FIRAT KARA, PhD

Assistant Professor of Radiology | Mayo Clinic, Rochester, MN

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linkedin.com/in/firat-kara-945669b | Citizenship: Dutch | Work authorization: EU/EFTA (Swiss employment eligible) | DOB: 05 July 1977 | Languages: English (fluent), Dutch (B1), Turkish (native) | https://www.mayo.edu/research/faculty/kara-firat-ph-d/bio-20485620

RESEARCH FOCUS

Firat Kara, PhD investigates neuroimaging in aging, dementia, and women's brain health, employing advanced multimodal methods including MRI, magnetic resonance spectroscopy (MRS), diffusion MRI (DTI/NODDI), resting-state fMRI, ultra-high-field MRI, and PET, to characterize neurochemical, microstructural, and inflammatory changes underlying neurodegenerative and neuroinflammatory disease. His research centers on sex differences in the Alzheimer's disease continuum, the impact of surgical menopause and menopausal hormone therapies on disease trajectories, and women's brain health across perimenopause to postmenopause.

ACADEMIC APPOINTMENT

Assistant Professor of Radiology — Mayo Clinic College of Medicine and Science Jan 2022 – Present
Department of Radiology, Rochester, MN, USA

PROFESSIONAL POSITIONS

Research Scientist — Mayo Clinic, Rochester, MN Oct 2025 – Present
Division of Neuroradiology, Department of Radiology

Research Associate — Mayo Clinic, Rochester, MN Sep 2019 – Sep 2025
Division of Neuroradiology, Department of Radiology

Postdoctoral Researcher — University of Antwerp, Belgium Jan 2014 – Jun 2018
Bio-Imaging Lab; FWO postdoctoral fellowship

Researcher — University of Antwerp, Belgium Nov 2012 – Dec 2013

Doctoral Candidate / Graduate Research Assistant — Leiden University, Netherlands Sep 2008 – Oct 2012

EDUCATION

Certificate in Clinical and Translational Science —
Mayo Clinic Center for Clinical and Translational Science, Rochester, MN June 2022
Biostatistics, epidemiology, regulatory affairs, research ethics, team science

PhD, Biophysical Chemistry — Leiden University, Leiden, The Netherlands Sep 2008 – Dec 2013
Thesis: Monitoring Alzheimer's disease in transgenic mice with ultra-high-field MRI

MSc, Biotechnology — Middle East Technical University, Ankara, Turkey Sep 2001 – Dec 2004

BSc, Biological Sciences — Middle East Technical University, Ankara, Turkey Sep 1996 – Aug 2001

HONORS AND AWARDS

- FWO Postdoctoral Fellowship — Research Foundation Flanders, Belgium (Oct 2014 – Sep 2017). Title: "Image-guided decoding of mechanisms involved in healthy, accelerated, and pathological aging"
- Mayo Clinic Radiology Travel Grant — ISMRM 2025 (May 2025)
- CTSI/CMRR Imaging Conference Travel Award — University of Minnesota (Nov 2019)
- Sokrates/Erasmus Scholarship — European Mobility Program, Leiden (Aug 2007 – Jul 2008)

RESEARCH GRANTS AWARDED (COMPLETED)

Principal Investigator — Alzheimer Research Foundation (SAO-FRA; P#14027) Jan 2015 – Dec 2016
Characterization of early functional network alterations in olfactory system and its association with default mode network in the course of Alzheimer's disease

Principal Investigator — University Research Fund (BOF; KLPROJ_32807) Apr 2016 – Mar 2017

Neuro-image guided investigation of the critical role of aromatase inhibitors on brain function

TECHNICAL AND ANALYTICAL SKILLS

- Neuroimaging: structural MRI; diffusion MRI (DTI, NODDI); PET SUVR; proton MRS metabolite quantification (LCModel, FitMAN); resting-state fMRI; ultra-high-field MRI (7T, 17.6T)
- Statistical computing and reproducible research: R (tidyverse, lme4, lavaan, pROC, ggplot2; Quarto/R Markdown)
- Statistical methods: linear regression; linear mixed-effects models; logistic regression; PCA; mediation analysis; ROC/AUC; ComBat harmonization; ANOVA; t-tests; Spearman/Pearson correlations; permutation testing; Table 1 / descriptive statistics
- Scientific communication: peer-reviewed manuscripts, grant applications, abstracts, conference presentations, figure design

