Maastricht University

Maastricht UMC+

MHeNs School for Mental Health & Neuroscience

Annual Report | 2016–2017

Maastricht University | Faculty of Health, Medicine and Life Sciences & Health Institutes:
Maastricht University Medical Centre+ | RIAGG Maastricht | PMS Vijverdal | Mondriaan Zorggroep Heerlen

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Preface

Prof.Dr. David Linden

The biennium 2016/2017 has been another successful period for MHeNs, under the directorship of Professor Harry Steinbusch, Vice Dean Professor Nanne de Vries as interim director, and since 1 September 2017 of myself. It is a pleasure to present this 2-year report, which, as in previous periods, covers a wide range of translational research activities in neuroscience and mental health that were conducted in close partnership with the Academic Hospital Maastricht (aZM) and other clinical, research and industrial partners. The research programmes highlighted in this report link cutting-edge methodology in basic research with healthcare innovation in psychiatry, clinical psychology, neurology and clinical neurophysiology, neurosurgery, anaesthesiology, paediatrics, urology, general surgery, otolaryngology, ophthalmology, internal medicine, general practice and rehabilitation medicine. This spread of translational links reflects the range of clinical disciplines of MHeNs investigators within aZM and in the wider region. One of our major aims is to link seemingly diverse clinical research themes by common conceptual or methodological threads that we can support with our expertise groups. In this spirit we are focusing our methodological expertise and research infrastructure in a number of cross-cutting themes, such as neuroimaging, genetics & genomics, neuromodulation, neuromonitoring and neurorehabilitation and are applying biological paradigms in the areas of neuroimmunology and neuroregeneration across different clinical areas and disease models. This approach, focussing on synergies in thematic areas across different clinical applications, has been successful in that it has allowed MHeNs to attract substantial external funding with an increase of ~ 70% in 2017 versus 2016 and continue expanding its PhD programme. Examples of this synergistic approach include the programme in deep brain stimulation, which includes basic mechanistic research in animal models and clinical programmes in movement disorders, psychiatry and tinnitus, or the work on symptom monitoring, which started with experience sampling in psychiatry but is now being rolled out across a large number of clinical disciplines.

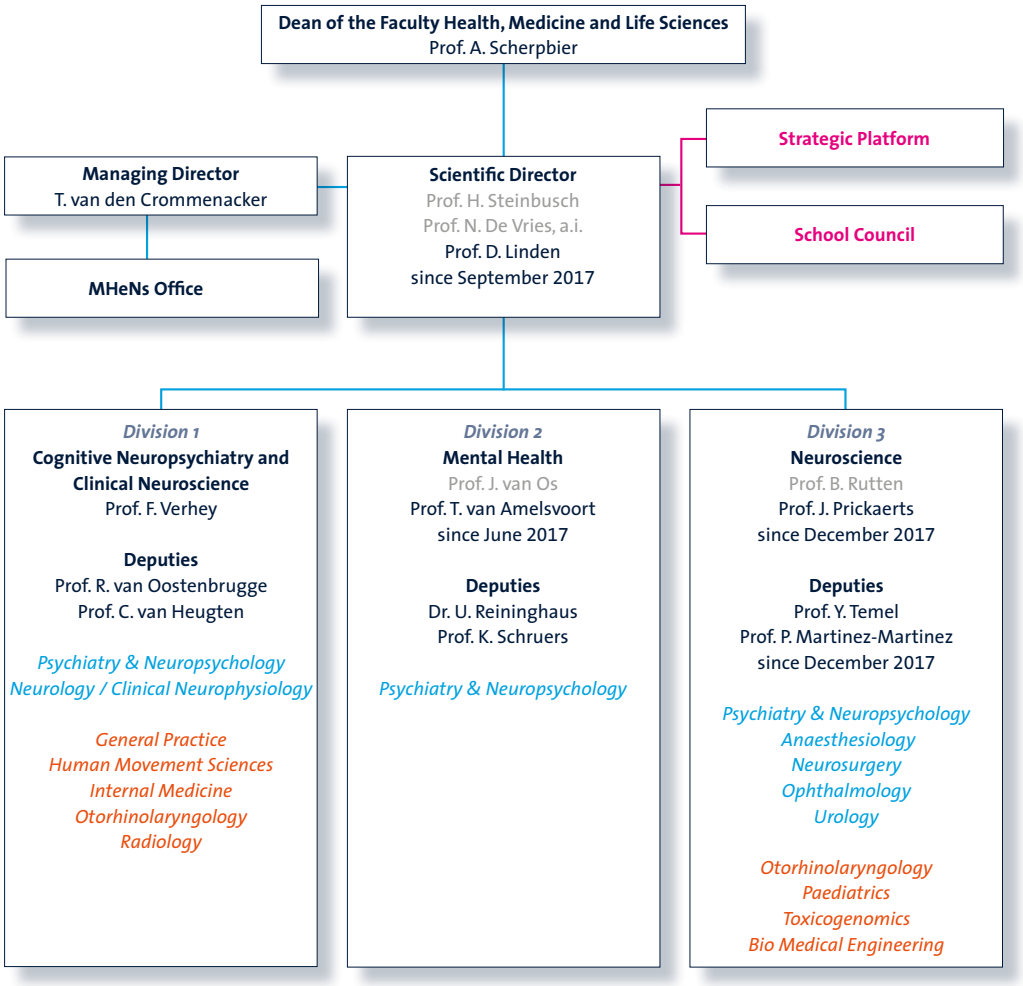
The collaboration with aZM is now firmly embedded in the Brain and Nerve Centre (Hersen en Zenuwcentrum, HzC, formerly NeuroIntervention Centre), led by Professor Robert van Oostenbrugge. The translational research programme of the HzC is already underway with two PhD positions cofunded by MHeNs in the field of neuromodulation. Another recent development in our collaboration with strategic partners was the start of the Centre for Integrative Neuroscience (CIN), which is cofunded by MHeNs and the Faculty of Psychology and Neuroscience (FPN). The first five PhD students have started, and all of them will be working across faculties with joint supervisory teams from FPN and MHeNs. The successful start of CIN attests to the excellent atmosphere of joint and collaborative working on the Randwyck campus. We have also started making links in integrative neuroscience with other parts of the University, bearing in mind that understanding the brain is not only an essential part of the classical health and life sciences but also increasingly relevant to informatics, social sciences, economics and other disciplines.

The groundwork of the last years has allowed us to build up an excellent base in expertise and resources within MHeNs and with our partners, and we will continue to expand on this with our translational research agenda. Joint initiatives like HzC and CIN feature prominently in our strategy and we will continue with our focus on competitive funding acquisition from governmental funding agencies, charities and the European Commission. We will also continue our commitment to internationalisation in research and education, and the renewal of the EURON graduate school with our partners in neighbouring countries is a centrepiece of this strategy. I would like to thank the previous directors and the division leaders and heads of the department for their many positive strategic initiatives and all the staff and students for contributing to the success of MHeNs in 2016/17.

Prof. Dr. David Linden
Scientific Director
School for Mental Health and Neuroscience

1. Organizational structure

MHeNs is managed by the Board of MHeNs. The board is the body where strategies discussed and effectuated. It consists of five members: the scientific director, the managing director and the three division leaders.



Core Departments
- Anaesthesiology - Prof. W. Buhre
- Neurology / Clinical Neurophysiology - Prof. R. Van Oostenbrugge / Prof. W. Mess
- Neurosurgery - Prof. J. Van Overbeeke
- Ophthalmology - Prof. C. Webers
- Psychiatry & Neuropsychology - Prof. J. Van Os, Dr. J. Strik a.i., Prof. B. Rutten since December 2017
- Urology - Prof. G. Van Koeveringe

Non Core Departments
- Bio Medical Engineering - Prof. T. Delhaas
- General Practice - Prof. J. Metsemakers, Prof J. Muris since January 2017
- Internal Medicine - Prof. C. Stehouwer
- Otorhinolaryngology - Prof. B. Kremer
- Paediatrics - Prof. L. Zimmerman
- Radiology - Prof. J. Wildberger
- Toxicogenomics - Prof. J. Kleinjans

2. Divisions

2.1 Division I: Cognitive Neuropsychiatry & Clinical Neuroscience

Division Leader:
Prof. Dr F. Verhey

Deputies:
Prof. Dr. R. van Oostenbrugge
Prof. Dr. C. van Heugten

Staff:
Dr. P. Aalten
Dr. J. Adam
Dr. M. van den Akker
Dr. R. Al Momani, until September 2017
Prof. Dr. B. Aldenkamp
Dr. L. Anteunis, passed away November 16th, 2016
Dr. M. Aries
Prof. Dr. W. Backes
Dr. L. Boots
Dr.G. Bogaarts
Dr. M. van Boxtel
Prof. Dr. J.W. Cohen Tervaert
Dr. J. Damoiseaux
Dr. K. Deckers
Dr. J. Dijkstra
Dr. E. Douven
Dr. A. Duits
Prof. Dr. C. Faber
Dr. E. George
Dr. E. Gommer
Dr. E. Gronenschild
Dr. H. van de Haar
Dr. R. Hamel de Bakker, until February 2016
Dr. R. Handels
Dr. J. Hendriksen
Dr. J. Hoeijmakers
Prof. Dr. P. Hofman
Dr. D. Horstkötter
Prof. Dr. R. Hupperts
Dr. D. In de Braek
Dr. J. Jansen
Dr. W. Jansen
Dr. H. Jacobs
Prof. Dr. H. Kingma
Dr. I. Klinkenberg
Dr. R. van Knippenberg
Dr. S. Köhler
Dr. V. Kranen-Mastenbroek
Prof. Dr. B. Kremer
Prof. Dr. A.A. Kroon
Dr. M. Kuijf
Dr. A. Leentjens
Prof. Dr. P. de Leeuw
Dr. B. Lenaert
Prof. Dr. J. Lodder
Prof. Dr. M. Majoie
Dr. V. Mastenbroek
Dr. I. Merkies, since April 2016 until April 2017
Prof. Dr. W. Mess
Dr. J. Millenaar
Dr. A. Moonen
Prof. Dr.J. Muris
Prof. Dr. R. Ponds
Dr. I Ramakers
Dr. J.P.H. Reulen
Dr. R. Rouhl
Prof. Dr. J. Schols
Prof. Dr. R. Smeets
Dr. P. Spauwen
Dr. A. Stiekema
Prof. Dr. R. Stokroos
Prof. Dr. J. Vermeulen
Dr. P.J. Visser
Prof.Dr. J. Vles
Dr. M. Vlooswijk
Dr. S. Vos
Prof. Dr. M. de Vugt
Prof. Dr. J. Wildberger
Dr. C. Wolfs
Dr. G. Wolters Gregorio


Science Story | Marjolein de Vugt

Trained as a psychologist, Marjolein de Vugt has made her mark both as a clinical researcher and as an innovative clinician. She was appointed as Professor of Psychosocial Innovations in dementia in September 2017. Her line of research pertains to the use of technology and ehealth to improve the quality of life of people with dementia and their care partners. She is the initiator of successful webbased interventions like Partner in Balance, InLife, the Braincoach and DealId. These ehealth products are now being implemented on a national and international scale, which is illustrative for her efforts not only to develop innovations, but also to make them available for many people with dementia. In addition, Marjolein was the principal investigator of the national NEEDYD study into the specific needs of people with early onset dementia. She is recognised as an emerging international leader in the field, and as a board member of INTERDEM, the world's largest network for researchers on psychosocial interventions in dementia, she has strong links with European networks.

The overarching aim of Marjolein's research is to provide a more positive outlook for people with dementia, and to design a framework for positive social health for people with dementia. She is the co-chair of the Alzheimer Centrum Limburg, which integrates activities of Maastricht University and the University Hospital (aZM) and accommodates more than 50 researchers and clinicians of various disciplines. Her work is illustrative for the mission of the Alzheimer Center Limburg and the School for Mental Health and Neurosciences (MHeNS) to integrate innovative research with excellent clinical care, and to translate new scientific knowledge into clinical developments that are directly relevant for people with neurodegenerative disorders. In doing so, her work is very much aligned with the MUMC+ strategies of 'Healthy Living', and 'Better Health in a Changing World'.

Studies:

1993–1998:	Masters Degree, Health Sciences, Mental Health Care, Maastricht University
1995–1998:	Masters Degree, Psychology, Biological Psychology, Maastricht University
1999–2004:	Ph degree. Title of thesis: Behavioural problems in dementia: caregiver issues, FHML, Maastricht University. Promotor: Prof dr FRJ Verhey, Prof dr J.Jolles
2004–2006:	Postdoctoral training in Health Care Psychology, RINO ZuidNederland

Work experience:

1998–1999:	Neuropsychologist, Department Psychiatry and Neuropsychology, Academic Hospital Maastricht
1999–2003:	PhD student, Department Psychiatry and Neuropsychology, Maastricht University
2004–2005:	Traineeship Health Care Psychologist, Department of Traumatic Brain Injury; Departement of elderly care, Psychomedical centre Vijverdal, Maastricht
2005–2006:	Traineeship Health Care Psychologist, Memory Clinic Academic Hospital Maastricht
2006–2011:	Senior researcher, School for Mental Health and Neuroscience, Maastricht University
2006–present:	Health Care Psychologist/ Neuropsychologist, Department Psychiatry & Neuropsychology, Maastricht University Medical Center+
2011–2013:	Assistant professor, School for Mental Health and Neuroscience, Maastricht University
2013–2017:	Associate professor, School for Mental Health and Neuroscience, co-chair Alzheimer Center Limburg, Maastricht University
2017–present:	Professor of Psychosocial Innovations in Dementia, School for Mental Health and Neuroscience, co-chair Alzheimer Center Limburg, Maastricht University

Goals & Results

Cognitive NeuroPsychiatry & Clinical Neurosciences (CNP&CNS)
The Division CNP&CNS performs fundamental and applied research on cognitive, neurological and otorhinolaryngological disorders. CNP&CNS mission is to generate new insights into mechanisms of these conditions, which help to improve diagnosis and treatment, and quality of life of people with these disorders.

2.1.1 Research lines

1	Neurodegenerative disorders:
	1.1 Mechanisms and early diagnosis and biomarkers
	1.2 Neuroepidemiology
	1.3 Psychosocial interventions and cognitive rehabilitation
2	Vascular Neurology i.e. the vascular contribution to neurodegeneration
3	Movement disorders
	3.1 Movement disorders in adults
	3.2 Paediatric movement disorders
4	Epilepsy
	4.1 Epilepsy in adults
	4.2 Epilepsy in children
5	Neuromuscular disorders
	5.1 Neuromuscular disorders in adults
	5.2 Neuromuscular disorders and/or neurocognition in children
6	The sense of hearing and balance: advanced diagnosis and substitution

1. Neurodegenerative disorders	
1.1 Mechanisms, early diagnosis and biomarkers	
Coordinator:	Prof. Dr. F. Verhey
Faculty:	Dr. P. Aalten, Dr. M. Van Boxtel, Prof. Dr. R. Van Oostenbrugge, Prof. Dr. P. Hofman, Prof. Dr. W. Backes, Dr. J. Jansen, Dr. H. Jacobs, Dr. I. Ramakers, Dr. A. Leentjens, Dr. A. Duits, Dr. E. Gronenschild, Dr. S. Köhler, Dr. PJ. Visser, Prof. Dr. F. Verhey, Prof. Dr. M de Vugt, Prof. Dr. R. Ponds
Postdocs:	Dr. R. Handels, Dr. S. Vos
PhD-students:	H. van de Haar, M. Huijts, S. Schievink, T. Van der Voort, B. Reijs, E. Zhang, A. Mertens, W. Freeze, L. Kerpershoek, J Riphagen, B. Gulpers, L MüllerEhrenberg, N. Priovoulos, I. Verheggen, E. Douven, A. Gruters, L. Banning, L. Pagen, W. Jansen, A. Moonen
External collaborators:	European Alzheimer's Disease Consortium, Parelsnoer Initiative (PSI) , EMIFAD, ROADMAP, VPH, Neurodegenerative diseases consortium
Focus of research:	Translational research into the early diagnosis and pathophysiology of pathological ageing. A large-scale national biobank, coordinated by MUMC+ and the Erasmus MC, formed the infrastructure for translational research into the early diagnosis of pathological ageing (PSI Neurodegenerative disorders, coordinated by Dr. P. Aalten). Novel diagnostic technology for the early detection of Alzheimer's disease will be examined and evaluated in terms of Health Technology Assessment, i.e., with respect to its added value to existing diagnostic procedures (LeARN, CTMM).

This research line focuses on biomedical research on mechanisms of cognitive disorders, notably (prodromal and clinical stages of) Alzheimer's disease and other cognitive disorders. Research activities are integrated with patient care facilities in the Alzheimer Centre Limburg (PIs Prof. Dr.F. Verhey, Prof. Dr. M. de Vugt); and there is a close collaboration

with the Stroke centre (PI Prof. Dr. R. Van Oostenbrugge) and Centre for Motor Disorders (PIs Prof. Dr. Y. Temel, Dr. A. Leentjens).
We continued in 2017 to participate in the National Parelsnoer Initiative (PIs: Dr. P. Aalten, Dr. I . Ramakers), which is a collaboration of 8 Dutch UMCs on several chronic diseases. Maastricht University/ Alzheimer Centre Limburg, together with Erasmus MC (co-coordinator since 2017), is national coordinator of the Pearl "Neurodegenerative diseases", which focuses on the early diagnosis and prognosis of Alzheimer's disease.

The European IMI ROADMAP project started at the end of 2016 (PI: Dr. P.J. Visser; coworkers Dr. S. Vos, O. Janssen, Dr. R. Handels). The aim of the project is to model the progression of Alzheimer's disease across the full disease spectrum and to lay the foundation for a Europeanwide Real World Evidence (RWE) platform on AD. RWE and Randomised Controlled Trial (RCT) data sources relevant to Alzheimer's disease will be identified, extracted, harmonised, integrated and analysed. Examples of data sources are cohort studies, national registries, trial placebo data, health care registries, electronic medical records and data from general practitioners. Key outcome measures across stakeholder groups will be identified, and guidelines for combining different RWE data sources in AD will be developed. Maastricht is leading a work package on data collection and harmonisation and is involved in several data analyses.

The SNAPMCI project is a personal grant from ZonMw Memorable Deltaplan Dementia (PI: Dr. S. Vos). The aim of this study is to investigate the underlying mechanisms of individuals with mild cognitive impairment and an atypical Alzheimer's disease biomarker profile, i.e. neuronal injury without amyloid pathology. Existing clinical data, CSF samples and MRI scans were collected from 210 subjects with mild cognitive impairment and cognitively normal individuals from memory clinics in Maastricht, Amsterdam, and Antwerp. We have the first results of targeted CSF proteomics and MRI atrophy and vascular profiles in these subjects. Untargeted CSF proteomic analyses are planned for the first half of 2018.

The Maastricht group also coordinates a worldwide subject-level metaanalysis on the prevalence, risk factors, and clinical correlates of amyloid aggregation in nondemented and demented individuals (PI: Dr. P.J. Visser, coPI Dr. W. Jansen). This initiative started as part of EMIFAD (see above) and received additional funding from BIOGEN.

Several "LOCUS" projects are ongoing (PI: Dr. H. Jacobs), focused on investigating the structural and functional role of specific brainstem nuclei, including the locus coeruleus, for early detection of preclinical Alzheimer's disease. These projects are funded by NWO (VENI), Alzheimer Nederland and the Centre for Integrative Neuroscience of Maastricht University. Within these projects, we are collecting longitudinal state-of-the-art MRI methods at ultrahighfield MRI, CSF samples, blood samples and clinical data of healthy persons (20-100 years old) and patients with prodromal Alzheimer's disease. These projects are conducted in close collaboration with the Cognitive Neuroscience department of the Faculty of Psychology and Neuroscience.

Within the "MONA" project, funded by the Deutsche Forschungsgemeinschaft and NWO (PI: Dr. H. Jacobs), we investigate the potential of noninvasive brain stimulation methods (tDCS, tRNS, tVNS) to alter functional brain networks related to memory functioning in healthy older individuals and in patients with prodromal Alzheimer's disease. These projects run at standard 3T and ultrahighfield (7T) MRI scanners and are conducted in close collaboration with the Cognitive Neuroscience department of the Faculty of Psychology and Neuroscience and Massachusetts General Hospital (Boston).

