

# BRAINTRAIN Newsletter

No.8 –June 2018

*BRAINTRAIN started in November 2013 and is coordinated by Cardiff University (Professor David Linden, Wales, UK). Our consortium brings together 13 complementary partners, including 10 academic research institutions, one small medium sized enterprise, a larger industrial partner and a technology transfer/management company.*

*To achieve our objectives, BRAINTRAIN program comprises 6 complementary workpackages. WP1: Coordination and management of the consortium, has strong links to all other WPs as its objective is to ensure good management and timely implementation of the BRAINTRAIN workprogramme, communication between the different WPs via regular meetings and reports. In June 2017, the European Commission officially approved of a 12-month extension of the project, thus postponing its conclusion to October 31<sup>st</sup>, 2018.*

*So far, we have met five times: in Cardiff for the Kick-off meeting (2013) and in Maastricht (2014), Tel-Aviv (2015), Coimbra (2016), Leipzig (2017) for the annual meetings. The Next Annual meeting will be held in Maastricht, Netherlands on September 25<sup>th</sup>-26<sup>th</sup>, 2018. In between, we have had regular ExCom meetings, where WP leaders meet and discuss the strategic points of the project. Partners can find in the BRAINTRAIN secure intranet the main information related to the contractual aspects and the meetings.*

*Each team has now been working on its work packages for over four years now. The next pages provide an overview of what we have been doing so far and a focus on some important developments.*

BRAINTRAIN will focus on 4 objectives

Objective 1

Develop new or optimize existing imaging technologies

Objective 2

Validate their application to mental disorders by integrating imaging data with complementary knowledge resulting from bioinformatics and clinical data.

Objective 3

Allow the diagnosis of mental disorders at the pre-symptomatic stage or early during development.

Objective 4

Better measure disease progression.

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## ***BRAINTRAIN FINAL MEETING 2018 IN MAASTRICHT- SEPTEMBER 25<sup>TH</sup>-26<sup>TH</sup>***



The BRAINTRAIN Final Meeting will take place from September 25th to 26th 2018 in Maastricht, the Netherlands.

The final meeting will provide a comprehensive view of the project achievements. It will focus on the results of the clinical feasibility studies/ trials regarding alcohol dependence, binge eating disorders with obesity, PTSD, ASD and adolescent anxiety.

BRAINTRAIN Partners will finalize the project exploitation plan of the neurofeedback survey/template for intervention, serious game development, medical software development for TBV and Gadgetron/sequence sharing.

The consortium will also look into future developments and collaborations on neurofeedback after the project ending. Partners will discuss scientific strategy for neurofeedback, collaboration with other clinical neurofeedback research groups, and prospects for the future.

### **SYMPOSIUM ON NEUROFEEDBACK** ***Maastricht (School of Management), September 24<sup>th</sup> 2018***

BRAINTRAIN partners organise a symposium on neurofeedback and other innovative neurotechnologies – deep brain stimulation, transcranial magnetic stimulation, experience sampling method - in mental health. It will review methodological developments and the state of clinical evaluation and also address the expectations of patients and service providers. The target audience includes mental health clinicians, clinical researchers, healthcare organisations, and patient and carer organisations

More information can be found here : <http://www.braintrainproject.eu/news>

Online registration is required and available [here](#)

### *RTFIN 2017, NARA, JAPAN (NOV 29- DEC 1)*

The 3<sup>rd</sup> International real-time functional imaging and neurofeedback conference had an excellent programme and a broad international attendance: <http://rtfin2017.atr.jp/>

Several BRAINTRAIN consortium members presented talks and posters, and Professor Talma Hendler gave one of the keynote lectures. The photo shows BRAINTRAIN members in the traditional Japanese garden of the conference venue. BRAINTRAIN PI Professor Rainer Goebel will be the chair of the next, 4<sup>th</sup> International real-time functional imaging and neurofeedback conference, to be held in Maastricht, Netherlands, in late 2019.



BRAINTRAIN members in the Japanese garden of the conference venue in Nara



## **BRAINTRAIN CLINICAL STUDIES**

One of BRAINTRAIN objectives is to explore the clinical efficacy of fMRI-based neurofeedback in disorders where dysfunctional activity in motivational networks has been implicated and where current treatments are not satisfactory. BRAINTRAIN partners thus started clinical studies or trials in several countries.