PROFESSIONAL MEMBERSHIPS

- International Society for Magnetic Resonance in Medicine (ISMRM) — Member, 2009–Present
- International Society to Advance Alzheimer Research and Treatment (ISTAART) — Member, 2019–Present
- The Menopause Society (formerly NAMS) — Member, 2019–Present
- Mayo Clinic Women's Health Research Center — Member, 2019–Present
- Mayo Research Fellows Association — Member, 2019–Present

JOURNAL RESPONSIBILITIES

Ad hoc peer reviewer (2015–present): Alzheimer's & Dementia; eLife; Menopause; Maturitas; NeuroImage; Magnetic Resonance in Medicine; Scientific Reports; PLOS ONE; Brain Research; Frontiers in Aging Neuroscience; Neurobiology of Aging; Laboratory Animals

TEACHING

Integrated Research Practices — Lab Assistant / Course Developer, Univ. of Antwerp Aug–Dec 2017
System Neuroscience — Guest Lecturer, Dept. of Biomedical Sciences, Univ. of Antwerp Jan–Jun 2014
Laboratory Work Spectroscopy (LB1531) — Lecturer, Institute of Chemistry, Leiden Univ. 2009–2011
Introductory Biochemistry — Guest Lecturer, Leiden University Oct–Dec 2008
Physiology — Guest Lecturer, Dept. of Biological Sciences, METU, Ankara 2007

MENTORSHIP

Jasmien Orije (MSc Student) — Supervisor; outcome: MSc thesis Jun 2012 – Jun 2013
Zahra Sarwari (MSc Student) — Supervisor; outcome: MSc thesis Jun 2016 – Jun 2017
Voncken Rick (MSc Student) — Supervisor; outcome: MSc thesis Jun 2017 – Jun 2018

INVITED TALKS AND VISITING PROFESSORSHIPS

- Invited talk — Paul Flechsig Institute for Brain Research, Leipzig, Germany (2016)
- Invited talk — National Magnetic Resonance Research Center (UMRAM), Ankara, Turkey (2016)

BIBLIOGRAPHY

Peer-Reviewed Articles (29 total: 10 first-author, 19 co-authored)

1. Jakubowska-Dogru E, Gumusbas U, Kara F. Individual variation in the spatial reference and working memory assessed under allothetic and idiothetic orientation cues in rat. Acta Neurobiol Exp (Wars). 2003;63(1):17-23. PMID: 12784928
2. Haud N, Kara F, Diekmann S, et al. rnaset2 mutant zebrafish model familial cystic leukoencephalopathy and reveal a role for RNase T2 in degrading ribosomal RNA. Proc Natl Acad Sci USA. 2011;108(3):1099-103. PMID: 21199949. DOI: 10.1073/pnas.1009811107

