



Hugo Botha

ASSISTANT PROFESSOR

Department of Neurology, Mayo Clinic

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I am a behavioral neurologist at Mayo Clinic in Rochester, MN. My research is focused on understanding the dynamic, system level changes that characterize degenerative disease, with a focus on speech/language disorders, Alzheimer's disease, and Alzheimer's mimics. I have a particular interest in Bayesian methods and unsupervised machine learning applied to neurological and imaging data.

Education

Mayo Clinic

CLINICIAN INVESTIGATOR PROGRAM - RADIOLOGY

Rochester, MN, USA

07/2017-06/2019

Mayo Clinic

BEHAVIORAL NEUROLOGY FELLOWSHIP

Rochester, MN, USA

07/2016-06/2017

Mayo Clinic

NEUROLOGY RESIDENCY

Rochester, MN, USA

07/2012-06/2016

University of Stellenbosch

BACHELOR OF MEDICINE BACHELOR OF SURGERY (MBCbB)

Cape Town, WC, SA

01/2006-12/2011

Awards and Honors

Norman Geschwind Prize Award in Behavioral Neurology

AWARDED TO AN INDIVIDUAL FOR OUTSTANDING RESEARCH IN THE FIELD OF BEHAVIORAL NEUROLOGY.

2021

American Academy of Neurology

Department of Neurology Research Award

RECOGNITION OF OUTSTANDING BASIC OR CLINICAL RESEARCH DURING RESIDENCY OR FELLOWSHIP

2016

Mayo Clinic

Mayo Brother's Fellowship Award

AWARDED FOR OUTSTANDING CLINICAL PERFORMANCE, HUMANITARIANISM, AND SCHOLARLY ACTIVITY

2016

Mayo Clinic

Faculty of Health Sciences Medal for Best Graduating Student

AWARDED TO THE BEST UNDERGRADUATE STUDENT FROM THE GRADUATING CLASSES IN HEALTH AND ALLIED HEALTH SCIENCES

2011

University of Stellenbosch

Rector's Award for Excellent Achievement: Academics

AWARDED FOR OUTSTANDING ACHIEVEMENT IN EITHER ACADEMICS, SPORT OR CULTURE

2011

University of Stellenbosch

Professional Memberships and Activities

SOCIETY MEMBERSHIP

American Academy of Neurology

MEMBER

2013-present

International Society to Advance Alzheimer's Research and Treatment

MEMBER

2017-present

Organization for Human Brain Mapping

MEMBER

2017-present

International Society for Frontotemporal Dementias

MEMBER

2020-present

Organization for Computational Neurosciences

MEMBER

2020-present

PROFESSIONAL SERVICE

Conferences

COURSE MONITOR

- American Academy of Neurology Annual Meeting (2016)

ABSTRACT REVIEWER

- Alzheimer's Association International Conference (2018, 2019, 2020)

Journals

AD HOC REVIEWER

- Alzheimer's Research & Therapy
- Brain
- Human Brain Mapping
- JAMA Psychiatry
- Journal of Alzheimer's Disease
- Journal of the Neurological Sciences
- Mayo Clinic Proceedings
- Medical Image Analysis
- Nature: Scientific Reports
- Neurobiology of Aging
- NeuroImage: Clinical
- Neurology
- Neuropsychologia
- Parkinsonism and Related disorders

Teaching

INTERNAL LECTURES

Neurology Residency Program

BASIC SUMMER LECTURE SERIES

- Bedside Cognitive Assessment (2018,2019,2020)

NEUROANATOMY COURSE

- Cortex I: Cytoarchitecture and Organization (2019, 2020)
- Cortex II: Lobes and Functions (2019, 2020)

INTERNAL CONFERENCES

Neurology Department

GRAND ROUNDS

- Neurology Clinicopathologic Conference - A young man with progressive language difficulty (2015)

SUBSPECIALTY CONFERENCE

- Left Speechless: Dealing with the word salad of progressive aphasia and apraxia of speech (2015)
- The left hand of neurology: sinistrality, hemispheric specialization and neurodegenerative disease (2017)

LAY PUBLIC FOCUSED TALKS

ADRC Patient-Caregiver Seminars

POSTERIOR CORTICAL ATROPHY EDUCATION SEMINAR

- Making a Diagnosis

CBD AND PSP EDUCATION SEMINAR

- Journey to the Diagnosis (2017)

FRONTOTEMPORAL DEMENTIA AND PRIMARY PROGRESSIVE APHASIA EDUCATION SEMINAR

- FTD/PPA: Making a Diagnosis (2017)
- FTD/PPA: Pathology and Pathophysiology (2017)