For the INPAD project (PI: Dr. I. Ramakers) that just started, we aim to innovate and improve neuropsychological assessment in early dementia. The objectives are (1) to increase efficiency by the development of a webbased, computerized, cost-effective and user-friendly neuropsychological assessment analysis tool, and (2) to innovate patient communication by the development of a patient and clinicianfriendly visualization of cognitive test performances.

Collaboration with the Departments of Neurology and Radiology was intensified, which has led to a new study on neurovascular mechanisms of cognitive disorders, and the interaction between vascular and neurodegenerative mechanisms. Dr. H. Jacobs and Prof. Dr. W. Backes and Prof. Dr. F. Verhey continued their study on bloodbrain barrier (BBB) leakage in dementia (funded by an Alzheimer Nederland award), investigating the contribution of increased bloodbrain barrier permeability to Alzheimer disease pathology and cognitive deficits and developed a new dynamic contrast enhanced MRI scan. This project is conducted in collaboration with the University of Edinburgh and

Massachusetts General Hospital (Boston). A new grant Top talent (I. Verheggen) of was obtained by these researchers to expand this research line.

A second BBB project (funding NWO/Mozaïek; I Verheggen) is ongoing to investigate the role of BBB leakage and microvascular impairment in patients with Vascular Cognitive Impairment and Lacunar Stroke (Prof. Dr. R. van Oostenbrugge, Prof. Dr. W. Backes). Further research will be continued using advanced MRI techniques into the neuronal correlates of cognitive decrements in a diabetes cohort in collaboration with The Maastricht Study.

1.2 Neuroepidemiology	
Coordinators:	Dr. S. Köhler, Dr. M. van Boxtel
Faculty:	Prof. Dr. F. Verhey, Prof. Dr. W. Backes, Dr. J. Jansen, Prof. Dr. R. van Oostenbrugge
Postdocs	Dr. K. Deckers
PhD-students:	M. Wong, L. Berk, I. Verheggen, A. Geraets, I. Heger
Focus of research:	Insight into the prevention, etiology and treatment of cognitive dysfunction by conducting observational, interventional and implementation research in the general adult population.

Research line staff members are active contributors to De Maastricht Studie (DMS), a study to provide more insight into the prevention, etiology and treatment of type 2 diabetes and other chronic diseases in relation to mental health. DMS is a good example of the integrative approach that we aim for, with multidisciplinary input from staff in the Departments of Psychiatry & Neuropsychology, Neurology, Radiology, Ophthalmology and Otolaryngology. Participation in DMS so far has resulted in PhD theses of Dr. F. van Dooren (diabetes and depression, in collaboration with Tilburg University), Dr. P. Spauwen (cognition in diabetes) and Dr. F. van Bussel (multiparametric imaging of cerebral biomarkers of cognitive deterioration). Current projects focus on the relation between depression, cerebrovascular disease and cognition (A. Geraets) as well as lifestyle in relation to brain health (I. Heger).

The Maastricht Ageing Study (MAAS) is a 12-year observational cohort study with repeated assessments of health, lifestyle, cognitive functions and incident dementia spanning the whole adult age range. It continues to be a major source for new studies into determinants and course of cognitive ageing, including studies on positive affect, hypertension, obesity and cardiovascular disease. MAAS has been added to the 'Cohort Studies of Memory in an International Consortium (COSMIC)' harmonisation project, allowing highpowered analyses of population-based studies into cognitive ageing. In 2017, a new MRIsub study was launched to examine the role of bloodbrain barrier function in successful cognitive aging (I. Verheggen).

The FP7 funded 3year study into preventive strategies to ameliorate the individual dementia risk in middle aged individuals (InMINDD) has produced an evidence-based and well-validated polyenvironmental risk score to estimate individual potential for dementia risk reduction: the 'Lifestyle for Brain Health (LIBRA)' index. This product was implemented in an ongoing multicentre European intervention study in general practice aimed to reduce the dementia risk in middleaged individuals. Preliminary results have shown that the product is feasible and offers opportunities to be implemented fur use in the general population. Implementation of InMINDD findings is currently ongoing through funding from the Province of Limburg in the 'MijnBreincoach' project. The aim is to create awareness for factors that influence brain health by a dedicated campaign in Limburg and use of eHealth technology to help people in making and maintaining healthy lifestyle choices.

The results of the NWO/FES programme 'Healthy Cognitive Ageing' aimed at the development of internet-based lowlevel intervention strategies to support the cognitive ageing process in middle-aged and older adults have been implemented as the eHealth module 'Keep your brain fit!', which has been made available for the general public. Other products of this National collaboration with the universities of Amsterdam (VUmc, UvA) and Nijmegen (RUMC) are available at the consortium portal 'BreinWeb.nl'.

New projects explore the role of mindfulness in cognitive ageing and dementia, both in observational and in intervention studies, in part funded by Alzheimer Nederland (L. Berk).

Finally, members of the Neuroepidemiology group provide methodological support for different projects within MHeNs and MUMC+.

1.3 Psychosocial interventions and cognitive rehabilitation	
Coordinators:	Prof. Dr. C. van Heugten, Prof. Dr. M. de Vugt
Faculty:	Prof. Dr. R. Ponds, Dr. M. van Boxtel, Prof. Dr. F. Verhey
Postdocs	Dr. C. Wolfs, Dr. I. Klinkenberg, Dr. S. Smeets, Dr. L. Boots, Dr. J. Millenaar, Dr. A. Stiekema, Dr. M. Veenstra, Dr. B. Lenaert, Dr. A. Gerritsen
PhD-students:	C. Bakker, R. van Knippenberg, B. DandachiFitzgerald, J. Collet, M. Fens, R. B. ter Mors, V. Moulaert, N. Tielemans, M. van Eeden, A. Dam, L. Kerpershoek, E. Tan, B. Appelhof, J. van Duin, Y van Os, S. Bartels, H. Christie, A. Gruters, M. Schichel, L. Berk, J Bruinsma, M. Vruwink, D. Verberne, F. Domensino, J. Rauwenhoff, D. Hellebrekers
External collaborators:	International Interdem network, Horizon 2020 DRS.AITN2015 INDUCT consortium, JPND Actifcare consortium, JPND Rapsody consortium, ZonMw consortium Restore4stroke, NWO HCMI consortium Cognitive Rehabilitation, ZonMw Nationaal Programma Gehandicapten Gewoon Bijzonder
Focus of research:	Psychosocial interventions, cognitive rehabilitation and health service evaluation research. Interventions in cognitive and acquired brain disorders such as acquired brain injury (stroke and traumatic brain injury) and (young onset) dementia. In this research line a strong focus is put on evidence-based cognitive rehabilitation, neuropsychological interventions, psychosocial interventions, caregiver interventions, and health service evaluation research. Both clinical and cost-effectiveness and feasibility are investigated. In addition, research is focusing on the implementation of effective interventions, development and evaluation of new instruments to measure outcome of treatment and on investigating factors which influence outcome. Innovative treatment techniques are being evaluated in this programme, such as selfmanagement techniques and ehealth and mhealth interventions.

In 2016 we started a research line with joint initiatives in the field of dementia and brain injury. These clinical areas are linked by the experience of cognitive deficits and life changing consequences of the diseases. Neuropsychological and psychosocial interventions and outcome measures can be shared and common frameworks can be applied such as positive health and social health (Dr. A. Stiekema).

The programme on psychosocial aspects and interventions to support dementia patients and informal caregivers is part of the Alzheimer Centre Limburg and has received grants from Alzheimer Netherlands, Alzheimer Research Fund Limburg, the European Joint Programme of Neurodegenerative Diseases (JPND), ZonMW, Noaber foundation, Interreg VA Euregion MaasRhein, and Horizon 2020 DRS.AITN2015 MARIE SKLODOWSKACURIE Actions.

An important focus of the programme is the feasibility, effectiveness and implementation of ehealth interventions to support people with dementia and their caregivers. In this programme the blended care intervention 'Partner in Balance' was developed and evaluated, which resulted in the thesis defence of Dr. L. Boots, in 2016. The programme received the Medical Inspiration Award of ZonMW in 2017. The programme also resulted in the successful thesis defence of Dr. R. van Knippenberg on the topic of experience sampling methodology in dementia in 2017. The study on the social platform Inlife continued (A. Dam) and resulted in collaboration with Alzheimer Netherlands to integrate the tool on their national online platform Dementie.nl. The ehealth programme was expanded in 2014 with a JPND funded European study on the development of an elearning tool specific for young onset dementia (Dr. J. Millenaar, Dr. Ch. Bakker), and this resulted in the thesis defence of Dr. J. Millenaar in 2016. The project was successfully finished in 2017. The in 2015 awarded ITN H2020 Marie Curie grant called INDUCT (Interdisciplinary Network for Dementia Utilising Current Technology) was continued with Maastricht leading on training coordination (Dr. I. Klinkenberg, training manager) in this network, and with appointing 2 Early Stage Researchers/ PhDs (H. Christie, S. Bartels). An Interreg grant was received for the EUprevent senior friendly community's project that includes the implementation of several ehealth interventions (M. Schichel, Dr. M. Veenstra). In addition, the JPND granted study on access to timely formal care

in dementia (L. Kerpershoek, Dr. C. Wolfs) was successfully finished in 2017. The collaboration with Alzheimer Centre Nijmegen on young onset dementia was continued with three external PhD students (B. Appelhof, A. Gerritsen, J. van Duin) and one newly appointed PhD student in Maastricht (J. Bruinsma) that will work on adapting the Partner in Balance programme for the young dementia target group, for which a ZonMW grant was awarded in 2017.

In 2015 the development of the Limburg Brain Injury Centre was started. In this expertise centre, researchers of the UM of both FHML and FPN work closely together with psychologists from the MUMC+ and hospitals all over Limburg (Sittard, Heerlen, Roermond, Weert, Venlo). The expertise centre aims to improve the quality of life of brain injured patients and their caregivers by scientific research in combination with health care development and innovation, education and societal activities. On December 1st 2016 the first symposium of the centre was organized with a total of 120 delegates from all over the region. In 2017 formal collaboration was established between the Limburg Brain Injury Centre and Viecuri (Venlo), St. Jan's gasthuis (Weert), Adelante rehabilitation and research, SGL and the patient organizations Hersenletsel.nl Limburg and Samen Verder. In 2016 the centre started on initiative of Prof. Dr. C. van Heugten and Prof. Dr. R. Ponds with associate professor Dr. I. Winkens (FPN) and Dr. B. Lenaert and 2 PhDs M. Wijenberg (FPN) and M. Vruwink. In 2016/2017 the centre expanded with another researcher, Dr. Stiekema, and PhD students D. Verberne, F. Domensino, J. Bruijel (FPN) and J. Rauwenhoff.

In the programme on neuropsychological interventions for patients with acquired brain injuries, the two large national initiatives ZonMw Restore4stroke and NWO HCMI Cognitive Rehabilitation were successfully finished in 2016. In 2016 M. van Eeden successfully defended his PhD on the economic impact of stroke, a project conducted together with the School of CAPRHI. One more PhD student will finalize her thesis in this consortium (J. Kootker, Radboud UMC). In 2017 an important spin off of the NWO HCMI Cognitive rehabilitation consortium was the publication of national guidelines on neuropsychological interventions after brain injury.

In 2016 a ZonMw programme grant was received to develop a national network on brain injury in which our group executes a project in which a national minimal data set (MDS) for outcome after brain injury is developed (F. Domensino). In 2017 a ZonMw grant on the programme Mental Health was awarded to evaluate Acceptance and Commitment Therapy (ACT) for depression and anxiety after brain injury (J. Rauwenhoff). A project grant was awarded by the national Brain foundation for the development of a tool to support general practitioners in recognizing consequences of brain injury. Another project grant was received from the James S. McDonnell foundation for a collaborative project with Australia on societal participation after stroke.

2. Vascular Neurology i.e. the vascular contribution to neurodegeneration	
Coordinator:	Prof. Dr. R. van Oostenbrugge
Research Staff:	Prof. Dr. W. Backes, Dr. J. Jansen, Dr. J. Staals, Dr. S. Köhler, Prof. Dr. F. Verhey
Postdocs:	Dr. S. Foulquier
PhD-students:	S. Schievink, M. Wong, R. Uiterwijk, E. Douven, E. Zhang

The vascular Neurology group has a longstanding research tradition on cerebral small vessel disease (cSVD). Within division 1 the long term consequences of cSVD, specifically cognitive ones, are being studied. A project funded by NWO aiming to determine the role of blood brain permeability in cognitive function in cSVD was started in 2012. Two PhD defences are foreseen in 2018. At the end of 2015, funding within the framework of HORIZON 2020 was obtained for a collaborative project with several European universities to study mechanisms of disease in cSVD. Furthermore, we participate in the JPND funded project 'Vascular Contribution to Neurodegeneration'. Main aim of this collaboration is to establish a platform holding information about cohorts, relevant to vascular contribution to neurodegeneration (METACOHORTS). End of 2017, Renske Uiterwijk defended her thesis on the long term consequences of hypertension on cognitive function.
Translational research on cSVD is performed in collaboration with researchers from the School for Cardiovascular Diseases (CARIM). The focus is directed on the interaction of neuroinflammatory responses and blood brain barrier leakage in cSVD.

3. Movement disorders	
3.1 Movement disorders in adults	
Coordinators:	Prof. Dr. Y. Temel, Dr. A. Leentjens, Dr. M. Kuijf, Dr. A. Duits
Research staff:	Dr. M. Oosterloo
Co-investigators:	Dr. J. Janssen, Dr. S. Köhler
PhD's:	S. van de Weijer, A. Mulders, B. Isaacs, F. Gubben, A. Wolters, A. Moonen

Our research in movement disorders in adults focuses on non-motor symptoms in Parkinson's disease and optimization of deep brain stimulation treatment (DBS). Important non-motor symptoms in Parkinson's disease include neuropsychiatric symptoms and cognitive impairment. Research on anxiety and depression has focused on characterizing and modelling risk factors for the presence of these symptoms in PD and evaluating treatment options including ehealth applications and cognitive behavioural treatment. Currently, a multicentre clinical trial sponsored by the Michael J Fox Foundation has started on cognitive behavioural treatment and fMRI correlates in PD patients with anxiety. In addition, a multicentre clinical trial is coordinated from Maastricht in which an online training programme for cognition in Parkinson's disease is evaluated in a large group of patients. Identification of anatomical and functional connectivity in deep brain structures used as a target for electrical stimulation (DBS) is investigated with high field 7T MRI imaging in cooperation with the neuromodulation research group. Also in collaboration with this group, a new research line is being developed in which longitudinal 7T MRI imaging will be performed in Parkinson's disease patients to find new biomarkers and define clinical subgroups. The aim of this research line is to implement 7T MRI imaging for clinical use in diagnosis, prognosis and for preoperative DBS targeting and optimizing treatment. Besides the research line for Parkinson's disease, another line focuses on the hyperkinetic spectrum of movement disorders and Huntington's disease. In this research, phenotyping carriers of intermediate CAG lengths in Huntington genes and active participation in the European Huntington Registry study is ongoing.

3. Movement disorders	
3.2 Paediatric movement disorders	
Coordinators:	Prof. Dr. R.J. Vermeulen, Prof. Dr. J.S.H. Vles
Research staff:	Dr. S. Koudijs
Co-investigators:	L. Speth (Adelante, rehabilitation), K. Meijer (movement sciences, UM) Dr. JanssenPotten (Adelante, rehabilitation), Dr. E. Rameckers (Rehabilitation UM)
PhD's:	L. Bonouvrie, I. Moll

Early brain damage leads to movement disorders (spasticity, dystonia and ataxia), which interfere with motor development. We focus upon mobility (i.e. walking) and head use. Therefore, the focus of this research line is upon interventions as treatment for motor disorders. The abnormalities of the brain are the primary cause of the motor disorder and therefore extensively studied in the study populations, using standard and advanced MR imaging. Currently, a randomized controlled trial with Intrathecal baclofen is conducted in paediatric and adolescent patients with dyskinetic cerebral palsy. (IDYS study, sponsored by the Phelps stichting, revalidatie fonds and Johanna kinderfonds). Mobility is investigated with 3D over ground gait analysis (VICON) and treadmill gait analysis with virtual reality (CAREN).
In September 2017 we started a new study with functional electrical stimulation as treatment for children with unilateral spastic cerebral palsy. (Cosponsored by the "revalidatiefonds). In this study we will look at the effect of functional electrical stimulation on the drop foot in these children and we will look at predictors of outcome (e.g. neuroimaging). We also started a new study on the development of Walking ("Firststeps" study, in collaboration with the VU University in Amsterdam). For this project we got a new paediatric treadmill especially for young (small) children (Sponsoring Stichting Vooruit).
In collaboration with Adelante rehabilitation we started a new project on improvement of hand function in children with unilateral spastic cerebral palsy. We have a special interest in sensory function in these children. In the next years we will evaluate the effect of motor training on sensory function in relation the underlying brain abnormality.
For the next years we aim at further development of new imaging diagnostics (i.e. advanced MR Imaging) in paediatric movement disorders and further development of neurointerventions as deep brain stimulation.

4. Epilepsy	
4.1 Epilepsy in Adults	
Coordinators:	Prof. Dr. A. Aldenkamp , Dr. G. Hoogland, Dr. R. Rouhl, Prof. Dr. W. Backes, Dr. J. Jansen, Prof. Dr. J Vermeulen
Postdocs	Dr. A. Vinke, Dr. K. Bekelaar, Dr. E. Fonseca Wald, Dr. F. Schaper, Dr. M. Archila Melendez, Dr. G. Chaitanya, Dr. J. van Tuijl
PhD students:	W. van Blarikom, D. IJff, T. van Veenendaal, L. Gupta, M. Teunissen, , L Canjels, G. Drenthen

The central theme within the research topic of epilepsy is "Chronic Epilepsy", previously already funded by a substantial grant from the National Epilepsy Fund (NEF) for this programme (led by Prof. Dr. A. Aldenkamp). One of the most severe consequences of chronic epilepsy is the impairment of cognitive functioning, including the general thinking, memory, language and problem-solving capabilities. The novel insight today is that epilepsy is more a network disease rather than a single focal abnormality or malfunction. Traditionally, epilepsy research has utilised different techniques and methods: measurement of brain waves (electroencephalography, EEG), imaging (acquisition of anatomic and functional brain images) and neuropsychological assessment. Continuously ongoing technological developments of MRI methods, in particular functional, relaxation time and diffusion MRI, provide possibilities to obtain new insights in the organization and integrity of cerebral networks which may lead to strategies that prevent chronic epilepsy and cognitive comorbidity. Another direction is the noninvasive detection of neurotransmitters in the brain using advanced MRI methods and relating these with medication and cognitive performance.
Starting in 2014, as a consequence of a further integration of and novel opportunities within the Academic Centre for Epileptology (ACE) new focus points for research emerged: special diagnostic methods (immunology, autoantibodies) and genetics (whole exome sequencing)) as well as special therapeutic methods (deep brain stimulation) and intracranial registration. Cognition in relation to (interictal) epileptic discharges, especially in children, is another research focus point within ACE.