3. Kara F, Dongen ES, Schliebs R, Buchem MA, Groot HJ, Alia A. Monitoring blood flow alterations in the Tg2576 mouse model of Alzheimer's disease by in vivo MR angiography at 17.6 T. Neuroimage. 2012;60(2):958-66. PMID: 22227054. DOI: 10.1016/j.neuroimage.2011.12.055
4. Kara F, Chen F, Ronen I, de Groot HJ, Matysik J, Alia A. In vivo measurement of transverse relaxation time in the mouse brain at 17.6 T. Magn Reson Med. 2013;70(4):985-93. PMID: 23161407. DOI: 10.1002/mrm.24533
5. Kara F, Hofling C, Rossner S, Schliebs R, Van der Linden A, Groot HJ, Alia A. In Vivo Longitudinal Monitoring of Changes in the Corpus Callosum Integrity During Disease Progression in a Mouse Model of Alzheimer's Disease. Curr Alzheimer Res. 2015;12(10):941-50. PMID: 26502821. DOI: 10.2174/1567205012666151027123728
6. Praet J, Orije J, Kara F, et al. Cuprizone-induced demyelination and demyelination-associated inflammation result in different proton magnetic resonance metabolite spectra. NMR Biomed. 2015;28(4):505-13. PMID: 25802215. DOI: 10.1002/nbm.3277
7. Orije J, Kara F, Guglielmetti C, et al. Longitudinal monitoring of metabolic alterations in cuprizone mouse model of multiple sclerosis using 1H-magnetic resonance spectroscopy. Neuroimage. 2015;114:128-35. PMID: 25871629. DOI: 10.1016/j.neuroimage.2015.04.012
8. Shah D, Blockx I, Keliris GA, Kara F, et al. Cholinergic and serotonergic modulations differentially affect large-scale functional networks in the mouse brain. Brain Struct Funct. 2016;221(6):3067-79. PMID: 26195064. DOI: 10.1007/s00429-015-1087-7
9. Guglielmetti C, Le Blon D, Santermans E, ..., Kara F, et al. Interleukin-13 immune gene therapy prevents CNS inflammation and demyelination via alternative activation of microglia and macrophages. Glia. 2016;64(12):2181-2200. PMID: 27685637. DOI: 10.1002/glia.23053
10. Mannheim JG, Kara F, Doorduin J, et al. Standardization of Small Animal Imaging — Current Status and Future Prospects. Mol Imaging Biol. 2018;20(5):716-731. PMID: 28971332. DOI: 10.1007/s11307-017-1126-2
11. Servaes S, Kara F, Glorie D, et al. In Vivo Preclinical Molecular Imaging of Repeated Exposure to an NMDA Antagonist and a Glutaminase Inhibitor as Potential Glutamatergic Modulators. J Pharmacol Exp Ther. 2019;368(3):382-390. PMID: 30552293. DOI: 10.1124/jpet.118.252635
12. Lanz B, Abaei A, ..., Kara F, Kantarci K, et al. Magnetic resonance spectroscopy in the rodent brain: Experts' consensus recommendations. NMR Biomed. 2021;34(5):e4325. PMID: 33565219. DOI: 10.1002/nbm.4325
13. Kara F, Belloy ME, Voncken R, et al. Long-term ovarian hormone deprivation alters functional connectivity, brain neurochemical profile and white matter integrity in the Tg2576 amyloid mouse model of Alzheimer's disease. Neurobiol Aging. 2021; 102:139-150. PMID: 33765427. DOI: 10.1016/j.neurobiolaging.2021.02.011
14. Kara F, Joers JM, Deelchand DK, et al. 1H MR spectroscopy biomarkers of neuronal and synaptic function are associated with tau deposition in cognitively unimpaired older adults. Neurobiol Aging. 2022; 112:16-26. PMID: 35038671. DOI: 10.1016/j.neurobiolaging.2021.12.010
15. Deelchand DK, Henry PG, Joers JM, ..., Kara F, et al. Plug-and-play advanced magnetic resonance spectroscopy. Magn Reson Med. 2022;87(6):2613-2620. PMID: 35092085. DOI: 10.1002/mrm.29164
16. Kara F, Lohse CM, Castillo AM, et al. Association of raloxifene and tamoxifen therapy with cognitive performance, odds of mild cognitive impairment, and brain MRI markers of neurodegeneration. Cancer Med. 2023;12(3):2805-2817. PMID: 36040183. DOI: 10.1002/cam4.5175
17. Beyer J, Couch R, Ruddy KJ, ..., Kantarci K, Kara F. Longitudinal cognitive function and brain metabolites in women receiving chemotherapy for stage 1 to 3 breast cancer: Observational study. Medicine (Baltimore). 2023;102(42):e35524. PMID: 37861526. DOI: 10.1097/MD.0000000000035524
18. Kantarci K, Tosakulwong N, Lesnick TG, Kara F, et al. Cardiometabolic outcomes in Kronos Early Estrogen Prevention Study continuation: 14-year follow-up. Menopause. 2024;31(1):10-17. PMID: 37989141. DOI: 10.1097/GME.0000000000002278
19. Warner NS, Hanson AC, Schulte PJ, Kara F, et al. Prescription Opioids and Brain Structure in Community-Dwelling Older Adults. Mayo Clin Proc. 2024;99(5):716-726. PMID: 38702125. DOI: 10.1016/j.mayocp.2024.01.018
20. Mielke MM, Frank RD, ..., Kara F, et al. Premenopausal bilateral oophorectomy and brain white matter integrity in later-life. Alzheimers Dement. 2024;20(7):5054-5061. PMID: 38899634. DOI: 10.1002/alz.13852
21. Kara F, Kantarci K. Understanding Proton MRS Neurochemical Changes Using Alzheimer's Disease Biofluid, PET, Postmortem Pathology Biomarkers, and APOE Genotype. Int J Mol Sci. 2024;25(18):10064. PMID: 39337551. DOI: 10.3390/ijms251810064
22. Gleason CE, Dowling NM, Kara F, et al. Long-term cognitive effects of menopausal hormone therapy: Findings from the KEEPS Continuation Study. PLoS Med. 2024;21(11):e1004435. PMID: 39570992. DOI: 10.1371/journal.pmed.1004435
23. Kantarci K, Kapoor E, ..., Kara F, et al. Premenopausal bilateral oophorectomy and Alzheimer's disease imaging biomarkers later in life. Alzheimers Dement. 2024. Epub Dec 23. PMID: 39711285. DOI: 10.1002/alz.14469
24. Kara F, Tosakulwong N, Lesnick TG, et al. Associations of blood pressure with white matter hyperintensities later in life; influence of short-term menopausal hormone therapy. Menopause. 2025;32(1):12-22. PMID: 39729067. DOI: 10.1097/GME.0000000000002481
25. Faubion LL, Mak E, Kara F, et al. Long-term effects of 4 years of menopausal hormone therapy on white matter integrity. Menopause. 2025;32(9):818-828. PMID: 40694740. DOI: 10.1097/GME.0000000000002562
26. Kara F, Neyal N, Kamykowski MG, et al. Decoding Thalamic Glial Interplay in Multiple Sclerosis Through Proton MRS and PET. Int J Mol Sci. 2025;26(17):8656. PMID: 40943577. DOI: 10.3390/ijms26178656

