

BUSINESS MODEL		VISION—What is the purpose of this project?	
Vision: We envision a world in which brain health is visible and accessible – empowering everyone to reach their full potential for health and wellbeing.	Mission: To connect concussion patients with their brain data, so they can take control of their recovery.	Brand Essence: An understanding of connection should permeate all brand messaging and materials. We connect the brain data to the patient to the caregiver.	UI project purpose: to represent what our deep tech algorithms are providing to patients and doctors. We are making brain health accessible and visible. To achieve this, we need to tell the story of their sessions and how proper management of concussion is 1) helping to optimize their recovery in real-time (through visualization of the sessions) and 2) improving their health over time.
Customer / Markets	Market Needs	Solution / Product	Business Goals
What market segments should we serve?	What problems do we solve?	What is the solution?	What are our goals for serving our customers?
— We are serving the market of patients with concussion and their caregivers	— There is no ability today to self-measure and visualize brain health. A concussion is an “invisible injury.” Therefore, doctors tend to provide subjective and vague recovery guidance. Patients feel confused and isolated.	— A mobile application that keeps a diary of signals linked to brain activity with real-time feedback and optimization. Will have the potential to be used in concussion diagnosis and return to play/work/life.	— Our goal is to build a brain diary for each patient, by listening to the brain and sharing this diary with the patient and doctor. We empower patients to be actively engaged in their brain health, and physicians can receive the data they need to effectively monitor and guide concussed patients to a faster recovery.
Where might we find the biggest concentration of customers?	What are the biggest benefits?	What is the biggest point of difference? (including, if we have competitors)	How do we plan to charge for our solution?
Consumers (patients) but a large portion of this will be athletes and coaches	— Provide insight into their injury. The ability to visually detect patterns and share patterns with caregivers, and coaches. This makes the injury real, and visible	— Today, most physicians advise patients to record their symptoms on a piece of paper. We are the only concussion recovery solution that digitally transforms real-time brain data, based on scientific research, and delivers it to a patient's mobile device.	— If our technology is enabled in a headset, we will recognize a specific amount of revenue from the headset manufacturer. They share with us a portion of the revenue and the fee is fixed per headset or annual
What others are involved in the purchase decision (users, influencers, economic buyers)?	What problems don't we solve?	What are our core competencies?	Where are we going to and why? What does success look like in the future?
Main target: consumer electronic companies that will target users	- We don't heal concussions	- The team is composed of R&D in the neuroscience field.	- Our objective is to embed part of our solution in a consumer headset (Bose, SONY, Samsung, Apple, ...) which would allow us to gather significant data and improve algorithms
*note: a large part of this consumer play is athletes. In this process, there are coaches, doctors, trainers and athletes themselves.			- Helping sell 1M headsets (think SONY) would also allow us to reach specific revenue goals.
*other influencers: physiotherapists and others in the healthcare field			- Fast forward time, success is that (just like Intel Inside), every headset has a Neurovine inside.

Company Goals and objectives:

Similar to how Intel came out with the “Intel Inside” strategy, our monetization will be based on licensing the “Neurovine Inside” IP.

Customer segments

Primary - B2B Segments

The Licensors of the “Neurovine Inside” IP would be headphone makers (ex. BOSE) for their high-end headphones and hearing aid device makers (ex. AMPLIFON). A BOSE high-end headphones, as well as a specific model of AMPLIFON hearing aid devices, would have the Neurovine Inside logo on both the device as well as the packaging.

There are several monetization techniques:

- 1. We license our mobile SDK (cardiogram-like solution) to BOSE and AMPLIFON type of companies. We would take a fee for this, however, this is not a primary source of Neurovine revenue. The mobile SDK would allow the internal BOSE team to personalize “brand” the mobile app, or we do this for them for a fee.
- 2. Once a user pairs and authorizes themselves into the device, a licence is executed between the user, BOSE and Neurovine. The user does not pay an additional fee. However, BOSE does as the reason they bought those headphones was because of the Neurovine inside the technology.

Example. Let’s say the BOSE headphones with the Nuerovine Inside logo cost \$699. If the user pairs the mobile app with the headphones and authorizes it in the app, Neurovine issues a license to BOSE for \$20 (one time). We have not determined the price, but suppose it is \$20.

In our back office, we will have to track devices, activations, and invoices that will go to BOSE based on activation. There is no recurring model for this. It is just a one-time fee.
a credibility factor with consumer electronics makers. The mobile app is also a way for users to constantly ‘self-diagnose’ and register their brain diaries.

Note that the initial market is concussion; however, there are other markets that we will chase, like dementia. And hence, new markets will be opened.

Other segments

Military In terms of the military Market, we would have the same mobile app, however, initially would integrate with our or off the shelf headset (not headphones). Because the military pays for the number of headsets, in a similar IP strategy of “Neurovine inside”, we would partner with the headset maker. However, there would most likely be custom software developed for Military and physicians. Note, the military segment is most likely the first market we will acquire or our first revenue. However, the dynamics are very similar to the Consumer market, with most likely a twist in the software. Note, that most likely, the Military will use one headset for several people and so there needs to be a multi-user mobile application or pairing. Once BOSE or AMPLIFON comes out with the Neurovine inside technology and the EEG is sophisticated enough, then most likely we will sell to the Military BOSE headphones.	Athletes In terms of athletes, we think the same way as consumers, however, athletes have also team physicians. The monetization will be exactly like consumers, however, the “add physician” and share the data with physicians is a key element. Note, in Athletes' case and in some Consumer cases, it might be the insurance company that pays for the headsets or claims are made. Not sure yet. SPORT CONCUSSION ASSESSMENT TOOL
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Make a portable EEG headset that meets Neurovine's requirements in order to reach out to possible business partners.

The intention is not to go into manufacturing but to find a partner who can do this who wants to get into wearables and can fund the company as well e.g., Bose

Worst case, we manufacture our hardware (this means VC support, not a commercial partner).

Approach 1: prototype with a company that sells a package (i.e. wearable sensing) and use this for our trials. If we use a company like this we need to ensure there are no IP conflicts in any of the software we're developing (i.e. data cleaning or cognitive load).

Approach 2: source parts and build from scratch. Likely will not be able to use it for trials, but will be sure to own all IP.

Approach 3: continue with Muse for trials while building the Neurovine version for sale. Concern about IP ownership allows us to get evidence for the regulatory process for the software (not the ideal strategy unless we are going to continue with Muse in the market).

Product 1

Hardware developed to meet Health Canada Criteria but released as a wellness tool while it is in clinical trials

Software designed to optimize brain health through concussion recovery

- provides brain break alerts to a patient (frequency-based EEG measures)
- communicates patient registered triggers and symptoms with a clinician (not EEG)

Product 2

Hardware receives approval as a medical device

Software used to diagnose and monitor recovery from a concussion using EEG (likely ERP related) and balance (accelerometers and gyroscope).