4. Epilepsy	
4.2 Epilepsy in children	
Coordinators:	Prof. Dr. J.S.H. Vles, Prof. Dr. A.P. Aldenkamp
Research Staff:	Dr. S. Klinkenberg, Dr. M. Debeij van Hall, Dr. J.G.M. Hendriksen, Prof. Dr. H.J.M. Majoie, Dr. G. Hoogland, Dr. J. Jansen, Dr. J. Nicolai, Dr. S. Zinger
PhD students:	E. FonsecaWald, G. Drenthen, C. van den Bosch, /WagenerSchimme, S. Schipper
Co-investigator:	Prof. Dr. H.J.M. Majoie

Within the Academic Centre of Epilepsy (ACE) collaboration between Epilepsy Centre Kempenhaeghe and Departments of Neurology concerning diagnostic and treatment options augmented. In 2015 preparations were made for total package of diagnostic and treatment modalities for (refractory) epilepsy within ACE, leading among other things to scientific spin off in various directions: for example the thesis by S. Klinkenberg (VNS in children, a neuromodulation treatment alternative in refractory epilepsy).
Cognition in relation to (interictal) epileptic discharges and functional networks, especially during development in children, is another research focus in ACE. Preparation of the LEES study, a longitudinal follow-up study in children with absence epilepsy, was started. Benign childhood Epilepsy with Centro temporal spikes is another research theme, resulting in 'The Rolandic care programme, a national recognized expertise centre. This programme covers both diagnostic modalities (clinical, neurophysiological and neurocognitive) and expertise in counselling. Current study provides insight in subtypes and timing of treatment and consequences for later life. Next to these clinical research lines there is an established preclinical research programme on cognition in relation to epilepsy and interictal epileptic discharges among other themes.

5. Neuromuscular disorders	
5.1 Neuromuscular disorders in adults	
Coordinator:	Prof. Dr. C. G. Faber
Research staff:	Dr. J.G.J. Hoeijmakers, Dr. I.S.J. Merkies
Postdoc:	R. Almomani
PhD's:	B. de Greef, M. Sopacua, I. Eijkenboom, R. Slangen, B.A. Brouwer, T. Draak, M. Pruppers, I. Joosten
External collaborators:	Prinses Beatrix Spierfonds, FP7 Health Innovation, H2020 Giuseppe Lauria (Carlo Besta Institute Milan) and Stephen Waxman (Yale University)

Painful (small fibre) neuropathies (PhD students B. de Greef, M. Sopacua, I. Eijkenboom): the research on painful neuropathies focuses on the genetic mechanisms underlying neuropathic pain, identifying molecular targets which may reveal new drug gable sites, and creating the possibility for personalized pain medicine in a collaborative project, 'Probing the role of sodium channels in painful neuropathies (PROPANE Study)', granted by the EU (Health.2013.2.2.15; Understanding and controlling pain. FP7Health2013Innovation1). Furthermore, studies for improving diagnostic techniques and development of new therapeutic strategies, including new trials, are being performed.
Outcome measures for use in neuromuscular diseases (PhD students T. Draak, M. Pruppers) are essential for development of new trials in the upcoming therapeutic era, leading to several PhD theses (S. van Nes, E. Vanhoutte). M. Pruppers was awarded the Mazawey Fellowship, a 3-year Fellowship ($ 300.000) for the antiMAG neuropathy study proposal.
Myotonic dystrophy is another main research theme. The 'Maastricht Myotonic Dystrophy Register' dates from the early 1980s and contains data on more than 500 DM1 patients. A grant for development of the national registry for myotonic dystrophy was given to the Myotonic Dystrophy Centre the Netherlands (Maastricht UMC+ and Radboudumc), as well as new grant for developing new nutritional approaches (PhD student I. Joosten).

5.2 Neuromuscular disorders and/or neurocognition in children	
Coordinators:	Prof. Dr. J.S.H. Vles, Dr. J.G.M. Hendriksen
Research staff:	Dr. S. Klinkenberg
PhD Student:	R.G.F. Hendriksen

Learning problems, attention deficit disorders (ADHD) and autism spectrum disorders are more common among patients with dystrophinopathies (Duchenne muscular dystrophy and Becker muscular dystrophy) and myotonic dystrophy. Knowledge of this dyadic relationship between muscle and brain is important; with prolonged life expectancy these neurodevelopmental disorders may have growing impact and may be highly debilitating. The lack of dystrophin in the brain may be the explaining factor in this dyadic relationship. The possible role of dystrophin in neural excitability is the aim of the PhD study of R.G.F. Hendriksen and also focussed on the role of dystrophin deficiencies in epilepsy with both clinical and preclinical data being published. In collaboration with Leiden UMC a study on brain imaging (MRI and rfMRI) and neurocognition was done in 30 DMD patients and 30 controls. Results have been published in Annals of Neurology and are currently under further investigation for longitudinal follow up. Furthermore, in collaboration with Leiden UMC, Radboud UMC, Kempenhaeghe centre of Neurological Learning and Developmental Disorders (CNL) and Maastricht UMC+ (department of child neurology) acquired a grant of 250.000 Euro for a longitudinal follow up and intervention study of neurodevelopmental disorders in Duchenne and Becker dystrophy and a grant of 100.000 Euro for a study of medical outcome measures and relationship between dystrophin and somatic functioning.
In patients with myotonic dystrophy a prospective follow up study on neurocognitive and neurobehavioral functioning in collaboration with Prof. Dr. K. Faber is under progress.
Another focus of interest within the department of child neurology MUMC+ and Kempenhaeghe Centre of Neurological Learning and developmental disabilities is Neurofibromatosis type 1 and cognition, (a NF1 neurocognition registry) this is in line with the national recognition by NFU as a centre of expertise. (Coinvestigator: Dr. C. Catsman, Erasmus MC)

6. The sense of hearing and balance: advanced diagnosis and substitution	
Coordinator:	Prof. Dr. B. Kremer
Research Staff:	Dr. E. George, Prof. dr. H. Kingma, Dr. I. Maes, Dr. J. van Tongeren, drs. R. van de Berg
PhD-students:	J. Debruyne, J. Smit, M. van Hoof, S. Wagemakers, E. Devocht, R. Jansen, L. van Nierop, G. Dees, D. Henatsch, R. van de Berg, N. Guinand, M. van Tilburg, J. Smit, Kim Noij, F. Lucieer, J. Stultiens, T. van Dooren, D. Starkov, M. Pleshkov, M. van der Lubbe, T. Calon
Co-investigators:	Prof. dr. B. Kramer (MUMC+), Prof. dr. K. van Overbeeke (MUMC+)
External collaborators:	Prof. E. Formisano (FPN), Prof. Dr. Y. Temel, dr. L. Riecke (FPN), Dr. B. Sorger (FPN), K. Meijer, R. Peeters, D. Jiang (UK), Dr. D. Kunst (KU Nijmegen), V. Demkin (Russia), Dr. JP. Guyot (Switzerland), D. Zee, (US, Johns Hopkins), S. Rauch (US, MIT), V. Van Rompaey (Antwerp)
Focus of research:	Translational research into the etiology, treatment and consequences of hearing and balance disorders and the effect of neuromodulation with neuroprosthetic devices

Hearing and balance problems are among the most prevalent health problems in our population.
Our research activities are divided in three subcategories:

Tinnitus

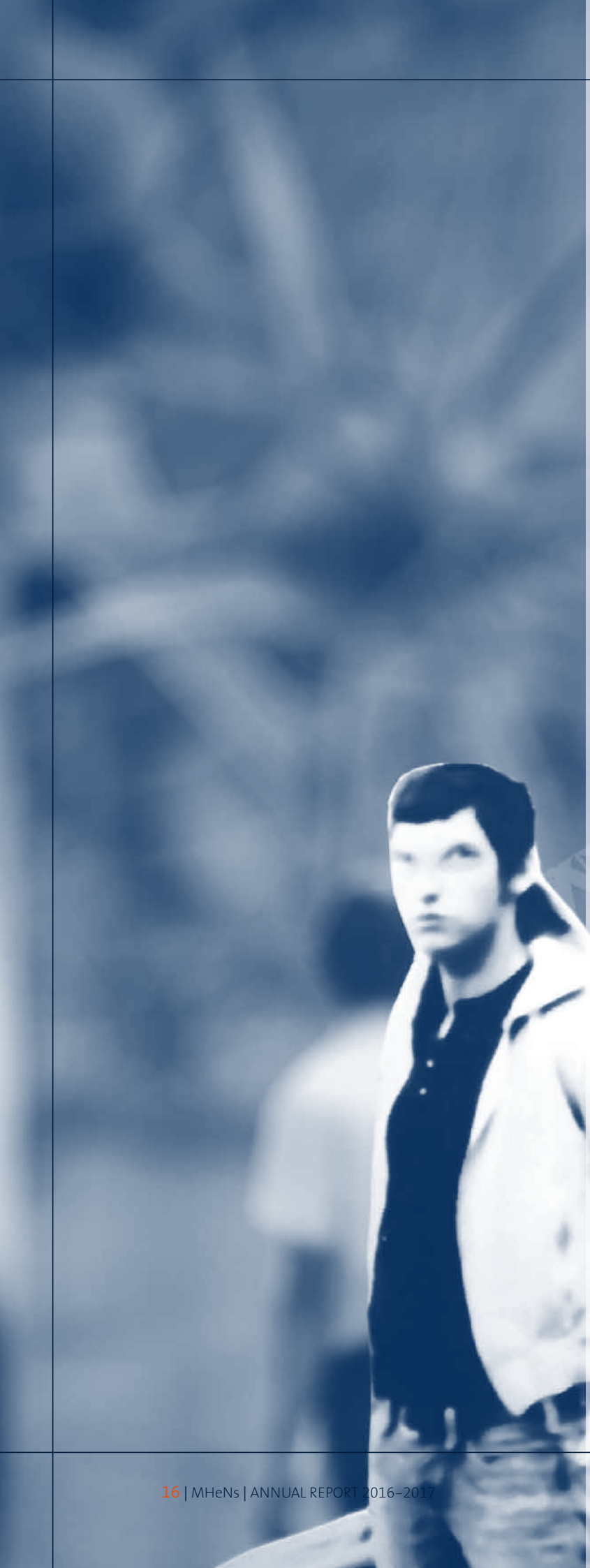
Basic research aims to unravel central nervous mechanisms causing tinnitus by using fMRI and animal models and the potential of neuromodulation using deep brain stimulation. This translates into clinical application wherein a specific neuromodulatory device, a tinnitus suppression implant has been applied. This has attracted a great number of patients for whom a care system was put in place which is systematically evaluated and improved further. Valorisation of this tinnitus care system is important since the new Dutch care standards are currently based on it. In the near future, the tinnitus implant will be further refined. A multidisciplinary approach is followed to combine hearing and tinnitus indications, and to assess acceptability, feasability and cost effectiveness of future interventions.

Hearing

Optimizing the diagnostics of hearing loss at a very young age has been systematically studied, aimed at improving both measuring instruments and at early detection and intervention. Special attention has been addressed to basic mechanisms causing hearing damage in premature infants. Bilateral deafness treatment by cochlear implantation has been institutionalized at MUMC+. Research efforts are focused on optimizing coding strategies, on improving electrode placement using advanced fusion imaging, and on optimizing electrical and acoustic (bimodal) bilateral hearing. Single sided deafness is treated using bone conductive hearing. Research efforts are focused on optimizing abutmentskin interaction for bone anchored systems and at bimodal hearing, finding optimized strategies to combine hearing with cochlear implant and hearing aid. Hearing aid provision has been studied from a cost effectiveness point of view.

Balance

Advanced diagnosis and treatment possibilities of vestibular disorders have attracted many patients to our MUMC+. New medical and surgical treatment strategies became available for balance disorders, for example using the round window membrane as a pathway to the inner ear. However, for an important proportion of these patients, neuromodulator devices remain the sole treatment option. A special balance belt has been developed with IDEE, supported by the Dutch Health Insurance Companies that increase the proprioceptive substitution for patients with severe balance disorders. In collaboration with Geneva, Tomsk, Antwerp and industrial partners a vestibular implant has been developed which substitutes a defect vestibular system and is currently evaluated and developed further.



2.2 Division 2: Mental Health

Division Leader:
Prof. Dr. J. van Os, until June 2017
Prof. Dr. T.A.M.J. van Amelsvoort, since June 2017

Deputies:
Dr. U Reininghaus, since June 2017
Prof. Dr. K. Schruers

Staff:
Dr. B. Arts
Dr. M. Bak
Prof. Dr. Ph. Delespaul
Dr. R. van Diest, until July 2016
Dr. P. Domen
Dr. G. Driessen
Dr. M. Drukker
Dr. L. Goossens
Dr. E. Gronenschild
Dr. P. Groot
Dr. S. Guloksuz
Prof. Dr. P. van Harten
Dr. D. Hernaus
Dr. G. Kenis
Dr. G. Konings
Dr. T. Lataster
Dr. Ch. van der Leeuw
Dr. N. Leibold
Dr. C. Leue
Dr. R. Lieverse
Dr. R. Lousberg
Dr. M. Marcelis
Prof. Dr. I. Myin-Germeys
Dr. N. Nicolson
Prof. Dr. F. Peeters
Dr. J. Schieveld
Prof. Dr. J.P. Selten
Dr. R. Severijns
Dr. C. Simons
Dr. J. Strik
Dr. M. Tijssen
Dr. W. Viechtbauer
Prof. Dr. M. Wichers
Prof. Dr. R. van Winkel
Dr. C. van Zelst


The Exposome Paradigm and the Complexities of Environmental Research in Psychiatry

Science Story | Sinan Guloksuz

With a background in psychiatric research and neuroscience, Sinan's broader research focus has been on understanding the mechanisms underlying psychosis spectrum disorder and mastering the phenotype encompassing traditional diagnostic categories, adopting a multimodal integrative approach that spans the translational continuum. Sinan has been a major driving force in collecting Europe's largest database on Gene-Environment interaction in psychosis research (EU-GEI). His diverse experience involving several countries and researchers with varying backgrounds and cultures have helped him to forge strong academic collaborations around the world to conduct innovative research.

His research is closely linked to the goals of precision/personalized medicine – to accelerate the delivery of improved health outcomes through more person-oriented clinical management and cost-effective treatment in the long run. His work on the schizophrenia spectrum and high risk concepts has received considerable media attention in 2017, including a feature in Newsweek and coverage by several social media outlets.

Studies:

1999–2005:	Medicine, School of Medicine, Ankara Gazi University, Ankara, Turkey
2005–2011:	Psychiatry Residency, Bakirkoy Research and Training Hospital for Psychiatry, Neurology and Neurosurgery, Istanbul, Turkey

Work experience:

2011–2013:	Psychiatrist/Investigator, Country Coordinator, Project EU-GEI, Turkey
2013–2016:	Postdoctoral Associate, Department of Psychiatry, Yale University School of Medicine, New Haven, CT, USA
2016-present:	Assistant Professor, Department of Psychiatry and NeuroPsychology, MHeNs, Maastricht University, the Netherlands
2016-present:	Adjunct Assistant Clinical Professor, Department of Psychiatry, Yale University School of Medicine, New Haven, CT, USA

Goals & Results

Division Mental Health aims to understand the etiology of mental disorders by using dimensional approaches applied to ecological, psychological and biological systems. This offers opportunities to develop more individualized treatments and accurate predictive markers that could improve an individual's quality of life.

The studies done in Division 2 capture a broad range of topics, and employing several different strategies.

In 2016/2017, we worked on the following goals:
1) The MUMC+ Brain and Nerve Centre. (Hersen Zenuw Centrum) Division 2 is actively involved in setting up and developing the novel Brain and Nerve Centre (BNC) at MUMC+. To this end, Division 2 has been rapidly expanding collaboration with the various clinical groups in BNC. Amongst others we are developing novel mHealth tools to facilitate outcome research in the area of neuromodulation.

2) In order to improve G*E studies searching for the causes of complex diseases such as severe mental disorders, increasingly large sample sizes are urgently required. The EUGEI study with 28 European partners, funded by a large FP7 grant, has come to an end. At present data are being analysed and papers are being written up. Secondly, a large general population study has been set up together with the Trimbos Institute. The NEMESIS II study has finished its genetic data collection and completed its third followup on mental health in 7000 participants from the general population. Division 2 was specifically involved in collecting data on psychosis. Third, the third wave of datacollection in the national (Amsterdam, Utrecht, Groningen, Maastricht) GROUP study has been completed and the fourth wave is about to start. This study is following up 1000 patients with psychosis, 1000 relatives and 1000 parents and 500 controls over a period of 10 years. The third wave data cleaning is almost finished.

3) Combining imaging data with real-time and real-world person-environment interaction patterns is a powerful way of conducting experimental medicine research, since it provides ecological validity for the neuroimaging data, correlating real life behaviour with alterations in specific brain regions, and vice versa, improves the understanding the neural mechanisms associated with reallife behaviour. Division 2 has been conducting a large cross-diagnosis study focusing on underlying mechanisms of reward, stress and aberrant salience, studied with experimental fMRI paradigms as well as reallife ESM assessment. The data collection of this large SMARTSCAN project (funded by the Weijerhorst Stichting) has come to an end in 2017. In a second study, funded by an ERC consolidator grant, the neural effects of a psychological reallife intervention will be assessed in a combined ESM – PET approach. This INTERACT study has been progressing well and is almost coming to an end. A multimodal imaging study (SMURF) looking at the neurobiological basis of cognition in psychosis, funded by a VIDI, has been successfully completed in 2017. Finally, Division 2 is also a partner in PSYSCAN, an EU FP7 funded study, which is collecting imaging data longitudinally in patients with psychosis or at risk of psychosis.

4) In 2016/7, the PsyMate app was further developed and is now downloadable from iTunes and Android Store. It includes a web-based feedback module; the PsyMate server now records 10,000 interactions per day. Currently around 29 different studies are being conducted using PsyMate technology, including studies to develop mROM, a number of n=1 single case experiments, novel psychopharmacological personalised dose- finding studies, novel studies of networked psychopathology models, PsyMate intervention studies based on, for example, ACT modules in PsyMate, positive health feedback modules, salience exposure modules and others. We also are conducting a clinical trial investigating a new PsyMate Acceptance and Commitment therapy, which is applied both in the SMARTSCAN and INTERACT studies. In addition, a new ZonMw funded study, SELFIE will use a new Psymate intervention to improve selfesteem in a RCT in youth.

5) Studying copy number variant disorders such as 22q11.2 deletion syndrome and other genetic syndromes has been one of division 2 main areas of expertise. Leadership of a national specialized clinic in combination with a NIH funded grant IBBC 22q (20132017) is resulting in major impact publications and extensive international collaborations.

6) Translational studies bringing together basic animal research and patient studies remain a core research line within division 2. The translational expert group has initiated a number of studies, translating human findings to animal models and vice versa, with a particular focus on epigenetic mediation of environmental exposure effects, epigenetic mediation of ECT therapy, and epigenetic mediation of interferon alpha therapy. In addition, a joint division

2/3 study looking at rare forms of psychosis has started and is well progressing successfully. In this study we are looking at inborn errors of metabolism and NMDA receptor antibodies.

7) Division 2 is actively involved in forming international networks to accelerate psychiatry research, for example, through intensive collaboration between the University of Leuven (UPC Kortenberg) and Division 2 of Maastricht University. This formal collaboration will also strengthen the clinical neuroscience within EURON.

8) Division 2 is proud to host the first User Research Centre (URC) in the Netherlands. The User Research Centre is a facility where academics with lived experience in psychiatry have successfully completed PhD projects and postdoc trajectories, investigating issues that are within the remit of Division 2 but developed from the user perspective. The first PhD completion was in 2014, based on user-led interventions to reduce self-stigma. A successful postdoc in the User Research Centre is conducted by Dr Peter Groot, based on developing methods for n=1 single case experiments for optimal dosing of psychotropic medication. This project has attracted funding from multiple sources. A very successful initiative of the URC was the website www.psychosenet.nl, which now attracts around a 1000 visitors per day.

The methodological expert groups within the division focus on 1) Genetics, 2) Experience Sampling, 3) Neuroimaging, 4) Clinical epidemiology and Mental Health Services Research, 5) Networks.

2.2.1. Expert groups

1	Genetics
2	Experience Sampling
3	Neuroimaging
4	Epidemiology and health services research
5	Networks

Expertgroup:	**1 Genetics**
Coordinators:	Dr. R. van Winkel, Prof. Dr. B. Rutten
Research Staff:	Prof. Dr. J. van Os, Prof. Dr. B. Rutten, Dr. G. Kenis, Dr. W. Viechtbauer, Dr. M., Prof. Dr. M. Wichers
Postdoc:	Dr. C. Simons, Dr. M. van Niero
PhD students:	C. Hamels, J. Decoster, C. Lothmann
Focus of research:	The design of genetic studies in the field of psychiatry as well as investigating the role of genetic variation and gene-environment interactions in the etiology, severity and course of psychopathology.