27. Kara F, Joers JM, Przybelski SA, et al. 1H-MR spectroscopy biomarkers are associated with plasma-derived biomarkers of amyloid-beta and tau in the early phase of AD continuum. Neurobiol Aging. 2026; 158:18-27. PMID: 41242191. DOI: 10.1016/j.neurobiolaging.2025.11.003
28. James TT, Dowling NM, ..., Kara F, et al. Association between central adiposity and cognitive domain function in recently postmenopausal women (KEEPS-Cog). Menopause. 2026;33(2):151-160. PMID: 41186575. DOI: 10.1097/GME.0000000000002666
29. Kantarci K, Kara F, Tosakulwong N, et al. Long-term amyloid PET and MRI outcomes in a menopausal hormone therapy trial. Alzheimers Dement. 2026;22(2):e71067. PMID: 41618732. DOI: 10.1002/alz.71067

Non-Peer-Reviewed Articles

1. Kara F, Braakman N, van Buchem MA, de Groot HJM, Alia A. Prospects of Magnetic Resonance Spectroscopy in Mouse Models of Alzheimer's Disease. Current Medical Imaging. 2011; 7:80-87.

Book Chapters

1. Kara F, Kantarci K. Application of Proton MRS in the Alzheimer's Disease Continuum: Recent Advances and Future Directions. In: Broderick PA, editor. Biomedical Imaging in Neurodegeneration. 2025. pp. 227-252.
2. Hamaide J, Van Ruijssevelt L, Kara F, De Groof G, Van der Linden A. Imaging in Neurology Research II: Exploring Plasticity and Cognitive Networks by In Vivo MRI. In: Kiessling F, Pichler B, Hauff P, editors. Small Animal Imaging. Springer, Cham; 2017.