Invited Talks

CHESLEY CENTER ON AGING 2017 DEMENTIA CARE CONFERENCE

- Latest Findings and Trends in Research (2017)

Institutional/Departmental Activities

ACTIVE

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| Neurology Research Committee VOTING MEMBER | 2019 - Current |
| Neurology Artificial Intelligence Program DEPUTY DIRECTOR | 2020 - Current |
| Behavioral Neurology Fellowship DEPUTY DIRECTOR | 2020 - Current |
| Machine Learning/Deep Learning Journal Club SECTION CHAIR (NEUROLOGY) | 2020 - Current |
| PRIOR | |
| Mayo Internal Medicine Residents Council PRELIM-YEAR REPRESENTATIVE | 2012 - 2013 |
| Neurology Residency Recruitment Committee VOTING MEMBER | 2014 - 2016 |

Mentoring

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| Johhny Dang (Medical student) PROJECT: DELAYS IN THE DIAGNOSIS OF PPAOS <ul style="list-style-type: none"> Abstract submitted to AAN 2021 Manuscript submitted | 2019 - Current |
| Zeynep Secking (Intern) PROJECT: NEUROLOGIC CAUSES FOR DELUSIONAL INFESTATION <ul style="list-style-type: none"> Manuscript in preparation | 2020 - Current |
| Ryan Coburn (Neurology Resident) PROJECT: FDG-PET TO PREDICT DECLINE IN ATYPICAL ALZHEIMER'S DISEASE <ul style="list-style-type: none"> Data analysis in progress | 2020 - Current |

Research funding

ACTIVE

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| The neurobiology of two distinct types of progressive apraxia of speech (Co-I) NATIONAL INSTITUTE ON DEAFNESS AND OTHER COMMUNICATION DISORDERS | 2017-2022 R01 DC 14942 |
| Longitudinal multi-modality imaging in progressive apraxia of speech (Co-I) NATIONAL INSTITUTE ON DEAFNESS AND OTHER COMMUNICATION DISORDERS | 2018-2023 R01 DC 12519 |
| ARTFL LEFFTDS Longitudinal Frontotemporal Lobar Degeneration (ALLFTD) (Co-I) NATIONAL INSTITUTE ON AGING | 2019-2024 U19 AG 63911 |
| Independent brain metabolic patterns in Progressive Supranuclear Palsy (Co-I) NATIONAL INSTITUTE OF NEUROLOGICAL DISORDERS AND STROKE | 2020-2022 R03 NS 114365 |

Presentations

CONFERENCE PRESENTATIONS (10)

- Botha,H.** (2014). *Diffusion tensor imaging in primary progressive aphasia and apraxia of speech* [Poster]. International Frontotemporal Dementia Conference, Vancouver, BC, Canada.
- Botha,H.** (2015). *Category Specific Imaging Correlates in Neurodegenerative Anomia* [Poster]. American Neurologic Association Annual Meeting, Philadelphia, PA, USA.
- Botha,H.** (2016). *Language network dysfunction in primary progressive apraxia of speech* [Poster]. Fifth Biennial Conference on Resting-State and Brain Connectivity, Vienna, Austria.
- Botha,H.** (2018). *A novel FDG-PET based marker of TDP-43 and hippocampal sclerosis pathology* [Platform]. 24th Mayo-KI Annual Scientific Research Meeting, Rochester, MN, USA.
- Botha,H.** (2018). *FDG-PET in tau-negative amnesic dementia resembles that of autopsy proven hippocampal sclerosis* [Platform]. Human Amyloid Imaging, Miami, FL, USA.

- Botha, H.** (2018). *Variability in pDMN Connectivity and Relative Hubness in Amyloid-Negative Cognitively Normal Individuals Predicts Amyloid and Tau Deposition Patterns in Typical Alzheimer's Disease* [Poster]. Alzheimer's Association International Conference, Chicago, IL, USA.
- Botha, H.** (2019). *Brain States and Tau PET Patterns Interact across the Aging-Alzheimer's Continuum* [Poster]. Alzheimer's Association International Conference, Los Angeles, CA, USA.
- Botha, H.** (2019). *Data-driven characterization of cross-sectional and longitudinal molecular imaging in aging and Alzheimer's disease* [Platform]. Human Amyloid Imaging, Miami, FL, USA.
- Botha, H.** (2019). *Linking Brain States to Molecular Pathology across the Aging-Alzheimer's Continuum* [Blitz-poster]. ADC Annual Conference, St Louis, MO, USA.
- Botha, H.** (2020). *Disrupted brain dynamics across the Alzheimer's disease spectrum is related to tau accumulation* [Platform]. Alzheimer's Association International Conference, Virtual, originally planned for Amsterdam, NL.