The genetics expert group coordinates the design of genetic studies in the field of psychiatry as well as the choice of various genetic methodologies, choice of polygenic scores, pathway scores, epigenetic scores and genes of interest for the different research lines. Furthermore, it offers a platform for bringing together several disciplines in order to conduct adequately designed multidisciplinary and translational research to establish the role of genetic variances and gene-environment interactions in the etiology, severity and course of psychopathology and dimensions of psychological and psychiatric traits.

Expertgroup:	2 Experience Sampling
Coordinator:	Dr. J. Bakker
Research Staff:	Dr. W. Viechtbauer, Prof. Dr. N. Jacobs, Prof. Dr. Ph. Delespaul, Dr. M. Drukker, T. Driesen, K. Borkelmans.
Post doc:	Dr. C. Simons, Dr. J. Lataster, Dr. M. Janssens, Dr. S. Peeters, Dr. V. Thewissen, Dr. N. Gunther.
PhD students:	S. Verhagen, S. Bartels, L. Berk, C. Rauschenberg, A. Klippel, S. Leijdesdorff, N. Daniels, R. van Knippenberg.
Focus of research:	To guard and increase the quality of ESM data collections and analyses, as well as to increase statistical expertise and analytic possibilities.

The aim of the EXM expert group is to guard and increase the quality of ESM data collections and analyses, to examine the validity of the method and the items used in ESM and report on this in international peer-reviewed journals, as well as to increase statistical expertise and analytic possibilities, such as timeseries analysis in ESM.

Expertgroup:	3 Neuroimaging
Coordinator:	Dr. M. Marcelis
Research Staff:	Prof. Dr. K. Schruers, Dr. E. Gronenschild, Prof. Dr. van Os, Dr. R. Lieverse, Prof. Dr. T van Amelsvoort
Post doc:	Dr. L. Goossens, Dr. S. Peeters, Dr. D. Hernaus, Dr. N. Leibold
PhD students:	S. Michielse, E. van Duin, S. Papalini, T. Vaessen, I. Lange, C. Vingerhoets, Dr. G. Bakker, C. van der Leeuw, P. Domen, A. Frissen
Focus of research:	Examining brain structure and function in relation to psychopathology and biological and environmental risk factors.

The Expert Group Neuroimaging is a group of researchers that is using various neuroimaging modalities (e.g. sMRI, DTI, fMRI, SPECT, PET, MRS) and analysing techniques to examine brain structure and function in psychiatric disorders, such as psychosis, affective and anxiety disorder. Our main goals are to examine i) neurobiological pathways influencing psychopathology, ii) genetic and environmental determinants of brain phenotypes, and iii) neural mechanisms underlying therapeutic interventions.

Expertgroup:	4 Epidemiology and health services research
Coordinator:	Dr. M. Drukker
Research Staff:	Dr. W. Viechtbauer, Prof. Dr. J. van Os, Dr. R. Lousberg, Dr. M. Drukker, Dr. M. Bak, Prof. Dr. Ph. Delespaul, Dr. G. Driessen (2016)
PhD students:	
Focus of research:	To discuss the correct use of research methods (epidemiology) and meta-analyses as well as to work on data of patient registers and monitors. Subgroup meta-analysis: Wolfgang Viechtbauer, Maarten Bak, Marjan Drukker, Philippe Delespaul, Ritsaert Lieverse; PhD students: Thierry Mentzel, Kay Deckers (Div. 1), Stijn Michielse, Claudia Lothman, Claudia Vingerhoets, Jindra Bakker, Ehsan Pishva, Zuzana Kasanova.

Expertgroup:	5 Networks
Coordinator:	Dr. M. Drukker
Research Staff:	Dr. W. Viechtbauer, Dr. M. Drukker
PhD students:	A. Klippel, S. Peeters, S. Michielse, L. Hasmi, J. Bakker
Focus of research:	Networks in all their diversity.

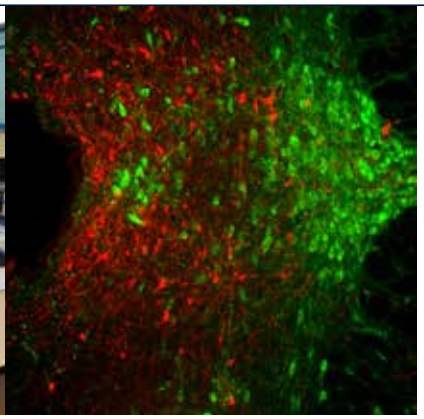
The network expert group was founded to exchange knowledge and to make use of each other's expertise rather than to re-invent methods. The group read and discussed important network literature. This group aims to include all colleagues working on networks.

2.3 Division 3: Neuroscience

Division Leader:
Prof. Dr. J. Prickaerts, since December 2017
Prof. Dr. B. Rutten, until December 2017

Deputies:
Prof. Dr. Y. Temel
Prof. Dr. P. Martinez, since December 2017
Prof. Dr. J. Prickaerts, until December 2017

Staff:
Prof. Dr. M. De Baets
Dr. T. Berendschot
Dr. J. Briede
Prof. Dr. W. Buhre
Dr. M. van Duinen, until March 2017
Dr. L. Eijssen
Dr. D. Gavilanes
Dr. M. Giris, since May 2016
Dr. N. van Goethem, since March 2017
Dr. Th. Gorgels
Dr. P. Heckman, since May 2017
Dr. S. Hescham
Dr. G. Hoogland
Dr. D. van den Hove
Dr. A. Jahanshahianvar
Prof. Dr. B. Joosten
Prof. Dr. A. Kijlstra
Prof. Dr. M. van Kleef
Prof. Dr. J. Kleinjans
Prof. Dr. G. van Koeveringe
Dr. I. Koneczny, until November 2016
Prof. Dr. B. Kramer
Dr. F. van Leeuwen
Prof. Dr. K.P. Lesch
Dr. M. Losen
Prof. Dr. M. Marcus, until February 2017
Dr. J. Mey
Dr. L. Nijs
Prof. Dr. K. van Overbeeke
Dr. S. Schipper, since December 2016
Prof. Dr. H. Steinbusch, until June 2016
Dr. T. Strekalova
Dr. J. Vangeneugden
Prof. Dr. C. Webers
Prof. Dr. L. Zimmermann



Science Story | Ali Jahanshahi

After graduation from the master's Physiology in Tehran, Iran, Ali Jahanshahi was awarded with a Marie-Curie fellowship to conduct PhD research at Maastricht University in early 2009. The main topic of Ali's research has been the mechanisms behind the effects and side effects of Deep Brain Stimulation (DBS) in neurodegenerative disorders, with emphasis on plasticity of monoaminergic neurotransmitter systems.

His research line has revealed that the neurotransmitter systems are more plastic than it was thought before. Particularly, internal and environmental challenges to the brain can induce fundamental changes e.g., the newly discovered form of neuroplasticity, "neurotransmitter respecification". Recently Ali was awarded a VENI grant from the NWO to take the next step and determine how monoaminergic systems plasticity plays a role in mechanism of action of deep brain stimulation. The aim of his research is to help direct more rational and effective use of DBS and unleash its full therapeutic potential.

Ali is very active in international research and educational activities and has recently been appointed as a a member of the "Global Young Academy" an international organization of outstanding young researchers with members from six continents. He contributes to the organization's programmes, which includes participation, e.g., in policy development, or promoting science and education at the international level.

Studies:

1998–2002:	BSc Nursing, Hamedan University of Medical Sciences, Hamedan, Iran
2004–2007:	MSc Physiology, Tarbiat Modares University, Tehran, Iran
2008–2011:	PhD Neuroscience, Maastricht University, Maastricht, the Netherlands

Work experience:

2012–2016:	Postdoctoral fellow, department Neurosurgery, Maastricht University, Maastricht, the Netherlands
2016 – present:	Assistant professor, departments Psychiatry & Neuropsychology/Neurosurgery, Maastricht University, Maastricht, the Netherlands.

Goals & Results

The Division Neuroscience performs fundamental and translational neuroscience research on the mechanisms related to neuroplasticity, neurodegeneration and regeneration in health and disease across the life span. Currently the division has converged the activities of the different research lines as described below into the following thematic research lines:

1 Neuroepigenetics
2 Neuropsychopharmacology
3 Neuroinflammation
4 Neuromodulation

We aim to gain knowledge of physiological and pathophysiological mechanisms underlying in particular affective, cognitive and motor functions and disorders thereof and to develop strategies for improving healthy living, as well as preventing and treating neurological and psychiatric disorders.

Our main research lines converge on regulation of neurotransmitter functioning, cell signalling, brain plasticity, biological mechanisms mediating gene-environment interactions (such as epigenetic control of gene expression), and neuroinflammation in a lifetime perspective. Our neuroscience studies combine fundamental, preclinical and clinical expertise and interests on developmental programming (including prenatal and perinatal life), as well as experience-dependent plasticity during sensitive time windows and age-related changes of the nervous system. Technological expertise in our division is currently centralised in four expertise groups that are coordinated by senior staff members and supported by experienced technicians: molecular and cell biology, microscopy, electrophysiology, in vivo and behaviour.

In addition to investigations on overt dysfunctions involving mainly the central nervous system including depression, dementia, Parkinson's disease and psychosis, we also investigate mechanisms mediating central control of peripheral bodily function such as pain, vision and neuro-urogenital functioning.

Our researchers conduct specific study paradigms to answer clinically relevant research questions, typically by combining a range of techniques and approaches such as detailed cellular work, experimental animal studies as well as observational human studies and clinical trials.
The multidisciplinary staff consists of professionals from relevant disciplines within research and clinic. There are collaborations within worldwide international networks of research offering a strong academic environment.
By doing so, we attempt to improve scientific knowledge on healthy functioning of the brain and on the aetiology of disorders. At the same time we translate relevant scientific findings swiftly into biomarkers development as well as new neurotherapeutical applications including lifestyle interventions, pharmaco and antibody-based therapies, or deep brain stimulation.

The results of the research efforts in division 3 are described for each research line by the different coordinators and expertise groups.

2.3.1 Research lines

1	Neuroepigenetics
2	Neuropsychopharmacology; Signal Transduction
3	Neuroinflammation; Nervous system neuroinflammation: immunotherapy and autoimmunity.
4	Neuromodulation
	4.1 Experimental Neurosurgery
	4.2 Modulation of chronic pain
	4.3 Functional Neuro-Urology
	4.4 Ophthalmology
	4.5 Neonatology, Developmental Neuroscience

1. Neuroepigenetics	
Coordinators:	Dr. D. van den Hove, Prof. Dr. B. Rutten
Faculty:	Dr. G. Kenis, Prof.Dr. KP. Lesch, Dr. L. Eijssen, Prof. Dr. K. Schruers, Dr. L. de Nijs, Dr. T. Strekalova, Prof. Dr. F. Verhey, Prof. Dr. H. Steinbusch, Prof. Dr. J. Prickaerts, Dr. P. Aalten, Prof. Dr. P. Martinez, Dr. D. Gavilanes, Dr. T. Wolfs
Postdocs:	Dr. E. Pishva, Dr. I. Ramaekers, Dr. N. Leibold
PhD-students:	F. Boulle, Y. Pujol Lopez, R. Lardenoije, M. Levy, A. Iatrou, M. Weidner, D. Kiser, R. Riemens, J. Roubroeks, M. Ali, J. Zöller, M. Bustelo, P. Koulousakis
Associated Researchers:	Prof. Dr. J. Mill, Dr. K. Lunnon (University of Exeter, UK), Prof. Dr. T. Haaf (University of Würzburg, Germany), Prof. Dr. M. Wagner, Dr. A. Ramirez (University of Bonn/Cologne, Germany), Dr. T. Sesia (University of Cologne, Germany), Dr. R. Delgado (IDIBELL, Spain), Prof. Dr. A. Del Sol (Luxembourg Centre for Systems Biomedicine, Luxembourg), Dr. T. Vanmierlo (BIOMED, University of Hasselt, Belgium), Prof. Dr. L. Lanfumey (University Pierre & Marie Curie, France), Dr. C. Lemere (Harvard Medical School, USA), Prof. Dr. P. Coleman, Dr. D. Mastroeni (Arizona State University, USA).
Focus of research:	Understanding the role of gene-environment (GxE) interactions and associated epigenetic mechanisms during development and aging, with a particular focus on the pathophysiology of psychiatric and neurodegenerative disorders.

The organization of DNA into chromatin enables the cell to use powerful regulatory mechanisms broadly defined as epigenetics. Epigenetic changes are reversible and responsive to environmental influences, unlike genetic mutations, which represent rare events with permanent consequences on genes. Research on Neuroepigenetics aims to characterize the molecular basis that underlies sensitivity to environmental exposures and associated gene-environment (GxE) interactions in (neuro) psychiatric and neurodegenerative phenotypes and disorders, with a particular interest in epigenetics.

This programme examines several aspects of epigenetic regulation, such as DNA methylation at promoter sites, chromatin modifications, gene silencing induced by miRNAs, and other novel epigenetic mechanisms, for their roles in disease and dysfunction consequent to environmental conditions. The ultimate goal of this programme is to identify molecular and cellular pathways that are causally involved in the aetiologies of psychiatric disorders, to identify biologic markers that predict disease onset and course, to determine the reversibility of neurobiological changes, and to find novel preventive and therapeutic strategies.

Neuroepigenetics focuses on two main research themes/questions. First, what are the neurobiological underpinnings of neuropsychiatric and neurodegenerative phenotypes, with a particular focus on risk and resilience? Second, what is the role of epigenetic mechanisms in mediating gene-environment interactions in and long-term consequences of environmental perturbations during development and aging?

These research themes/questions are applied to Alzheimer's disease, depression and anxiety disorders, schizophrenia and epilepsy. State-of-the-art technologies are being employed to analyse the epigenetic changes in single genes, signalling pathways or the entire genome in response to variations in environmental exposure. Research involves various innovative, translational projects using in vitro cell cultures, in vivo animal models, and human tissues and/or biologic samples to examine (epi) genetic modifications and to determine the precise mechanism responsible for these changes.

2. Neuropsychopharmacology; Signal Transduction	
Coordinator:	Prof. Dr. J. Prickaerts
Faculty:	Prof. Dr. Y. Temel, Prof. Dr. F. Verhey, Prof. Dr. M. De Baets, Dr. P. Aalten, Dr. D. van den Hove, Prof. Dr. B. Rutten
Postdocs:	Dr. N. van Goethem, Dr. M. van Duinen
PhD-students:	S. Akkerman, P. Heckman, B. van Hagen, E. Argyrousi, L. Mendes, D. Paes, M. Schepers, S. Caldenhove, M. van den Berg
External collaborators:	Dr. A. Blokland, Dr. A. Sambeth, Prof. Dr. J. Ramaekers (FPN), Prof. Dr. H. Schmidt (CARIM), Dr. T. Vanmierlo, Prof. Dr. N. Hellings (BIOMED, University of Hasselt, Belgium), Prof. Dr. O. Bruno, Dr. E. Fedele (University of Genoa, Italy), Dr. D. Puzzo (Città, Universitaria, Catania, Italy), Dr. L. Wennogle (IntraCellular Therapies, New York, USA), Dr. O. Arancio, (Columbia University, NY, USA), Dr. R. Weffort de Oliveira (State University of Maringá, Brasil)
Focus of research:	Cellular signal transduction in affective and cognitive processes in health and disease.

The major aim is to unravel the mechanism of action of signalling pathways both in health and disease (e.g. Alzheimer's disease and depression), while at the same time exploring the therapeutic potential of key factors in the affected signalling pathway. The focus in this respect is on the growth factor Brain Derived Neurotropic Factor (BDNF) and the second messengers cAMP and cGMP. Research involves working in a translational context ranging from molecular biology to behaviour.

We have shown that phosphodiesterase (PDE) inhibitors, which inhibit the degradation of cAMP and/or cGMP by PDEs, improve signal transduction and memory processes in rats independently of cerebrovascular effects. This is of major importance since this indicates that the second messengers can be targets for new drugs to improve memory function directly. Therefore, the biological mechanism of action of specific PDE inhibitors to improve memory is investigated in depth in collaboration with international academic partners (e.g. University of Genoa, University of Columbia, State University of Maringá) and pharmaceutical companies. Part of this research is also in close collaboration with Hasselt University and funded by Alzheimer Nederland in which PDEs are being explored at the isoform level as therapeutic targets for the treatment of Alzheimer's disease. Recently, a proof of concept study funded by a grant from ZonMw showed the memory improving potential of the PDE type 4 inhibitor roflumilast in human subjects with age- associated memory impairment. This was done in collaboration with Division 1 of MHeNs and the Faculty of Psychology and Neuroscience (FPN). Next to this, parallel preclinical and clinical studies are ongoing on new therapeutic targets besides PDEs to stimulate signal transduction. Some of these studies were part of the HEaL (Human Enhancement and Learning) project, which is an initiative between schools (MHeNs, CARIM) and faculties (FHML, FPN and SBE) at Maastricht University with the aim to enhance memory function and thus quality of life. This is now followed up within the Centre for Integrative Neuroscience (both FHML and FPN) in which the focus is also on miRNA as biomarkers of drug induced changes in neural integrity and cognition.

Finally, besides using pharmacological interventions, signalling is manipulated in for instance mouse models of Alzheimer's disease via gene transfer techniques including CRISPR/Cas9 and a micro electroporation approach. The results of these studies will help us to find new therapeutic targets for affective and cognitive disorders.

3. Neuroinflammation; Nervous system neuroinflammation: immunotherapy and autoimmunity	
Coordinators:	Prof. Dr. P. Martinez & Dr. M. Losen
Research Staff:	Prof. Dr. B. Rutten, Prof. Dr. J. van Os, Prof. Dr. M. De Baets, Dr. P. Molenaar
Postdocs:	C. Hoffmann
PhD-students:	M. Mané-Damas, S. Crivelli, S. Zong, D. van Kruining, L. Quian, C. Giovagnoni
Focus of research:	Understanding neuroinflammation in neurodegenerative diseases and nervous system autoimmunity.

Our team is studying neuroimmunological mechanisms of the innate and adaptive immune response in the peripheral and central nervous system, with focus on antibody-mediated autoimmune diseases. We are working on various diseases, including myasthenia gravis (MG), Alzheimer's disease (AD), schizophrenia and depression.

An important goal of our work is the development of new methods to diagnose psychosis with autoimmune origin (projects funded by ZonMw and the Hersenstichting) in order to enable specific (immunosuppressive) treatment of patients.

Additionally, we study the role of lipids and their transporters in the early inflammatory process of neurodegenerative diseases. In particular, we investigate the function/dysfunction of danger signal molecules e.g., serum amyloid P component and the ceramide transporter. This work is supported by the Internationale Stichting Alzheimer Onderzoek (ISAO). Additionally, a Weston brain institute grant from Canada, and European grant Interreg, and a Memorabel/ ZonMw support the work of sphingolipids in AD.

Finally, we are working on the development of relevant experimental CNS autoimmune models of mental illness, work funded by an awarded Aspasia grant and industry initiated grants.

In MG, we are investigating the possible use of proteasome inhibitors for targeting autoimmune plasma cells. Long-living plasma cells are resistant against broad-range immunosuppressant's and are therefore a major problem in the current treatment of MG and other antibody-mediated autoimmune diseases. Plasma cells depend on their proteasome to sustain highrate protein synthesis. Consequently, proteasome inhibitors have the capacity to kill plasma cells by inducing the terminal unfolded protein response.

With support from the AFM Telethon (France), we are investigating disease pathology in a rare form of MG with musclespecific kinase antibodies. For this purpose, we are generating monoclonal autoimmune Bcells from these patients. The cell lines are used to define fine antigen-specificities of individual patients' antibodies and to develop an animal model that can be used for testing future therapies.

