Personal details

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Research statement

How does the coordinated activity of millions of neurons lead to human cognition and behaviour? My work tries to answer this question by looking at the motor system in healthy human subjects and patients with movement disorders. I use techniques such as magneto-encephalography (MEG), electro-encephalography (EEG), electro-myography (EMG), and local field potentials (LFPs) recorded from deep brain stimulation electrodes to study how synchronized neural activity leads to movement in healthy subjects and abnormal movement in Parkinson's disease. One of my contributions is the finding of abnormal cross-frequency coupling in the subthalamic nucleus of patients with Parkinson's disease (van Wijk et al. 2016). I also showed that beta oscillations have a role in inhibiting movements (van Wijk et al. 2009). In addition to this experimental work, I have a strong methodological interest. I revealed important caveats in the application of graph theory to describe the structure of complex networks (van Wijk et al. 2010), and contributed a novel method for the estimation of cross-frequency coupling (van Wijk et al. 2015). Furthermore, I am involved in the development of dynamic causal modelling (DCM), which is a Bayesian computational modelling technique to infer (synaptic) connectivity underlying neuroimaging data features as observed in experimental recordings. On this topic I teach within the annual SPM course at University College London and contribute Matlab code to the open source SPM toolbox.

Key words

- Brain oscillations
- MEG / EEG / LFPs / EMG
- Functional connectivity
- Human motor control
- Parkinson's disease
- Cross-frequency coupling
- Dynamic causal modelling
- Computational neuroscience
- Cognitive neuroscience
- Graph theory

Experience

Post-doctoral

Current

Research Associate 01/06/2018 - 31/05/2020
Integrative Model-based Cognitive Neuroscience Research Unit, Department of Psychology, University of Amsterdam, the Netherlands. Collaborator: Prof. BU Forstmann

Honorary Research Affiliate 01/04/2016 - …
Wellcome Centre for Human Neuroimaging, University College London, UK.

Previous

Research Associate 01/05/2016 - 31/03/2018
Movement Disorder and Neuromodulation Unit, Department of Neurology, Charité-University Medicine Berlin, Germany. Collaborator: Prof. AA Kühn

Research Associate 01/06/2013 - 31/03/2016
Wellcome Trust Centre for Neuroimaging, University College London, UK.
Collaborators: Dr. V Litvak, Prof. KJ Friston

Research Officer 16/01/2013 - 31/03/2013
Queensland Institute of Medical Research, Brisbane, Australia. Collaborator: Prof. MJ Breakspear

During PhD

International working visit 01/03/2010 - 30/06/2010
Wellcome Trust Centre for Neuroimaging, University College London, UK. Group Prof. KJ Friston

PhD student 01/06/2008 - 31/08/2012
Faculty of Human Movement Science, VU University Amsterdam, NL.
Supervisors: Prof. A Daffertshofer, Prof. PJ Beek

Before PhD

Teaching and Research Assistant 01/09/2005 - 30/06/2006
Research Assistant 01/02/2008 - 31/05/2008
Faculty of Human Movement Science, VU University Amsterdam, NL.

International working visit 01/02/2007 - 14/07/2007
Master's Research internship at the School of Psychology, University of Birmingham, UK.
Supervisor: Dr. P Praamstra

Education

Doctoral degree	Human Movement Sciences	2008-2012
VU University Amsterdam, The Netherlands		cum laude (top 5%)
Master's degree	Human Movement Sciences	2006-2007
VU University Amsterdam, The Netherlands		cum laude (top 5%)
Bachelor's degree	Human Movement Sciences	2003-2006
VU University Amsterdam, The Netherlands		cum laude (top 5%)

PhD thesis

Neural synchronization within and between regions of the motor system
Defended on 26/11/2012.

Publications

Total = 24
First Author = 13

H-index = 14 (Google Scholar)

Espenhahn S, **van Wijk BCM**, Rossiter HE, de Berker AO, Redman ND, Rondina J, Diedrichsen J, Ward NS (2019). Cortical beta oscillations are associated with motor performance following visuomotor learning. Neuroimage 195:340-353.