Bibliography

BOOK CHAPTERS (2)

- Botha, H.**, & Jones, D. T. (2018). Functional Connectivity in Dementia. In C. Habas (Ed.), *The Neuroimaging of Brain Diseases: Structural and Functional Advances* (pp. 245–266). Springer International Publishing. https://doi.org/10.1007/978-3-319-78926-2_11
- Botha, H.**, & Utianski, R. L. (n.d.). Primary Progressive Apraxia of Speech. In *Primary Progressive Aphasia and Other Frontotemporal Dementias: Diagnosis and Treatment of Associated Communication Disorders*. Plural Publishing.

PREPRINTS (1)

- Jones, D., Lowe, V., Graff-Radford, J., **Botha, H.**, Wiepert, D., Murphy, M. C., Murray, M., Senjem, M., Gunter, J., Wiste, H., Boeve, B., Knopman, D., Petersen, R., & Jack, C. (2020). Patterns of neurodegeneration in dementia reflect a global functional state space. *medRxiv*. <https://doi.org/10.1101/2020.11.09.20228676>

PEER REVIEWED (57)

- Botha, H.**, Schalkwyk, G. van, Bezuidenhout, J., & Schalkwyk, S. van. (2011). Discourse of final-year medical students during clinical case presentations. *African Journal of Health Professions Education*, 3(1), 3–6. <https://www.ajol.info/index.php/ajhpe/article/view/69937>
- Botha, H.**, Ackerman, C., Candy, S., Carr, J. A., Griffith-Richards, S., & Bateman, K. J. (2012). Reliability and Diagnostic Performance of CT Imaging Criteria in the Diagnosis of Tuberculous Meningitis. *PLOS ONE*, 7(6), e38982. <https://doi.org/10.1371/journal.pone.0038982>
- Schalkwyk, G. van, **Botha, H.**, & Seedat, S. (2012). Comparison of 2 Dementia Screeners, the Test Your Memory Test and the Mini-Mental State Examination, in a Primary Care Setting. *Journal of Geriatric Psychiatry and Neurology*, 25(2), 85–88. <https://doi.org/10.1177/0891988712447895>
- Botha, H.**, & Carr, J. (2012). Attention and visual dysfunction in Parkinson's disease. *Parkinsonism & Related Disorders*, 18(6), 742–747. <https://doi.org/10.1016/j.parkreldis.2012.03.004>
- Botha, H.**, Whitwell, J. L., Madhavan, A., Senjem, M. L., Lowe, V., & Josephs, K. A. (2014). The pimple sign of progressive supranuclear palsy syndrome. *Parkinsonism & Related Disorders*, 20(2), 180–185. <https://doi.org/10.1016/j.parkreldis.2013.10.023>
- Zalewski, N., **Botha, H.**, Whitwell, J. L., Lowe, V., Dickson, D. W., & Josephs, K. A. (2014). FDG-PET in pathologically confirmed spontaneous 4R-tauopathy variants. *Journal of Neurology*, 261(4), 710–716. <https://doi.org/10.1007/s00415-014-7256-4>
- Botha, H.**, Duffy, J. R., Strand, E. A., Machulda, M. M., Whitwell, J. L., & Josephs, K. A. (2014). Nonverbal oral apraxia in primary progressive aphasia and apraxia of speech. *Neurology*, 82(19), 1729–1735. <https://doi.org/10.1212/WNL.0000000000000412>
- Martinez-Thompson, J. M., **Botha, H.**, & Katz, B. S. (2014). Clinical Reasoning: A woman with subacute progressive confusion and gait instability. *Neurology*, 83(5), e62–e67. <https://doi.org/10.1212/WNL.0000000000000648>
- Botha, H.**, Moore, S. A., & Rabinstein, A. A. (2014). Teaching NeuroImages: Massive cerebral edema after CT myelography: An optical illusion. *Neurology*, 83(18), e170–e170. <https://doi.org/10.1212/WNL.0000000000000946>
- Botha, H.**, Duffy, J. R., Whitwell, J. L., Strand, E. A., Machulda, M. M., Schwarz, C. G., Reid, R. I., Spychalla, A. J., Senjem, M. L., Jones, D. T., Lowe, V., Jack, C. R., & Josephs, K. A. (2015). Classification and clinicoradiologic features of primary progressive aphasia (PPA) and apraxia of speech. *Cortex*, 69, 220–236. <https://doi.org/10.1016/j.cortex.2015.05.013>
- Botha, H.**, Boeve, B. F., Jones, L. K., Parisi, J. E., & Klaas, J. P. (2016). A Young Man With Progressive Language Difficulty and Early-Onset Dementia. *JAMA Neurology*, 73(5), 595–599. <https://doi.org/10.1001/jamaneuro.1.2016.0246>
- Yost, M. D., Chou, C. Z., **Botha, H.**, Block, M. S., & Liewluck, T. (2017). Facial diplegia after pembrolizumab treatment. *Muscle & Nerve*, 56(3), E20–E21. <https://doi.org/10.1002/mus.25663>
- Cohen, A., Kenney-Jung, D., **Botha, H.**, & Tillema, J.-M. (2017). NeuroDebian Virtual Machine Deployment Facilitates Trainee-Driven Bedside Neuroimaging Research. *Journal of Child Neurology*, 32(1), 29–34. <https://doi.org/10.1177/0883073816668113>