4. Neuromodulation	
4.1 Experimental Neurosurgery	
Coordinator:	Prof. Dr. Y. Temel
Research staff:	Dr. L. Ackermans, Dr. G. Hoogland, Dr. A. Jahanshahi, Dr. M. Janssen, Dr. P. Kubben, Dr. M. Kuijf, Dr. K. Rijkers, Dr. O. Schijns, Prof. Dr. Y. Temel
Postdocs:	Dr. S. Hescham
PhD-students:	A. Smeets, T. Bouwens van der Vlis, M. Aldheri, L. Huawei, R. Haeren, K. Hakvoort, F. Schaper, F. Alosaimi, S. Pol, M. Roet, J. Smit, M. Bos, F. Almasabi, G. van Zwieten, J. Habets, M. Heijmans, A. Wolters,M. Alahmari, R. Assmann, C. Vanderheijden, F. Gubler, B. Isaacs, A. Mulders, Y. Yakkioui
Research interests:	Neuromodulation, Basal Ganglia, Epilepsy, Neural circuits, Neurodegeneration, Neurogenesis, Neuroanatomy.

The experimental neurosurgery group has developed over the last decades. Currently, more than 20 PhD students are trained under the guidance of several senior researchers. These experts are neuroscientist with different backgrounds, ranging from neurobiologist and neurophysiologists, to clinical neurologists and neurosurgeons.

The focus of the research group is to make progress in neuromodulative treatments in neurological and psychiatric disorders. Several lines of investigation are conducted: 1) Novel neuromodulative techniques are tested in early phases of development. 2) New applications are investigated. 3) Novel DBS paradigms are developed, like adaptive or closedloop DBS and coordinated reset stimulation. 4) Optimization of the DBS target is investigated by ultrahigh field MR imaging and electrophysiological techniques. 5) Finally, we investigate the mechanisms of DBS. This research is conducted in both human and preclinical studies. Moreover, we investigate the histopathology in drug-refractory temporal lobe epilepsy

These lines of research are supported by grants from the ZonMw, NWO, Cure Huntington's Disease Initiative (CHDI, New York, USA), transnational University Limburg, Prosensa BV, Medtronic, Hersenstichting Nederland, Stichting Wijerhorst, Stichting St. Annadal, and Saudi Ministry of Health.

4. Neuromodulation	
4.2 Modulation of chronic pain	
Coordinator:	Prof. Dr. E.A. Joosten
Research Staff:	Prof. Dr. M. van Kleef, Dr. M. Sommer, Dr. A. Balthazar, Dr. H. Gramke, Dr. Nynke van de Hoogen, Dr. Hon, Prof. Dr. D. Tibboel
PhD-students:	G. Franken, R. van Reij, E. Koetsier, P. Maino, D. Hoofwijk, B. Vossen, K. Meuwissen, B. Brouwer, P. Douven
Focus of research:	Part A: The understanding and application of neuromodulatory techniques, in particular spinal cord stimulation and pulsed radiofrequency, in order to minimize chronic (neuropathic) pain.
	Part B: Identification of predictors of chronic postoperative pain and investigating approaches aimed at prevention and detection of chronic postoperative pain.

Part A: Today Spinal Cord Stimulation (SCS) is used in the treatment of intractable neuropathic pain (NPP). Despite the existence of SCS as a pain therapy for over 40 years, up till now only two randomized clinical trials (RCT's) have been performed: one in patients with CRPS1 (Chronic Regional Pain Syndrome) and the other one in patients with Failed Back Surgery Syndrome (FBSS), both of which provide limited clinical evidence that SCS relieves neuropathic pain. We extend implementation of SCS in other NPP syndromes and designed and completed an RCT on the clinical effect of SCS in painful diabetic polyneuropathy (PDP) (thesis M van Beek, Nov 2017). Within HKC a collaborative PhD project is started to understand sacral neuromodulation and urinary/ faecal control (P. Douven; Prof. Dr. G. van Koeveringe (Urology, MUMC+); Dr. S. Breukink (General Surgery MUMC+)). The effects of new spinal cord stimulation paradigms including High-Frequency Burst stimulation and Dorsal Root Ganglion Stimulation are studied in separate projects (K. Meuwissen, G. Franken and E. Koetsier respectively). We further study the role of SCS in small fibre neuropathies experimentally as well as clinically (B. Brouwer) in collaboration with Prof. Dr. K. Faber (Neurology, MUMC+). From a basic scientific point of view the role of glial cells (as immuneregulatory cells) in the modulation of chronic pain (or plasticity of the nervous system) has our prime interest. Pulsed Radiofrequency as a minimally invasive therapy for treatment of chronic lumbar radicular pain (low back pain) is being studied based on an RCT. In a rat model of lumbar radicular pain, the mechanism of action PRF is being studied (G. Franken).

Part B: Chronic postoperative pain is associated with an enormous socio-economic burden and can result from a plethora of clinical conditions. In our research, we focus primarily on trauma-induced neuropathies in the peripheral and/or central nervous system, which are a common cause of chronic pain. The initial pathological events at the site of nerve damage form the drive of pathological events higher up in the neuraxis, and are considered to be fundamental to the establishment and chronification of acute pain into chronic postoperative pain (project D. Hoofwijk). Research on chronification of postoperative pain includes studying effects of procedural pain during NICU (R. van Reij; N. van den Hoogen; Prof. Dr. D. Tibboel). We aim at understanding the genetic and psychological (the latter in collaboration with Prof. Dr. M. Peeters, Faculty of Psychology) processes underlying chronification of postoperative pain. Together with Division 2 MHeNs (Prof.dr. B. Rutten and Dr. G. Kenis) and the University of Bonn (Germany; Prof. Dr. M. Nothen) genome wide analysis study has been performed on a cohort of chronic postoperative pain patients (R. van Reij; N.van den Hoogen; D. Hoofwijk) and experimental studies have been initiated (R. van Reij in collaboration with Prof. Dr. B. Smeets, Dr. J van Oevelen, Clinical Genetics, MUMC+). Within H2020 and together with various European and Canadian Partners it is aimed for further extending genetic research (biobank) and prediction of chronic postoperative pain (N. van den Hoogen).

Development and use of eventrelated potentials (ERP) allow to study many aspects of pain construct, interrelations and mechanisms and are now quantified based on a new developed analyses method in Event related fixed interval areas (ERFIAs) (project C. Vossen; Dr. R.. Lousberg, Division 2 MHeNs). In line with this we developed the PsyMate app, a tool to monitor fluctuations in mood, affect, and context, and also pain. Therefore, we currently perform a pilot study to investigate the feasibility of the PsyMate in day case surgery and to gain more insight in how fluctuations in acute postoperative pain covary with painrelated psychological and contextual factors and with cortical processing of pain as analysed via ERFIAs (C. Vossen; A. Balthazar; collaboration Prof. Dr. B. Rutten).

4. Neuromodulation	
4.3 Functional Neuro-Urology	
Coordinator:	Prof. Dr. G. Van Koeveringe
Research staff:	Prof. Dr. Ph. van Kerrebroeck
Postdocs:	Dr. S. Schipper, Dr. M. Rahnama'i, Dr. D. Vrijens
PhD-students:	R. Jairam, J. Drossaerts, D., A. Zare, P. Douven, M. de Rijk, (External: M Walter (Zurich), U Mehnert (Zurich), M. Skowron (Düsseldorf)
Focus of research:	Neuro-Urology: Lower urinary tract signalling, control mechanisms and neuromodulation.

The research focus is directed towards fundamental understanding of bladder and lower urinary tract physiology, pharmacology and the origins and treatment of lower urinary tract dysfunction. Three project lines are ongoing in order to study different levels of bladder dysfunction in a translational research programme based in the Research School for Mental health and Neuroscience, The Brain and Nerve Centre (BNC), the MUMC+ profile Neurosciences and in close association with the clinical urology department and the Pelvic Care Centre Maastricht.

Line 1, Basic research: Characterisation, analysis and physiological and structural mapping of control pathways within the urinary bladder wall and their connections with the central nervous system. In this basic research line, multiple pharmacological pathways have been studied in the intrinsic control mechanism inside the bladder wall, involving the network of interstitial cells and autonomous bladder activity. The way by which this mechanism is efferent modulated or afferent used by the central nervous system is subject to future electrophysiological recording and tracer studies. In a collaborative project with the Neurosurgery department (Prof. Dr. Y. Temel) connections of the lower urinary tract to specific brainstem areas such as PAG and dorsal raphe are being studied. The determination of the respective contribution of either bladder or brain/nerve dysfunction to these diseases will contribute to a better understanding of the clinical problems and (patho) physiological mechanisms. Moreover knowledge of these systems is necessary to understand and improve current treatment regimens such as: neurostimulation, neuromodulation and both peripheral and central pharmacological therapy. A basic RUBICON Project is started in collaboration with Aachen University on innovative methods for neuromodulation (Dr. S. Schipper). A basic collaborative peripheral neuromodulation project was started in collaboration with the departments of Anaesthesiology (Prof. Dr. B. Joosten) and General Surgery (Dr. S. Breukink) on stimulation parameters and paradigms in an animal model for Neuromodulation. This latter project is done in close collaboration with the Central neuromodulation project of Neurosurgery, ENT and Neurology. The latter activity is currently being funded by a grant from the Brain and Nerve Centre.

Line 2: The bladder and urinary sphincter control system in humans in the normal and the diseased state. Bladder and sphincter pressures during different disease states and during innovative treatment techniques are studied using highresolution urodynamic measurements in combination with innovative imaging. A large part of these studies are performed in collaboration with the High Flux MRI facility, Scannexus in order to develop a physiological and imaging biomarkers (funded by a Kootstra Fellowship, Dr. S. Rahnamai and the Astellas Europe fund prize 2015). A new tissue engineering study has been initiated in collaboration with MERLN to treat structural defects leading to functional problems in the lower urinary tract. A relationship is sought between psychological profile and the degree of bladder fullness perception. Related to this new research areas are being explored in collaboration with the Pelvic care centre Maastricht and the department of Psychiatry with the focus on associations of functional bladder and pelvic floor complaints in combination with psychiatric comorbidity. For the underactive bladder, an algorithm for detection diagnosis and evaluation is being elaborated on in the Pelvic care centre Maastricht, with several international partnerships in Germany and Brazil.

Line 3: Neuromodulation in humans for complaints of overactive bladder and voiding dysfunction (over and underactive bladder and bladder outlet), supervised by Prof. Dr. Ph. van Kerrebroeck and co-supervised by Prof. Dr. G. van Koeveringe. In this research line both working mechanisms (using techniques and models described above) and an optimisation of the current neuromodulation treatments by means of determination of predictive factors and optimisation of techniques are the main subjects to be studied. A clear link is made with the neuromodulation research in Line 2. Patient selection through for example determination of certain psychological patient traits (in collaboration with Dr. C. Leue), sub-characterisation of the diseases and evaluation of the largest urological neuromodulation patient cohort will be done using different possible psychological, physiological, biochemical and imaging biomarkers.

4. Neuromodulation	
4.4 Ophthalmology	
Coordinator:	Prof. Dr. C. Webers
Research staff:	Prof. Dr. R. Nuijts, Dr. H. Beckers, Dr. T. Berendschot, Dr. T. Gorgels
PhD-students:	A. Tan, M. Elshout, M. Dickman, L. Wielders, J. Hoevenaars, H. Römkens, N. Makhotkina, S. Zhang, S. Jonker, W. Hubens, C. Bertens, R. Simons, P. Mokhles, V. Webers, J. Brekelmans, I. Liesenborghs, S. Dunker, F. van der Heide, L. Spekreijse, N. Pahuja, A. Mohan, P. Sarbanja, M. Francis, S. Mohan, N. Shetty, K. Nagpal, Z. Pradhan, R. Battu, R. Teja, A. Abhishek
Focus of research:	Scientific research focuses on glaucoma, corneal diseases and cataract and ocular neurodegenerative changes in diabetes and other chronic diseases.

Research is primarily clinical in nature, with a direct impact for patients (clinical trials, clinical decision models) and society (efficiency research and costeffectiveness models). Research results contribute directly to sustainable care by preventing diseases and by controlling growth in care costs thanks to costeffective solutions. Further, abnormalities of both neural and vascular tissues are directly measurable in the living eye.

Research is concentrated along the following lines:
Glaucoma: Modelling (identification of risk factors for disease progression), imaging (anterior chamber morphometry, nerve tissue analysis) and the development of new treatment strategies (glaucoma filtration implant). In addition, basic studies on retinal ganglion cells, trabecular meshwork and aqueous humour aim to discover the molecular pathology of glaucoma and to design new (neuroprotective) treatments. Omics research and systems biology are used to integrate findings.

Cataract and Refractive Surgery: Development of innovative cataract surgical technologies such as femtosecond laser assisted cataract surgery. Development of biomaterial applications for sustained release of drugs. Improvement of presbyopia correction using adaptive optics and toric (multifocal) intraocular lenses, intracorneal inlays and scleral implants.

Corneal Transplantation: Optimizing lamellar corneal surgery for diseases of the cornea and development of regenerative medicine models using corneal stem cells and biomaterial technology.
Prevention: Development of retinal vascular analysis for early detection and monitoring of diseases such as diabetic retinopathy, age related macular degeneration and Alzheimer's disease and research into the influence of diet in these diseases.

The Maastricht study: In a large epidemiological cohort study diabetes patients and controls are measured with state of the art measurement modalities to study causes and consequences of diabetes and other chronic diseases. Imaging techniques of the optic nerve, cornea and retina will provide new insights into neurodegenerative changes in these syndromes.

4. Neuromodulation	
4.5 Neonatology, Developmental Neuroscience	
Coordinators:	Prof. Dr. B. Kramer, Dr. A. Gavilanes
Research Staff:	Prof. Dr. H. Steinbusch, Prof. Dr. L. Zimmermann, Prof. Dr. J. Vles, Dr. D. van den Hove, Dr. T. Wolfs, MSc, Dr. Markus Müller, Prof. Dr. B. Rutten
PhD-students:	M. Seehaase, J. Heiter, L. Klein, M. Cetinkaya
Focus of research:	Asphyxia and inflammation.

The department of Paediatrics continued its research line on perinatal hypoxiaischemia in newborn rats and preterm sheep and in patient studies. Multiple approaches to treat brain injury were studied (and discussed in invited reviews): In the past years, we have developed an understanding of the effects of hypoxiaischemia on the immune system of the exposed foetus with profound modulation of inflammatory responses. We studied the effects on isolated astrocytes in a cell culture model of hypoxia and glucose deprivation.
We published two key papers in the pursuit of translating the identified mechanisms of disease into clinical care. We tested a clinical grade stem cell product which is already in clinical trials in our model of hypoxiaischemia in preterm lambs where we could show a neuroprotective effect on brain function and baroreceptor reflex. These findings substantiate the possibility of stem cells in the treatment of brain injury after hypoxiaischemia.
We also investigated the possibilities of a postnatal treatment for neuroprotection by administering propofol after hypoxiaischemia. Propofol protected the newborn brain against hypoxic ischemic brain injury.
Two new aspects were recently developed when we studied the innervation of the fetal gut after antenatal exposure to inflammation. We hypothesize that the innervation of the gut is impaired after antenatal inflammation. The second aspect is epigenetic changes that antenatal inflammation induces in the fetal brain, which we explore in vivo and in vitro.

3. Facts and Figures

3.1 Earning Power 2016

In this section, we present information concerning resources and funding.
Direct funding is provided mainly by the MUMC+ and comes indirectly from the Dutch Ministry of Education, Culture and Science. Research Funding: funds received in competition from national and international science foundations. Contracts: funds from third parties.

3.1.1 Direct Funders by Division: 2016

Div.	Year	Funders	Project	Amount in €	Acquired by
SUBTOTAL CNP&CNS				**–**	
SUBTOTAL MENTAL HEALTH				**–**	
3	2016	Maastricht University	Kootstra fellowship** October 2016.	20.947	D. Paes
SUBTOTAL NEUROSCIENCE				**20.947**	
TOTAL MHeNs 2016				**20.947**	

** *Talented future postdocs: The fellowship is meant to bridge the time between graduation of the PhD-student and the start of an official contract as a postdoc.*

3.1.2 National Research Funders by Division: 2016

Div.	Year	Funders	Project	Amount in €	Acquired by
1	2016	ZonMw	ZonMw Horstkötter / De Wert / projectnr. 707300098104 / Parents who are alcoholics: Towards a normative framework of integrative care and responsible	100.000	G. de Wert / D. Horstkötter
1	2016	ZonMw	ZonMw S. Vos / projectnummer: 733057003 / Kennisbenutting in het dementieveld: van onderzoek naar implementatie (thema 1) binnen de ronde "Werken aan kennisbenutting in themawerkgroepen" van het programma Memorabel.	20.000	S. Vos / F. Verhey
1	2016	ZonMw	ZonMw / projectnummer: 845004001 / NAHKennisnetwerk: Gewoon Bijzonder met nietaangeboren hersenletsel (NAH).	203.844	C. van Heugten
SUBTOTAL CNP&CNS				**323.844**	
SUBTOTAL MENTAL HEALTH				**–**	
SUBTOTAL NEUROSCIENCE				**–**	
TOTAL MHeNs 2016				**323.844**	

3.1.3 National and international Funders by Division: 2016

Div.	Year	Funders	Project	Amount in €	Acquired by
1	2016	Alzheimer Nederland	Alzheimer Nederland Fellowship K. Deckers / projectnr. WE. 15201501.	12.500	K. Deckers / F. Verhey
1	2016	Alzheimer Nederland	Alzheimer Nederland: Samenwerkingsovereenkomst.	95.000	F. Verhey
1	2016	EU	Marie Curie fellowship H. Jacobs / H2020 Proposal: 706714 CONNECT.	174.864	H. Jacobs / F. Verhey
1	2016	EU	Marie Curie Innovative Training Networks (ITN) / F. Verhey / H2020 Proposal: 676265 — INDUCT.	510.748	F. Verhey
1	2016	The Foundation Duchenne Parent Project / Stichting Spieren voor Spieren	Duchenne / Spieren voor Spieren: "Aspecten van gezondheidsgerelateerde kwaliteit van leven: beperkingen en participatieproblemen, pijn en vermoeidheid vanuit medische en psychologische hoek" / "Topzorg voor Topjongens".	347.500	J. Hendriksen / H. Vles
1	2016	Provincie Limburg	Mijn Breincoach (Provincie Limburg) / projectnr. SAS201504931.	129.500	F. Verhey
1	2016	Kerry Stichting	Kerry Stichting / Partner in Balans II / "Dementie op jonge leeftijd".	134.043	M. de Vugt
1	2016	Fred Foundation	Fred Foundation / donatie Alzheimer Nederland – Mindfulnesstraining voor mensen met dementie in een vroege fase en hun mantelzorger.	75.000	M. van Boxtel
1	2016	Interreg / Provincie Limburg	Interreg / euPrevent Senior vriendelijke gemeente in de Euregio Maas Rijn (EMR), Callnr. 1.	373.997	F. Verhey
1	2016	Hersenstichting	Centrum Hersenletsel / Hersenstichting / Projectnummer: PZ 2016.03.1 / Project Huisartsentool.	13.000	C. van Heugten
1	2016	EU	Marie Curie Innovative Training Networks (ITN) / PAINNet / Grant Agreement number: 721841 — PAINNet — H2020MSCAITN2016/H2020MSCAITN2016 / Starting Date of Action: 1 February 2017.	510.748	C. Faber
1	2016	The Florey Institute	The Florey Institute / Van Heugten / Trajectory of Participation Outcomes following Stroke: Mapping Activities and Participation.	13.500	C. van Heugten
1	2016	EU	ROADMAP / IMI / Real World Outcoms across the AD spectrum for better care: Multimodal data Access Platform (ROADMAP).	291.000	P.J. Visser
SUBTOTAL CNP&CNS				**2.681.400**	

Div.	Year	Funders	Project	Amount in €	Acquired by
2	2016	Actelion	Actelion / Van Amelsvoort / The identification of inborn errors of metabolism (IEM) in patients with recent onset schizophrenia spectrum disorders.	125.000	T. van Amelsvoort
2	2016	Provincie Limburg	LIME Psymate.	136.500	P. Delespaul
2	2016	J.M.C. Kapteinfonds	Salarislasten onderzoeksmedewerker HBO t.b.v. de autisme studie.	65.000	J.P. Selten
SUBTOTAL MENTAL HEALTH				**326.500**	
3	2016	EU	Marie Curie fellowship L. de Nijs / H2020 Proposal: 707362 — TraumiR.	177.598	L. de Nijs / B. Rutten
3	2016	Weston Brain Institute	Plasma ceramides and CERT proteins as prognostic biomarkers for AD.	107.625	P. Martinez Martinez
SUBTOTAL NEUROSCIENCE				**285.223**	
TOTAL MHeNs 2016				**3.293.123**	

