CRC 1451 – Key Mechanisms of Motor Control in Health and Disease

Newsletter November 2025

“Retreat review and insights into the work of the new projects”

Dear readers,

welcome to a new issue of the CRC 1451 Newsletter.
The first year of the second funding phase of CRC 1451 is slowly coming to an end, and we hope that all projects had a successful start and have been able to fill their vacancies. We warmly welcome all new members of CRC 1451.

This year we already had nine guest speakers at our Motor Control Science Club, all of whom are experts in their respective fields. We are grateful to Dr. Arnab Barik (Bangalore), Prof. Angelika Harbauer (Munich), Prof. Rüdiger Klein (Martinsried), Prof. Onur Güntürkün (Bochum), Prof. Olivia Masseck (Cologne), Dr. Damian Herz (Heidelberg), Prof. Rob Brownstone (London), Prof. Mac Shine (Sydney), and Prof. Sung-Yon Kim (Seoul) for presenting their groundbreaking work, which contributes to our understanding of motor control from various perspectives.
We are very much looking forward to the next guest speakers (see Dates and Events).

The CRC annual retreat took place in March, and we would like to take this opportunity to look back on it. Besides, the new CRC projects A08, A09 and B06 briefly present their work.
We hope you enjoy reading our newsletter and wish you a wonderful rest of autumn! 🍁 🍂 🍄

Whenever you have any topics, scientific advances, announcements, etc., please send them to sfb1451-sekretariat@uni-koeln.de for the next issue.

Please do not hesitate to comment on and discuss your topics with the Central Office and/or Management Team at any time.

Gereon Fink
Spokesperson

Tatiana Korotkova
Deputy Spokesperson

Peter Weiss-Blankenhorn
Deputy Spokesperson

Topics

1. Look Back at Annual Retreat 2025
2. Introduction to CRC projects A08, A09 and B06
3. CRC 1451 Ombudspersons
4. Highlight Paper
5. Dates and Events

1. Look Back at Annual Retreat 2025

From 20 to 21 March 2025, the annual retreat of CRC 1451 took place at the GenoHotel Forsbach. For the first time, a mixed team of early career researchers and PIs was responsible for the content of the retreat. Thanks again to Gina Schumacher, Martin Nawrot and Jochen Roeper for successfully organising this year's retreat programme. The long poster session and open discussion rounds, which provided time for exchange and interaction, were particularly well received. The hotel premises and the great weather contributed to this.

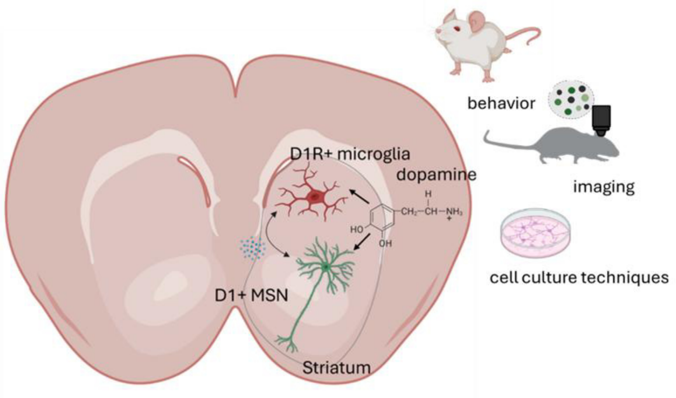
Thank you to all participants who made the retreat a successful and interactive event. We are already looking forward to next year's retreat, where we intend to continue focusing on cooperation between the projects.

2. Introduction to CRC projects A08, A09 and B06

With the start of the second funding phase, three new projects are part of CRC 1451. Here, the three new projects provide an insight into their work. We wish them every success!

A08: Microglia-mediated regulation of striatal neuronal activity and motor control – mechanisms and functions

Project leaders: Anne Schäfer, Sabine Vay and Tatiana Korotkova



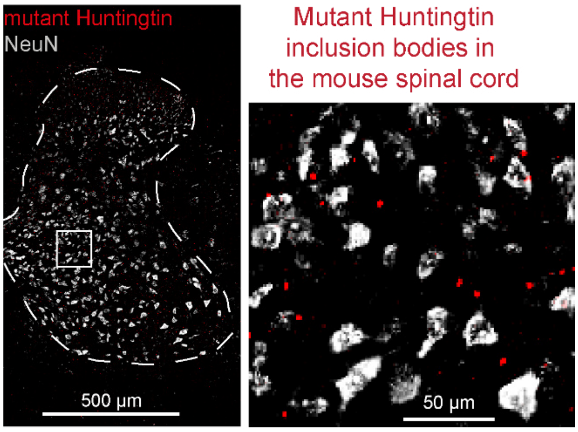
In Project A08, we are excited to explore how microglia shape locomotor behaviour by regulating dopamine signalling in the striatum. Our preliminary findings reveal that about 10–15% of striatal microglia express a functional D1 receptor (D1R), pointing to a previously underappreciated role of these D1R-positive microglia in modulating the dopamine responses of striatal neurons. Building on these insights, we are now investigating how microglia-mediated regulation of dopamine signalling in medium spiny neurons (MSNs) influences locomotion, reward-based learning, and addiction-related changes in motor activity. To tackle these questions, we combine MERFISH, extra- and intracellular electrophysiological recordings, in vivo calcium imaging, and behavioural analyses in transgenic mice. Through this work, we aim to deepen our understanding of how microglia contribute to the modulation of motor function in both physiological and pathological contexts.