- Botha, H.**, Finch, N. A., Gavrilova, R. H., Machulda, M. M., Fields, J. A., Lowe, V. J., Petersen, R. C., Jack, C. R., Dheel, C. M., Gearhart, D. J., Knopman, D. S., Rademakers, R., & Boeve, B. F. (2017). Novel GRN mutation presenting as an aphasic dementia and evolving into corticobasal syndrome. *Neurology Genetics*, 3(6), e201. <https://doi.org/10.1212/NXG.0000000000000201>
- Jones, D. T., Graff-Radford, J., Lowe, V. J., Wiste, H. J., Gunter, J. L., Senjem, M. L., **Botha, H.**, Kantarci, K., Boeve, B. F., Knopman, D. S., Petersen, R. C., & Jack, C. R. (2017). Tau, amyloid, and cascading network failure across the Alzheimer's disease spectrum. *Cortex*, 97, 143–159. <https://doi.org/10.1016/j.cortex.2017.09.018>
- Josephs, K. A., Martin, P. R., **Botha, H.**, Schwarz, C. G., Duffy, J. R., Clark, H. M., Machulda, M. M., Graff-Radford, J., Weigand, S. D., Senjem, M. L., Utianski, R. L., Drubach, D. A., Boeve, B. F., Jones, D. T., Knopman, D. S., Petersen, R. C., Jack, C. R., Lowe, V. J., & Whitwell, J. L. (2018). [18F]AV-1451 tau-PET and primary progressive aphasia. *Annals of Neurology*, 83(3), 599–611. <https://doi.org/10.1002/ana.25183>
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- Botha, H.**, Utianski, R. L., Whitwell, J. L., Duffy, J. R., Clark, H. M., Strand, E. A., Machulda, M. M., Tosakulwong, N., Knopman, D. S., Petersen, R. C., Jack, C. R., Josephs, K. A., & Jones, D. T. (2018). Disrupted functional connectivity in primary progressive apraxia of speech. *NeuroImage: Clinical*, 18, 617–629. <https://doi.org/10.1016/j.nicl.2018.02.036>
- Townley, R. A., **Botha, H.**, Graff-Radford, J., Boeve, B. F., Petersen, R. C., Senjem, M. L., Knopman, D. S., Lowe, V., Jack, C. R., & Jones, D. T. (2018). 18F-FDG PET-CT pattern in idiopathic normal pressure hydrocephalus. *NeuroImage: Clinical*, 18, 897–902. <https://doi.org/10.1016/j.nicl.2018.02.031>
- Botha, H.**, Mantyh, W. G., Graff-Radford, J., Machulda, M. M., Przybelski, S. A., Wiste, H. J., Senjem, M. L., Parisi, J. E., Petersen, R. C., Murray, M. E., Boeve, B. F., Lowe, V. J., Knopman, D. S., Jack, C. R., & Jones, D. T. (2018). Tau-negative amnesic dementia masquerading as Alzheimer disease dementia. *Neurology*, 90(11), e940–e946. <https://doi.org/10.1212/WNL.0000000000005124>
- Tetzloff, K. A., Duffy, J. R., Strand, E. A., Machulda, M. M., Boland, S. M., Utianski, R. L., **Botha, H.**, Senjem, M. L., Schwarz, C. G., Josephs, K. A., & Whitwell, J. L. (2018). Clinical and imaging progression over 10 years in a patient with primary progressive apraxia of speech and autopsy-confirmed corticobasal degeneration. *Neurocase*, 24(2), 111–120. <https://doi.org/10.1080/13554794.2018.1477963>
- Botha, H.**, Mantyh, W. G., Murray, M. E., Knopman, D. S., Przybelski, S. A., Wiste, H. J., Graff-Radford, J., Josephs, K. A., Schwarz, C. G., Kremers, W. K., Boeve, B. F., Petersen, R. C., Machulda, M. M., Parisi, J. E., Dickson, D. W., Lowe, V., Jack, C. R., & Jones, D. T. (2018). FDG-PET in tau-negative amnesic dementia resembles that of autopsy-proven hippocampal sclerosis. *Brain*, 141(4), 1201–1217. <https://doi.org/10.1093/brain/awy049>