3.1.4 Industrial Funders by division: 2016

Div.	Year	Funders	Project	Amount in €	Acquired by
1	2016	Biogen MA Inc.	Biogen / AD pathology and demographic, lifestyle, and comorbid factors: a study level and subject level metaanalysis.	247.808	P.J. Visser
SUBTOTAL CNP&CNS				**247.808**	
SUBTOTAL MENTAL HEALTH				**–**	
3	2016	Chiesi Farmaceutici	Chiesi 5 / In vivo proof of inactivation of surfactant by preceding chorioamnionitis by Ureaplasma.	280.460	B. Kramer
3	2016	Actelion Pharmaceuticals Ltd.	Actelion / Martinez / A clinical study focussing on Plasma and cerebrospinal fluid sphingolipids as biomarkers for identification of subgroups of patients with recent onset schizophrenia spectrum disorders.	60.000	P. Martinez Martinez
3	2016	Bayer Pharma AG	Bayer Pharma / Prickaerts / The conduct of a study of pharmacological effects of the sGc modulating agents on memory function in rodents.	40.000	J. Prickaerts
3	2016	Dart NeuroScience, LLC	Dart NeuroScience / Prickaerts / The effects of combined administration of putative cognition enhancers on memory performance in rats.	100.000	J. Prickaerts
3	2016	St. Jude Medical B.V.	St. Jude / P. Kubben / Research in the field of Tremor measurement for clinical research and follow up.	50.000	P. Kubben
3	2016	Natural Stacks, Inc.	Natural Stacks / Prickaerts / "CILTEP Study"; Testing the effects of CILTEP on cognitive performance.	275.532	J. Prickaerts
SUBTOTAL NEUROSCIENCE				**805.992**	
TOTAL MHeNs				**1.053.800**	
Overall total MHeNs 2016				**4.596.714**	

3.2 Earning Power 2017

3.2.1 Direct Funders by Division: 2017

Div.	Year	Funders	Project	Amount in €	Acquired by
1	2017	Maastricht University	Kootstra fellowship* April 2017.	29.532	W. Jansen
1	2017	Maastricht University	Kootstra fellowship** October 2017.	29.532	K. Deckers
SUBTOTAL CNP&CNS				**59.064**	
2	2017	Maastricht University	Kootstra fellowship** April 2017.	29.532	I. Lange
2	2017	Maastricht University	Kootstra fellowship** April 2017.	29.532	C. Vingerhoets
SUBTOTAL MENTAL HEALTH				**59.064**	
3	2017	Maastricht University	Kootstra fellowship** October 2017.	29.532	M. Dickman
3	2017	Maastricht University	Kootstra fellowship** October 2017.	29.532	C. Hoffmann
SUBTOTAL NEUROSCIENCE				**59.064**	
TOTAL MHeNs 2017				**177.192**	

* *Kootstra Talent Fellowships: Awarded by the Faculty Health, Medicine and Life Sciences. Talented future PhD students: The fellowship is meant to bridge the time between graduation of a talented student in Medicine, Health or Life Sciences and the start of an official contract as a PhD-student.*

** *Talented future postdocs: The fellowship is meant to bridge the time between graduation of the PhD-student and the start of an official contract as a postdoc.*

3.2.2 National Research Funders by Division: 2017

Div.	Year	Funders	Project	Amount in €	Acquired by
1	2017	ZonMw	ZonMw Memorabel / R. Ponds / projectnr. 733050821 / Timely diagnosis of Alzheimer Disease. Improving Shared DecisionMaking in General Practice.	608.060	R. Ponds
1	2017	ZonMw	ZonMw C. van Heugten / projectnr. 636310003 / Clinical and costeffectiveness of third wave psychotherapy for depression and anxiety after acquired brain injury.	259.701	C. van Heugten
1	2017	NWO	NWO NeuroLabNL / D. Horstkötter / Dossiernr: 400.17.602 / NeuroLabNL: Optimale condities voor leren en veiligheid van jongeren.	40.228	D. Horstkötter
1	2017	ZonMw	ZonMw RUMC M. de Vugt / projectnr. 639010002 / Op weg naar implementatie van de zorgstandaard voor jonge mensen met een dementie.	52.990	M. de Vugt
1	2017	ZonMw	ZonMw Medische Inspirator 2017 / M. de Vugt / projectnr. 427002005 / 'Cursus 'Partner in Balans' bij dementie'.	75.000	M. de Vugt
SUBTOTAL CNP&CNS				**1.035.979**	
2	2017	ZonMw	ZonMw U. Reininghaus / projectnummer: 636310006 / Improving selfesteem in traumatized youth: a transdiagnostic ecological momentary intervention trial (SELFIE).	399.862	U. Reininghaus
SUBTOTAL MENTAL HEALTH				**399.862**	

Div.	Year	Funders	Project	Amount in €	Acquired by
3	2017	NWO	NWO Westerdijk leerstoel / Martinez.	50.000	P. Martinez-Martinez
3	2017	ZonMw/NWO	Aspasia P. Martinez / subsidienummer 015.011.033.	200.000	P. Martinez-Martinez
3	2017	ZonMw	ZonMw / R. Nuijts / projectnr. 843004111 / Costeffectiveness of immediately versus delayed sequential bilateral cataract surgery (ISBCS vs. DSBCS).	299.923	R. Nuijts
3	2017	NWO	NWO / Rubicon dr. S. Schipper / File no: 019.163LW.037 / Correspondence no.: 2017/ ENW/00238562 / Selective brain cooling for neuromodulation.	130.008	G. van Koeveringe
3	2017	ZonMw	ZonMw/Dossiernummer 80843009861023/ projectnummer: 843001603 / Corneal Transplantation by DMEK (Descemet Membrane Endothelial Keratoplasty) is it really better than DSAEK?	249.550	R. Nuijts / F. van den Biggelaar
SUBTOTAL NEUROSCIENCE				**929.481**	
TOTAL MHeNs 2017				**2.365.322**	

3.2.3 National and international Funders by Division: 2017

Div.	Year	Funders	Project	Amount in €	Acquired by
1	2017	Alzheimer Nederland	Fellowship Alzheimer Nederland drs. I. Bos / project nr. WE.15201608.	6.500	I. Bos
1	2017	Alzheimer Nederland	Alzheimer Nederland: Samenwerkingsovereenkomst.	95.000	F. Verhey
1	2017	Prinses Beatrix Spierfonds	PBSF / Faber / W.OR1525 / Biobank myotone dystrofie.	30.532	C. Faber
1	2017	Alzheimer Nederland	Alzheimer Nederland Fellowship Handels / project number WE.15201609.	55.952	R. Handels
1	2017	Prinses Beatrix Spier Fonds	PBSF W.OK1709 / J. Hoeijmakers / "Psychologische benadering om de pijn bij dunnevezelneuropathie onder controle te krijgen".	247.560	J. Hoeijmakers
1	2017	Revalidatiefonds	Revalidatiefonds / J. Vermeulen / projectnr. R201605614 / "Functional electrical stimulation as treatment for gait problems in children".	103.890	J. Vermeulen
1	2017	FIL Foundation	FIL Foundation / S. Vos / Mechanisms of Neuronal Injury Subtypes in Early Alzheimer's Disease.	138.159	S. Vos
1	2017	EU	EU / RECAGE R. Handels / H2020 / How to best meet the needs of people with dementia with severe behavioural disturbances. Toward a respectful and costeffective model.	59.000	R. Handels

Div.	Year	Funders	Project	Amount in €	Acquired by
1	2017	GieskesStrijbis stichting / Alzheimer Nederland	PRECODE M. de Vugt / Prevalence, recognition and care pathways in young onset dementia (PRECODE).	935.000	M. de Vugt
1	2017	Prinses Beatrix Spier Fonds	PBSF / C. Faber / Myotone Dystrofie, PrOteiNe en Dieet (MD POuND).	199.187	C. Faber
SUBTOTAL CNP&CNS				**2.681.400**	
2	2017	HFL / Cortina Group	HFL / Cortina Group / projectnummer 201703 / De uitrol van PsychoseNet in Vlaanderen.	300.000	J. van Os
2	2017	HFL / Provincie Limburg	HFL / Provincie Limburg / mHealth.	93.200	J. van Os
2	2017	Innovatiefonds	Innovatiefonds Headspace / VU.	80.000	T. van Amelsvoort
SUBTOTAL MENTAL HEALTH				**473.200**	
3	2017	Stichting Sint Annadal	Stichting Sint Annadal / Temel / Parcellation of the subthalamic nucleus in Parkinson's disease: towards personalized deep brain stimulation.	184.741	Y. Temel
3	2017	AFMTelethon	AFMTelethon – Martinez / Characterizing the autoantibodyproducing Bcell in MuSK Myasthenia gravis and cloning the MuSK autoantibody to unravel pathogenic mechanisms of MuSK autoantibodies, reference number 20851.	27.000	P. Martinez Martinez
3	2017	ISAO	ISAO / Prickaerts / projectnr. WE.03201607 / Targeting cAMPspecific PDE for Alzheimer's disease.	200.000	J. Prickaerts
3	2017	Interreg	Interreg Euregio Maas Rijn Project EURLIPIDS.	262.500	P. Martinez Martinez
3	2017	Interreg	Interreg Herinneringen VLNL / J. Kleinjans / CCIcode: 2014TCI6RFCB046.	536.183	J. Kleinjans
3	2017	Stichting De Weijerhorst	Weijerhorst / Y. Temel / The UnderstandTrackAdjust Parkinson's disease study (UTAPstudy).	2.043.373	Y. Temel
3	2017	Oogfonds / Landelijke Stichting voor Blinden en Slechtzienden / Algemene Nederlandse vereniging ter voorkoming van Blindheid	UitZicht 2016 / project: Ontwikkeling van een innovatief iPSCafgeleide bioengineered endotheelcelcarrier voor endotheliale keratoplastiek.	89.000	F. van den Biggelaar
3	2017	HFL	HFL / Rutten / project: "Veerkracht na een kwetsbare start".	175.000	B. Rutten
3	2017	EU	EU grant no: 709723 / Nuijts / Dickman / HP European Cornea and Cell Transplantation Registry (ECCTR).	43.429	R. Nuijts / M. Dickman
3	2017	Alzheimer Nederland	Alzheimer Nederland / N. van Goethem / projectnummer WE.03201711 / a7 Subunit containing nAChR antagonism and the interaction with amyloidB in AD.	50.000	J. Prickaerts/ N. van Goethem
SUBTOTAL NEUROSCIENCE				**3.611.226**	
TOTAL MHeNs 2017				**5.955.206**	

3.2.4 Industrial Funders by division: 2017

Div.	Year	Funders	Project	Amount in €	Acquired by
SUBTOTAL CNP&CNS				**–**	
SUBTOTAL MENTAL HEALTH				**–**	
3	2017	St. Jude Medical Nederland B.V.	St. Jude / B. Joosten / Dorsal Root Ganglion Stimulation in neuropathic pain: Effect of stimulation settings and pain relief in an experimental model of painful diabetic polyneuropathy.	44.628	B. Joosten
3	2017	Grünenthal GmbH	Grünenthal / Prickaerts / Order Number 4500472465 / Effect of GRT6015 on memory function in a mouse object location test in a shortterm and longterm memory model (PH3577).	20.000	J. Prickaerts
SUBTOTAL NEUROSCIENCE				**64.628**	
TOTAL MHeNs				**64.628**	
Overall total MHeNs 2017				**8.467.348**	

3.3 Research staff 2016–2017

3.3.1 Research staff input at School level (n fte/year)

Position	2016	2017
Senior Research staff		
inclusive external funding		
Tenured staff	22,76	24,34
Nontenured staff	20,62	22,45
Subtotal senior research staff	43,38	46,79
PhD students		
PhD students	57,84	66,69
PhD students external (in#)	178	200
Total research staff	**101,22**	**113,48**
Supporting staff	18,79	18,15
Total staff	**120,01**	**131,63**

3.3.2 Research staff input at Cognitive Neuropsychiatry & Clinical Neuroscience (n fte/year)

Position	2016	2017
Senior Research staff		
inclusive external funding		
Tenured staff	9,88	10,76
Nontenured staff	8,76	10,69
Subtotal senior research staff	18,64	21,45
PhD students		
PhD students	27,52	32,55
PhD students external (in#)	61	60
Total research staff	**46,16**	**54,00**
Supporting staff	4,20	4,54
Total staff	**50,36**	**58,54**

3.3.3 Research staff input at Mental Health (n fte/year)

Position	2016	2017
Senior Research staff		
inclusive external funding		
Tenured staff	4,75	4,45
Nontenured staff	3,68	3,13
Subtotal senior research staff	8,43	7,58
PhD students		
PhD students	9,57	10,30
PhD students external (in#)	30	38
Total research staff	**18,00**	**17,88**
Supporting staff	6,27	6,00
Total staff	**24,27**	**23,88**

3.3.4 Research staff input at Neuroscience (n fte/year)

Position	2016	2017
Senior Research staff		
inclusive external funding		
Tenured staff	8,13	9,13
Nontenured staff	8,18	8,63
Subtotal senior research staff	16,31	17,76
PhD students		
PhD students	20,75	23,84
PhD students external (in#)	87	102
Total research staff	**37,06**	**41,60**
Supporting staff	8,32	7,61
Total staff	**45,38**	**49,21**

4. Output Results

4.1 Aggregated results of the School Output 2016 /2017

This overview presents the output, expressed as peer reviewed publications. The full list of publications is reported at our website (publications MHeNs 2016 and 2017). In chapter 4.2 the best 5 publications per year, per division are listed illustrating the core research.
In addition the overview below shows the number of PhDtheses. A full list of PhDtheses is listed in chapter 4.3.

Academic publications in refereed journals (wi1)	2016	2017**
Division I	210	185
Division 2	112	99
Division 3	160	203
Total Divisions	482	487
Total MHeNs*	437	440
PhD theses	40,7	46

* *Since some of the same publications are included in various Divisions there is a difference between the total number of the divisions and MHeNs in its entirety.*

** *Preliminary figures.*

4.2 5 top publications per year, with a first and/or last author per division core research

Division 1: Cognitive Neuropsychiatry & Clinical Neuroscience 2016

1. Broen, Martijn P. G. ; Köhler, Sebastian ; Moonen, Anja J. H. ; Kuijf, Mark L. ; Dujardin, Kathy ; Marsh, Laura ; Richard, Irene H. ; Starkstein, Sergio E. ; MartinezMartin, Pablo ; Leentjens, Albert F. G./ *Modeling anxiety in Parkinson's disease*. In: Movement Disorders. 2016 ; Vol. 31, No. 3. pp. 310316AF. [IFf 7.08]

2. van de Haar, H.J., BurgMans, S., Jansen, J.F.A., van Osch, M.T.J.P., van Buchem, M.A., Muller, M., Hofman, P.A.M., Verhey, F.R.J., and Backes, W.H., *BloodBrain Barrier Leakage in Patients with Early Alzheimer Disease* (vol 281, pg 527, 2016). Radiology, 2017. 282(2): p. 615615.[IF 7.296]

3. Vos, S.J.B., Gordon, B.A., Su, Y., Visser, P.J., Holtzman, D.M., Morris, J.C., Fagan, A.M., and Benzinger, T.L.S., *NIAAA staging of preclinical Alzheimer disease: discordance and concordance of CSF and imaging biomarkers.* Neurobiology of Aging, 2016. 44: p. 18.[IF 5.117]

4. Jansen, J.F., van Bussel, F.C., van de Haar, H.J., van Osch, M.J., Hofman, P.A., van Boxtel, M.P., van Oostenbrugge, R.J., Schram, M.T., Stehouwer, C.D., Wildberger, J.E., and Backes, W.H., *Cerebral blood flow, blood supply, and cognition in Type 2 Diabetes Mellitus*. Sci Rep, 2016. 6(1): p. 10.[IF 4.259]

5. Handels, R.L., Joore, M.A., Vos, S.J., Aalten, P., Ramakers, I.H., Rikkert, M.O., Scheltens, P., Jansen, W.J., Visser, P.J., van Berckel, B.M., van Domburg, P., Smid, M., Hoff, E., Hoogmoed, J., Bouwman, F., Claassen, J., Leentjens, A.F., Wolfs, C.A., Severens, J.L., and Verhey, F.R., *Added Prognostic Value of Cerebrospinal Fluid Biomarkers in Predicting Decline in Memory Clinic Patients in a Prospective Cohort*. J Alzheimers Dis, 2016. 52(3): p. 87585.[IF 3,731]

Division 1: Cognitive Neuropsychiatry & Clinical Neuroscience 2017

1. Handels, R.L.H., Vos, S.J.B., Kramberger, M.G., Jelic, V., Blennow, K., van Buchem, M., van der Flier, W., FreundLevi, Y., Hampel, H., Rikkert, M.O., Oleksik, A., Pirtosek, Z., Scheltens, P., Soininen, H., Teunissen, C., Tsolaki, M., Wallin, A.K., Winblad, B., Verhey, F.R.J., and Visser, P.J., Predicting progression to dementia in persons with mild cognitive impairment using cerebrospinal fluid markers. Alzheimers & Dementia, 2017. 13(8): p. 903912.[IF 9.478]

2. Zhang, C.E., Wong, S.M., van de Haar, H.J., Staals, J., Jansen, J.F.A., Jeukens, C.R.L.P.N., Hofman, P.A.M., van Oostenbrugge, R.J., and Backes, W.H., Bloodbrain barrier leakage is more widespread in patients with cerebral small vessel disease. Neurology, 2017. 88(5): p. 426432.[IF 8.320]

3. Bos, I., Vos, S.J., Frolich, L., Kornhuber, J., Wiltfang, J., Maier, W., Peters, O., Ruther, E., Engelborghs, S., Niemantsverdriet, E., De Roeck, E.E., Tsolaki, M., FreundLevim, Y., Johannsen, P., Vandenberghe, R., Lleo, A., Alcolea, D., Frisoni, G.B., Galluzzi, S., Nobili, F., Morbelli, S., Drzezga, A., Didic, M., van Berckel, B.N., Salmon, E., Bastin, C., Dauby, S., Santana, I., Baldeiras, I., de Mendonca, A., Silva, D., Wallin, A., Nordlund, A., Coloma, P.M., Wientzek, A., Alexander, M., Novak, G.P., Gordon, M.F., Wallin, A.K., Hampel, H., Soininen, H., Herukka, S.K., Scheltens, P., Verhey, F.R., Visser, P.J., and Initi, A.s.D.N., The frequency and influence of dementia risk factors in prodromal Alzheimer's disease. Neurobiology of Aging, 2017. 56: p. 3340.[IF 5.117]

4. Vos, S.J.B., van Boxtel, M.P.J., Schiepers, O.J.G., Deckers, K., de Vugt, M., Carriere, I., Dartigues, J.F., Peres, K., Artero, S., Ritchie, K., Galluzzo, L., Scafato, E., Frison, G.B., Huisman, M., Comijs, H.C., Sacuiu, S.F., Skoog, I., Irving, K., O'Donnell, C.A., Verhey, F.R.J., Visser, P.J., and Kohler, S., Modifiable Risk Factors for Prevention of Dementia in Midlife, Late Life and the OldestOld: Validation of the LIBRA Index. Journal of Alzheimers Disease, 2017. 58(2): p. 537547.[IF 3.731]

5. De Clerck, E.E.B., Schouten, J.S.A.G., Berendschot, T.T.J.M., Beckers, H.J.M., Schaper, N.C., Schram, M.T., Stehouwer, C.D.A., and Webers, C.A.B., Loss of Temporal Peripapillary Retinal Nerve Fibers in Prediabetes or Type 2 Diabetes Without Diabetic Retinopathy: The Maastricht Study. Investigative Ophthalmology & Visual Science, 2017. 58(2).[IF 3.303]