https://www.crc1451.uni-koeln.de/a08/

A09: Descending control of spinal circuits in health and disease

Project leaders: Irina Dudanova and Graziana Gatto

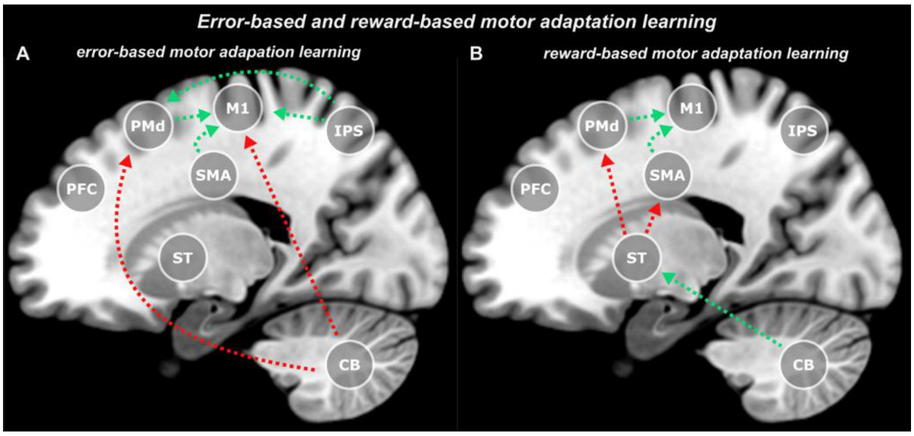


Project A09 investigates the corticospinal neural underpinnings of locomotion in physiological and pathological states. Using mouse as model organism, and leveraging our complementary expertise in circuit and molecular neuroscience, we will assess the dynamics of cortical (Dudanova) and spinal (Gatto) neurons and their interactions in the planning and execution of behaviour. We will undertake a holistic approach, combining cell type-specific *in vivo* calcium imaging, anatomical mapping, chemogenetic manipulations, and behavioural analyses to elucidate the connectivity and functions of distinct neural pathways, and their alterations in Huntington's disease. Project A09 will advance our understanding of descending control of spinal locomotor circuits in health and disease.

https://www.crc1451.uni-koeln.de/a09/

B06: Network-level mechanisms underlying adaptation of motor control

Project leaders: Lukas Volz and Gereon Fink



Project B06 aims to characterise the neural mechanisms underlying error- and reward-based motor adaptation learning of human reaching movements. We use task-based functional brain imaging (fMRI) and effective connectivity analyses to disentangle how cortical-basal ganglia-cerebellar loops interact in order to enable motor adaptation in the presence and absence of monetary reward feedback. The inclusion of volunteers across the lifespan and the longitudinal assessment of stroke patients from the acute to the chronic stage allow us to address how these network dynamics are affected by ageing and elevated levels of motor network plasticity early after stroke. We will collaborate with several other CRC projects focussing on the adaptation of reaching movements to advance our mechanistic understanding of motor control.

https://www.crc1451.uni-koeln.de/b06/

3. CRC 1451 Ombudspersons

Conflicts, misunderstandings, or tensions may occasionally arise during your doctoral or postdoctoral project. This is a normal part of collaborative research. In most cases, these situations can be clarified through open dialogue with your supervisor or research team, as they often stem from unspoken expectations or differing perspectives.

If concerns remain, the CRC 1451 ombudspersons provide a confidential, impartial, and supportive platform for addressing problems at an early stage. As neutral mediators, they can help you clarify misunderstandings, facilitate communication, and work towards constructive solutions.

In addition, the ombudspersons are available to advise and intervene in cases of suspected scientific misconduct, ensuring that appropriate steps are taken to restore fairness and integrity in our collaborative work.

All members of the CRC 1451 are welcome to contact the ombudspersons Natalia Kononenko and Kerstin Konrad for advice or support at any time.

Natalia Kononenko

Kerstin Konrad

https://www.crc1451.uni-koeln.de/people/ombudspersons/

4. Highlight Paper

Congratulations to the authors!!