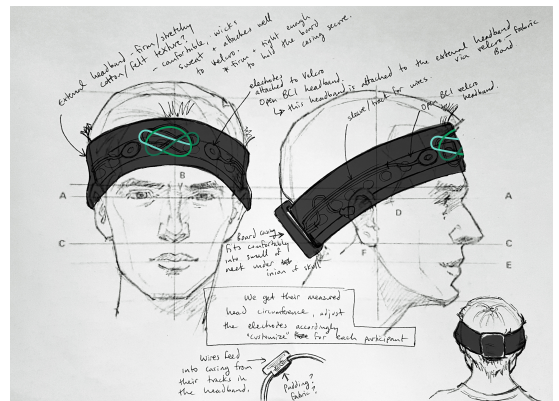
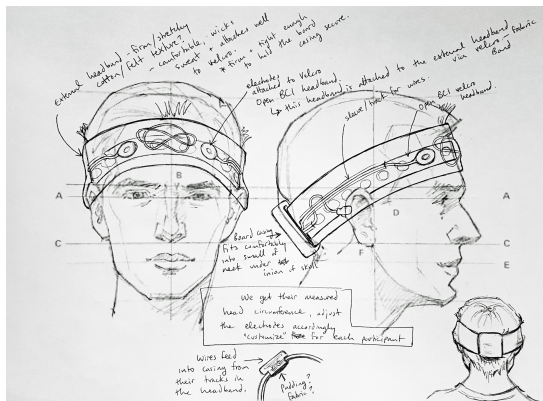
High-level hardware specs

Bluetooth, battery-powered, > 4 electrodes and ground (2 frontal electrodes for sure), heart rate (perhaps separate), accelerometer (and likely gyroscope), biocompatible materials, comfortable

Technology Overview.

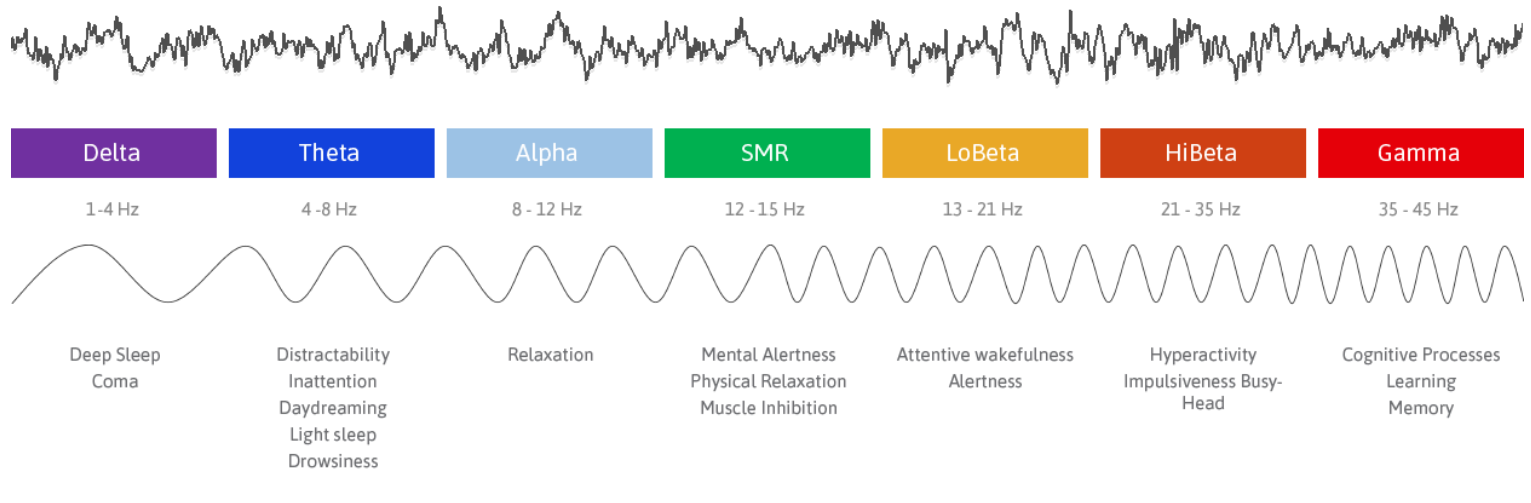
The Device

A possible draft for our EEG prototype. Just to start a discussion etc. I think if we could get the board and battery in the back in a comfortable way, that would be great.



The main waves:

EEG



1. Concussion Triggers

Cognitive triggers:

Reading, studying, writing, concentrating, watching TV, texting, computer work, video games, emotional stress

Physical Triggers

Exercise, Driving, Rapid head movements, Poor sleep

Environmental Triggers

Noise, light

Concussion Symptoms

- Headache or a feeling of pressure in the head
- Temporary loss of consciousness
- Confusion or feeling as if in a fog
- Amnesia surrounding the traumatic event
- Dizziness or "seeing stars"
- Ringing in the ears
- Nausea
- Vomiting
- Slurred speech
- Delayed response to questions
- Appearing dazed
- Fatigue
- Concentration and memory complaints
- Irritability and other personality changes
- Sensitivity to light and noise
- Sleep disturbances
- Psychological adjustment problems and depression
- Disorders of taste and smell
- Balance problems
- Moves clumsily
- Drowsy
- appears dazed or stunned
- Confused about assignment or position
- Forgets instruction or play
- Is unsure of score or opponent
- Repeat things
- Can not recall before (after) blow

Suggested Physical Activities for Graduated Return to play from Zurich Consensus:

- Limit physical activity
- Walking
- Swimming
- Stationary bike
- heart rate < 70 % max
- no resistance training

- Sport Specific Drills
- Throwing or passing ball/puck
- Progressive resistance training
- Full contact
- Following medical clearance, participate in normal training activities
- Normal gameplay

Suggested Cognitive Activities to return to work/school:

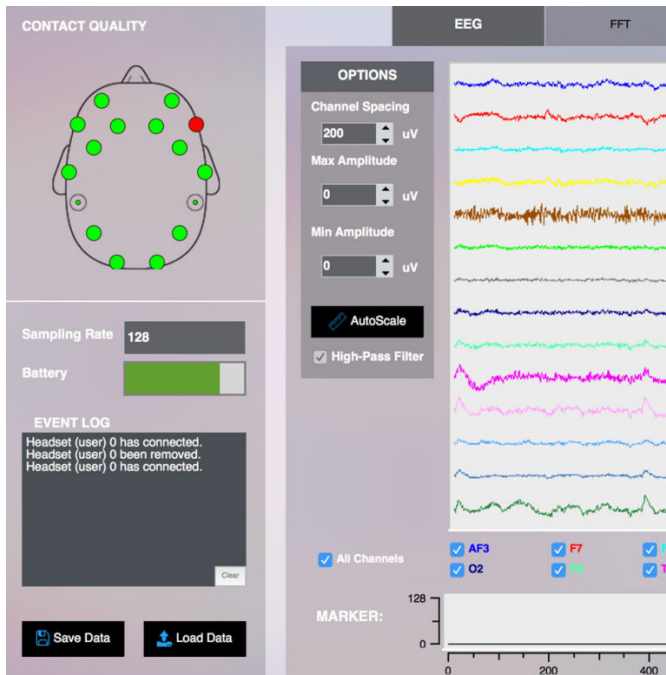
Barriers to return-to-work are varied and include both medical and non-medical factors. Cognitive difficulties (i.e., thinking, concentrating, and fatigue) are the most commonly reported medical factors that interfere with workability. Other factors include “seeing stars” the invisibility of the injury, persistent symptoms affecting the ability to do the job, and lack of advice and guidance on returning to work. In addition to these barriers, RTW support systems were considered to be poorly coordinated and managed. Workers reported common factors perceived in facilitating RTW were the support of family, friends, treatment providers, and employers who provided accommodations.

