CNB Newsletter
4/2019

UNIVERSITÄT BERN

CLINICAL NEUROSCIENCE BERN

Dear CNB members,

With the CNB Newsletter, we intend to inform you about upcoming CNB events, ongoing projects and give insights to the research topics of selected CNB members.

We hope you enjoy reading the April 2019 edition.

Prof. Dr. Tobias Nef
President CNB

① CNB Annual Meeting 2019

Friday, 14th of June 2019, 9.00 – 17.45

UniS Room A003, Schanzeneckstrasse 1

We are pleased to invite you to the 14th CNB Annual Meeting on the overall topic *G protein-coupled receptors (GPCRs): From Molecules to Systems.*

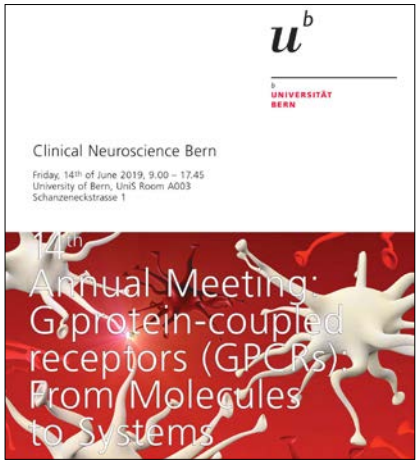
This year's program includes keynote lectures of Prof. Chris Tate (MRC Laboratory of Molecular Biology, UK), Title: *G protein-coupled receptors: the structural basis for their pharmacology* and Prof. Ron Stoop (University of Lausanne, CH), Title: *How oxytocin can transform the processing of fear*.

During the afternoon session, you will get the chance to attend translational symposia on various topics, such as *Opsins, Neuroimmunology, Stroke* and *Emotional processing.*

Young researchers will further have the opportunity to present their ideas and research achievements by a short talk or during the poster session. Three poster prizes will be awarded.

We invite you to register and to submit abstracts (free contribution) on www.conftool.com/cnbam2019.

Deadline for abstract submission is May, 12.



Full program

② Selected Research Groups

PD Dr. med. Yosuke Morishima

Functional brain connectomics
Translational Research Center
University Hospital of Psychiatry

Our research interests are to understand brain network functions in healthy populations and their impairments in psychiatric disorders. Our brain, comprised of complex networks, processes information according to the demand of environments. Optimal information processing in our brain that is achieved by control of communication in brain networks is crucial for adaptive behavioural control. However, such communication in the brain is disturbed in psychiatric disorders. Therefore, studying brain network functions helps to understand brain functionalities as well as psychiatric illness.

In human research, available methodology is limited compared to research involving experimental animals. We thus take a multi-modal approach to understand human brain functions. Our research program is comprised of two directions: 1) Identifying brain network interactions and 2) Testing causal roles by modulating brain network interactions.

For the first aim, we particularly focus on causal interactions in brain networks. We use mathematical approaches to estimate causal interactions of brain networks with neuroimaging data (such as Dynamic causal modelling) as well as an experimental approach to probe strength of communication with concurrent use of non-invasive brain stimulation and neuroimaging methods. These approaches helped to elucidate functional impairments of brain networks and their improvement by pharmacological intervention in psychiatric disorders (Mueller et al., 2018; Nakataki et al., 2017) as well as brain network interactions serving complex motivations of social behaviour in a healthy cohort (Hein et al., 2016).

For the second aim, we focus on modulation of brain networks. In recent research, we have been accumulating the association of specific mental disorders with brain network alterations. If we could introduce a mean to modulate specific brain networks, we will be able to provide a new approach for treatment of psychiatric disorders. We are thus trying to develop a new methodological framework to modulate brain network interactions with non-invasive brain stimulation methods (Fehér et al., 2017).

All together, we aim to understand our brain network functions in neuropsychiatric disorders as well as healthy cohorts. Ultimately, this would help to establish better interventions for treatment of neuropsychiatric disorders.