The Cardiff trial on **motivational neurofeedback in alcohol dependence** (clinicaltrials.gov: NCT02486900) finished recruitment (52 patients in total were randomised) and the primary outcome measures were completed in January 2018. Follow-up will be completed in July/ August 2018.

For the Oxford/King's College London **trial on emotion regulation in adolescent girls with a range of anxiety levels** (clinicaltrials.gov: NCT02463136), recruitment and testing was completed in May 2017. A total of 50 participants were recruited and screened and 41 participants completed testing. For the final months, a follow-up project is being set-up where participants to come back in June/July 2018 for another testing session to assess the longevity of the training effects.

The University of Coimbra conducted two trials on **Autism Spectrum Disorder**. The first trial, entitled "Improving facial expression identification in Autism Spectrum Disorder (ASD): a real-time fMRI neurofeedback approach" (Registration number: NCT02440451) included 15 participants (1 without 6 months follow-up). The second trial, entitled "An interventional study to improve social attention in autism spectrum disorder (ASD): a brain computer interface (BCI) approach" (Registration number: NCT02445625) included 15 participants (1 without 6 months follow-up).

**Regarding PTSD**, Tel-Aviv University has completed the primary end point of the Prevention study which has aimed at assessing the feasibility and efficacy of an amygdala-targeted NF intervention in reducing stress symptoms in people who were recently exposed to a traumatic event and are exhibiting acute PTSD symptoms. The prevention study was concluded with a total of 36 participants (Amygdala-EFP test group n=17, T/A-NF control group n=19). Follow up assessments are performed six months following the end of the intervention period and are expected to be completed by October 2018.

The intervention study has also completed the primary end point. The objective of the Intervention study is to examine the feasibility and efficacy of the mentioned amygdala-targeted NF intervention in treating PTSD patients in a neutral context or a trauma-related

context, in comparison to no NF intervention. The Intervention study was concluded with a total of 57 patients (no NF  $n=20$ , trauma-context  $n=18$ , neutral-context  $n=19$ ). Similarly to the Prevention study, follow-up assessments are performed six months following completion and are also expected to conclude by October 2018.

Eberhard Karls Universitaet Tübingen focuses on how neurofeedback can also help to **modulate the activity of eating-related brain areas in overweight and obese subjects**. The prevalence of overweight and obesity has increased rapidly in less than half a century. It is assumed that this development is due to interplay between behavioural, environmental and genetic factors. Neuroimaging has become increasingly common to investigate the neural networks underlying eating behaviour and food preference in normal-weight and obesity, and brain-focused intervention strategies for weight loss and long-lasting weight maintenance are of particular interest. Individuals who are capable of losing more weight than others appear to exhibit stronger functional connectivity between areas that process food value (vmPFC) and those that control eating behaviour (dlPFC). In addition, healthy food choice was associated with the degree of functional connectivity between dlPFC and vmPFC. Therefore, targeting dlPFC activation to influence eating behaviour is of great interest. Humans can learn to regulate their brain activity by neurofeedback training using real-time functional magnetic resonance imaging (rt-fMRI). Behavioural effects of self-regulation in brain areas governing eating and reward-processing may provide the basis for an innovative non-invasive tool to reduce obesity. EKUT tema aimed at using rtfMRI training to enable obese participants to regulate dlPFC activity, and examine the behavioural consequences of the expected improvement in dlPFC activity, i.e., whether it translates into reduced food intake on the short and long term.

Forty overweight or obese subjects (BMI, 25-40  $\text{kg/m}^2$ ) took part in a single-blind randomized controlled trial. During rt-fMRI neurofeedback, participants either had to increase activity of the left dlPFC (dlPFC group;  $n=19$ ) or visual cortex (control group;  $n=21$ ). The training session took place on a single day and included three training runs of six trials of either up-regulation or passive viewing. Food ratings and snack intake as a measure of ingestive behavior were assessed before and after training and in a follow-up session four weeks later. Data are currently being analysed and prepared for publication.

## NEUROFEEDBACK “CROSS COUNTRY” A SPEAKER TOUR THROUGH THE STATES

*David Mehler is a PhD student in Neurosciences at the School of Psychology of Cardiff University. His PhD work in the research group of David Linden focused on a randomised clinical trial of [fMRI-NF in depressed patients](#), as well as fMRI-NF training for motor rehabilitation after stroke and principles of neurofeedback for Parkinson’s disease. As a member of the BRAINTRAIN project, David recently presented his work in the United States, and shares his experience.*

Towards the end of my PhD I had the incredible opportunity to present some of our work on clinical applications of fMRI neurofeedback (fMRI-NF) training at some leading academic institutions in the United States.