- Limit screen time and performance-based cognitive tasks
- Defined work sessions followed by a restful brain break.
- 30 minutes of light reading or writing or problem-solving. Limit 3 sessions/day
- 10 minutes of screen time. Limit 3 sessions/day
- 10 minutes of music. Limit 3 sessions/day
- Return to school/work for shortened hours (e.g. ½ day)
- Return to work

Competitors research

Device	Research Tools	Output	Platforms	Price	SDKs
Emotiv EPOC (14 channels) and Insight (5 channels)	PureEEG: Access to pre-filtered raw data from the headset and FFT, online monthly subscription-based software. An annual subscription-based offline version is now coming. No formal SDK, must contact the company	EDF	Windows, Mac, Android, iOS	\$49 /mo for 50 recordings	-
Open BCI UltraCortex Multiple configs from 4 to 32 electrodes	OpenBCI GUI: Access the raw data with tools to view raw data and Power Spectrum and perform offline filtering. Developer tools and templates available for Java, Python and Node.js	EDF	Windows, Mac	Free with device	Tools and templates for development with Java, Python, and Node.js
Neurosky Mindwave Mobile and Mobile Plus (single channel)	Neuroview/NeuroskyLab: Access to pre-filtered raw signal, FFT, and processed metrics (attention and meditation). NeuroView provides CSV output, NeuroskyLab integrates with MATLAB where you can use other tools like EEGLAB.	CSV	Windows, Mac, And, iOS	500	Free, standardized toolsets for all platforms with raw signal access
Neurosky MindWave Mobile	MyndPlay Pro: third party app providing access to the raw signal, real-time frequency bands (theta, alpha, beta, gamma)	CSV	Windows, Mac	121.74	
MUSE (4 channels)	MuseIO and MuseLAB: Access to raw signal and FFT.	MUSE format	Windows, Mac, Linux	Free	
NeXus EEG HeadSet	The NeXus EEG HeadSet was designed for clinicians and researchers who want quality EEG signals.	CSV	Windows 10 64-Bit	Free	-

Emotiv EPOC



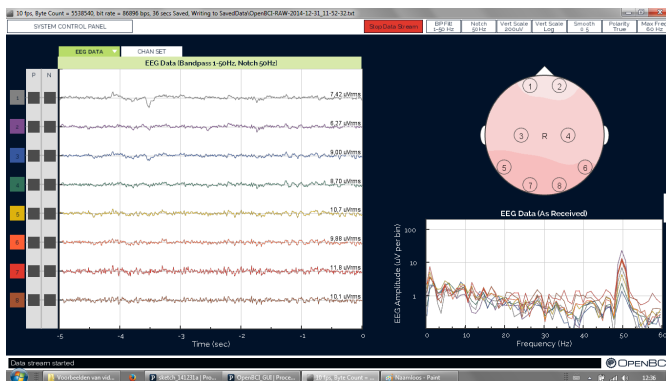
Emotiv EPOC is a 14 channel headset that uses gold electrodes with sponge contacts that are wet with saline, while Insight has 5 polymer-based dry electrodes. Emotiv has discontinued its downloadable TestBench software for accessing the raw EEG signal from EPOC and moved to a subscription-based model that supports both EPOC and Insight.

The subscription-based pricing model is based on the number of recordings that you do. You pay \$49/month for 50 recordings, ~ \$1/recording. If you do 250 recordings a month you pay \$149, which is 60 cents per recording. You can also prepay for the year and get some pricing benefits – for 50 recordings a month with the annual prepaid, you pay 83 cents per recordings rather than \$1. The big downside is that if you make mistakes in your recordings and need to scrap one and start over you end up paying for all that – on the other hand, it can make you more diligent about your data collection.

In terms of developing new applications that work with the Emotiv devices, there is not yet an established SDK or application developer program. At present, you have to 'apply' or basically

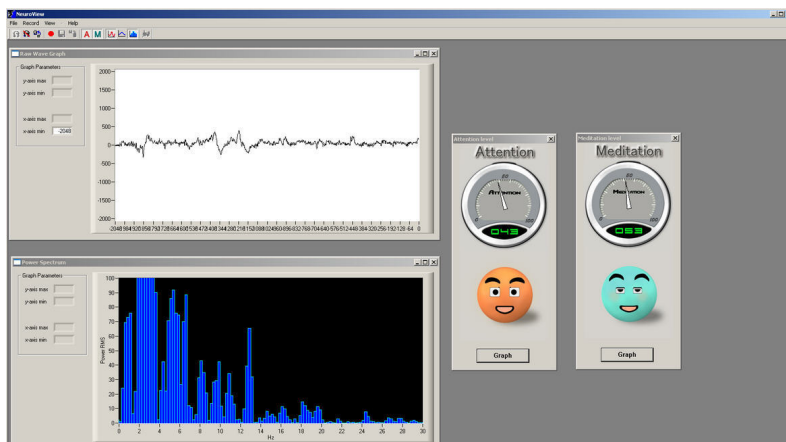
talk to them to develop applications. Presumably, this will change someday.

OpenBCI



OpenBCI's UltraCortex comes in various configurations from 4 to 32 electrodes and has traditional gold electrodes used with conducting paste so would, therefore, have good contact quality. While the device is priced higher than EPOC, the software is free to use. The raw signal they provide is less processed than the Emotiv – you get the raw signal and then have the flexibility to do the processing in the software GUI. For example, the GUI has options to apply your own filters to the data including band pass filters and notch filters at 50 and 60 Hz.

Neurosky



Neurosky is fundamentally different from Emotiv EPOC and OpenBCI: first it is a single channel system (with a mastoid reference and a ground) that uses a dry stainless steel electrode (that presses too hard on your forehead if we may say so) and provides a pre-filtered signal sampled at 512 Hz as output (compared to 128 and 125 Hz for Emotiv and OpenBCI respectively). Neurosky's device Mindwave has been built for consumer applications, not research, and they have a well-established app marketplace and SDKs for iOS, Android, Mac, and Windows. The developer tools are