- Botha, H.**, Duffy, J. R., Whitwell, J. L., Strand, E. A., Machulda, M. M., Spychalla, A. J., Tosakulwong, N., Senjem, M. L., Knopman, D. S., Petersen, R. C., Jack, C. R., Lowe, V. J., & Josephs, K. A. (2018). Non-right handed primary progressive apraxia of speech. *Journal of the Neurological Sciences*, 390, 246–254. <https://doi.org/10.1016/j.jns.2018.05.007>
- Utianski, R. L., Duffy, J. R., Clark, H. M., Strand, E. A., **Botha, H.**, Schwarz, C. G., Machulda, M. M., Senjem, M. L., Spychalla, A. J., Jack, C. R., Petersen, R. C., Lowe, V. J., Whitwell, J. L., & Josephs, K. A. (2018). Prosodic and phonetic subtypes of primary progressive apraxia of speech. *Brain and Language*, 184, 54–65. <https://doi.org/10.1016/j.bandl.2018.06.004>
- Jones, D. T., Townley, R. A., Graff-Radford, J., **Botha, H.**, Knopman, D. S., Petersen, R. C., Jack, C. R., Lowe, V. J., & Boeve, B. F. (2018). Amyloid- and tau-PET imaging in a familial prion kindred. *Neurology Genetics*, 4(6), e290. <https://doi.org/10.1212/NXG.0000000000000290>
- Utianski, R. L., **Botha, H.**, Duffy, J. R., Clark, H. M., Martin, P. R., Butts, A. M., Machulda, M. M., Whitwell, J. L., & Josephs, K. A. (2018). Rapid rate on quasi-speech tasks in the semantic variant of primary progressive aphasia: A non-motor phenomenon? *The Journal of the Acoustical Society of America*, 144(6), 3364–3370. <https://doi.org/10.1121/1.5082210>
- Ali, F., **Botha, H.**, Whitwell, J. L., & Josephs, K. A. (2019). Utility of the Movement Disorders Society Criteria for Progressive Supranuclear Palsy in Clinical Practice. *Movement Disorders Clinical Practice*, 6(6), 436–439. <https://doi.org/10.1002/mdc3.12807>
- Ali, F., Martin, P. R., **Botha, H.**, Ahlskog, J. E., Bower, J. H., Masumoto, J. Y., Maraganore, D., Hassan, A., Eggers, S., Boeve, B. F., Knopman, D. S., Drubach, D., Petersen, R. C., Dunkley, E. D., Gerpen, J. van, Uitti, R., Whitwell, J. L., Dickson, D. W., & Josephs, K. A. (2019). Sensitivity and Specificity of Diagnostic Criteria for Progressive Supranuclear Palsy. *Movement Disorders*, 34(8), 1144–1153. <https://doi.org/10.1002/mds.27619>
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- Whitwell, J. L., Tosakulwong, N., Schwarz, C. G., **Botha, H.**, Senjem, M. L., Spychalla, A. J., Ahlskog, J. E., Knopman, D. S., Petersen, R. C., Jack, C. R., Lowe, V. J., & Josephs, K. A. (2019). MRI Outperforms [18F]AV-1451 PET as a Longitudinal Biomarker in Progressive Supranuclear Palsy. *Movement Disorders*, 34(1), 105–113. <https://doi.org/10.1002/mds.27546>
- Graff-Radford, J., **Botha, H.**, Rabinstein, A. A., Gunter, J. L., Przybelski, S. A., Lesnick, T., Huston, J., Flemming, K. D., Preboske, G. M., Senjem, M. L., Brown, R. D., Mielke, M. M., Roberts, R. O., Lowe, V. J., Knopman, D. S., Petersen, R. C., Kremers, W., Vemuri, P., Jack, C. R., & Kantarci, K. (2019). Cerebral microbleeds: Prevalence and relationship to amyloid burden. *Neurology*, 92(3), e253–e262. <https://doi.org/10.1212/WNL.0000000000006780>
- Botha, H.**, & Josephs, K. A. (2019). Primary Progressive Aphasias and Apraxia of Speech: *CONTINUUM: Lifelong Learning in Neurology*, 25(1), 101–127. <https://doi.org/10.1212/CON.0000000000000699>

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