. Maria A, Jose C 2021, Role of Neurosonology in Vascular Dementia, Department of Neurology & Psychiatry Faculty of Medicine & Surgery, University of Santo Tomas Manila, Chapter 4
23. Mayza A et al. (2022) 'Buku Ajar Neurologi. Neurobehavior dasar dan pemeriksaannya.' Indonesia.
24. Popa, L.L. et al. (2020) 'The Role of Quantitative EEG in the Diagnosis of Neuropsychiatric Disorders', *Journal of Medicine and Life*, 13(1), pp. 8–15. Available at: <https://doi.org/10.25122/jml-2019-0085>.
25. Schleiger, E. et al. (2017) 'Poststroke QEEG informs early prognostication of cognitive impairment', *Psychophysiology*, 54(2), pp. 301–309. Available at: <https://doi.org/10.1111/psyp.12785>.
26. Sofiah, dkk. (2018). Analysis of quantitative EEG (QEEG) parameters on the effect of transcranial direct current stimulation (TDCS) on post-stroke patients. *AIP Conference Proceedings*, 2092(1)
27. Soliman, R.H. et al. (2018) 'Risk factors of acute ischemic stroke in patients presented to Beni-Suef University Hospital: prevalence and relation to stroke severity at presentation', *Egyptian Journal of Neurology, Psychiatry and Neurosurgery*, 54(1). Available at: <https://doi.org/10.1186/s41983-018-0012-4>.
28. Song, Y. et al. (2015) 'Background rhythm frequency and theta power of quantitative EEG analysis: Predictive biomarkers for cognitive impairment post-cerebral infarcts', *Clinical EEG and Neuroscience*, 46(2), pp. 142–146. Available at: <https://doi.org/10.1177/1550059413517492>.
29. Steliga, A. et al. (2020) 'Neurovascular Unit as a Source of Ischemic Stroke Biomarkers-Limitations of Experimental Studies and Perspectives for Clinical Application', pp. 553–579. Available at: <https://doi.org/10.1007/s12975-019-00744-5/Published>.
30. Sun, J.H., Tan, L. and Yu, J.T. (2014) 'Post-stroke cognitive impairment: Epidemiology, mechanisms and management', *Annals of Translational Medicine*. AME Publishing Company. Available at: <https://doi.org/10.3978/j.issn.2305-5839.2014.08.05>.
31. Tammasse, J., dkk. (2022). The differences of frontal delta-alfa (DAR) ratio and alfa-beta interhemispheric coherence between ischemic stroke patients with and without cognitive impairment. *NeuroQuantology*, 20(6), 114–121.
32. Valeria Battistella, V. D. Camarn, C. B. Nogueira, F. H. G. Porto, L. Jamaci, · C. V. Guillermo, J. M. N. Osvaldo, J. A. Souza. Transcranial Doppler could help to diferentiate the types of dementia? A pilot study when CSF biomarkers are not available. Springer-Verlag GmbH Austria, part of Springer Nature 2020
33. Wang, J. et al. (2013) 'Resting state EEG abnormalities in autism spectrum disorders', *Journal of Neurodevelopmental Disorders*, 5(1). Available at: <https://doi.org/10.1186/1866-1955-5-24>.
34. Wang, S. et al. (2022) 'Impact of impaired cerebral blood flow autoregulation on cognitive impairment', *Frontiers in Aging*. Frontiers Media S.A. Available at:

- <https://doi.org/10.3389/fragi.2022.1077302>.
35. Wilkinson, C.M. et al. (2020) 'Predicting stroke severity with a 3-min recording from the Muse portable EEG system for rapid diagnosis of stroke', *Scientific Reports*, 10(1). Available at: <https://doi.org/10.1038/s41598-020-75379-w>.
 36. Xu, M. et al. (2024) 'EEG biomarkers analysis in different cognitive impairment after stroke: an exploration study', *Frontiers in Neurology*, 15. Available at: <https://doi.org/10.3389/fneur.2024.1358167>.
 37. Yang, Y.M. et al. (2020) 'Trends in cognitive function assessed by a battery of neuropsychological tests after mild acute ischemic stroke', *Journal of Stroke and Cerebrovascular Diseases*, 29(7). Available at: <https://doi.org/10.1016/j.jstrokecerebrovasdis.2020.104887>Xiong, L., Tian, G., Leung, H., Soo, Y. O. Y., Chen, X., Ip, V. H. L., Mok, V. C. T., Chu,
 38. Yuanmei Pan, Wenbin Wan, Minjie Xiang and Yangtai Guan. Transcranial Doppler Ultrasonography as a Diagnostic Toll for cerebrovascular Diseorder, *Frontiers in human neuroscience* 2021
 39. W. C. W., Wong, K. S., & Leung, T. W. H. (2018). Autonomic Dysfunction Predicts Clinical Outcomes After Acute Ischemic Stroke: A Prospective Observational Study. *Stroke*, 49(1), 215–218. <https://doi.org/10.1161/STROKEAHA.117.019312>
 40. Yperzeele, L., van Hooff, R.-J., Nagels, G., De Smedt, A., De Keyser, J., & Brouns, R. (2015). Heart rate variability and baroreceptor sensitivity in acute stroke: A systematic review. *International Journal of Stroke: Official Journal of the International Stroke Society*, 10(6), 796–800. <https://doi.org/10.1111/ijis.12573>