Reis C, Sharott A, Magill PJ, **van Wijk BCM**, Parr T, Zeidman P, Friston KJ, Cagnan H (2019). Thalamocortical dynamics underlying spontaneous transitions in beta power in Parkinsonism. Neuroimage 193:103-114.

Meidahl AC, Moll CKE, **van Wijk BCM**, Gulberti A, Tinkhauser G, Westphal M, Engel AK, Hamel W, Brown P, Sharott A (2019). Synchronised spiking activity underlies phase amplitude coupling in the subthalamic nucleus of Parkinson's disease patients. Neurobiology of Disease 127:101-113.

van Wijk BCM, Cagnan H, Litvak V, Kühn AA, Friston KJ (2018). Generic dynamic causal modelling: an illustrative application to Parkinson's disease. Neuroimage 181:818-830.

Lofredi R, **van Wijk BCM**, Neumann W-J, Schneider G-H, Sander TH, Kühn AA (in production). Movement-related changes in cortico-pallidal coupling revealed by simultaneous intracranial and magnetoencephalography recordings in dystonia patients. Journal of Visualized Experiments.

van Wijk BCM (2017). Is broadband gamma activity pathologically synchronized to the beta rhythm in Parkinson's disease? The Journal of Neuroscience 37:9347-9349.

van Wijk BCM, Neumann W-J, Schneider G-H, Sander TH, Litvak V, Kühn AA (2017). Low-beta cortico-pallidal coherence decreases during movement and correlates with overall reaction time. Neuroimage 159:1-8.

van Wijk BCM, Pogosyan A, Hariz MI, Akram H, Foltynie T, Limousin P, Horn A, Ewert S, Brown P, Litvak V (2017). Localization of beta and high-frequency oscillations within the subthalamic nucleus region. Neuroimage: Clinical 16:175-183.

Espenhahn SE, de Berker AO, **van Wijk BCM**, Rossiter HE, Ward NS. Movement-related beta oscillations show high intra-individual reliability (2017). Neuroimage 147:175-185.

van Wijk BCM, Beudel M, Jha A, Oswal A, Foltynie T, Hariz MI, Limousin P, Zrinzo L, Aziz TZ, Green AL, Brown P, Litvak V (2016). Subthalamic nucleus phase-amplitude coupling correlates with motor impairment in Parkinson's disease. Clinical Neurophysiology 127:2010-2019.

Friston KJ, Litvak V, Oswal A, Razi A, Stephan KE, **van Wijk BCM**, Ziegler G, Zeidman P (2015). Bayesian model reduction and empirical Bayes for group (DCM) studies. Neuroimage 128:413-431.

van Wijk BCM, Jha A, Penny W, Litvak V (2015). Parametric estimation of cross-frequency coupling. Journal of Neuroscience Methods: 243:94-102. *This paper describes a new statistical method to estimate significant cross-frequency coupling from electrophysiological recordings.*

Friston KJ, Bastos AM, Oswal A, **van Wijk B**, Richter C, Litvak V (2014). Granger causality revisited. Neuroimage 101:796-808.

van Wijk BCM, FitzGerald THB (2014). Thalamo-cortical cross-frequency coupling detected with MEG. Frontiers in Human Neuroscience 8:187.

Boersma M, de Bie HMA, Oostrom KJ, van Dijk BW, Hillebrand A, **van Wijk BCM**, Delemarre-van de Waal HA, Stam CJ (2013). Resting-state oscillatory activity in children born small for gestational age: an MEG study. Frontiers in Human Neuroscience 7:600.

van Wijk BCM, Litvak V, Friston KJ, Daffertshofer A (2013). Nonlinear coupling between occipital and motor cortex during motor imagery: a dynamic causal modeling study. Neuroimage 71:104-113. *In this paper we apply DCM for time-frequency responses as a phenomenological generative model.*

van Wijk BCM, Beek PJ, Daffertshofer A (2012). Neural synchrony within the motor system: what have we learned so far? Frontiers in Human Neuroscience 6:252.

van Wijk BCM, Willemse RB, Vandertop WP, Daffertshofer A (2012). Slowing of M1 oscillations in brain tumor patients in resting state and during movement. Clinical Neurophysiology 123:2212-2219.

van Wijk BCM, Beek PJ, Daffertshofer A (2012). Differential modulations of ipsilateral and contralateral beta (de)synchronization during unimanual force production. European Journal of Neuroscience 36:2088-2097.