Division 2: Mental Health 2016

1 Reininghaus, U., Kempton, M.J., Valmaggia, L., Craig, T.K., Garety, P., Onyejiaka, A., GayerAnderson, C., So, S.H., Hubbard, K., Beards, S., Dazzan, P., Pariante, C., Mondelli, V., Fisher, H.L., Mills, J.G., Viechtbauer, W., McGuire, P., van Os, J., Murray, R.M., Wykes, T., MyinGermeys, I., and Morgan, C., Stress Sensitivity, Aberrant Salience, and Threat Anticipation in Early Psychosis: An Experience Sampling Study. Schizophr Bull, 2016. 42(3): p. 71222.[IF 7.575]

2 BartelsVelthuis, A.A., Wigman, J.T., Jenner, J.A., Bruggeman, R., and van Os, J., Course of auditory vocal hallucinations in childhood: 11year followup study. Acta Psychiatr Scand, 2016. 134(1): p. 615.[IF 6.79]

3 Bakker, G., Caan, M.W.A., Schluter, R.S., Bloemen, O.J.N., da SilvaAlves, F., de Koning, M.B., Boot, E., Vingerhoets, W.A.M., Nieman, D.H., de Haan, L., Booij, J., and van Amelsvoort, T.A.M.J., Distinct whitematter aberrations in 22q11.2 deletion syndrome and patients at ultrahigh risk for psychosis. Psychological Medicine, 2016. 46(11): p. 22992311.[IF 5.23]

4 Reininghaus, U., Gayer-Anderson, C., Valmaggia, L., Kempton, M.J., Calem, M., Onyejiaka, A., Hubbard, K., Dazzan, P., Beards, S., Fisher, H.L., Mills, J.G., McGuire, P., Craig, T.K., Garety, P., van Os, J., Murray, R.M., Wykes, T., Myin-Germeys, I., Morgan, C. Psychological processes underlying the association between childhood trauma and psychosis in daily life: an experience sampling study. Psychological Medicine, 2016. 46(13). p2799-813. [IF: 5.23]

5 van Duin, E.D.A., Goossens, L., Hernaus, D., Alves, F.D., Schmitz, N., Schruers, K., and van Amelsvoort, T., Neural correlates of reward processing in adults with 22q11 deletion syndrome. Journal of Neurodevelopmental Disorders, 2016. 8.[IF 3.852]

Division 2: Mental Health 2017

1. Klippel, A., MyinGermeys, I., ChavezBaldini, U., Preacher, K.J., Kempton, M., Valmaggia, L., Calem, M., So, S., Beards, S., Hubbard, K., GayerAnderson, C., Onyejiaka, A., Wichers, M., McGuire, P., Murray, R., Garety, P., van Os, J., Wykes, T., Morgan, C., and Reininghaus, U., Modeling the Interplay Between Psychological Processes and Adverse, Stressful Contexts and Experiences in Pathways to Psychosis: An Experience Sampling Study. Schizophrenia Bulletin, 2017. 43(2): p. 302315.[IF 7.58]

2. Rauschenberg, C., van Os, J., Cremers, D., Goedhart, M., Schieveld, J.N.M., and Reininghaus, U., Stress sensitivity as a putative mechanism linking childhood trauma and psychopathology in youth's daily life. Acta Psychiatrica Scandinavica, 2017. 136(4): p. 373388.[IF 6.79]

3. van der Steen, Y., GimpelDrees, J., Lataster, T., Viechtbauer, W., Simons, C.J.P., Lardinois, M., Michel, T.M., Janssen, B., Bechdolf, A., Wagner, M., and MyinGermeys, I., Clinical high risk for psychosis: the association between momentary stress, affective and psychotic symptoms. Acta Psychiatrica Scandinavica, 2017. 136(1): p. 6373.[IF 6.79]

4. Mentzel, C.L., Bakker, P.R., Van Os, J., Drukker, M., Matroos, G.E., Hoek, H.W., Tijssen, M.A.J., and van Harten, P.N., Effect of Antipsychotic Type and Dose Changes on Tardive Dyskinesia and Parkinsonism Severity in Patients With a Serious Mental Illness: The Curacao Extrapyramidal Syndromes Study XII. Journal of Clinical Psychiatry, 2017. 78(3): p. E279E285.[IF 5.29]

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Division 3: Neuroscience 2016

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4.3 PhD Theses 2016/2017

Division 1 2016

Last name	Initials	Thesis defence	Promotor	Copromotor	Titel Thesis
Arts	R.A.G.J.	15–1–2016	Prof. Dr. R. Stokroos	Dr. E. George	*Intracochlear electrical stimulation to suppress tinnitus*
Boots	L.	17–2–016	Prof. Dr. F. Verhey Prof. Dr. G. Kempen	Dr. M. de Vugt	*Balanced and Prepared: development and evaluation of a supportive ehealth intervention for caregivers of people with earlystage dementia*
Broen	M.	21–2–2016	Prof. Dr. R. van Oostenbrugge	Dr. A. Leentjens Dr. M. Kuijf	*Anxiety and depression in Parkinson's disease*
Bussel, van	F.	9–6–2016	Prof. Dr. Ir. W. Backes Prof. Dr. P. Hofman	Dr. J. Jansen	*Advanced MRI in diabetes; cerebral biomarkers of cognitive decrements*
Eeden, van	M.	22–1–2016	Prof. Dr. S. Evers Prof. Dr. C. v. Heugten	Dr. G. van Mastrigt	*The €–Restore4stroke study: Economic evaluation of stroke care in the Netherlands*
Geerlings	R.	15–6–2016	Prof. Dr. A. Aldenkamp	Dr. A. de Louw (Kempenhaeghe) Dr. L. Gottmer (Kempenhaeghe)	*Transition in patients with childhoodonset epilepsy; a long way to adulthood.*
Gerlach	O.H.H.	15–1–2016	Prof. Dr. R. van Oostenbrugge	Dr. W. Weber	*Parkinson's disease, deterioration during hospitalization*
Haar, van de	H.	10–11–2016	Prof. Dr. Ir. W. Backes Prof. Dr. F. Verhey	Dr. J. Jansen Dr. Ir. M. van Osch	*Microvascular and bloodbrain barrier dysfunction in Alzheimer's disease*
Ijff	D.	91–2–2016	Prof. Dr. A. Aldenkamp Prof. Dr. H. Majoie	Dr. J. Jansen Dr. R. Lazeron (Kempenhaeghe)	*Trick or Treat? Cognitive sideeffects of antiepileptic treatment*
Jansen	W.	25–11–2016	Prof. Dr. F. Verhey	Dr. P.J. Visser Dr. I. Ramakers	*The Path of Alzheimer's disease: from neuropathology to clinic*
Lambrechts	D.	1–6–2016	Prof. Dr. H. Majoie Prof. Dr. H. Vles Prof. Dr. A. Aldenkamp	Dr. A. de Louw (Kempenhaeghe)	*Ketogenic diet therapies; treatment for children and adults with refractory epilepsy*
Millenaar	J.	22–12–2016	Prof. Dr. F. Verhey Prof. Dr. R. Koopmans (RUN)	Dr. M. de Vugt Dr. C. Bakker (RUN)	*Young onset dementia; towards a better understanding of care needs and experiences*
Moonen	A.J.H.	24–3–2016	Prof. Dr. F. Verhey	Dr. A. Leentjens	*Emotion and Cognition in Parkinson's disease; etiology and neurobiological mechanisms*

Last name	Initials	Thesis defence	Promotor	Copromotor	Titel Thesis
Muris	A.H.	7–10–2016	Prof. Dr. R. Hupperts	Dr. J. Damoiseaux Dr. J. Smolders (CWZ Nijmegen)	*Hype or hope? Vitamin D in multiple sclerosis; A clinical and immunological perspective*
Peijnenborgh	J.	22–12–2016	Prof. Dr. J. Vles Prof. Dr. A. Aldenkamp	Dr. J. Hendriksen Dr. P. Hurks	*Assessment of cognition, time perception, and motivation in children*
Schipper	S.	8–12–2016	Prof. Dr. J. Vles	Dr. G. Hoogland Dr. S. Klinkenberg Dr. M. Aalbers	*Extrasynaptic receptors as a treatment target in epilepsy*

Division 1 2017

Last name	Initials	Thesis defence	Promotor	Copromotor	Titel Thesis
Barendse	E.	7–9–2017	Prof. Dr. A. Aldenkamp Prof. Dr. R. Kessels (Radboud)		*Autism Spectrum Disorders in High functioning Adloscents; Diagnostic considerations (AHA).*
Bogaarts	J.G.	23–2–2017	Prof.Dr. W. Mess	Dr.ir. J. Reulen Dr.Ir. E. Gommer	*Quantitative EEG and machine learning methods for the detection of epileptic seizures and cerebral asymmetry*
Bouwmans	A.	26–1–2017	Prof.Dr. W. Mess	Dr. W. Weber Dr. A. Leentjens	*Transcranial sonography in parkinsonian disorders: clear window or blurred vision?*
Buskermolen	W.	4–5–2017	Prof.Dr. A. Aldenkamp	Dr. J. Hoekman (UL)	*If only I could tell ...; Measuring predictors for challenging behaviour in people with both intellectualdisability and hearing impairment*
Cleutjens	A.	16–6–2017	Prof. Dr. E. Wouters Prof. Dr. R. Ponds	Dr. D. Janssen Dr. J. Dijkstra	*Cognitive Pulmonary Disease? Neuropsychological functioning in patients with COPD*
Dandachi-Fitzgerald	B.	2–6–2017	Prof. Dr. F. Verhey Prof. Dr. R. Ponds		*Symptom validity in a clinical assessments.*
Deckers	K.	11–5–2017	Prof.Dr. F. Verhey	Dr. M. van Boxtel Dr. S. Kohler	*The role of lifestyle factors in primary prevention of dementia; an epidemiological perspective*
Douven	E.	8–12–2017	Prof. Dr. F. Verhey	Dr. P. Aalten Dr. J. Staals	*Depression and Apathy after Stroke; The influence of risk factors on their development and course*

Last name	Initials	Thesis defence	Promotor	Copromotor	Titel Thesis
Hendriksen	R.	16–11–2017	Prof. Dr. J. Vles	Dr. G. Hoogland Dr. M. Aalbers	*Evidence for a dystrophinassociated encephalopathy in Duchenne Muscular Dystrophy*
Knippenberg, van	R.	17–3–2017	Prof.Dr. F. Verhey Prof.Dr. R. Ponds Prof.Dr. I. MyinGermeys (Leuven)	Dr. M. de Vught	*Experience sampling in dementia care; an innovative intervention to support caregivers in daily life*
Laar, van de	M.	3–5–2017	Prof.Dr. A. Aldenkamp Prof. Dr. D. Pevernagie	Dr. S. Overeem	*Individual differences in insomnia; implications of Psychological factors for diagnosis and treatment*
Rolf	L.	24–11–2017	Prof. Dr. R. Hupperts	Dr. J. Damoiseaux Dr. J. Smolders	*Mapping the effects of vitamin D in multiple sclerosis: a 3D perspective*
Smit	D.	12–1–2017	Prof. Dr. R. Stokroos Prof. Dr. B. Kramer Prof. Dr. B. Kremer		*Perinatal factors and hearing outcome*
Uijterwijk	R.	7–12–2017	Prof. Dr. R. Oostenbrugge	Dr. J. Staals	*Cognitive function and cerebral small vessel disease in hypertension*
Veenendaal, van	T.	13–7–2017	Prof. Dr. Ir. W. Backes Prof. Dr. A. Aldenkamp	Dr. J. Jansen	*Neurotransmitters & Networks. An MR view on epilepsy and antiepileptic drugs*

Division 2 2016

Last name	Initials	Thesis defence	Promotor	Copromotor	Titel Thesis
Frissen	A.	21–12–2016	Prof. Dr. J. van Os		*Psychosis and the environment; Multimodal assessment of environmental risk factors for psychotic disorders*
Heins	M.	5–10–2016	Prof. Dr. I. Germeys	Dr. D. Collip	*The Relationship between Social Adversity, Psychosis and Depression across an Individual's Life Span*
Kasanova	Z.	25–5–2016	Prof. Dr. I. MyinGermeys		*Environmental reactivity for better or worse; The impact of stress and reward on neurochemistry, affect and behaviour across the psychosis continuum*
Luijcks	R.	28–10–2016	Prof. Dr. J. van Os Prof. Dr.Ir. H. Hermens (UT)	Dr. R. Lousberg	*Stress and pain in muscles and brain; developing psychophysiological paradigms to examine stress and pain interactions*

Last name	Initials	Thesis defence	Promotor	Copromotor	Titel Thesis
Ven, van der	E.M.A.	22–4–2016	Prof. Dr. J.P. Selten Prof. Dr. J. van Os		*Ethnic minority position as risk indicator for autismspectrum and psychotic disorders*

Division 2 2017

Last name	Initials	Thesis defence	Promotor	Copromotor	Titel Thesis
Bakker	G.	12–4–2017	Prof.Dr. T. van Amelsvoort Prof.Dr. J. Booij (UvA)	Dr. M. Caan (UvA) Dr. O. Bloemen	*Innovative Approaches to Understanding the Neurobiology of Psychosis.*
Batink	T.	20–10–2017	Prof. Dr. F. Peeters Prof. Dr. J. van Os Prof. Dr. M. Wichers (UMCG)		*Third Wave Behaviour Therapy: Process Measures and Contextual Interventions*
Boevink	W.	13–4–2017	Prof.Dr. J. van Os Prof.Dr. Ph. Delespaul	Dr. H. Kroon	*What psychiatric patients effectively do to help themselves*
Domen	P.	12–4–2017	Prof.Dr. J. van Os	Dr. M. Marcelis	*Stay connected: a family-based diffusion imaging study in psychotic disorder.*
Honings	S.	22–12–2017	Prof. Dr. J. van Os	Dr. M. Drukker	*Exploring psychosis and multidirectional violence: a prospective study in the general population*
Lange	I.	9–11–2017	Prof. Dr. K. Schruers Prof. Dr. T. van Amelsvoort	Dr. L. Goossens	*Should I stay or should I go? Brain mechanisms underlying fear and safety learning, and explosure therapy outcome*
Leue	C.	14–12–2017	Prof. Dr. J. van Os Prof. Dr. A. Masclee	Dr. J. Strik Dr. J. Kruimel	*Hyperarousal in the Hospital and what to do about it: the MEDPSYCHNET a transitional network approach fostering personalized care in psychosomatic medicine*
Mentzel	C.	4–10–2017	Prof. Dr. P. van Harten Prof. Dr. M. de KoningTijssen (UMCG)	Dr. P. Bakker	*The course recognition and treatment of movement disorders in severe mental illness*
Pessia	M.	11–12–2017	Prof. Dr. H. Steinbusch Prof. Dr. M. Donati		*Brain K+ Channels: from molecular and physiological features to autism spectrum disorder and intellectual disability*
Vingerhoets	C.	23–3–2017	Prof.Dr. T.A.M.J. van Amelsvoort Prof.Dr. J. Booij (UvA)	Dr. O.J.N. Bloemen	*Investigating neurobiological mechanisms underlying comorbid cognitive symptoms in psychosis and substance use*

Division 3 2016

Last name	Initials	Thesis defence	Promotor	Copromotor	Titel Thesis
Akkerman	S.	24–3–2016	Prof. Dr. H. Steinbusch	Dr. J. Prickaerts Dr. A. Blokland	*Temporal aspects of cyclic messenger signaling in object recognition*
Bode	G.	14–10–2016	Prof. Dr. M. de Baets	Dr. P. Martinez Dr. M. Losen	*The link between ceramide transporters, innate Immunity and Alzheimer's disease*
Burgstaller	J.	12–12–2016	Prof. Dr. M. van Kleef	Dr. M. Wertli (Zurich) Dr. H. Gramke	*Prognostic indicators for patients with degenerative lumbar spinal stenosis*
Carreira	J.	8–12–2016	Prof. Dr. Y. Temel	Dr. A. Jahanshahi Dr. W. van RoonMom (LUMC)	*Making sense of Antisense Oligonucleotides Therapy in Experimental Huntington's disease*
Claes	N.	16–6–2016	Prof. Dr. V. Somers (Hasselt) Prof. Dr. R. Hupperts	Prof. Dr. P. Stinissen Dr. J. Fraussen (Hasselt)	*B cells as multifactorial players in multiple sclerosis pathogenesis: insights from therapautics*
Donders	W.	6–7–2016	Prof. Dr. T. Delhaas Prof. Dr. Ir. F. van de Vosse	Dr. Ir. W. Huberts	*Towards patientspecific (cerebro) vascular model applications*
Dos Santos Mendes Lemes	L.	11–2–2016	Prof. Dr. H. Steinbusch	Dr. R. Weffort de Oliveirea Dr. J. Prickaerts	*Phosphodiesterase inhibitors: a potential therapeutic approach for ischemic cerebral injury*
Ganzewinkel, van	C.	6–10–2016	Prof. Dr. B. Kramer	Dr. P. Andriessen (MMC Veldhoven)	*NEONATAL PAIN; Out of Sight, Out of Mind?*
Haanschoten	M.	13–10–2016	Prof. Dr. W. Buhre Prof. Dr. A. van Zundert (Queensland)	Dr. M. Soliman Hamad Dr. A. van Straten (CZE)	*Towards efficient cardiac surgery – the integrating role of anesthesiology and intensive care*
Hohnen	R.	25–2–2016	Prof. Dr. Ph.E. van Kerrebroeck	Dr. G. van Koeveringe Dr. M. Sahnama'i Dr. C. Meriaux	*Peripheral pharmacological targets to modify bladder contractility*
Hurk, van de	M.	13–12–2016	Prof. Dr. H. Steinbusch Prof. Dr. B. Rutten	Dr. G. Kenis Dr.C. Bardy (Adelaide)	*Neuronal Identity and Maturation: Insights from the SingleCell Transcriptome*
Itz	C.	16–11–2016	Prof. Dr. M. van Kleef Prof. Dr. F. Huygen	Dr. B. Ramaekers	*Chronic low back pain, considerations about: Natural Course, Diagnosis, Interventional Treatment and Costs*
Kocabicak	E.	26–2–2016	Prof. Dr. Y. Temel Prof. Dr. K. van Overbeeke	Dr. A. Jahanshahi	*Deep brain stimulation of the subthalamic nucleus: clinical and scientific aspects*
Nikiforou	M.	20–12–2016	Prof. Dr. B. Kramer Prof. Dr.H.Steinbusch	Dr. T. Wolfs	*Prenatal stress and the fetal gut. Potential interventions to prevent adverse outcomes*

Last name	Initials	Thesis defence	Promotor	Copromotor	Titel Thesis
Ramirez	A.	9–12–2016	Prof. Dr. B. Rutten Prof. Dr.H.Steinbusch Prof. Dr. M. Nöthen		*Neurogenetic approach in neurodegenerative disorders*
Schijns	O.	1–7–2016	Prof. Dr. J. van Overbeeke Prof. Dr. H. Clustermann (Aachen)	Dr. G. Hoogland Dr. M. van Kroonenburgh	*Epilepsy surgery and biomarkers from history to molecular imaging*
Schönfeldt	L.	10–6–2016	Prof. Dr. Y. Temel Prof. Dr. S. Hendrikx (Hasselt)	Dr. A. Jahanshahi	*Neurostimulation to treat brain injury?*
Schüth	A.K.D.	21–4–2016	Prof. Dr. G. van Koeveringe Prof. Dr. M. van Zandvoort Prof. Dr. Ph. Van Kerrebroeck		*Threedimensional bladder tissue morphology*
Stevens	J.	28–10–2016	Prof. Dr. M. de Baets	Dr. M. Losen Dr. P. Martinez	*Advanced diagnostics and therapeutics for Alzheimer's disease*
Vanterpool	S.	30–9–2016	Prof. Dr. B. Kramer	Dr. J. Been (Erasmus MC) Dr. U. van Rango	*The implications of intrauterine invasion by microbes for placental Pathology and the occurrence of adverse pregnancy outcomes*
Visser	N.	9–12–2016	Prof. Dr. R. Nuijts	Dr. N.J.C. Bauer	*Toric Intraocular lenses in cataract surgery*