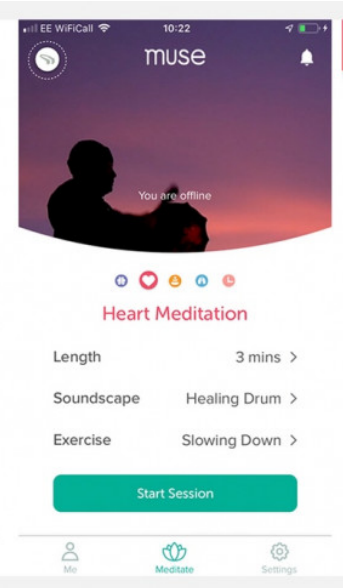
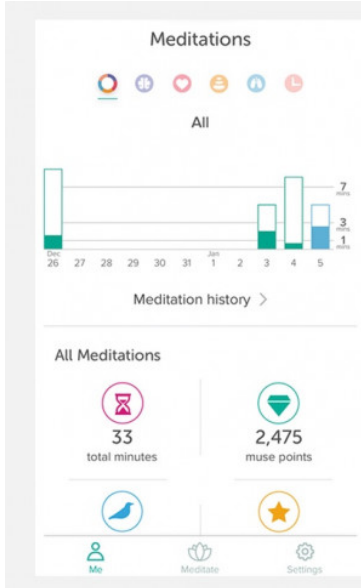
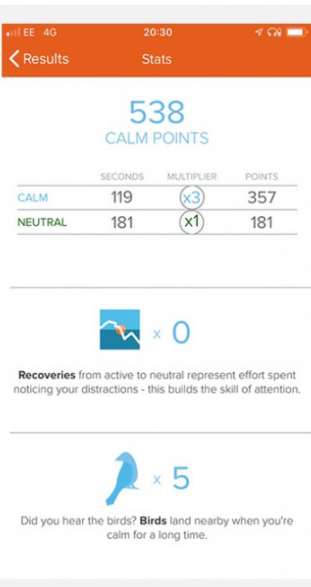
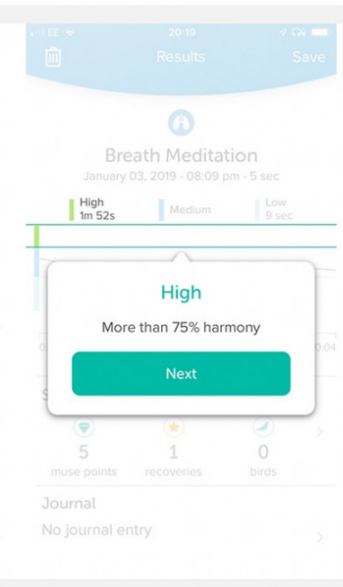
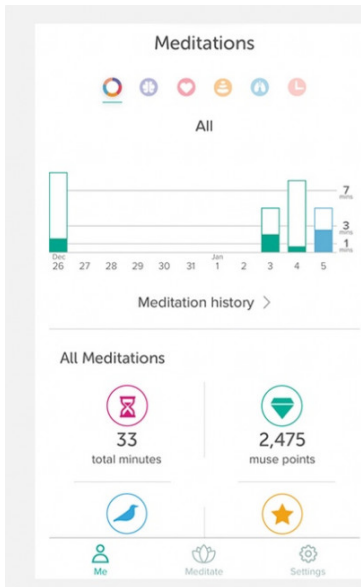
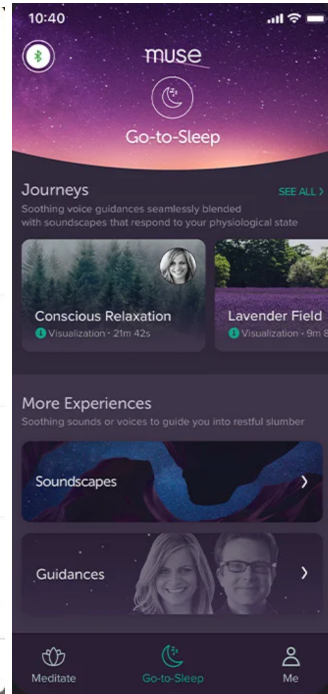
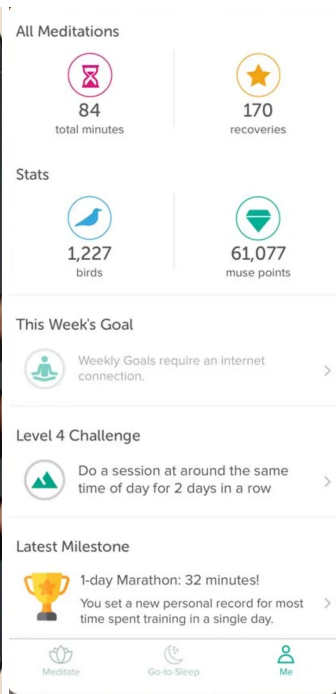
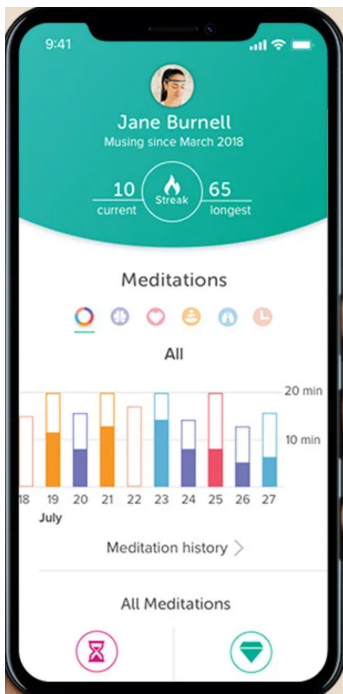
free and also give you access to the raw signal. Neurosky also has a standardized platform and revenue share structure for selling apps in their store. here are two different versions – **Neuroview**, which does not provide an EDF output but rather simply gives you the signal as a CSV and **NeuroSkyLab** which integrates with MATLAB. Both cost \$499 and only work with Windows.

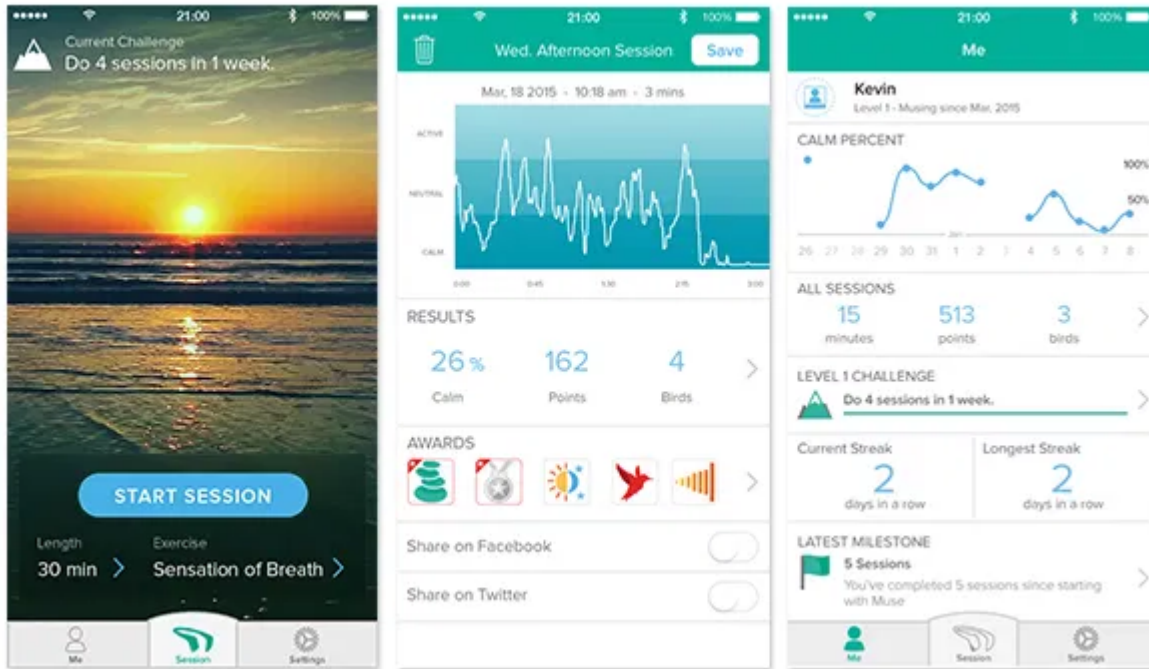
There are also third-party research tools compatible with Neurosky. MyndPlay for instance provides all of the same basic features as Neuroview and Neuroskylab but is only \$121 and works on both Mac and PC.

