

*Products in Practice***Welcome to eXtreme EEG***by Patrick Britz, Sales & Support*

What does the brain do when accelerated at 3G in a centrifuge? What does a racing driver's EEG look like? Can EEGs give us answers to questions like this or is it impossible to record an EEG under such conditions? Naturally, as an attentive reader of our Press Release, you know that it can be done. But what is now the limit of what can be achieved with an EEG?

At Brain Products, we want to push the boundaries even further and we're asking you to help us. What we need to find out is which of the restrictions known from traditional EEG research still apply and which have been overcome. That means under what (exceptional and unusual) conditions do EEG studies remain feasible?

In conventional, research-oriented EEG examinations, we need a shielded cabin and do everything we can to keep the test subject's movements to an absolute minimum. These are just two considerations which have severely limited the capabilities of EEG research in the past. We, however, are convinced that the continuous enhancement and refinement of EEG equipment have now overcome these limitations and opened up new fields to perform EEG research. Welcome to „eXtreme EEG“!

Let me give you an example of what we mean by that. What, do you think, happens in a table tennis player's brain when he fluffs a shot? Presumably what is known as ERN (Error Related Negativity) – but can we demonstrate that? The mere idea that the test subject would have to be moving as little as possible has caused researchers



„eXtreme EEG Pack“



„eXtreme EEG Belt“



in the past to shy away from this type of measurement. And where you would find a big enough shielded room is something we'd rather not think about.

But what if it could be done? We have tried it and recorded an EEG from a table tennis player. In other words, an EEG recording from a person moving energetically in an office lit by fluorescent tubes. I shall present the results a little later but, for the moment, let me just say this: Even with a single test subject, it is possible to observe an ERP which looks something like an ERN. I must admit that I was positively surprised. So why has Brain Products launched the „eXtreme EEG“ project? As I have already said, we wanted to expand the horizons of EEG research even further. But to do that, scientists (i.e. you) sometimes have to be able to try out things that would be difficult to write down in an official application. Without prior experience there can be no application and without equipment there can be no prior experience but, usually, without an application, no equipment is available. So how can we break out of this vicious circle?

**What we do for you**

To overcome precisely these hurdles, we have put together an „eXtreme EEG Pack“ which you can borrow from us for two weeks to perform your pilot studies. The pack contains everything you need to measure an „eXtreme EEG“:

- A mobile 16-channel research amplifier, our V-Amp, equipped with the 16-channel active electrode system our actiCAP.
- A suitable portable minicomputer running the best and newest software that Brain Products has to offer (actiCAP software, BrainVision Video Recorder, BrainVision Video Analyzer 2.0).
- Due to that we know full well that the analysis takes longer than the experiment, you can even keep Video Analyzer 2.0 for an extra three months.

What is more, we will pay for the event, that is to say the parachute jump (or whatever else you are inspired to do) - including the travel costs. But before you ask me the intriguing question of an EEG in outer space, we think that the cost of this type of project should be limited to about 750 Euros.

And while I'm on the subject of support, our rapid response support team will be happy to assist you as always. We will help wherever we can. Sounds interesting and exciting, doesn't it?

**What we expect from you**

Of course, we could test the boundaries of „eXtreme EEGs“ ourselves. But because our close cooperation with our customers has always been important to us, we want to work together with YOU to collect examples of „eXtreme EEG“ and the reports of your experiences. The results will then be available to all of us, helping us to identify new possibilities for EEG research and understand the criteria that we have to take into account. And, naturally, the collated results will be available to help you when you have to convince someone else (a reviewer, for example) that what you're planning is

