

Public Summary

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Development of a Mobile EEG for Neurofeedback Training

The bachelor assignment was provided by a researcher from the University of Twente and two researchers from the University of Münster and entailed creating a mobile Electroencephalogram (EEG) headset that can be used for the treatment of ADHD (attention deficit hyperactivity disorder). The following research question was therefore created:

‘How can we create a mobile EEG that can be used by adults with ADHD for neurofeedback training in their own homes?’

The initial literature review consisted of three big topics: 1. EEGs, 2. neurofeedback training and 3. ADHD.

Now the EEG is a clinical device that measures the brain activity using metal electrodes that are placed on the top of the scalp (non-invasive). Normally this is done at a clinic where a medical professional will be responsible for placing the sensors, also called electrodes on the scalp, and interpreting the results, however with a mobile headset the user can do it themselves. This provides many opportunities for both the patient and the clinician by allowing freedom of movement and a possibility for different testing conditions.

The term Neurofeedback describes a method in which the patient is shown and taught how to control their brain waves actively and consciously. This is accomplished by presenting the recorded data to the patient and showing how and why the waves are changing. This way, the patients can visualise the changes of his brain activity happening in real time and can try to influence them by, for example, focussing on a task. For ADHD patients the goal would be e.g., to improve their attention by looking at their brain waves when they are focused and when they are not and trying to replicate this situation. At a clinic the display will be provided in the room, but for the mobile EEG the user will use their phone to look at the waves.

The first part of the design phase was setting up a list of requirements that included all needed parts, functions, and wanted results. This provides a reference and guidance throughout the developing process.

The product that was created is an EEG headset that can be bought by patients with ADHD and used on their own without any external help. This was achieved by having a structure that is easily adjustable for different head sizes and different ages. It is also easily set up and requires minimal maintenance.

During the adjustment however it is important to note that the electrodes should be positioned on their predefined places to enable good measurements. Therefore, the EEG was designed in such a way that during the adjustment, the electrodes will automatically move to their needed positions when the size of the structure is being increased or decreased. This reduces mistakes and ensures an

easy and fast set up. Recharging the device is also easily done with a USB cable and rechargeable battery in the device.

After developing the design, a prototype was made to test the shape, size, and curvature of the EEG to assure stability and comfort. The model was completely 3D printing because of the needed shape and a few hollow parts. This confirmed some of my design choices but also showed that some parts were too bulky and unproportionally big. The product was not yet tested on test subjects yet as it still needs to be redesigned before it can be used for testing and eventually produced.