Equipped with an ambitious set of slides, I started the tour in the city “that never sleeps”. My first stop was a visit at [Prof Xiaofu He’s lab](#) at the New York Psychiatric Institute, Columbia University. It was inspiring to discuss neural pathways that could mediate therapeutic effects of fMRI-NF and its potential for personalised medicine and measures of neurofeedback success in individual patients.



*Prof. Xiaofu He and David Mehler*

A flight to the West Coast took me to Stanford University in California. Here I met a familiar face, [Mona Rosenke](#), who used to work for BRAINTRAIN in Maastricht. She and her mentor [Dr Kevin Weiner](#) had kindly invited me to present at their weekly seminar series. One focus of the discussion was the therapeutic role of [self-efficacy](#), a psychological self-concept that has been developed at Stanford. Being also leading centre of open and [reproducible neuroscience](#), it was a great opportunity to discuss [our own preregistration](#) of fMRI neurofeedback in stroke patients.





*David's trip for the BRAINTRAIN project*

Next stop: [Baltimore](#), allegedly the “greatest city in America” and home to the Johns Hopkins University. I accepted a kind invitation by [Dr Mark Mikkelsen](#) and [Dr Nick Puts](#), who are both [CUBRIC](#) alumni and now work as post-doctoral fellows at Hopkins to speak. It was a particularly rewarding experience to present as an MD/PhD student at the institution that has prototyped joint clinical and research training in academic medicine. The discussions focused on fMRI acquisition details, but also considered the role of localiser scans to identify suitable target regions in depression.



The tour finished with a visit to [Dr Martin Hebart](#) and [Dr Michael Ramot](#) at the National Institutes of Health ([NIH](#)). A power house of biomedical research with over 20,000 employees and about 1,200 principal investigators, it has played a pivotal role in the development of fMRI methodology, our understanding of [treatment effects in depression](#), and more recently also in the development of [clinical real-time fMRI-NF](#).

*David Mehler, Dr Mark Mikkelsen and Dr Nick Puts*

I would like to thank everyone for their generous support, especially my hosts and PhD supervisor David Linden for making this truly inspiring and rich experience possible.

## ***Publications***

**Elizabeth Randell, Rachel McNamara, Leena Subramanian, Kerenza Hood, David Linden**, *Current practices in clinical neurofeedback with functional MRI—Analysis of a survey using the TIDieR checklist*, European Psychiatry (2018), <https://doi.org/10.1016/j.eurpsy.2017.10.011>

## ***Dissemination activities***

### **David Linden:**

- Clinical neurofeedback using fMRI – principles, results and future developments, Dept. of Psychology, University of Glasgow, 6 April 2018.
- Translating neuroimaging findings into psychiatric practice, lecture at the Annual Congress of the Dutch Psychiatric Association, Maastricht, 13 April 2018
- Perspektiven fuer klinisches Neurofeedback, Klinik fuer Psychiatrie und Psychotherapie, Universitaet Tuebingen, 16 Mai 2018

### **Kathrin Cohen Kadosh:**

- Talk : Using fMRI-based neurofeedback to train emotion-regulation networks in adolescents, Birkbeck College, London, Dec 12, 2017
- Also featured in: <http://www.baby-brains.com/?p=4598>

### **Miguel Castelo Branco :**

- Presentation of the Trial “Improving facial expression identification in Autism Spectrum Disorder (ASD): a real-time fMRI neurofeedback approach” at INSAR World Meeting of Autism, Rotterdam, May 9-12 2018 <https://www.autism-insar.org/page/IMFARAnnualMeeting>

### **Nikolaus Weiskopf :**

- Interview with Swiss MR technology company Skope : <http://www.skope.swiss/anatomy-and-function-6-questions-for-nikolaus/>



*BRAINTRAIN team members (Oct.2016).*

- ✓ **The BRAINTRAIN website is available at the address: [www.braintrainproject.eu](http://www.braintrainproject.eu)**
- ✓ **The extranet where you can find all the important documents regarding the agreement, the meetings and the dissemination is available at this address (access to BRAINTRAIN partners only): <https://extranet-braintrain.atreal.fr/>**