Facilitators and barriers of using mobile EEG: a workshop using the extreme test case of BCIs for space flights

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Workshop abstract

Since the advent of mobile EEG with which the subject is no longer constrained by a lab environment, but can be tested in a realistic environment, an increasing number of application areas are opening up for investigation. For example, mobile EEG offers new research opportunities in Sports and Movement Science, Entertainment, Neuromarketing *and* more fundamental Cognitive Neuroscience. However, mobile EEG also confronts us with new technical and experimental challenges. During our workshop we aim to start a constructive multidisciplinary technology assessment to identify the main barriers and facilitators of mobile EEG. To facilitate the discussion, we focus on the extreme use scenario of Brain-Computer Interface research for space flights. Thus, speakers will first present their scientific findings, experience and challenges with mobile EEG. Then, we narrow the discussion to the extreme use scenario of BCI for space flights, which prepares workshop participants for a final group discussion.

Why do we focus on this scenario? We will argue that pioneering studies in this new field, one of which (Brainfly) will be presented and announced during the workshop, may be the ultimate test-bed for mobile EEG. If you can remove movement artefacts in a plane during microgravity, chances are high you can also remove them during a walk through the city while measuring EEG.

But why is it important to study the brain in space at all? And are NASA and the European Space Agency interested in neuroscience. Yes, they are. With the execution of frequent space operations and suborbital space flight on the brink of opening up to thousands of potential space tourists, it is important for safe and effective human exploration of space to understand how the brain works in different gravity regimes. Brain-Computer Interfaces (BCIs) can potentially facilitate space operations and improve space experience. However, the brain's response to different gravity conditions, and especially the effectiveness of BCIs in space,

have not been further examined after an initial parabolic flight experiment conducted by the European Space Agency's (ESA) Advanced Concepts Team in 2007.

Workspace timetable from 14.00 – 17.00

Time		*Speakers*[1]	*Topic*
	Welcome	F. Nijboer Leiden University	Why this workshop; Goals; Tasks for participants
	Presentation	J. Farquhar, Donders Institute for Brain and Cognition	Robust motor signature detection in highly non-stationary and noisy environments
	Presentation	Reinhold Scherer, TU Graz	Mobile Neuro Information Systems studies
	Break		
	Presentation	N. Savage, European Space Agency (ESA)	Overview of neuroscience research and assistive technology on the International Space Station (ISS)
	Presentation	Team Brainfly, Leiden University	Fly Your Thesis experiment: an EEG/BCI experiment in November 2017
	Presentation	J. del R. Millán, EPFL	Pioneering study on BCI in parabolic flight: lessons learned and recommendations
	Demo	Martijn Schreuder, ANT Neuro and Team Brainfly	Demo of the Fly Your Thesis experiment as a case for opening up the debate on how to do ecologically valid experiments
	Structured discussion with audience	Moderated by F. Nijboer	Technology assessment: Barriers, facilitators, trends, opportunities
	Wrap up with presenters	All speakers	Wrapping up: shortlist of main issues

Number of expected participants:
20

Workshop format:

[1] All speakers have confirmed their contribution to the workshop and attendance of the BCI conference

This workshop will consist of multiple short presentations, all covering a different aspect of space flight and the potential of mobile EEG and BCI during space flight. Speakers from multiple backgrounds and expertise will share their point of view and start a constructive multidisciplinary technology assessment to identify the main barriers, facilitators and opportunities for BCI in space.