Thesis

1. Kara F. Monitoring Alzheimer's disease in transgenic mice with ultra-high-field magnetic resonance imaging. PhD thesis, Leiden University. 2013.

Conference Abstracts (32 total)

1. Braakman N, Kara F, van Buchem MA, Schliebs R, de Groot HJM, Alia A. In Vivo Localized Two-Dimensional MR Spectroscopy to Compare the Neurochemical Profile in Wild-Type and Transgenic Mouse Model of Alzheimer's Disease. ISMRM Annual Meeting. 2009.
2. Kara F, Ravensbergen J, Braakman N, et al. MRI Assessment of Blood Flow Artifacts in a Transgenic Mouse Model of Alzheimer's Disease. ISMRM Annual Meeting. 2009.
3. Van Duijn S, Kara F, Braakman N, et al. 2D L-COSY MR Spectroscopy Detects Very Early Changes in the Brain of Alzheimer Mouse. ISMRM Annual Meeting. 2010.
4. Kara F, Braakman N, van Buchem MA, de Groot HJM, Schliebs R, Alia A. In vivo longitudinal monitoring of blood flow alterations in TG2576 mouse model of Alzheimer's disease. ISMRM Annual Meeting. 2010.
5. Kara F, Alia A. Magnetic resonance angiography of the mouse cerebrovascular system at 17.6 T. ISMRM Annual Meeting. 2010.
6. Kara F, Mobius K, van Buchem MA, De Groot H, Reinhard S, Alia A. Changes in glucose level with age and its correlation with severity of plaque deposition in a transgenic model of Alzheimer's disease. ISMRM Annual Meeting. 2011.
7. Kara F, Chen F, Matysik J, Alia A. In vivo measurement of T2 relaxation times in mouse brain at 17.6 Tesla. ISMRM Annual Meeting. 2011.
8. Alia A, Noémie H, Kara F, Hurlstone A. Ultra High Field MR Microimaging in Zebrafish Model of Cystic Leukoencephalopathy. ISMRM Annual Meeting. 2011.
9. Kara F, van Dongen ES, Schliebs R, van Buchem MA, de Groot HJM, Alia A. Probing Age-Dependent Cerebrovascular Alterations in the Tg2576 Mouse Model of Alzheimer's Disease by MR Angiography at 17.6 T. ISMRM Annual Meeting. 2012.
10. Alia A, Kara F. Regional Glutamate Alterations in 11-Month-Old Tg2576 Mouse Model of Alzheimer's Disease Detected by In Vivo 1H MRS at 9.4 T. ISMRM Annual Meeting. 2012.
11. Alia A, Kara F, Braakman N, van Buchem MA, Schliebs R. 2D L-COSY MR Spectroscopy Detects Changes in Brain Glucose Level in a Mouse Model of Alzheimer's Disease. ISMRM Annual Meeting. 2013.
12. Kara F, Chen F, Ronen I, de Groot HJM, Matysik J. Age-Related Changes in Regional Brain T1 and T2 Relaxation Times in the Healthy Mouse at 17.6 T. ISMRM Annual Meeting. 2013.
13. Orije J#, Kara F#, Guglielmetti C, et al. Longitudinal monitoring of metabolic alterations in cuprizone mouse model of Multiple Sclerosis using 1H-MRS. ISMRM Annual Meeting. 2014. Abstract no. 0692. [# equal contribution]
14. Kara F, Hofling C, Rossner S, et al. Longitudinal monitoring of transverse relaxation time changes in the corpus callosum of a mouse model of Alzheimer's disease. ISMRM Annual Meeting. 2014.
15. Hamaide J, De Groof G, Van Audekerke J, ..., Kara F, et al. In vivo detection of sexual dimorphisms in the brain of a Passerine songbird. European Society for Molecular Imaging Meeting. 2014.
16. Kara F, Hofling C, Rossner S, et al. In vivo MRI evidence of white matter damage in a mouse model of Alzheimer's disease. European Society for Molecular Imaging Meeting. 2014.
17. Alia A, van Duijn S, Kara F, van Buchem MA. Direct in vivo assessment of sex-related metabolic differences in a mouse model of Alzheimer's disease by MRI. Alzheimer's & Dementia. 2014;(4S, part 22):826.
18. Kara F, Rossner S, Van der Linden A, de Groot HJM, Alia A. Probing In Vivo T2 Relaxation Time Alterations in the Corpus Callosum of a Mouse Model of Alzheimer's Disease. ISMRM Annual Meeting. 2015. Abstract no. 0395.
19. Van der Jeugd A, Bloemen I, Kara F, et al. The olfactory system and its relevance for behavioral screening and diagnostic imaging in neurological disorders. Society for Neuroscience Annual Meeting. 2016.