Muse



Muse, which calls itself the ‘brain-sensing’ headband, has 4 dry electrodes, 2 silver electrodes on the forehead (anterior frontal) and 2 conductive silicone-rubber electrodes behind the ear (temporoparietal). Maybe a step up from the Neurosky stainless steel in terms of signal quality but not by too much. They use electrodes on the forehead (FPz; CMS/DRL) for reference. The raw signals can be accessed through their developer tool kit with sampling rates set to either 220 Hz or 500 Hz and is low pass filtered at 100Hz. The 60 Hz notch filter which is turned on in the consumer application is switched to off for the research applications. [Wave filtration](#) video [Muse App](#)



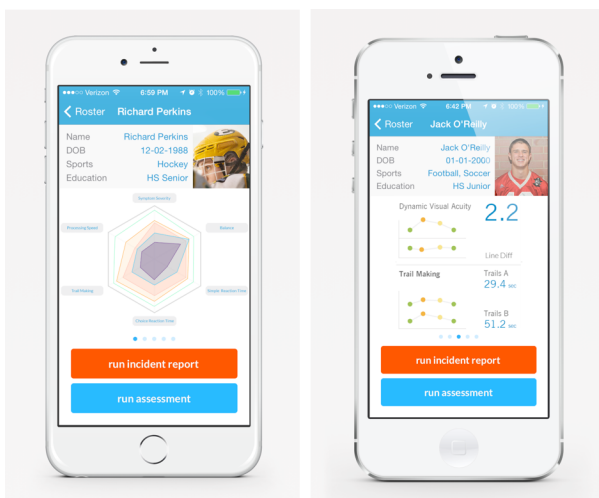


Zeto ([Raises \\$7.3M in Series A](#)) The FIRST TRUE DRY ELECTRODE EEG SYSTEM cleared for clinical use by FDA.



The headset is easy to use and comfortable to wear, uses dry electrodes and no wires, improving the patient and technician experience dramatically. Coupled with our intuitive cloud software, the technician can now be more productive and perform more EEGs in a day. EEG is instantly uploaded to the cloud and any laptop, tablet or even a smartphone can be used to monitor live or analyze previously recorded EEG. We offer an easy to use, turnkey solution for Outpatient EEG.

C3Logix: Comprehensive Concussion Management System ([case study](#))



A concussion is an injury affecting the brain, induced by direct or indirect biochemical forces. A concussed patient is at risk of long-term health effects, such as loss of memory, cognitive, and other degenerative impairments, unless their injury is quickly and accurately identified and managed. Second and third injuries are likely to be more severe, can take longer to recover from, can cause permanent brain damage and increase risk of retirement from sports.

The C3Logix System removes the guesswork from managing the injury and assisting clinicians in determining when it is safe to return to physical activity.

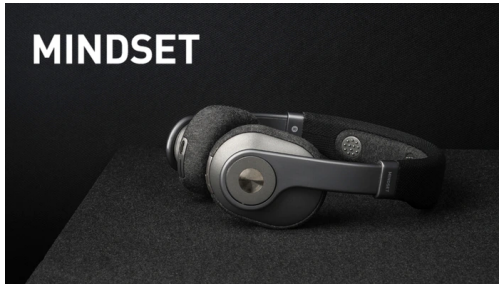
C3 Research: A platform for the exploration of TBI

Building on the success of the C3 System, NeuroLogix has expanded the original platform for use as a broader data collection tool for traumatic brain injuries.

C3 Military: TBI field diagnostics

NeuroLogix is making a version of the core C3 system for use by the military. It will be ready for testing by the end of 2019.

[Mindset](#): smart headphones that improve your concentration



Every time you get distracted, your mindset lets you know through an auditory cue, bringing your attention back to the task. Each reminder is like the coach's feedback - your brain learns to recognize its distractions, and tune them out. In time, you won't even need the headphones any more because your brain will have rewired itself to naturally tune out distractions. This will help you focus better and get more done.

[Nurio](#)



[It uses](#) AI algorithms that let users transform thoughts into commands to control things, such as IoT devices connected to the nūrio cloud. The proprietary architecture allows Brain-Computer interfaces to control most devices with an internet connection.

Nūrio is the world's smallest wearable consumer EEG device. It simply slips over the ear like a headphone and provides consumers with app- and cloud-based command capabilities, comparable to Alexa Skills, but with just their brain waves – no voice commands required.

[NioWear](#)



NioWear is a smart device that captures human brain waves or EEG signals. The captured EEG signals are wirelessly transferred to a smartphone by NioWear using Bluetooth Light. From the smartphone, the EEG data is sent to the cloud, where our cutting-edge machine learning algorithms analyze and convert this low-level EEG sensor data into high-level actionable and tangible events. Depending on the use case, the later events may range from — seizure prediction in Health Care through — emotion and behavior detection in Neuromarketing to — directly controlling objects with the mind for Gaming or people with disabilities.

Product analysis

	Muse	Welltory	Mind monitor	Opti Brain	FocusMe
Monetisation model	Device purchase	Subscriptions	Paid app	Subscriptions	
Waves. Display and analytics.	yes	no	yes	yes	
Store the measured data (csv, etc). Cloud upload	no	no	yes	no	
Concentration	no	no	yes	yes	
Stress Measurement	no	yes	no	no	
Self-tests	no	yes	no	no	
3rd party products support	no	yes	no	no	
Hartbeat analytics	no	yes	no	no	
Daily activity measuring	no	yes	no	no	
Productivity tracking	no	yes	no	no	
Workout activities tracking	no	yes	no	no	
Sleep tracking	no	yes	no	yes	
Meditation	+	yes	no	no	
Fitness trackers support	no	yes	no	no	
Courses and training analytics	no	yes	no	no	
Gamification	+yes	no	no	no	
	Meditation functionality mostly				

MVP overview

Personas

Professional Sports Buyer Personas:

Player

General Manager

Athletic Trainer



23 years old
Not married, no kids
United States, New York

Jayden

Football player

“I am a professional football player, and this is what I've been aspiring to my entire life. I love what I do and a cannot disapoint my fans and family”

Goals

- Return to game ASAP
- Decrease Concussion Symptoms like Headache, loss of consciousness, Amnesia, Slurred speech

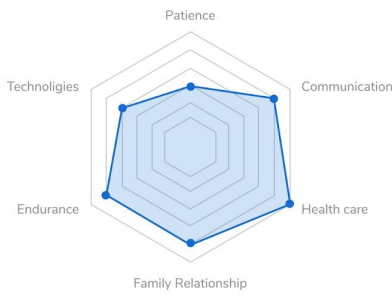
Frustrations

- Doesn't want to miss the next game
- Loosing money
- This will affect my productivity
- Lack of friends and teammates attention

Behavioral Considirations

- Will try to find the fastest way to cure
- Has trusted relationship with clinics and doctors
- Likes new approaches in a purpose to get more heightened sports results
- Always using mobile applications to monitor all sports events.
- He has a high pain threshold, so he has increased pain tolerance.

Qualities





43 years old
Married, three kids
United States, New York



James Gordon

Athletic Trainer

"Life-work balance is my main reason to work in this direction. I am continuously collaborating with doctors and other medical professionals to oversee treatment "

Goals

Evaluate injuries

Make the all team healthy

Player continuity (keeping players on the ice/field)

Being able to recognize injuries or unusual movements immediately following an injury

Biggest Concerns

Earning and maintaining player trust

Will the data you provide prevent us from putting a 'healthy enough' athlete back on the field or will it make the athletes anxious?

