Developing a Tool for Mobile Brain Health Assessment

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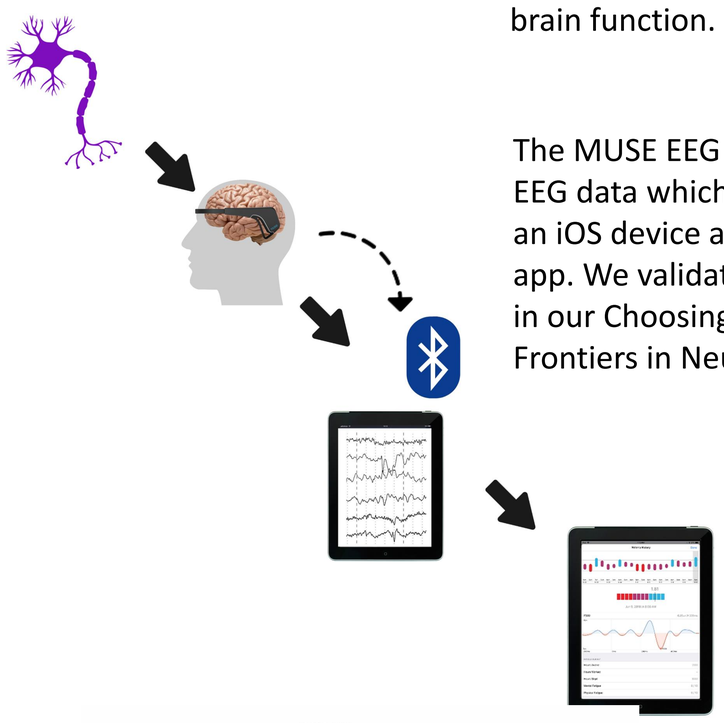
Overview

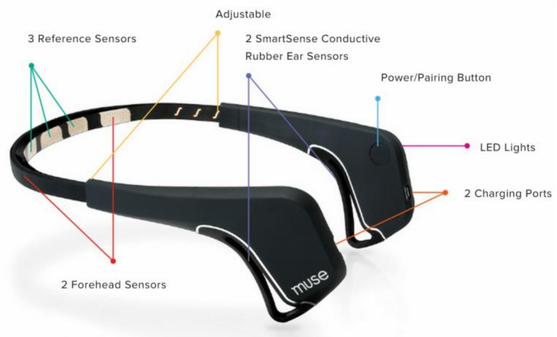
Cost-effective means of measuring brain health in the real world is imperative. Be it in the emergency wing of a hospital or the operations of industrial machinery, assessing individual brain health can be important for both individual health and safety, as well as minimizing cost of potential errors. By utilizing a portable electroencephalography (EEG) device, we may utilize human event-related potentials (ERPs) in a cost-effective and reliable manner to assess individuals' brain health by way of the ERP components and frequency analysis

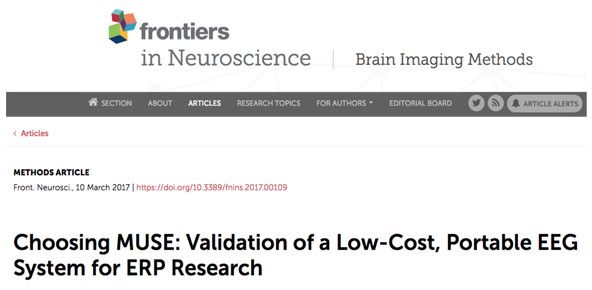
Using MUSE and Aspire

Electroencephalography (EEG) is a non-invasive and painless test that detects rhythmic electrical activity in the brain (more popularly known as brainwaves). Because EEG directly measures brain activity, it continues to be the most accurate assessment of brain function.



The MUSE EEG headband utilizes 5 channels of EEG data which is streamed through Bluetooth to an iOS device an iPad to connect to the Aspire app. We validated the MUSE as a research device in our Choosing MUSE paper, published in Frontiers in Neuroscience in 2017.





