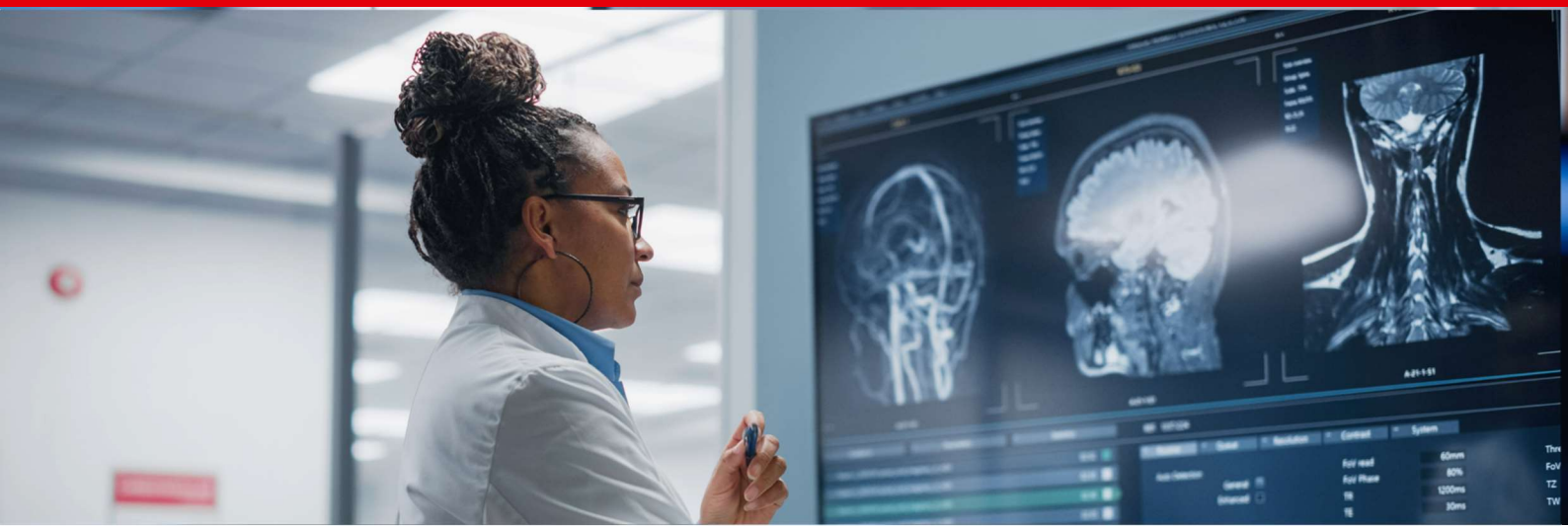
Specialisation – Master's in Biomedical Sciences

Medical Neuroscience



Bridge the gap between fundamental neurobiology and clinical neurosciences

The Medical Neuroscience Specialization within the BMS master's programme at the Donders Center for Medical Neuroscience (DCMN) offers a comprehensive range of courses spanning various aspects of neuroscientific research, from genetics and molecular biology to behavioral and clinical neuroscience. Positioned between the more fundamental Neurobiology specialization and the cognition-focused Cognitive Neuroscience research master at Radboud University, this program emphasizes interdisciplinary translational approaches to healthcare innovations. It equips students to make a significant impact on healthcare by bridging the gap between fundamental neurobiology and clinical neurosciences.

Specialisation Coordinator

Dr. Nils Kohn

Dept. of Clinical Neuroscience (DCMN)

Nils.kohn@donders.ru.nl

Deputy Specialisation Coordinator

Dr. Joanes Grandjean

Dept. of Cognitive Neuroscience (DCMN)

Joanes.grandjean@radboudumc.nl

Radboud University

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Radboudumc university medical center

Courses within this specialization (1/2)

W36 = September, W40 = October,
A = Monday/Tuesday contact hours, time for self study or exam (final week) on Wednesdays,
B = Thursday/Friday contact hours, time for self study on Wednesdays.