Facilitating healing, educating about injury prevention and implementing programs and practices to keep athletes performing their best without compromising their safety

Covid-19 (and similar possible future incidents)

How to learn/develop protocols to work safely in the new reality

Potential of losing my job

Behavioral Considerations

Collaborate regularly with doctors to oversee initial treatment

Apply preventative devices to athletes preceding and ensure that application won't affect their ability to play

Instruct athletes about how to use sporting equipment to maximize performance without causing unnecessary strain or injury

Oversee basic administrative duties, including injury documentation, filing insurance claims, updating athlete rosters, etc



57 years old
Married, four kids
United States, New York



Alen Crestersen

General Manager

"Winning is tied inextricably to the bottom line and in turn, job security"

Goals

Make a stable financial result

Urgency to win and build stable franchises immediately; dealing with often-impatient billionaire owners

Player continuity (keeping players on the ice/field)

Biggest Concerns

Success may depend more on the acquisition of a superstar athlete than on an impressive management skillset

Navigating the turbulent salary-cap waters, making often-risky bets on long-term contracts, free agents, building a potent team on and off the field

Covid-19 (and similar possible future incidents)

What will the upcoming season look like? And how quickly/safely can we pivot to a new reality?

How to keep players and staff safe?

Impact of having to lay off staff

The financial impact of pandemic on the bottom line

Behavioral Considerations

Create alignment around philosophy, style of play, type of players, embrace of technology and comfort with collaboration with ownership and head coaches

Manage day-to-day operations and long- and short-term strategic planning

Mentor and develop players and staff

Communication: be the public face of the team

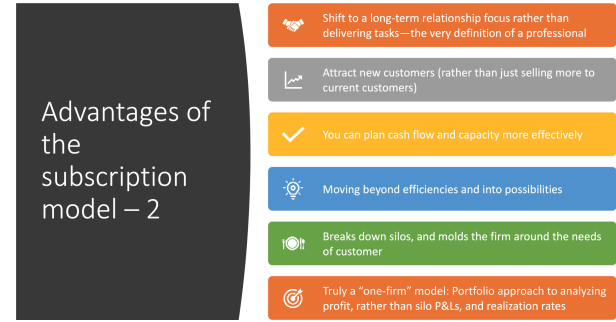
Manage player personnel decisions, including drafting, handling free agents and contracts

Oversee budgets for many of the groups in the sports organization

Main app monetization strategy - Subscription model.

Key advantages:

1. **Flexibility** you can predict the revenue based on monthly usage
2. **Ability to scale** - subscription model allows clients the security of knowing that everything is month-to-month, and nothing will not be changed without client approval.
3. **Stronger relationships** - it builds a substantial level of trust since the client knows that you have their best interests in mind and understand their needs.

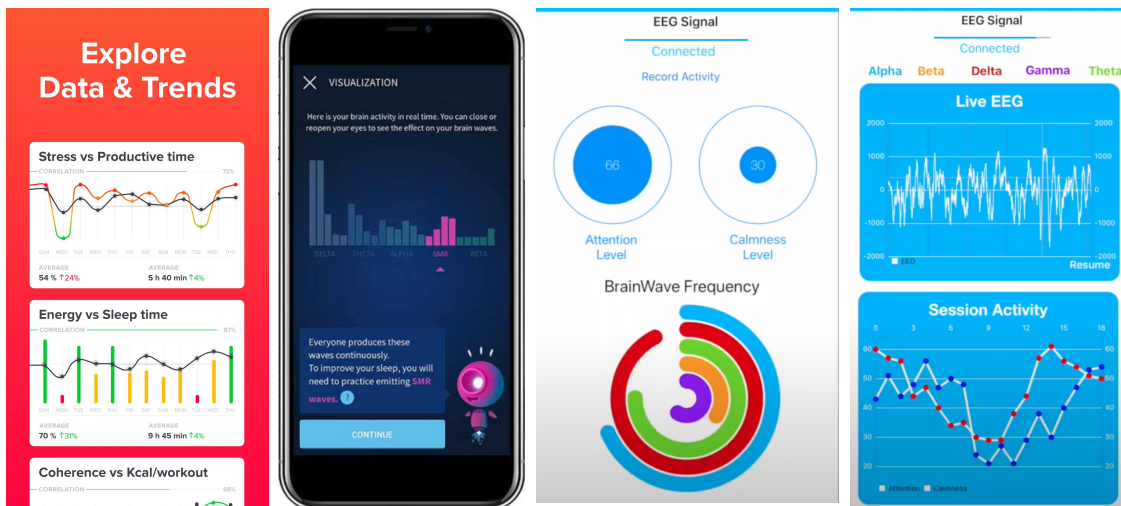


Possible premium features:

- EEG care - system will continuously monitor your brain wave using AI algorithms and users will get some useful insights from this process, some alerts, suggestions, and others.
- Share with doctor Export EEG measurements to doctor via PDF, some Raw data, etc. Users are able to cover more precisely by a physician's support. This feature could be covered via medical assurance or similar approaches.
- Heath metrics comparison. This feature allows comparing the exact user data with other member groups' historical data (with full privacy of users data of course). It also gives us more user-based insights.
- Sharing data with family allows controlling the user's health and controlling rehabilitation process by relatives.
- Return to play strategy - provide more deeply suggestions on how to return to work/sport/school.

Screens

1. The main app screen must show the processed raw data from the device.

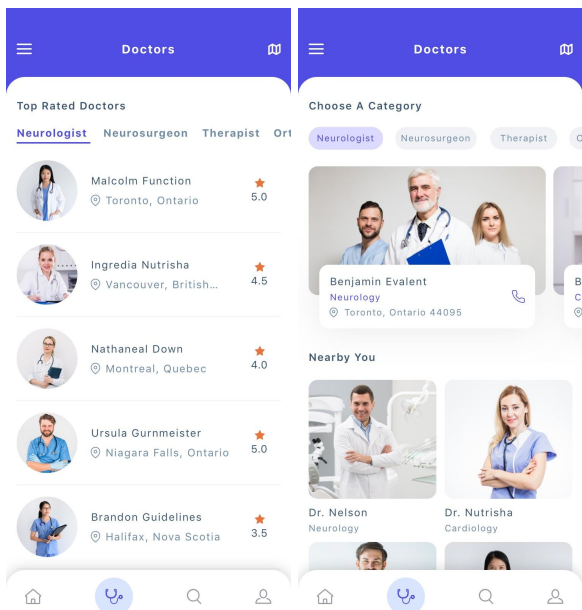


Measure key indicators:
EEG waves (need from API)
Patient Productivity
Recovery process overview