Daffertshofer A, **van Wijk BCM** (2011). On the influence of amplitude on the connectivity between phases. Frontiers in Neuroinformatics 5(6).

van Wijk BCM, Stam CJ, Daffertshofer A (2010). Comparing brain networks of different size and connectivity density using graph theory. PLoS ONE 5:e13701. ***This paper reveals important methodological caveats of popular graph theory analysis. These are relevant for a wide range of structural and functional brain connectivity studies. To date the paper has received >650 citations (Google Scholar).***

Antiqueira L, Rodrigues FA, **van Wijk BCM**, Costa L da F, Daffertshofer A (2010). Estimating complex cortical networks via surface recordings – a critical note. Neuroimage 53:439-449.

Boonstra TW, **van Wijk BCM**, Praamstra P, Daffertshofer A (2009). Corticomuscular and bilateral EMG coherence reflect distinct aspects of neural synchronization. Neuroscience Letters 29:17-21.

van Wijk BCM, Daffertshofer A, Roach N, Praamstra P (2009). A role of beta oscillatory synchrony in biasing response competition? Cerebral Cortex 19:1294-1302.

Research grants and prizes

- **Horizon 2020 Marie Skłodowska-Curie Individual Fellowship 2018 - 165.600 EURO**
- GSK Stiftung Travel Grant. 2017 (800 EURO)
- Guarantors of Brain Travel Grant 2016 (800 GPB)
- MEG UK 2015 - Best presentation award
- Data analysis competition Biomag 2014 – third prize
- Data analysis competition Biomag 2010 – first prize (500 EURO)
- ***NWO Toptalent 2008***
  The Netherlands Organisation for Scientific Research
  Personal grant for financing the salary of a 4-year PhD project. **180.000 EURO**
  Competitive national grant scheme with several selection rounds aiming at excellent Master students from all scientific disciplines for financing their own PhD in The Netherlands.
- *Hersenstichting Nederland* (Dutch Organization for Brain Research)
  Grant for students to support an international research internship related to brain research. 2007 (500 EURO)

Invited talks

- Colloquium at Institute of Brain and Behaviour, VU University Amsterdam, NL. 12/04/2018
- 14th Karniel Computational Motor Control Workshop, Ben-Gurion University of the Negev, Beer-Sheva, Israel. 13-15/03/2018
- Seminar at the Max Planck Institute for Human and Cognitive Brain Sciences, Leipzig, Germany. 19/02/2018
- BCN Symposium on Invasive and Non-Invasive Neuromodulation, University of Groningen, NL. 12/10/2017
- Seminar at Institute of Psychiatry, King's College London, UK. 29/01/2016
- Lab meeting Centre for Neuropsychopharmacology group, Imperial College London, UK. 19/01/2016
- Seminar at the Movement Disorders Unit, Charité Universitätsmedizin Berlin, Germany. 03/12/2015
- Workshop on synchrony and connectivity, King's College London, UK. 16/09/2015
- Brain meeting lecture at Wellcome Trust Centre for Neuroimaging, University College London, UK. 03/07/2015
- Lecture at British Neuroscience Association meeting 2015, Edinburgh, UK. 13/04/2015
- Seminar at Sir Peter Mansfield Magnetic Resonance Centre, University of Nottingham. 06/11/2014
- Lab meeting experimental Neurology group, University of Oxford, UK. 30/04/2014
- Seminar at Centre for Complexity Sciences, University of Bristol, UK. 25/03/2014
- Lab meeting SyMoN group, School of Psychology, University of Birmingham, UK. 06/03/2014
- Workshop on functional connectivity, Donders Institute, Nijmegen, NL. 17/06/2011
- Lecture at annual SPM course on M/EEG, Institute of Neurology, University College London, UK. 2011-…

Organization

Organizer of weekly scientific lab meetings. Integrative Model-based Cognitive Neuroscience Research Unit, Department of Psychology, University of Amsterdam. 2018-2019.