Journal of Neurology (2025) 272:654
https://doi.org/10.1007/s00415-025-13401-9

ORIGINAL COMMUNICATION

Apraxic deficits predict general cognitive impairment in patients with biomarker-verified Alzheimer's pathology

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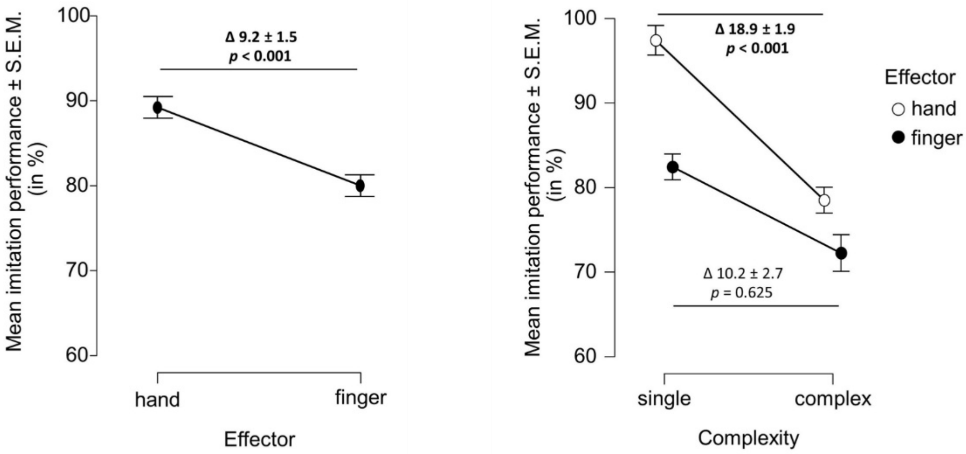
Abstract

Apraxia represents a core feature of Alzheimer's disease (AD), a neurodegenerative disorder characterised by the accumulation of β-amyloid plaques and tau deposition. However, systematic descriptions of apraxic deficits in AD patients remain scarce. Here, we comprehensively investigate apraxia profiles and their link with cognitive impairment in patients with biomarker-verified Alzheimer's pathology. We characterised the frequency and patterns of apraxic deficits in patients with biomarker-verified Alzheimer's pathology using a battery of standardised apraxia tests. Demographic variables and apraxia scores were related to patients' general cognitive impairment using hierarchical regression analysis. Apraxic deficits were found in 67% of patients with biomarker-verified Alzheimer's pathology ($n = 63$). Patients with Alzheimer's pathology were more impaired in imitating finger gestures (than hand gestures: 89.2% vs. 80.0%, $p < 0.001$) and imitating complex hand movements (than single hand movements: 97.4% vs. 78.5%, $p < 0.001$), even when controlling for general cognitive impairment. Apraxia assessments explained about 60% of the variance in dementia severity, with performance in the KAS subtest of pantomiming object use (beta coefficient: 0.47, $p = 0.001$) and the DATE subtest for limb apraxia (beta coefficient: 0.37, $p = 0.005$) constituting significant predictors of general cognitive impairment. These findings emphasise the relevance of apraxia in patients with biomarker-verified Alzheimer's pathology, revealing that praxis deficits predict general cognitive impairment in AD. Further research is warranted into the role of apraxia as a potential early diagnostic criterion in AD.

Keywords Limb apraxia · Gesture imitation · Pantomime · Mini-Mental State Examination (MMSE) · Alzheimer's disease



All past papers of the month can be found here:
https://www.crc1451.uni-koeln.de/publications-2-2-2/paper-of-the-month/

5. Dates and Events

All ongoing and past events can be found here:
https://www.crc1451.uni-koeln.de/calendar-2/

Open Consultation Hours of the Central Office

Every Monday, 1:00-2:00 pm
via Zoom https://uni.koeln/V7XJP

Save the Date 2026

March 26-27	CRC 1451 Annual Retreat 2026, GenoHotel Forsbach

Motor Control Science Club

November 24, 2:00 pm	Dr. Winfried Ilg, University Tübingen, “From cerebellar control mechanisms to signatures of real-world walking behaviour in cerebellar ataxia”

PI Meetings

November 18, 3:30 pm	Hosts: Marc Tittgemeyer & Frank Jessen (C06)
December 09, 5:00 pm	Hosts: Lukas Volz & Gereon Fink (B06)

Early Career Researcher (ECR) Specials:

MotoRTG Lecture

November 19, 4:00 pm	Martin Nawrot, NN
November 26, 4:00 pm	Lukas Volz, “Reorganization of motor control after stroke”
December 03, 4:00 pm	Graziana Gatto, “Motor circuits in Huntington’s disease”
December 10, 4:00 pm	Kei Ito, “Organisation of neurons in the fruit fly brain – sensory input, modulation, and motor output”

MotoRTG Progress Report

December 15, 9:00 am

Further information on MotoRTG events is sent out by the CRC 1451 MotoRTG coordinator Claudia Wegscheid on a regular basis. If you do not receive the information, please contact c.wegscheid@uni-koeln.de.

The structured programmes (PhD and Postdoc) of the CRC 1451 Graduate School can be found here:
https://www.crc1451.uni-koeln.de/young-researchers/

Collaborative Research Centre 1451
Key Mechanisms of Motor Control in Health and Disease
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