Recent publications:

- Mueller SV, Morishima Y, Schwab S, Wiest R, Federspiel A, Hasler G. Neural Correlates of Impaired Reward-Effort Integration in Remitted Bulimia Nervosa. Neuropsychopharmacology. 2018 Mar;43(4):868-876
- Fehér KD, Nakataki M, Morishima Y. Phase-Dependent Modulation of Signal Transmission in Cortical Networks through tACS-Induced Neural Oscillations. Front Hum Neurosci. 2017 Sep 27;11:471
- Nakataki M, Soravia LM, Schwab S, Horn H, Dierks T, Strik W, Wiest R, Heinrichs M, de Quervain DJ, Federspiel A, Morishima Y. Glucocorticoid Administration Improves Aberrant Fear-Processing Networks in Spider Phobia. Neuropsychopharmacology. 2017 Jan;42(2):485-494
- Hein G, Morishima Y, Leiberg S, Sul S, Fehr E. The brain's functional network architecture reveals human motives. Science. 2016 Mar 4;351(6277):1074-1078

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Prof. Dr. Alex Bertrams

Self-Regulation
Department of Educational Psychology
Institute of Educational Science

The term *self-regulation* refers to the psychological processes and actions that people can use to achieve their goals. Goals can mean very different things in this context. This can be a certain minimum grade in an exam, to exercise regularly for one's own health, to have less fear, or to function as an autistic person in a predominantly non-autistic world. In the research literature, self-regulation is described as a key to success in life. This may stem from the fact that people who have higher self-regulation skills are on average healthier, show a higher well-being, and bring higher achievement.

Self-regulation includes cognitive processes such as the comparison between one's target state as the point of reference and one's momentary state. Another important element of self-regulation is *self-control*, that is, the deliberate modification of one's predominant response tendencies. Self-control can be subsumed under the umbrella term of executive functioning and it is particularly needed when disturbing influences (e.g., distractions, motivational deficits) impair the actions necessary to achieve goals. In our research group we are primarily concerned with this aspect of self-regulation.

Self-control is exerted, for example, when one actively diverts one's attention from anxiety-related thoughts and concentrates instead on other thoughts and mental processes. Anxiety usually produces an attentional bias, so that attention is automatically drawn to threatening stimuli (i.e., a predominant response tendency), including one's own anxiety-related worries. This is the reason why test anxiety can go hand in hand with lower performance results: Instead of using their limited working memory capacity to solve complex tasks, test anxious candidates are concerned with the idea that they might fail. However, in a series of laboratory and field experiments, we found reliably that the momentary self-control capacity makes a crucial difference. When the study participants' self-control capacities were temporarily reduced, the expected negative relationship between anxiety and performance was found in ego-threatening test situations: the higher the anxiety, the lower the performance. However, when the self-control capacity was high in the same test situation, anxiety and performance were not related. We found this effect both for cognitive tasks (e.g., mental arithmetic, intelligence tests) and for perceptual-motor tasks (e.g., fine motor movement in the game "Doktor Bibber" ["Operation"], basketball free throws)—as long as the involved actions had a certain degree of complexity and therefore required active attention. We interpret this finding in such a way that self-control in the form of active attention regulation enabled the participants to shield their mental operations from the performance-detrimental worries.

In further studies, we now take a closer look at the processes involved. The distinction between effectiveness and efficiency plays an important role here. When the self-control capacity was high, individuals with high and with low anxiety did not significantly differ in terms of their test performance. In other words, they were equally effective. However, it can be assumed that the compensation of anxiety processes requires additional mental effort and cognitive resources. Accordingly, performance under anxiety should be less efficient than the same performance without anxiety. A look into the brain as well as other physiological measures should show us differences that the performance results do not show us in this case. To this end, we will begin this year with studies using functional near-infrared spectroscopy (fNIRS) to assess oxygenation changes in self-control relevant cortical areas (e.g., the lateral prefrontal cortex) during ego-threatening test situations. We expect this research program to ultimately provide us with a deeper understanding of the benefits and costs of compensated test anxiety. In this context, we also look at the potential cost-reducing effects of an intervention of cognitive restructuring.