Potential functionality

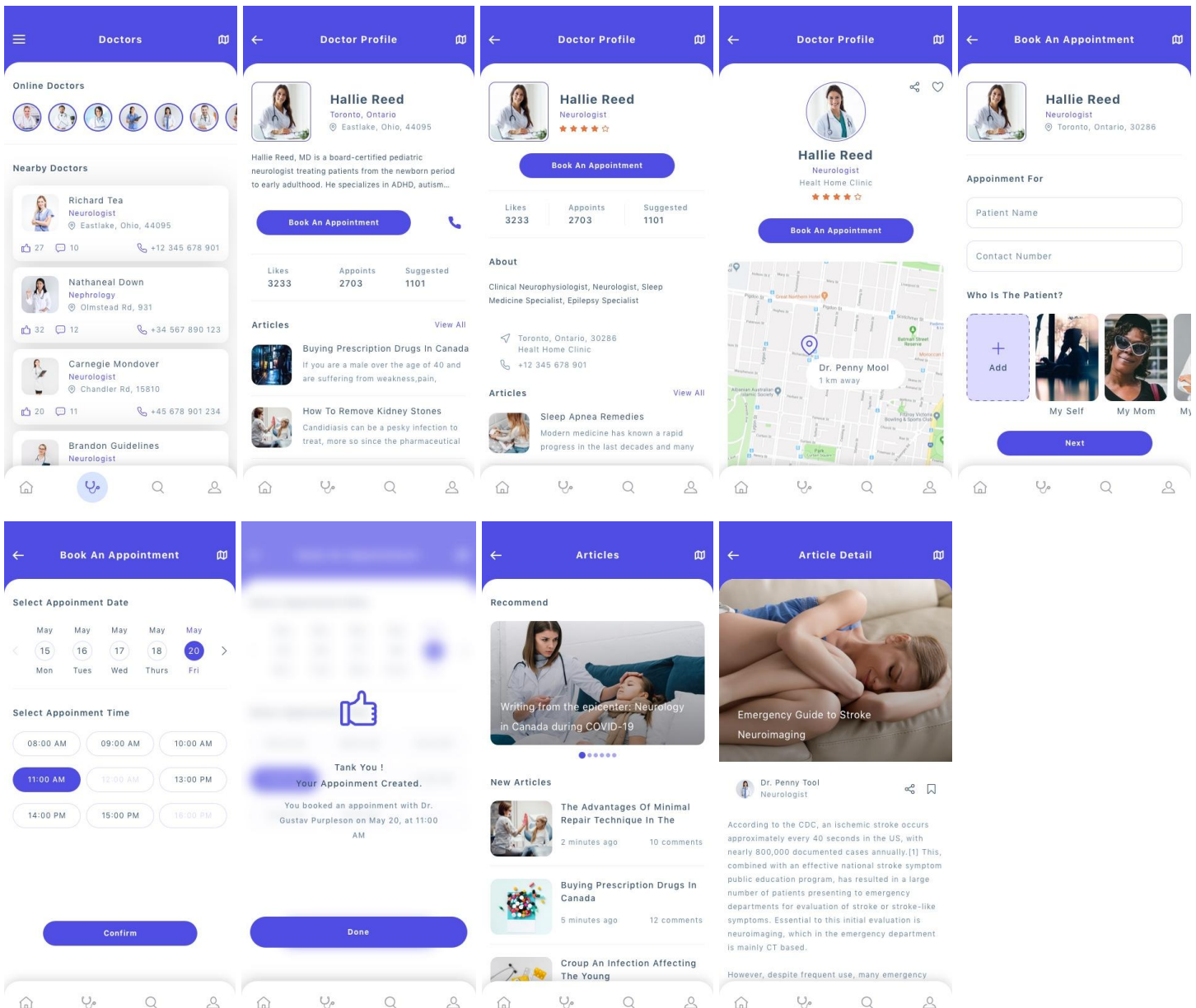
- One important feature should be the doctors choosing process. If the patient does not have any contracts with doctors and they have wave indications that show some brain injury, patients should find the doctors as fast as they could.



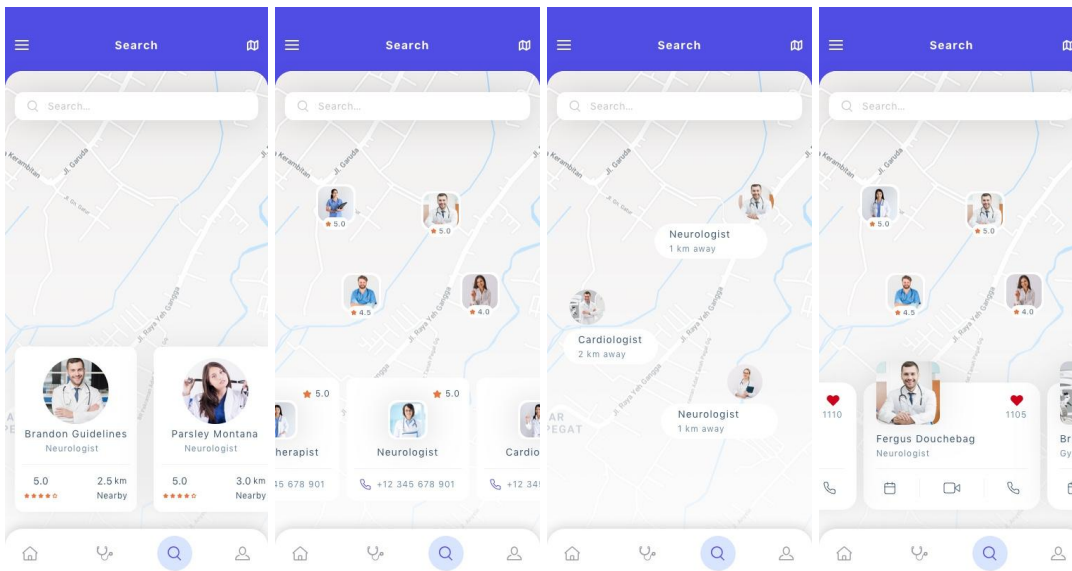
- Also a critical feature can be direct call to a doctors via app especially without of any 3-rd party applications (like whatsapp, skype, direct call, etc)



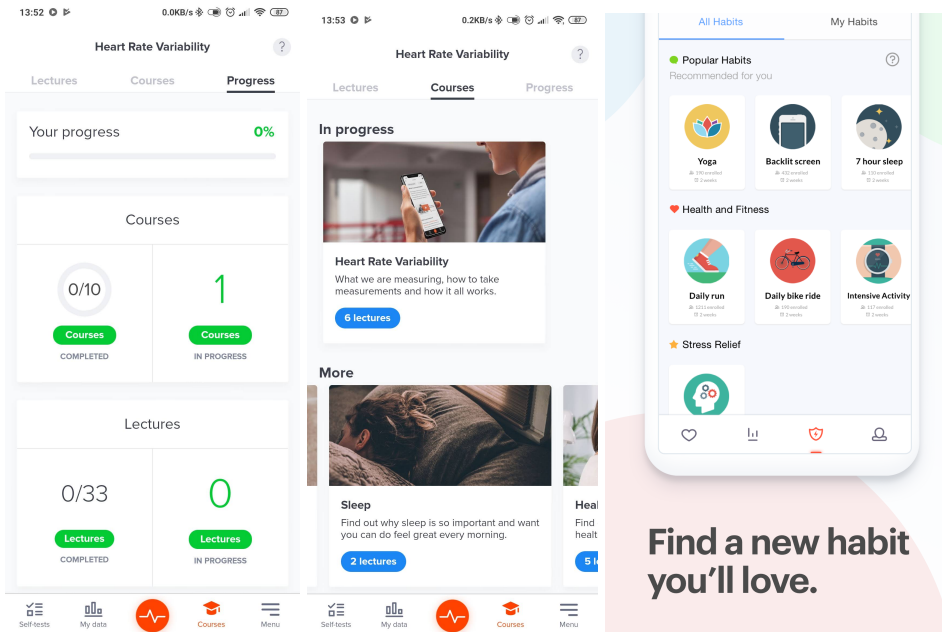
- After the call the main user segments should make appointments with doctors (something similar we could do for caregivers). This feature is based on GPS and helps users find the right doctor fast.



