

## BRAINTRAIN NEWSLETTER 2

*BRAINTRAIN started in November 2013 and is coordinated by Cardiff University (Professor David Linden, Wales, UK). Our consortium brings together 10 complementary partners, including 7 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. So far, we have met twice, in Cardiff for the Kick-off meeting and in November in*

*Maastricht for the annual meeting. In between, we have had regular ExCom meetings, where WP leaders meet and discuss the strategic point of the project. You can find in the Braintrain secure intranet the main information related the contractual aspects and the meetings. We look forward to the next annual meeting to be held in Tel Aviv in November 2015.*

*Each team has now been working on its work packages for two years and 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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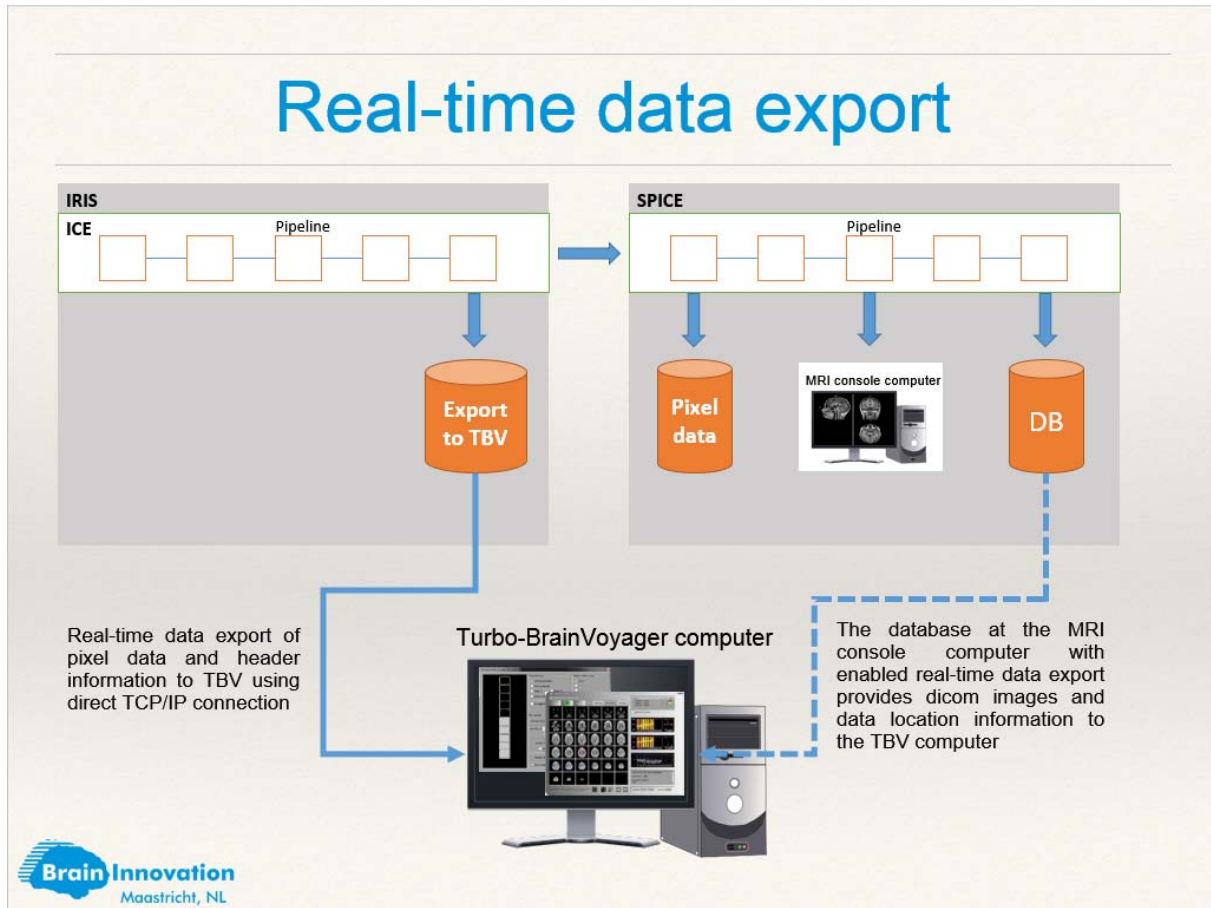
## *Update from Brain Innovation*

Three new colleagues started working at Brain Innovation for the BrainTrain project. Our new PhD student Leon Skottnik is investigating individual differences related to neurofeedback performance and training success, as well neurofeedback related changes in functional connectivity during fMRI based neurofeedback training approaches. Avraam Marimpis will support the team in developing new tools for the analysis of EEG and fMRI data. As a technical research assistant, Rick van Hoof is currently assisting in the development of a Psycho-Physiological Interaction (PPI) analysis plugin for BrainVoyager and will further support BrainTrain related projects with the experimental setup, data acquisition and analysis.