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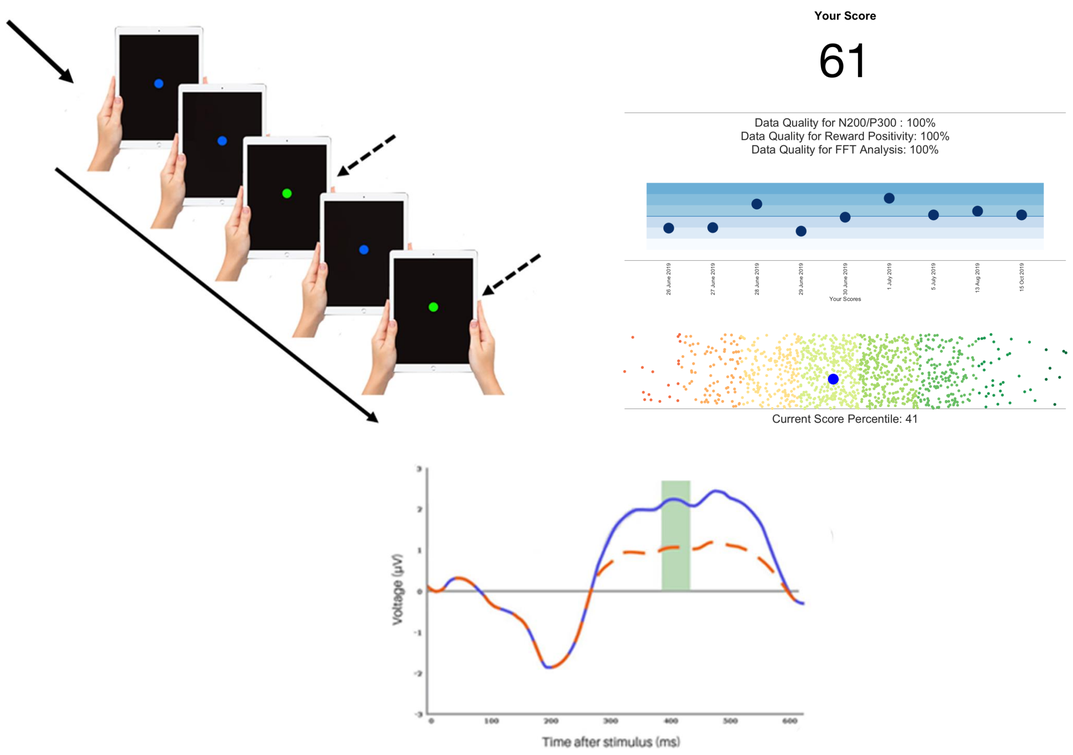
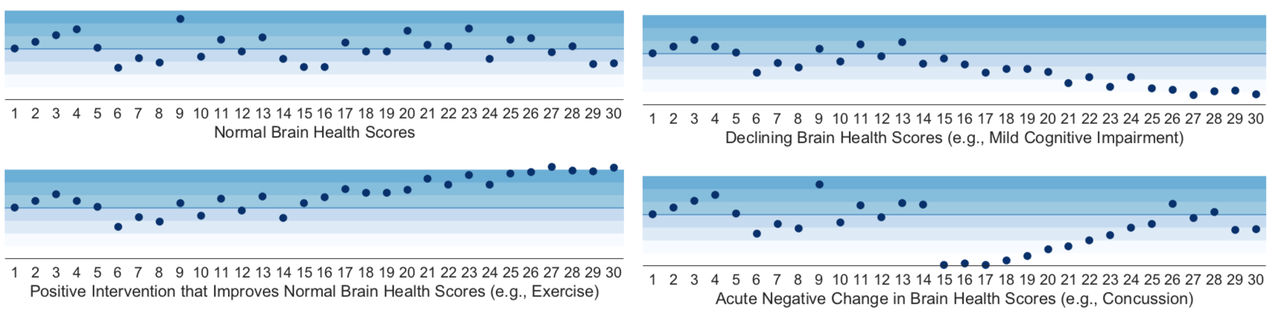
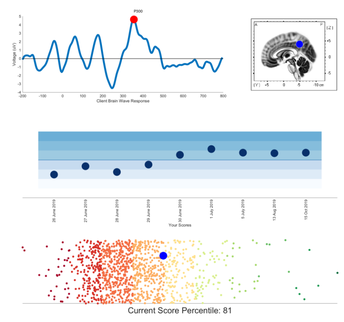
Developed by SUVA Technologies Inc., Aspire is an ongoing app for iOS platforms. This app is an excellent tool in the analysis and assessment of brain health. Aspire can output **a brain health score** based on performance in a series of classic neuroscience research tasks.