The principle of *equal effectiveness-different efficiency* due to compensatory mental control processes can be applied to a variety of phenomena. Another subject that we are approaching in this way is the compensation of autistic traits. Recently, research has begun to focus on the question of how some people in the highly functioning area of the autism spectrum (e.g., Asperger syndrome) are able to interact with others in a largely conventional way—at least viewed from outside. The literature suggests that this group of people has learned to interpret the non-verbal communication signals of others, which are usually intuitively processed and understood by neurotypical people, through controlled cognitive processing. Accordingly, these autistic people should achieve similar results to non-autistic people in tests of their *theory of mind*, and thus be indistinguishable from them in this respect. At the cortical level, however, there should be visible differences in the mental control used. Again, the question of the benefits and costs of compensation arises. With this research idea, we are entering new fields

for ourselves and are therefore looking forward to cooperation opportunities with experienced researchers from clinical disciplines.

Selected publications:

- Bertrams, A., Englert, C., Dickhäuser, O., & Baumeister, R. F. (2013). Role of self-control strength in the relation between anxiety and cognitive performance. *Emotion*, *13*, 668–680. doi:10.1037/a0031921

  In three experiments, when the self-control capacity was reduced, highly anxious university students showed impaired learning or arithmetic performance. However, when the self-control capacity was high, anxious students performed at the same level as non-anxious students.

- Englert, C., Zwemmer, K., Bertrams, A., & Oudejans, R. R. D. (2015). Ego depletion and attention regulation under pressure: Is a temporary loss of self-control strength indeed related to impaired attention regulation? *Journal of Sport and Exercise Psychology*, *37*, 127–137. doi:10.1123/jsep.2014-0219

  Using an eye-tracking device, it could be demonstrated that reduced self-control capacity decreased attention regulation in an anxiety-inducing situation.

- Englert, C., & Bertrams, A. (2015). Integrating attentional control theory and the strength model of self-control. *Frontiers in Psychology*, *6*:824. doi:10.3389/fpsyg.2015.00824

  The integration of two theories to explain the moderating effect of self-control capacity on the anxiety-performance relationship.

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③ Review Brainweek Bern 2019

We are looking back on another successful Brainweek Bern with almost 900 visitors. Thank you very much for your participation and contributions.

This year's program included evening symposia on Big Data and Machine Learning, Brain diseases, controversial aspects of mobile phones, the HORAO Conference, contributions to the Museumsnacht and the CNB Science Slam.

Selected pictures of the various events can be found on the Brainweek homepage.

We are especially grateful that many of you joined the 3rd edition of the CNB Science Slam. We would like to congratulate the team of the Theodor Kocher Institute, the winners of this year's trophy! And thanks again to all the presenters for their entertaining and creative contributions.

The next Brainweek on the overall topic of *Gender & Brain* will take place from the 16th to the 20th of March 2020.

The 4th CNB Science Slam is preliminarily scheduled for Thursday, 19th of March. Next year's contributions may be rather free – without predefined questions – but should somehow refer to the overall topic *Gender & Brain*.

Team Theodor Kocher Institute – Winners of the Science Slam 2019
CNB Science Slam, 12. March 2019 / © Angela Botros

Symposium Brain Diseases, 12. March 2019
© Clinical Neuroscience Bern

④ Upcoming events

14. June 2019	CNB Annual Meeting 2019 *GPCR's: From Molecules to Systems*
16. – 20. March 2020	Brainweek Bern 2020 *Gender & Brain*
23. October 2020	CNB Annual Meeting 2020

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