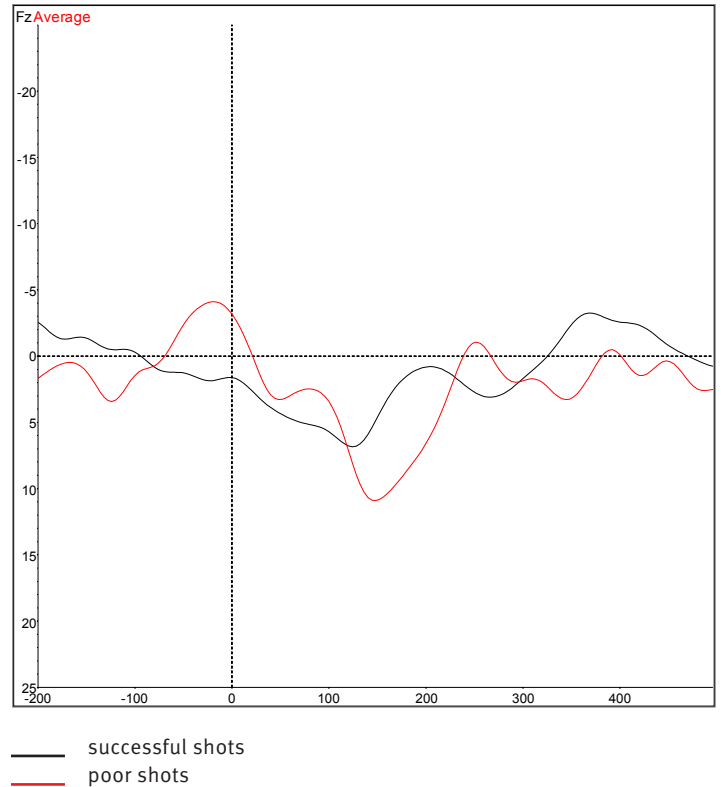


actually achievable. The eXtreme EEG database should be filled with the following information:

- a brief description of the respective project
- a short report of what happened (Did everything work? What problems occurred? What results were archived?)
- a short video
- an extract of the EEG data (optional)

You can already find a report and a short video of our „eXtreme EEG“ trial (table tennis) on our web site ([www.brainproducts.com/extreme\\_eeg.php](http://www.brainproducts.com/extreme_eeg.php)). You can use this as a guide. To explain in a little more detail what it is we hope to achieve with you and your help, here is a short description of what we did and the results we observed. As I reported above, we rigged our offices slightly so that we could play table tennis in them. In the figure, you can see an earlier version of our „eXtreme EEG Pack“: A rucksack with a normal laptop – not exactly comfortable and convenient.

It was with great excitement that we examined our data. Although it contained some artifacts, the overall quality was surprisingly good. First of all, we used the video to set the Analyzer 2 triggers for the „player’s shot“ in the EEG: 111 for successful shots and 112 for poor shots. Next, we marked the most extreme artifacts using Raw Data Inspector, filtered these (1 to 15 Hz at 48db) and then cleaned the data of blinks, saccades and a muscle component by means of an ICA. After this, we segmented the EEG at the two different markers. Within the 20 minutes of recorded EEG, we found a total of 48 bad and 223 good shots which we were able to analyze. We then performed a baseline correction of the segments and calculated an average wave for both conditions.



It would be wrong to read too much into the data given that we observed only a single test subject. Furthermore, the timing is a little imprecise due to the video (25 frames per second ~ 40ms) and the nature of the task itself – this could be another reason for the blurred appearance of the ERN. However, it was never our aim to capture a perfect ERN. We simply wanted to demonstrate that it is possible to derive EEGs successfully even under extreme conditions and find out what elements we need to bear in mind when doing so. And that is just what this pilot project did.

You can read the associated report and examine the data from the video on our web site: [www.brainproducts.com/extreme\\_eeg.php](http://www.brainproducts.com/extreme_eeg.php) We hope it will inspire you to start designing your own „eXtreme EEG“ project ...

#### How can I take part in the eXtreme EEG project?

You should have EEG experience and have an idea that you think is right for this project. If you would like to borrow our „eXtreme EEG Pack“ (inc. actiCAP and V-Amp) for two weeks and watch your idea become a reality, send an e-mail to [extreme.eeg@brainproducts.com](mailto:extreme.eeg@brainproducts.com) explaining what you want to do and what you need to do it. We’re looking forward to hearing from you and getting to know your ideas! Make sure you get in touch with us! ●