Period	Code	Course
W36-A	MED-BMS24	**Medical Neuroscience: Conceptual basics and anatomy**

This course is the second module which explores neuroimaging, a vital field offering insights into the living human brain's structure and function. It provides students with knowledge of various neuroimaging techniques, brain anatomy, and analytical approaches for structural and functional brain analysis. The first module covers brain anatomy and the fundamentals of magnetic resonance imaging (MRI). The second module expands on MRI basics and delves into MRI data analysis, with a focus on diffusion weighted imaging (DWI). This course equips students to understand and conduct neuroimaging research, bridging theory and practical application.

Period	Code	Course
W36-B	MED-BMS32	**Medical Neuroscience: Molecular and cellular neuroscience**

This course focuses on molecular and cellular processes underlying neural processes in the central nervous system in normal conditions as well as in neural disorders. This module provides comprehensive basic and advanced knowledge of the molecular and cellular biology of neurons and glia, major molecular pathways and mechanisms underlying learning and memory, and the application of state-of-the-art methodologies to identify and manipulate the neural correlates of learning, memory and behavior. The different topics will be discussed in the context of normal functionality and development as well as in pathological aberrations of the nervous system.

Courses within this specialization (2/2)

Note: Unlike the other specializations within the master's programme in Biomedical Sciences, the specialization Medical Neuroscience consists of four core courses instead of six. This offers students within this specialization extra opportunites to follow more advanced within Medical Neuroscience.

Period	Code	Course
W40-A	MED-BMS25	**Medical Neuroscience: Functional imaging**

This course is the second module which explores neuroimaging, offering insights into the living human brain's structure and function through technological advancements. It covers various neuroimaging techniques, brain anatomy, and analytical approaches for structural and functional brain analysis. The second module builds on the foundation laid by the first, focusing on functional imaging. It introduces electrophysiological methods, principles of blood-oxygen-level-dependent (BOLD) MRI, and practical skills for task-related functional MRI studies. The module also covers functional connectivity analyses and exploratory data analysis techniques for neuroimaging data. This course equips students to understand and conduct advanced neuroimaging research.

Period	Code	Course
W44-A	MED-BMS49	**Animal models for psychiatric and neurological disorders**

This course focuses on the importance of animal experimental research in advancing our understanding of brain structure and function. It covers practical aspects of using rodent models, including generating and maintaining transgenic mice and rats. The course also explores behavioral methods for modeling stress-related, neurodevelopmental, and neurological disorders in rodents and their translational relevance. Additionally, it delves into cutting-edge neurotechnologies for linking behavior to brain function and manipulating brain activity, which are primarily applicable in animal models. Finally, it discusses animal sacrifice methods and ex vivo brain function assessment.

Internship testimonial (1)

Examining the Variability of Sensory-Evoked Functional MRI Data in Rat Models

I chose a challenging internship to develop skills and become a competent researcher in neuroscience. I joined the Donders Institute, within the Department of Cognitive Neuroscience. I learned how to code from scratch, and for 9 months I worked on a project entitled: How Variable Are Our Rat Sensory-Evoked Functional MRI Datasets? In collaboration with international laboratories, we gathered more than 20 datasets of rodents' brain images through fMRI. I have analyzed and compared them to point out the heterogeneity within and between datasets, as well as to identify the protocols that would give the best results. I also had the honor to present my work as a poster during a workshop in Italy, awesome experience! I had the opportunity to network with researchers from all over the world. I still aim to the results of my work an official publication!

Dept. of Cognitive Neuroscience
Donders Institute
Nijmegen, the Netherlands

Internship testimonial (2)

Gait analysis of patients with ankle-foot orthoses

I have always been fascinated about how memory works in our brain in fear-related disorders, especially at the molecular level. Thereby, in my first research internship, I worked with dr. Kübra Gülmez Karaca on developing a technique to label remote fear memory. During this internship, I got to learn how to use animal models in neuroscience research as well as experienced molecular wet lab with immunohistochemistry and confocal microscopy. I really enjoyed the internship as it gave me guidance and prepared me for my further career as a future researcher in neuroscience.

Here is a picture of me, my supervisor, and a colleague before our first surgery on a mouse model! It was a really great experience!

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Donders Institute
Nijmegen, the Netherlands