LAMPIRAN

Lampiran 1. Naskah Penjelasan pada Subjek



KEMENTERIAN PENDIDIKAN DAN KEBUDAYAAN
UNIVERSITAS HASANUDDIN FAKULTAS KEDOKTERAN
KOMITE ETIK PENELITIAN KESEHATAN
RSPTN UNIVERSITAS HASANUDDIN
RSUP Dr. WAHIDIN SUDIROHUSODO MAKASSAR



Sekretariat : Lantai 2 Gedung Laboratorium Terpadu
JL. PERINTIS KEMERDEKAAN KAMPUS TAMALANREA KM.10 MAKASSAR 90245.
Contact Person: dr. Agus salim Bukhari., MMed.PHD., SpGK TELP. 081241850858, 0411 5780103, Fax : 0411-581431

LAMPIRAN 1

FORMULIR PERSETUJUAN SETELAH PENJELASAN (PSP) (INFORMED CONSENT)

Template

Selamat pagi Bapak /Ibu /Saudara(i), saya **dr. Murali Idris Madij**, bermaksud untuk melakukan penelitian **Quantitative Electroencephalography Theta Activity and Trans Cranial Doppler-Derived Hemodynamic Indices as Early Biomarkers of Cognitive Impairment After Ischemic Stroke: A Pilot Exploration**

Penelitian ini bertujuan untuk menjelaskan gambaran qEEG dan TCD pada pasien stroke iskemik yang mengalami gangguan fungsi kognitif.

Populasi dan sampel adalah pasien yang berobat di poli RSUP Dr. Wahidin Sudirohusodo dengan keluhan infark cerebri yang mengalami gangguan fungsi kognitif dan tidak mengalami gangguan fungsi kognitif.

Subyek yang terpilih untuk diteliti haruslah memenuhi kriteria sebagai berikut : kriteria inklusi : laki-laki dan perempuan yang sedang berobat di poli RSUP Dr. Wahidin Sudirohusodo dengan keluhan infark cerebri.

Kriteria Eksklusi : pasien yang berobat di poli RSUP Dr. Wahidin Sudirohusodo selain keluhan seperti infark cerebri, dan pasien dengan infark cerebri tetapi menolak mengikuti pemeriksaan.

Kriteria pengunduran diri : Pasien/keluarga pasien menolak untuk dilakukan observasi lanjutan. Jika partisipan menyetujui untuk ikut maka harus mengikuti protocol penelitian sampai selesai.

Penelitian ini dilakukan anamnesis dan pemeriksaan fisik serta pemeriksaan penunjang, kemudian akan dijelaskan tujuan dari penelitian serta meminta persetujuan kepada pasien. Kemudian akan dilakukan pemeriksaan qEEG dan TCD pada arteri Cerebri Media.

kerahasiaan data partisipan akan dijaga dan tidak dipublikasi

Jika ada hal yang ingin ditanyakan mengenai penelitian ini dapat menghubungi penelitian dengan alamat dan nomor kontak di bawah ini

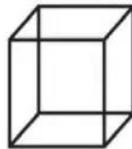
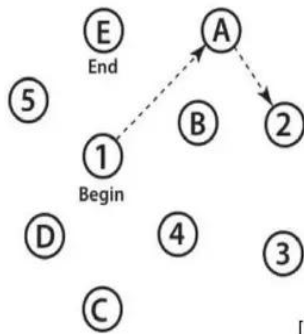
Lampiran 2. Montreal Cognitive Assessment Versi Indonesia (MOCA-INA)

MONTREAL COGNITIVE ASSESMENT-Versi Indonesia (MoCA-INA)

NAMA:
Pendidikan:
Jen. Kelamin:

Tgl Lahir:
Tgl Pemeriksaan:

VISUOSPASIAL/EKSEKUTIF



salin
gambar

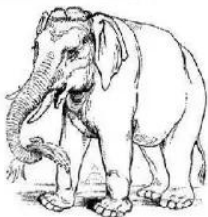
Gambar jam (11 lebih 10 menit)
(3 poin)

POIN

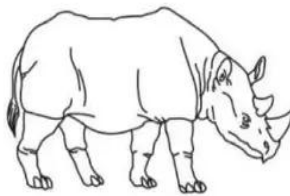
[] [] []
bentuk angka jarum jam

....5

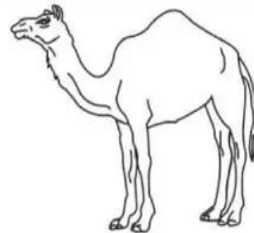
PENAMAAN



[]



[]



