Methodology

This project will come up for the solution to help treat the patient with BFRB by using a wearable device that will warn or send signal. By doing this, we need a microcontroller unit that can provide all the parameters we need. The Arduino Nano family is designed to fit any electronic project in affordable way. Its dimensions are why we are able to make this project compact. It also has motion sensors to measure the tri-axial acceleration and angular rate, these two are the main factor of our project.

The MCU will know if the patient is going to commit its repeating behavior by simply using a machine learning technique. The accelerometer and gyroscope will detect the angular velocity of the wrist, in that way, we can store the raw data and use it for training the model using a machine learning algorithm. We will use the cross-platform deep learning framework TensorFlow Lite. It is open source and product ready that converts pre-trained model to a special format that can be optimized for speed storage.

As part of the software requirements of this project, we will create a mobile application so that the patient can have a better experience using the device. It will monitor the changes of the motion sensors in real time and with this application we can train the software to detect the range when the device will send a signal to the patient or not. This is a great help for the new patient that is willing to use the device.

The device will be able to send a signal to the patient by using the vibration motor. We can tweak the frequency so that the patient will sense or receive the signal. For the power supply, we will use the Lithium Polymer battery for 3.7 supply voltage for the MCU. It is also a rechargeable battery to avoid the replacement each time the battery has run out.

*BLE = Bluetooth Low Energy*

Materials:

* TP4056 – Lithium Battery Charger Module
* Arduino Nano 33 BLE Sense – Microcontroller Unit
* Micro Vibration Motor – For haptic feedback
* 601220 Lithium Polymer Battery – 3.7V 110mAh

Features might add:

* Pulse Sensor – BPM
* HTS221 – Temperature and Humidity
* APDS9960 – Gesture sensor includes with angular velocity for increased accuracy.
* VL53L0X – ToF Distance Sensor includes with angular velocity for increased accuracy.