Brain Innovation can announce several new developments. A new functional connectivity plugin for Turbo-BrainVoyager 3.2 was introduced allowing real-time volume by volume calculation of Pearson product-moment correlation coefficient and Partial correlation. Functional connectivity allows the inspection of the correlation between two or more regions of interest. Because neural bases of complex cognitive process are not considered to be limited to the activation of unique, isolated brain areas, these new procedures allow to inspect these effects in more detail. Also several neuronal and psychiatric disorders are thought to arise from

the uncoordinated activation of distributed brain regions, or from their impaired functional coupling. The Scan Session Tool, a graphical application for documenting (f)MRI scan sessions and automatized data archiving, has been developed. Information about the scan session itself, used forms and documents, as well as the single measurements can be entered and saved into a protocol file. This information can furthermore be used to copy acquired data (DICOM images, stimulation protocols, log-files, Turbo Brain Voyager files) into a specific hierarchical folder structure for unified archiving purposes. The new Turbo-BrainVoyager network interface is now available in three applications, Expyriment ([www.expyriment.org](http://www.expyriment.org) [<http://www.expyriment.org>]), BrainStim ([github.com/svengijzen/BrainStim](https://github.com/svengijzen/BrainStim)) and soon also Matlab. This allows a fast, reliable and easy way to create real-time fMRI experiments and procedures making use of the direct interface to most of the data that is available in Turbo-BrainVoyager. Eventually, improved data transfer procedures are currently under development for SIEMENS MRI devices. These procedures allow to access the MRI data directly from the image reconstruction computer ensuring a short delay between data acquisition and processing in Turbo-BrainVoyager. Additionally the standard export provided by SIEMENS can still be used to receive images in the DICOM standard (see figure).

## Real-time data export

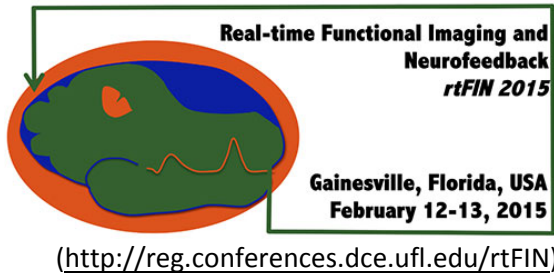


### Update from Cardiff:

Dr Niklas Ihssen has left BRAINTRAIN to take up a lectureship at Durham University. The consortium would like to congratulate him on this appointment. Dr Joseph Whittaker, a biomedical engineer with a background in

methods of neuroimaging, and Angharad Williams, a psychologist with background in cognitive neuroscience and EEG, have started on the Cardiff team. Angharad has kindly taken on the task of editing this newsletter.

***Real-time Functional Imaging and Neurofeedback,  
February 12-13<sup>th</sup> 2015, Gainesville, Florida, USA***



The second instalment of the Real-time Functional Imaging and Neurofeedback Conference took place from Feb. 12-13, 2015, in Gainesville, Florida. The conference was a great success with more than 100 attendees from across the world (inc. Japan, Europe, USA) and several sponsors. The presented work was highly interdisciplinary and ranged from fundamental to clinical sciences.

An important focus was real-time fMRI based neurofeedback. The Braintrain project was well represented by different presentations. For example, Nikolaus Weiskopf was one of

the organizers of the conference and also gave a presentation on the technical real-time fMRI developments in the Braintrain project and provided a brief overview of the project. There was considerable interest in Braintrain at the conference. It was generally well received and regarded as one of the top projects stimulating the clinical applications of neurofeedback. The scientific program also included engaging discussions about the future direction of neurofeedback and its application in clinics.