[]

....3

MEMORI

Baca kata berikut dan minta

subjek mengulangnya. lakukan 2 kali, meski berhasil
pada percobaan ke-1. lakukan recall setelah 5 menit

wajah Sutera Masjid anggrek merah

ke-1

ke-2

ATENSI

Baca daftar angka (1 angka/detik)

Subjek harus mengulangi dari awal [] 2 1 8 5 4

Subjek harus mengulangi dari belakang [] 7 4 2

....2

Baca daftar huruf. subjek harus mengetuk dengan tangannya setiap kali huruf A muncul. poin nol jika ≥ 2 kesalahan

[] F B A C M N A A J K L B A F A K D E A A A J A M O F A A B

....1

Pengurangan berurutan dengan angka 7. Mulai dari 100 [] 93 [] 86 [] 79 [] 72 [] 65
4,5 hasil benar: 3 poin, 2 atau 3 benar: 2 poin; 1 benar: 1 poin, 0 benar: 0 poin

....3

BAHASA

Ulangi: Wati membantu saya menyapu lantai hari ini. []

Tikus bersembunyi di bawah dipan ketika kucing datang. []

....2

Sebutkan sebanyak mungkin kata yang dimulai dengan huruf S [] (N ≥ 11 kata)

....1

ABSTRAKSI

Kemiripan antara, contoh pisang - jeruk = buah [] kereta - sepeda [] jam tangan - penggaris

....2

DELAYED RECALL

Harus mengingat kata

TANPA PETUNJUK

wajah Sutera Masjid anggrek merah

[] [] [] [] []

poin untuk recall
tanpa petunjuk

Opsional

petunjuk kategori

petunjuk pilihan ganda

....5

ORIENTASI

[] Tanggal [] Bulan [] Tahun [] Hari [] Tempat [] Kota

....6

Normal $\geq 26 / 30$

Total30

Dilakukan oleh.....

Tambahkan 1 poin jika pend. ≤ 12 tahun

Lampiran 3. Lembar pengesahan Komite Etik



KEMENTERIAN PENDIDIKAN, KEBUDAYAAN, RISET DAN TEKNOLOGI
UNIVERSITAS HASANUDDIN FAKULTAS KEDOKTERAN
KOMITE ETIK PENELITIAN UNIVERSITAS HASANUDDIN
RSPTN UNIVERSITAS HASANUDDIN

RSUP Dr. WAHIDIN SUDIROHUSODO MAKASSAR

Sekretariat : Lantai 2 Gedung Laboratorium Terpadu

JL. PERINTIS KEMERDEKAAN KAMPUS TAMALANREA KM.10 MAKASSAR 90245.

Contact Person: dr. Agussalim Bukhari, MMed, PhD, SpGK TELP. 081241850858, 0411 5780103, Fax : 0411-581431

**REKOMENDASI PERSETUJUAN ETIK**

Nomor : 472/UN4.6.4.5.31/ PP36/ 2025

Tanggal: 5 Juli 2025

Dengan ini Menyatakan bahwa Protokol dan Dokumen yang Berhubungan Dengan Protokol berikut ini telah mendapatkan Persetujuan Etik :

No Protokol	UH25050343		No Sponsor	
Peneliti Utama	dr. Murali Idris Madjid		Sponsor	
Judul Peneliti	Quantitative Electroencephalography Theta Activity and Trans Cranial Doppler-Derived Hemodynamic Indices as Early Biomarkers of Cognitive Impairment After Ischemic Stroke: A Pilot Exploration			
No Versi Protokol	1	Tanggal Versi	5 Juli 2025	
No Versi PSP	1	Tanggal Versi	5 Juli 2025	
Tempat Penelitian	RSUP Wahidin Sudirohusodo Makassar			
Jenis Review	☐ Exempted ☒ Expedited ☐ Fullboard Tanggal		Masa Berlaku 5 Juli 2025 sampai 5 Juli 2026	Frekuensi review lanjutan
Ketua KEP Universitas Hasanuddin	Prof. dr. Muh Nasrum Massi, PhD, SpMK, Subsp. Bakt(K)		Tanda tangan	
Sekretaris KEP Universitas Hasanuddin	dr. Firdaus Hamid, PhD, SpMK(K)		Tanda tangan	

Kewajiban Peneliti Utama:

- Menyerahkan Amandemen Protokol untuk persetujuan sebelum di implementasikan
- Menyerahkan Laporan SAE ke Komisi Etik dalam 24 jam dan dilengkapi dalam 7 hari dan Laporan SUSAR dalam 72 Jam setelah Peneliti Utama menerima laporan
- Menyerahkan Laporan Kemajuan (progress report) setiap 6 bulan untuk penelitian resiko tinggi dan setiap setahun untuk penelitian resiko rendah
- Menyerahkan laporan akhir setelah Penelitian berakhir
- Melaporkan penyimpangan dari protokol yang disetujui (protocol deviation / violation)
- Mematuhi semua peraturan yang ditentukan