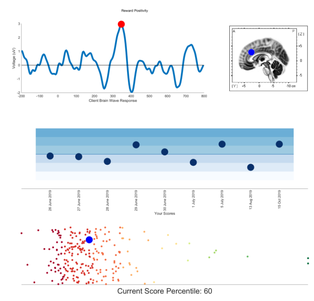
How the Brain Health Assessment Works

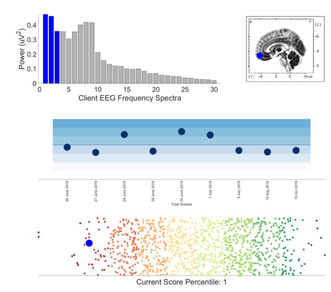
We calculate your overall brain health score by combining your various sub-scores with a method grounded in over fifty years of neuroscience research on EEG data. It is an easily understandable figure that serves as our best estimate of your current brain health and performance.



We measure information processing, cognitive control, and response evaluation by analyzing the N200 and P300. These effects are clearly identifiable changes in your EEG data that appear about 200-300 milliseconds after the appearance of a visual stimulus.

To assess the neural learning response to feedback and cognitive load, neuroscientists measure your reward positivity. It is thought to send a learning signal from your midbrain to your anterior cingulate cortex, which is a part o the brain that is heavily involved in learning and decision-making.





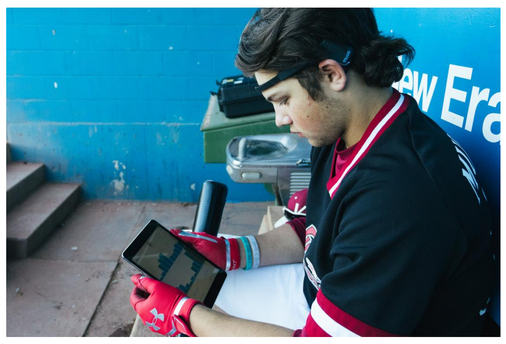
Another important method we use to analyze your brain activity is focused on the frequency at which your neurons are firing. Frontal delta brain wave rhythms are associated with your background or baseline brain activity. In other words, this is the natural or baseline pattern of activity in your brain.

Use Cases

The brain health scores outputted from Aspire can be put to use in various professional scenarios. We have used this tool to great affects in real-world settings such as:

Sports

In a previous study done in our lab, we used the MUSE to predict baseball player's batting performance using beta power. We are currently using similar methods in cooperation with Vikes Athletics, Mamba Sports Academy, and the Oklahoma City Thunder.



Mild Cognitive Impairment

We also implement our tech in clinical settings. We are currently working with UBC and the Vancouver Island Health Authority on a study about the effects of Mild Cognitive Impairment (MCI) on brain health scores.

Concussion

Another clinical application of our Aspire app is in concussion assessment. Working with Dr. Steve Martin at the UVic Sports injury clinic, we are assessing the effects of concussions on athletes' brain health scores.

Conclusions

Utilizing the MUSE EEG headband and Aspire, we provide an accessible, portable tool for unique health assessment scenarios. By testing professionals in working and competitive environments around the world, our brain health assessment is a unique and helpful tool for valuation of brain performance.

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