### *Update from Tel Aviv University (TAU), July 2015*

The Functional Brain Center at Tel-Aviv University is working on two tasks: a prevention study and chronic PTSD study. In the recent months we have welcomed to our team two PhD students, Ruth Abulafia and Tom Fruchtmann, who will lead these projects under the supervision of Prof. Talma Hendler. Ruth and Tom attend the Sagol School of Neuroscience and the School of Psychological Sciences, respectively, at Tel Aviv University (TAU). Halen Baker has also joined our laboratory as a new research manager. Halen is a recent graduate of Boston University with her bachelor's degree in neuroscience. The team is currently in the process of performing a pilot study to test the probes and tasks selected for both clinical studies are in order. The group is also setting up recruitment teams to assist us following the pilot. This team includes a psychiatrist and clinical psychologist from the psychiatry service of Tel Aviv Sourasky Medical Center that will lead and overlook the clinical assessments of the NF training. Professor Hendler organized and led a symposium on domain based network approach in psychiatry, at the Society of Biological Psychiatry conference in Toronto and presented on Brain Guided Stress

Inoculation, at the Stress, PTSD, and Psychiatric Disorders meeting at the Weizmann Institute for Science in May 2015. In addition, the TAU team has been planning what is sure to be an interesting and informative symposium and an annual meeting for the BRAINTRAIN consortium members in Tel Aviv for November 2015.

## *Dissemination*

The objective of WP6 is to insure an effective dissemination using different tools. A brochure was distributed to the partners, a logo for BRAINTRAIN was created and we have a public website which is updated regularly. In parallel, partners are very active presenting neurofeedback research at national and international conferences and invited seminar talks. We can list the following presentations:

- ✚ Since our last newsletter David Linden presented "Neurofeedback and models of neuroplasticity" at the symposium "Learning, Memory and Brain Plasticity: Implications for Psychopathology", at the November 4-6<sup>th</sup>, 2015 International Conference of the German Collaborative Research Centre SFB 636 in Schwetzingen Castle.
- ✚ Nikolaus Weiskopf was on the organising committee for the February 12-13<sup>th</sup>, 2015 International Real-time Functional Imaging and Neurofeedback (rtFIN) Conference in Gainesville, Florida, USA.
- ✚ UCL also had a mini rtfMRI Neurofeedback workshop meeting in London, UK, on April 22<sup>nd</sup> 2015.

- ✓ *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: <https://extranet-braintrain.atreal.fr/>*
- ✓ *The Next Annual meeting will be held in Israel in November 2015*

## ***Publications:***

Sokunbi, M. O., Linden, D. E., Habes, I., Johnston, S., & Ihssen, N. (2014). Real-time fMRI brain-computer interface: development of a “motivational feedback” subsystem for the regulation of visual cue reactivity. *Frontiers in Behavioral Neuroscience*, 8(392), 1-10. doi:10.3389/fnbeh.2014.00392

Esmail, S., & Linden, D. E. (2014). Neural Networks and Neurofeedback in Parkinson’s Disease. *NeuroRegulation*, 1(3-4), 240-272. doi:10.15540/nr.1.3-4.240

Scharnowski, F., Veit, R., Zopf, R., Studer, P., Bock, S., Diedrichsen, J., Gobel, R., Mathiak, K., Birbaumer, N., & Weiskopf, N. (2015). Manipulating motor performance and memory through real-time fMRI neurofeedback. *Biological Psychology*, 108, 85-97. doi:10.1016/j.biopsycho.2015.03.009

Scharnowski, F., & Weiskopf, N. (2015). Cognitive enhancement through real-time fMRI neurofeedback. *Current Opinion in Behavioral Sciences*, 4, 122-127. doi:10.1016/j.cobeha.2015.05.001

Cohen-Kadosh, K., Luo, Q., de Burca, C., Sokunbi, M. O., Feng, J., Linden, D. E., & Lau, J. Y. (2015). Using real-time fMRI to influence differential effective connectivity in the developing emotion regulation network. *NeuroImage*. doi:10.1016/j.neuroimage.2015.09.070

Kirilina, E., Lutti, A., Poser, B. A., Blankenburg, F., & Weiskopf, N. (2015). The quest for the best: The impact of different EPI sequences on the sensitivity of random effect fMRI group analyses. *NeuroImage*. doi:10.1016/j.neuroimage.2015.10.071