Division 3 2017

Last name	Initials	Thesis defence	Promotor	Copromotor	Titel Thesis
Barkhuizen	M	4–12–2017	Prof. Dr. B. Kramer Prof. Dr.H.Steinbusch Prof. Dr. A. Grobler	Dr. A. Gavilanes	*Genetic and perinatal risk factors for movement disorders*
Clerc k, de	E	22–12–2017	Prof. Dr. C. Webers Prof. Dr. C. Stehouwer	Dr. J. Schouten	*Ocular neurodegenerative changes and macular cysts in prediabetes and type 2 diabetes*
Gofeld	M.	17–11–2017	Prof. Dr. M. van Kleef	Dr. M. Sommer	*Strengths and limitations of the lumbar spine ultrasound-guided interventions*
Heckman	P.	4–7–2017	Prof. Dr. J. Ramaekers (FPN)	Dr. J. Prickaerts Dr. A. Blokland (FPN)	*Targeting phosphodiesterase type 4 for improving cognitive frontostriatal functioning: a translational approach*
Herps	M.	26–10–2017	Prof. Dr. L. Curfs	Dr. W. Buntinx	*Real Lives on Paper Plans; Individual Support Planning for People with Intellectual Disabilities*

Last name	Initials	Thesis defence	Promotor	Copromotor	Titel Thesis
Herrera Soto	A.	18–12–2017	Prof. Dr.H.Steinbusch	Prof. Dr. J. SeguraAquilar Prof. G. DiazVeliz	*Aminochrome, an endotoxin for inducing a new rat model of Parkinson's Disease*
Janssen	P.	11–2–2017	Prof. Dr. N. Bouvy Prof. Dr. Y. Temel	Dr. S. Breukink	*Sacral Neuromodulation: from mechanisms to clinical applications*
Keijzer	H.	19–10–2017	Prof. Dr. L. Curfs	Dr. K. Spruyt Dr. M. Smits (Ede)	*Melatonin treatment in circadian rhythm sleepwake disorders: towards personalized sleep medicine*
Lardenoije	R.	7–9–2017	Prof. Dr. B. Rutten Prof. Dr.H.Steinbusch	Dr. D. van den Hove Dr. C. Lemere (USA)	*A venture into the epigenetics of aging and Alzheimer's Disease*
Levy	M.	5–4–2017	Prof. Dr.H.Steinbusch Prof.Dr. L. Lanfumey (Parijs)	Dr. G. Kenis Dr. D. van den Hove	*Evaluation of BDNF/TrkB signaling as a common target in the treatment of major depression and Alzheimer's disease.*
Markova	N.	2–5–2017	Prof.Dr. H. Steinbusch Prof.Dr. K.P. Lesch (Wurzburg)	Dr. T. Strekalova	*Modified swim test as a mouse depression paradigm of enhanced Cognitive processing: the role of GSK3*
Muller	M.	24–2–2017	Prof.Dr. B. Kramer Prof.Dr. B. Surbek (Bern)	Dr. T. Wolfs Dr. D. Gavilanes	*Pregnancy derived products for treatment of perinatal brain injuries*
Oerlemans	D.	31–3–2017	Prof.Dr. Ph.E. van Kerrebroeck Prof.Dr. G. van Koeveringe	Dr. E. Weil Dr. T. Marcelissen	*Evolution of Neuromodulation for Lower Urinary Tract Dysfunction; Past, Present and Future.*
Ophelders	D.	16–3–2017	Prof.Dr. B. Kramer	Dr. T. Wolfs Dr. R. Jellema	*Novel treatment strategies for the protection of the preterm brain; Rebalancing inflammation and regeneration*
Rademakers	K.	26–10–2017	Prof. Dr. G. van Koeveringe Prof. Dr. Ph.E. van Kerrebroeck	Dr. M. Oelke	*Detrusor Underactivity: From Theory To Clinical Assessment*
Serpero	L.	19–6–2017	Prof. Dr. D. Gazallo (Alessandria, Ita) Prof. Dr. B. Kramer	Dr. A. Gavilanes	*Next Generation Biomarkers in Perinatal Medicine: S100B Protein*
Stessel	B.	10–2–2017	Prof.Dr. W. Buhre Prof.Dr. B. Joosten	Dr. A. Gramke	*Patient centred care after day surgery: scope for improvement*
van Beek	M.	30–11–2017	Prof. Dr. E. Joosten Prof. Dr. M. van Kleef	Dr. S. van Kuijk	*Spinal Cord Stimulation in Clinical and Experimental Painful Diabetic Polyneuropathy*

Last name	Initials	Thesis defence	Promotor	Copromotor	Titel Thesis
van Poucke	S.	5–7–2017	Prof. Dr. M. Marcus Prof. Dr. W. Buhre	Dr. M. Lancé	*Platelets, from sample to big data; exploring granularity in platelet research*
Varrica	A.	19–6–2017	Prof. Dr. D. Gazallo (Alessandria, Ita) Prof. Dr. J. Vles Prof. Dr. L. Zimmermann	Dr. A. Gavilanes	*S100B Protein and Congenital Heart Diseases: Brain Aspects*
Vrijens	D.	6–7–2017	Prof. Dr. Ph. E. van Kerrebroeck Prof. Dr. G. van Koeveringe	Dr. C. Leue	*Dysfunctions of the Lower Urinary Tract and Affective Symptoms*
Zwaans	W.	17–11–2017	Prof. Dr. M. van Kleef	Dr. R. Roumen (MMC) Dr. M. Scheltinga	*Strategies for chronic inguinal pain*

5. Master's and PhD education

5.1 Master's Programmes

Training of Master and PhD students in the area of neuroscience and related medical disciplines is a primary aim of MHeNs. In addition, MHeNs coordinates the European Graduate School of Neuroscience (EURON) and has an internationally recognized PhD educational programme.

MHeNs is involved in the curricula of several Master's programmes of the Faculty of Health, Medicine and Life Sciences (FHML) and the Faculty of Psychology and Neuroscience (FPN). Personnel for these programmes is provided by the complementary educational capacity granted by the FHML Educational Institute, which is awarded by departments to qualified staff members. Primarily MHeNs personnel from the departments of Psychiatry and Neuropsychology and the department of Neurology are deployed in the master programmes. E.g., in 2017 in the dept. of Psychiatry and Neuropsychology alone, 45% (5,7 fte) of all teaching (12,8 fte) was spent in the master programmes, particularly in the Research Master in Cognitive and Clinical Neuroscience (see below).

Research Master in Cognitive and Clinical Neuroscience (RMCCN)

This selective 2 years research master (RM) programme provides six top training specialisations in Cognitive and Clinical Neuroscience for students aiming to become high-level researchers in academia, or envisioning a career in industrial, governmental, clinical, or other work environments.

- Cognitive Neuroscience
- Drug Development and Neurohealth
- Fundamental Neuroscience
- Neuroeconomics
- Neuropsychology
- Psychopathology

The different specializations are jointly organized by the faculties Psychology and Neuroscience, Health, Medicine and Life Sciences and the School of Business and Economics (SBE).
The number of admissions of students in the RMCCN is illustrated in table 1.

	2016	2017
RM CCN	**107**	**102**
Cognitive Neuroscience	17	17
Drug Development and Neurohealth	15	13
Fundamental Neuroscience	22	22
Neuroeconomics	10	10
Neuropsychology	22	24
Psychopathology	21	16

Table 1: the number of RM CCN students, per year and specialization.

MHeNs staff is involved in all specialisations and is coordinating the Fundamental Neuroscience specialization (coordinator Jos Prickaerts). The specializations Fundamental Neuroscience (FN, 1,0 fte WP staff involvement), Neuropsychology (NP, 0,4 fte) and Psychopathology (PP, 0,35 fte) form and important source of PhD students for the MHeNs PhD programme.

Research Master Physician-Clinical Investigator (AKO)

This 4 year RM has started in 2009 and has provided since then promovendi to MHeNs. The four-year FHML programme offers the opportunity to combine a medical degree with a clinical investigator degree. MHeNs staff is involved in this programme, as being coordinators of different modules, coordination of the neuroscience internships, and several other important teaching roles within the programme.

Master Biomedical Sciences (BMS)

The master's degree in Biomedical Sciences is jointly offered by Maastricht University and Hasselt University in Diepenbeek (Belgium), together referred to as the transnational University Limburg (tUL).
The BMS programme offers, since a reorganisation in 2017, five research specialisations. After the first multidisciplinary block on Biomedical Challenges, students choose one of the following specialisations:

- Genetics and Genomics
- Inflammation and Pathophysiology
- Nutrition, Physical Activity and Metabolism
- Regenerative Medicine
- Imaging from Molecule to Men

MHeNs staff is involved in this programme, as course planners, being teachers in different courses, supervisors of neuroscience internships, and several other important teaching roles within the programme. One of the specialisations, Inflammation and

Pathophysiology, is coordinated by MHeNs (coordinator Pilar Martinez). Within BMS, internships to gain practical and professional experience, is an important part. The BMS therefore contains a junior internship and a 30 to 32-week senior internship, which may take place at MHeNs or another approved laboratory, in the Netherlands or abroad.
In addition, the BMS master programme, offers a Double Degree programme, that is coordinated by MHeNs and focussing on Neuroscience., The programme was set up between MHeNs, 3 other partner universities (Université Lille, Université catholique de Louvain and the University of Cologne), and 3 Japanese universities (Tohoku University, Toho University and Kyoto Prefectural University of Medicine), all in the framework of an EU-financed exchange programme that has run from October 2013 – 2017. MHeNs and 3 other partners (Université Lille, Université catholique de Louvain and the University of Cologne) were involved in this programme. In total 23 BMS students (period 20142017) went to Japan for their 2nd Master's year (speciality Neuroscience).

International Master in Affective Neuroscience
The International Master of Affective Neuroscience is a postgraduate joint degree master programme from the Universities of Maastricht and Florence. The programme teaches scientific competences in the subspecialty of affective neuroscience, dealing with the latest developments in the field taught by leading scientists. The programme is a combination of distance teaching, scientific research and residential courses. The division Mental Health is co-organizer of this joint master's degree programme. Chairman of the Board is Dr K. Schruers, Professor of Experimental Psychiatry. In 2016, 26 new students were enrolled in the Summer School programme of which 9 continued with the Affective Neuroscience master programme. In 2017, 34 new students were enrolled in the Summer School programme of which 16 continued with the master. A total of 5 students in 2016 and 5 in 2017 have graduated.

5.2 PhD Programme

Respectively, in 2016 and 2017, MHeNs has in total 264 and 301 registered PhD candidates, of whom 86 and 101 are employed by MHeNs as regular PhD students. Furthermore, there are 178 and 200 external promovendi, respectively. Regular PhD contracts run for 3 or 4 (more common) years. Each candidate is supervised by at least two researchers, including at least one full professor. MHeNs has established educational guidelines, whereby PhD students with a 4-year contract are expected to complete educational activities equivalent to at least 20 European credits (EC/ECTS). The PhD students formulate and regularly update their personal education plan in consultation with his/her supervisors, based on an assessment of previously acquired competencies, skills specifically needed for the PhD research, more general knowledge and skills, and future career plans.
The PhD student programme of MHeNs has a strong multidisciplinary character and is embedded within the European Graduate School of Neuroscience (EURON). As part of their training, PhD candidates are expected to follow both general courses offered by Maastricht University (for example, writing skills, statistics, teaching skills, and career development) in addition to specific, research-related courses organized by MHeNs and EURON (Annex 1). In addition PhD students have had the opportunity to present their work via oral or poster presentations at the annual Research Day of MHeNs (Nov. 30th, 2016; Nov. 29th, 2017) and in addition at the annual EURON PhD days (Oct. 1314, 2016, Université Lille, France; Oct. 2526, 2017, Maastricht University).
To improve the cohesion and interdisciplinary of research training across the three divisions, MHeNs instituted the "Topics in Translational Neuroscience" PhD workshops, which are organized once or twice a year. These workshops consist of two parts: expert talks in the morning and an interactive programme of using group discussion, debates or assignments in the afternoon. Respectively, in 2016 and 2017 MHeNs has organized the 10th MHeNs one-day workshop for PhD students "Recovery after stroke: a translational perspective" (May 24, 2016) and the 11th on "Studying Experience and Behaviour in Neuroscience: Methods and Challenges" (Jan. 9, 2017). In addition, MHeNs organizes annually the basic theoretical and practical 4 days course on "Human Neuroanatomy to Psychopathology" in which many staff members of MHeNs are involved.

European Graduate School of Neuroscience (EURON)
EURON is a research and training network of 8 Belgian, Dutch, French, German, French and Luxembourg universities whose partners aim to share expertise and knowledge to offer Master and PhD students a unique chance to broaden their research competencies and horizon. Ever since 1995, MHeNs has been the principal coordinator of EURON. EURON aims for joint PhD positions between partner universities resulting in joint or double PhD doctorates and in addition EURON organizes PhD courses and workshops with input of the expertise of all EURON partners.

In addition to participating in the international EURON network MHeNS has created an international atmosphere in which 40% of its PhD students are from abroad and 22 nationalities are represented. While the international environment of MHeNS stimulates the breakdown of cultural boundaries and opens communication between different backgrounds, students are encouraged to explore scientific perspectives by learning from other departments, disciplines, institutes, universities and international scholars. Master and PhD students are thus trained to look across traditional boundaries and make use of various scientific perspectives.

There is a continuous exchange of PhD students between MHeNs research groups and international collaborating partners, within and beyond EURON. PhD students are stimulated to perform part of their research in international labs, as these visits are mandatory to obtain the MHeNs and EURON certificates (see below). Many of these collaborations concern mutual PhD projects and often result in a joint or double PhD degree.

MHeNs and EURON certificate

To receive a MHeNs certificate at the end of the PhD trajectory, the PhD candidate needs to have at least the following activities included in the required 20 EC: at least one presentation (oral or poster) of the PhD research at a national or international congress; at least two presentations (oral or poster) at the annual MHeNs Research Day; participation in two or more MHeNs Topics in Translational Neuroscience workshops. There are separate requirements for the MHeNs certificate and the EURON certificate; it is possible to obtain both. For the EURON certificate the most important requirement is a scientific exchange visit(s), related to the PhD research, preferably to other EURON research groups (or other international research group) for a total period of at least 3 months. Respectively, in 2016 and 2017, 6 and 7 PhD candidates qualified for the MHeNs certificate whereas 4 and 6 PhD candidates qualified for the EURON certificate.

MHeNs Educational Committee

The MHeNs Educational Committee comprises senior researchers involved in both Master and PhD education and representing the three MHeNs divisions (as well as EURON). Two PhD student representatives from each division attend the Educational Committee meetings, advising on policy decisions and informing about target group's expectations.

MHeNs PhD coordinator

The MHeNs PhD coordinator's role is to facilitate communication between promovendi and the MHeNs Board, to monitor the School's PhD educational programme and develop new course offerings, and to provide confidential support and guidance. Since January 2016, Dr Martin van Boxtel has served in this role.

Monitoring of PhD progress and satisfaction

The online monitoring system TRACK plays a central role in assuring the quality of the PhD trajectory. TRACK not only enables closer monitoring of the PhD students via twice yearly progress assessments, it also enables PhD students and supervisors to develop, update, and share the individual Training and Supervision Plan (TSP), the Personal Research Plan, and the PhD's portfolio of educational and professional activities, as well as research output. Furthermore, in an annual survey, PhD students assess their own progress, education, and career development; quality of supervision is assessed in a strictly confidential section of this survey, visible only to the PhD coordinator. This information is used to improve the quality of the PhD training programme in general, but also (as needed, and with the respondent's permission) to investigate individual interventions to facilitate progress or improve communication within the research team. Via TRACK document folders as well as via the MHeNs website promovendi have access to all information needed at each stage of the PhD trajectory: endterms, UM dissertation regulations, requirements for obtaining the MHeNs education certificate, etc. Additional information is regularly forwarded to them by the PhD coordinator and the MHeNs office

MHeNs PhD representation

PhD students from each division elected two representatives forming the PhD committee of the school. One of the committee members is selected as general PhD representative. The role of the PhD committee and the PhD representative is to facilitate communication between PhD students, the PhD coordinator and the MHeNs Board, to facilitate

communication among PhD students over the three MHeNs divisions and to help develop PhD grassroots initiatives. They meet on a regular basis to discuss PhD matters (every two months) and think of ways to improve or further develop PhD education, for example by implementing activities such as discussion rounds, symposia, etc. In addition they have organised "Pizza meetings" on the following topics: "What comes after your PhD" by Nienke Jabben (2016), "What comes after your PhD" by Jos Prickaerts and Jeroen van Deursen (Nov. 2016) and "The river of my PhD life: rediscovering my motivation and accomplishments" by Lukas Figge (March 2017), "Help my career to the next level: tips and tricks for great grant proposals!" by Marco Berndes (June 2017), and "Boost your attention" by Lotte berk (Sept. 2017). To stimulate collaboration between divisions and giving the PhD students the opportunity to get to know each other, the PhD representatives organise annually a mingle day. The annual mingle days of 2016 and 2017 took place on Dec. 9th, 2016 and Dec. 15th,2017 and were organised with interesting discussions and workshops regarding the respective themes "How to get your research out there" and "Publishing 101".

Feedback on quality of PhD education and supervision

MHeNs systematically obtains feedback from current PhD students to improve education and supervision. Every MHeNs and EURON course or workshop is evaluated via an online assessment; results are summarized and presented to the course organizers and the MHeNs Educational Committee. Quality of supervision is monitored via a confidential annual survey. MHeNs implemented this online survey in 2010; as of 2014, it is incorporated into the TRACK monitoring system. Questions are completed for each member of the supervision team, as well as for the team as a whole. So far this information has remained confidential and available to the PhD coordinator only, to safeguard the privacy of the student.

Guidance of PhDs to labour market

As noted above, the MHeNs PhD Educational Programme puts considerable emphasis on the development of competencies and transferrable skills. In addition, through participation in UM PhD workshops on career management, individual branding, valorisation, and individual guidance programmes, promovendi are encouraged to explore a broad range of career options and to prepare themselves for the transition to the labour market (academic, clinical, industry, or other). An important aspect is that MHeNs encourages PhD students during their PhD trajectory to go abroad for a period between 36 months to receive international experience. It is important for future research career opportunities that PhD tracks are completed within 4-5 years. 80% of MHeNs regular PhDs currently achieve this, with the remainder completing the degree within 6 years. Within this latter group, many work parttime on their thesis, combining this with their clinical duties. The mean study duration is currently 4.24 years.
Follow-up data indicate that MHeNs PhD alumni are successful in obtaining jobs in various categories of employment.

FHML/ Maastricht UMC+ Talent Policy

The FHML/Maastricht UMC+ wishes to adopt a well-balanced Talent Management system, offering talented academics opportunities to develop their talent at their own pace, excel in their area of expertise and acquire new useful skills, while acknowledging the impact of the broader research team and institutional context, and the involvement of multiple stakeholders. Supervisors, heads of departments and programme/ division leaders play a pivotal role in the talent policy as regards to young academic talents, in the sense of recognising and propelling talents in an early stage and bringing them into contact with those that can facilitate their growth/career path within (and even outside) the organisation. Excellent PhD candidates are encouraged to write a grant research proposal. The scientific directors of the schools, heads of departments, and the dean/vice dean and other members of the board play an important role when it comes to facilitating talented researchers to further develop themselves and grow into an aspired position, such as a tenure track towards a fixed position or eventually a professorship.

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Based in Europe, focused on the world. Maastricht University is a stimulating environment. Where research and teaching are complementary. Where innovation is our focus. Where talent can flourish. A truly student oriented research university.

Contact information

School for Mental Health and Neuroscience
Universiteitssingel 40
6229 ER Maastricht
The Netherlands

Telephone: +31 43 388 1021
E-mail: secr-mhens@maastrichtuniversity.nl
Internet: www.maastrichtuniversity.nl/mhens
www.euronschool.eu