Organizer of weekly scientific lab meetings. Movement Disorder and Neuromodulation Unit, Charité - University Medicine Berlin. 2017

Co-organizer of the SPM course for MEG/EEG in May 2014, May 2015, and May 2016, London. The course consists of two days lectures and demonstrations, and a one day computer seminar. Organization involves constructing the course program and inviting local and external speakers.

Co-organizer of a one-day workshop on Fieldtrip and SPM toolboxes at MEG UK 2015, January 7, Birmingham, UK. The workshop consists of short lectures and hands-on computer sessions.

Co-organizer of the weekly 'brain meeting' seminars at the Wellcome Trust Centre for Neuroimaging for the year 2013-2014. Organization involves inviting and hosting national and international speakers working on various neuroscientific topics.

Co-organizer of a symposium on 'Cross-frequency coupling – methodological challenges' at Biomag 2014, Halifax Canada.

Teaching experience

Course coordination

Introduction to Neuroscientific Methods and Brain Anatomy 2018 [6 EC] an elective course in the Research Master Brain and Cognitive Sciences, Institute for Interdisciplinary studies, UvA

Coordinator of Masterthesis research projects and internships for the Mastertracks Brain and Cognition in Society and Clinical Neuropsychology 2018-2019, Department of Psychology, UvA

Student supervision

Supervision of research projects at UvA: 2 Research Master students, 1 Bachelor student (6 months). 2018-2019

Supervision of literature theses at UvA: 11 Bachelor students ('Miniscriptie Psychobiologie'). 2017-2018

Supervision of research projects at Charité: 1 Research Master student (3 months), 1 Bachelor student (3 months). 2016-2017

Supervision of research projects at UCL: 1 Research Master student (6 months). 2015

Supervision of research projects at VU: 8 Bachelor students (4 projects of 4 months each). 2008-2012

Supervision of literature theses at VU: 1 Bachelor student. 2011

Seminars

Supervision during a one day computer seminar of the annual SPM course hosted by the Institute of Neurology, UCL. The students in this course are primarly PhD students and post docs from universities across Europe. 2010-2018

Teaching assistant for dissection classes of the Neuranatomy course in the Bachelor's curriculum of Human Movement Sciences, VU University Amsterdam. 2009-2011

Teaching assistant for various Matlab-based computer seminars for courses in the Bachelor's curriculum of Human Movement Sciences, VU University Amsterdam: *Introduction to Matlab*, *Introduction to research methods*, *Simulation models of neuromuscular systems*. 2005-2007

Lectures

6 lectures in Introduction to Neuroscientific Methods and Brain Anatomy, UvA, 2018.

8 lectures on dynamic causal modelling in the annual SPM course, UCL, May 2011-2018.

2 lectures on Computational Neuroscience in Introduction to Neurophysiology, UvA, 2018-2019.

2 lectures on Introduction to Model-based EEG. Model-based Cognitive Neuroscience Summer School, UvA, August 2018-2019.

1 lecture on Electrophysiology of the motor system. Clinical Neuroscience, Charité. March 2017

1 lecture on Neuronal models of cortico-basal ganglia loops. Medical Neuroscience, Charité. Nov 2016

1 lecture on Dynamic causal modelling. MEG UK, Birmingham. 2015

1 lecture on Dynamic causal modelling. BNA, Edinburgh. 2015

Committees

Member of a department-wide committee for improving the organisation and quality of the Masterthesis course, 2018-2019, Department of Psychology, UvA

PhD Committee Member

Maarten van den Heuvel (VU University Amsterdam, December 2017)

Loek Brinkman (Radboud University Nijmegen, June 2016)

Reviewer activities

Review editor for:

- Frontiers in Human Neuroscience
- Brain Topography

Ad-hoc peer reviewer for:

- The Journal of Neuroscience
- PLoS One
- Neuroimage
- Journal of Neuroscience Methods
- Schizophrenia Bulletin
- Movement Disorders
- European Journal of Applied Physiology
- Journal of Neurophysiology
- Chaos
- Neuroscience Letters
- Human Movement Science
- Clinical Neurophysiology

Skills

Matlab programming ●●●●●●●●●●

SPM ●●●●●●●●●○

Fieldtrip ●●●●●●●○○○

Signal processing	●●●●●●●●●○
MEG acquisition	●●●●●●●●●○
EEG acquisition	●●●●●●●●○○
Experimental design	●●●●●●●●●○

Experienced with data acquisition and signal processing of: MEG (CTF system), EEG (Biosemi), EMG (surface bipolar and high-density grids), force sensors, accelerometers, and motion capturing (Optotrak).

Experienced with various signal processing methods: e.g., spectral analysis, event-related potentials, coherence, phase synchronization, source localization, principal component analysis, graph theory, dynamic causal modeling, cross-frequency coupling.

Contributor of SPM Matlab functions for analysis of cross-frequency coupling and dynamic causal modeling.

Experienced with macOS, Windows and Linux operating systems, as well as grid computing.

Extra-curricular courses

- UvA Leadership course for VENI laureates 2019, VU Learn Academy
- BKO teaching course for UvA lectures 2018, VU Learn Academy
- Linear Algebra (first year Bachelor's Mathematics, VU University Amsterdam)
- Non-linear dynamics (second year Bachelor's Mathematics, VU University Amsterdam)
- Probabilistic and Unsupervised Learning, Approximate Inference and Learning in Probabilistic Models (Gatsby Unit for Computational Neuroscience, University College London)
- Model-based Cognitive Neuroscience summer school 2017 (University of Amsterdam)

Other presenta-tions

Oral presentations

MEG UK 2017, Oxford, UK
Biomag 2016, Seoul, South Korea
Biomag 2014, Halifax, Canada
MEG UK 2014, Nottingham, UK
Brainmodes 2012, Brisbane, Australia
Brainmodes 2010, Copenhagen, Denmark
7th NFSI & ICBEM 2009, Rome, Italy

Poster presentations

Human Brain Mapping 2019, Rome, Italy
IBAGS 2017, Mérida, Mexico
MEG UK 2017, Oxford, UK
International DBS Symposium KFO 247, 2016, Berlin, Germany
Bernstein Conference 2016, Berlin, Germany
20th International Congress of Parkinson's Disease and Movement Disorders 2016, Berlin, Germany
Society for Neuroscience 2015, Chicago, USA
CuttingEEG 2015, Berlin, Germany
UCL Neuroscience Symposium, 19 June 2015, London, UK
MEG UK 2015, Birmingham, UK
Brainmodes 2014, London, UK
UCL Neuroscience Symposium, 13 June 2014, London, UK
HBM 2014, Hamburg, Germany
MEG UK 2014, Nottingham, UK
Brainmodes 2013, Amsterdam
7th FENS forum of European Neuroscience, 2010, Amsterdam, NL

	7th edition of Progress in Motor Control, 2009, Marseille, France Biomag 2008, Sapporo, Japan
Other international conferences	Attendance of international conferences (>1 day) without presenting own work: *Brain informatics and Health* (London 2015), *Brainmodes* (Amsterdam 2008 & Marseille 2011), *Brain Connectivity Workshop* (Maastricht 2009 & Berlin 2010), *FENS Satellite Symposium on Motor Control* (Nijmegen 2010). *Cosyne* (Lisbon, 2019).
Public engagement	UCL Hospitals Research Open Day, 10 July 2014. Helping out at information stall on deep brain stimulation in Parkinson's disease. Explaining ongoing research to members of the public.
Languages	Dutch ●●●●●●●●●● English ●●●●●●●●●○ German ●●●●●●●○○○ French ●●●○○○○○○○ Swedish ●●●○○○○○○○