Also we could use Google Maps API and show the near doctors via map:



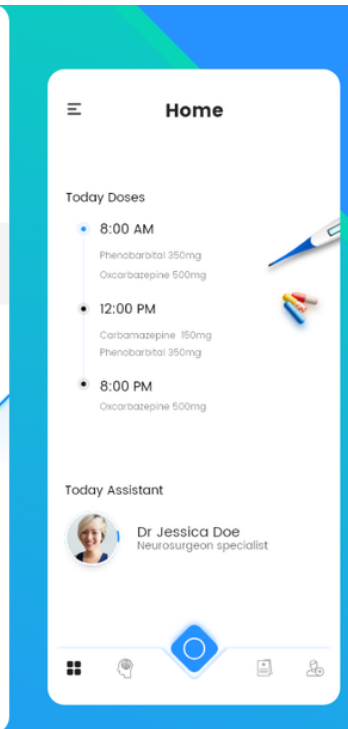
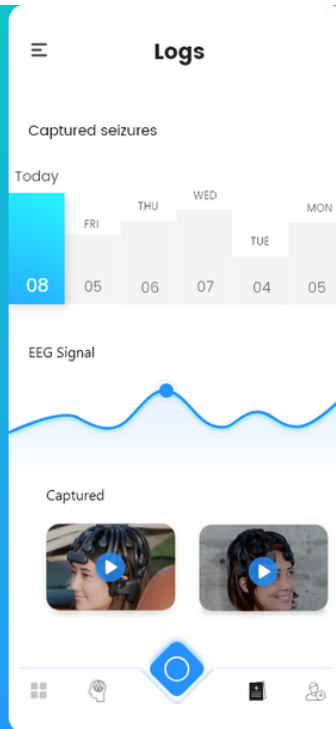
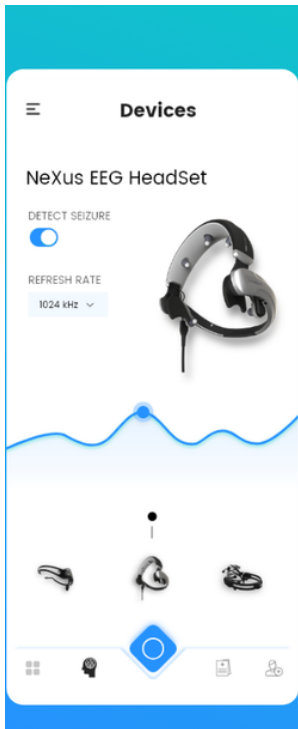
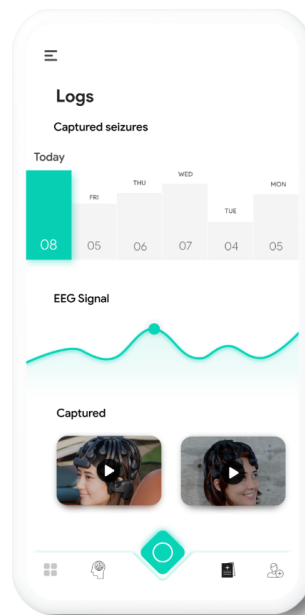
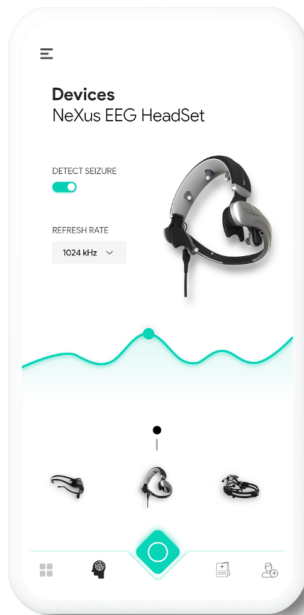
5. Some learning process - how we need to manage the recovery process without physicians.



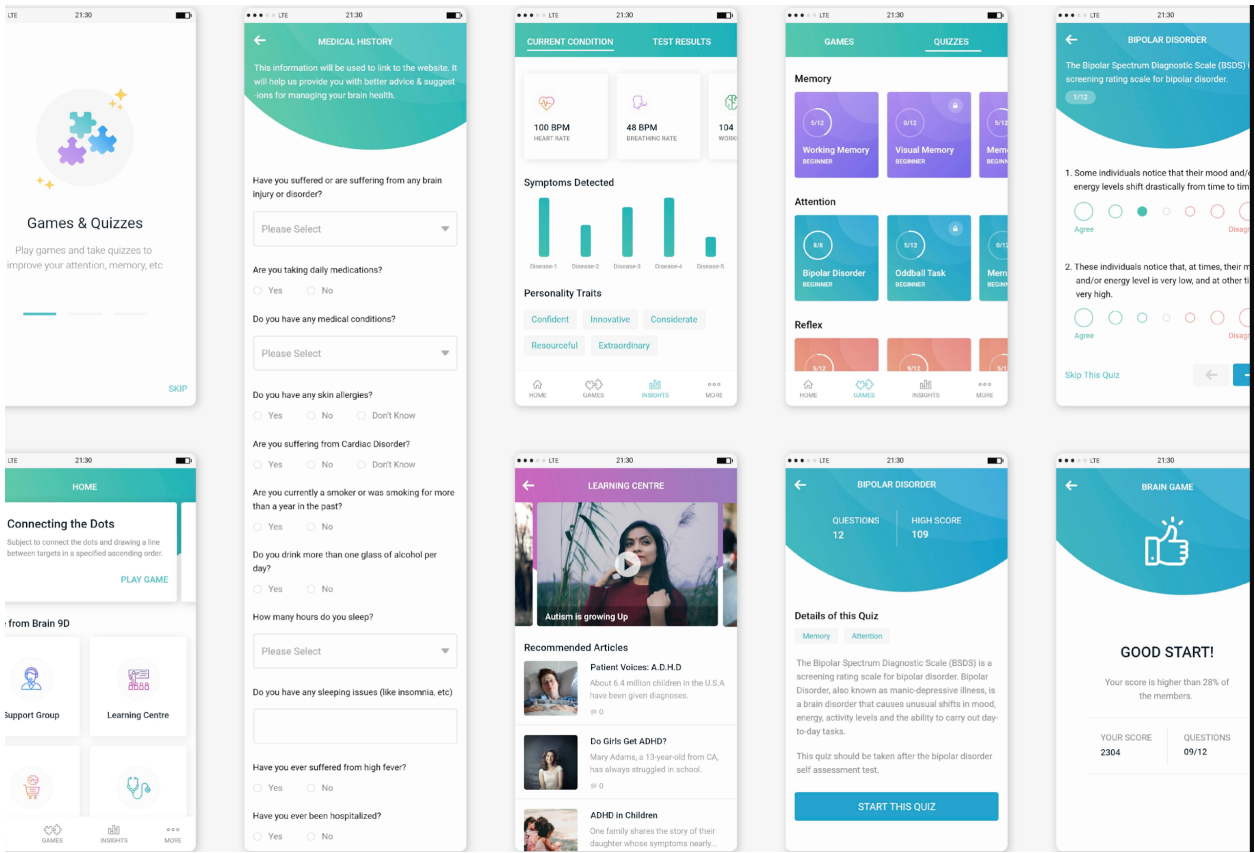
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