20. Belloy M, Kara F, Langbeen A, et al. The effect of sex hormones and AD on hypothalamic inflammation: In vivo MRS in ovariectomized old mice. Alzheimer's & Parkinson's Diseases Congress. 2017.
21. Kara F, Belloy M, Yadav G, et al. Hypothalamic-Pituitary-Gonadal Axis Dysregulation Alters Resting State fMRI in a Mouse Model of Alzheimer's Disease. ISMRM Annual Meeting. 2017. Abstract no. 4130.
22. Kara F, Chen Q, Reid RI, et al. Preservation of white matter integrity on DTI 3 years after early menopausal hormone therapies. Alzheimer's Association International Conference (Virtual). 2020.
23. Kara F, Belloy ME, Voncken R, et al. Prolonged loss of ovarian hormones alters functional connectivity, brain neurochemistry and white matter integrity but does not affect amyloid and activated glial cell levels in a mouse model of Alzheimer's disease. AAIC. 2020.
24. Kara F, Lowe VJ, Reid RI, et al. Higher blood pressure is associated with loss of white matter integrity and higher Alzheimer's tau biomarkers in postmenopausal women of the KEEPS continuation study. Menopause. 2020;27(12):1457-8.
25. Kara F, Reid RI, Schwarz CG, et al. Higher systolic and diastolic blood pressures are associated with loss of white matter integrity in postmenopausal women of the KEEPS Continuation Study. AAIC. 2021.
26. Kara F, Joers JM, Deelchand DK, et al. Neurochemical levels measured by 1H MRS are associated with amyloid-beta and tau deposition in cognitively unimpaired older adults. AAIC. 2021.
27. Gleason CE#, Dowling NM#, James T, Kara F#, et al. Long-term cognitive effects of menopausal hormone therapy: preliminary data from the KEEPS continuation study. Menopause. 2023;30(12):1258. [# equal contribution]
28. Faubion L, Mak FK, Tosakulwong N, ..., Kara F, et al. Long-term effects of short-term menopausal hormone therapy on white matter integrity. Menopause. 2023;30(12):1276.
29. Kling JM, Tosakulwong N, Fought A, Kara F, et al. White matter hyperintensities and pituitary-ovarian hormones in postmenopausal women in the KEEPS continuation study. Menopause. 2025;32(12):1189-90.
30. Buyukturkoglu K, Kara F, Davis L, et al. Radiomics Detects 1H-MRS-Linked Metabolic Signatures in the Thalamus. ECTRIMS 2025, Barcelona, Spain. Sep 2025.
31. Kara F, Neyal N, Kamykowski MG, et al. The association between the 1H-MRS biomarker of astrogliosis and the PET biomarker of microglia in the thalamus in multiple sclerosis. ISMRM 2025, Honolulu, HI. May 2025.
32. Kara F, Kondrakunta S, Neyal N, et al. Thalamic Myo-Inositol Tracks Diffuse Microstructural Injury, Atrophy and Lesion Burden in MS. ACTRIMS Forum, San Diego, CA. Feb 2026.