Sensitivity Button:

The red button on the back of the HHI device can be pressed to control the level of muscle activity necessary to light up the red LEDs on the LED barand stimulate the Minion.. The default sensitivity setting is the first yellow LED on the LED bar, and each button press moves the LED one step to the right, before going back to the green, the easiest setting. This difficulty adjustment allows for weaker EMG signals from muscles to be picked up by the HHI device, i.e., flexing your forearm versus moving one finger.

Battery Replacement:

The Power LED also indicates battery level. When the LED is green, the battery is still in working condition and is ready to be used. When the LED is solid red the battery should be replaced, and the stimulation is disabled until a new battery is inserted. The HHI device is NOT recommended for use with a rechargeable battery. ONLY use a 9V, non-rechargeable battery with the device.

Green Cable Recording Setup:

To record muscle activity on smartphones such as iPhones and Android devices use the green cable, plug the "SpikerBox" end into the green audio jack on the HHI device, and the "Smartphone" end into the headphone jack on the smartphone. If the smartphone is not equipped with an audio jack, use a headphone adapter between the smartphone and the green cable.

Troubleshooting

If Power LED is ON:
1) Check to see if the ON/OFF knob is turned ON.
2) Check the battery compartment to make sure the battery is inserted correctly.
3) Replace the battery if one is present.
4) If the battery was replaced, turn the device OFF then ON.

If Power LED is blinking green and red:
A safety lock has beed activated on the devide.
1) Turn OFF the device.
2) When you turn the device ON, rotate the knob until you see a response in the Minion's arm.

If LED bar is fully lit up WITHOUT Master movment or LED bar is NOT lighting up at all WITH Master movement:
1) Check connections of the orange cable to the HHI device and make sure it is fully inserted into the orange jack.
2) Ckeck connections of the orange cable to the Master and confirm that all electrodes and plugs are properly connected.
3) Check the Power LED for battery level indication and confirm that it is green
1) Check that the black cable is connected to the HHI device and is fully inserted and to Minion's electrode pads.
2) Check that the black cable's plugs are connected to the Minion's electrodes.
3) If the Minion does not feel any stimulation, turn the Intensity Knob up NO MORE than halfway and try again.
4) Check the Power LED for battery level indication and confirm that it is green.
5) If all previous tests pass, a safety feature may have engaged to prevent more than 3 seconds of continuous stimulation. To reset this safety feature, the Master controller needs to relax and the LED bar needs to be off or at the first green for six continuous seconds. Turning the device completely OFF ca also reset this feature.
6) If stimulation is felt by the Minion but no movement occurs, turn up the Intensity

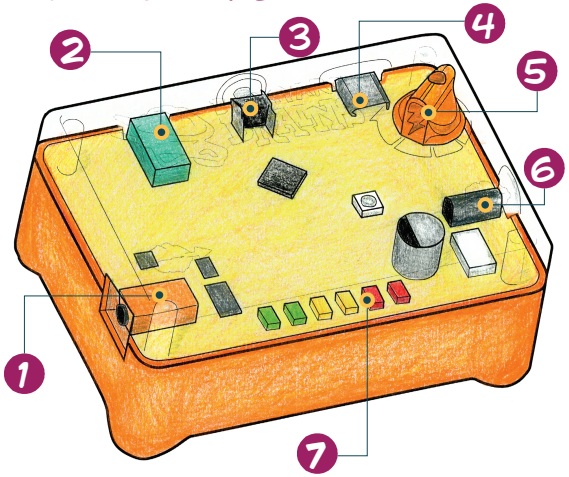
Background:

Accents and diseases can cause permanent damage to a person's nervous system. Unlike skin or other tissue, nerves don't grow back, so damage to the nervous system can be scary. There are few to no treatments that can reliably repair or "rewire" damaged nerves, but the growing field of functional electrical stimulation (FES) offers treatments which can restore mobility to those who have suffered from motor nerve damage.
The Backyard Brains Human Human Interface (HHI) replicates this high-tech science for educational experiments and demonstrations. The basic HHI experiment utilizes FES to stimulate the ulnar nerve in one participant utilizing the muscular activity of another participant. This works well because the ulnar nerve lies just below the surfice of the skin in your forearm and elbow, making it easy to stimulate.

BACKYARD BRAINS

HUMAN HUMAN INTERFACE

Anatomy of the board

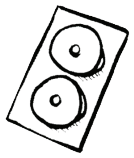


1. Master Input
2. Smartphone Output
3. Sensitivity
4. USB-C
5. Power and Intensity Level
6. Minion Output
7. Activity Level

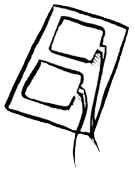
What's Inside?

1. Muscle Electrode Pads
2. Minion Electrode Pads
3. Master Cable
4. Minion Cable
5. Smartphone Cable
6. 9V Battery

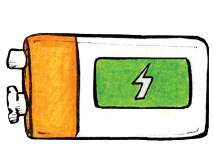
* Stim electrodes are reusable. Do not pull them by the cable when removing



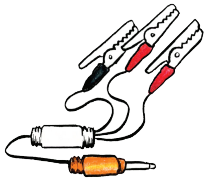
1 Stick to the Master Muscles



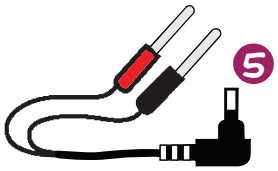
2 Stick to the Minion Muscles



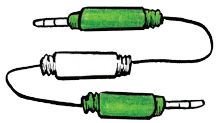
3 Alkaline battery to power up your HHI device



4 Use this to connect The Master to The HHI Device



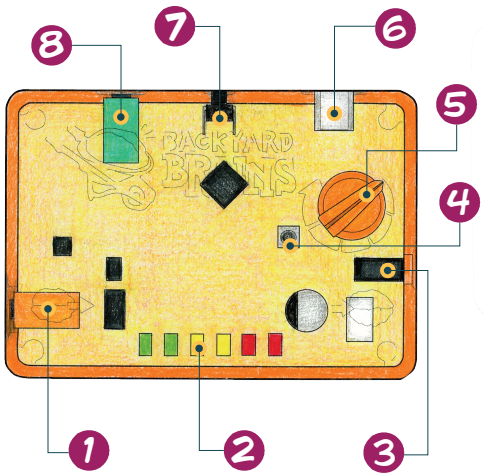
5 Use this to connect The Minion to The HHI device

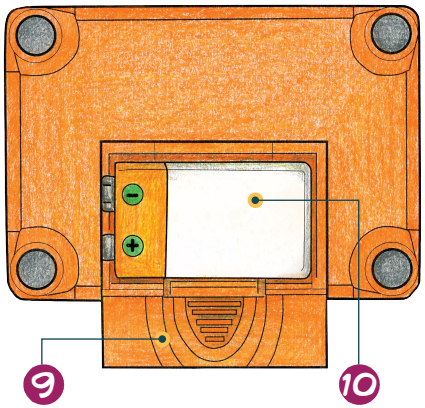


6 Use this to connect the HHI device and smarphone

Product Description:

The HHI device is an educational tool used to demonstrate nerve activity and electrical signaling that occurs throughout our bodies. The device amplifies the electromyography (EMG) signal recorded from the muscles of one subject (the Master), and sends it into the body of another use (the Minion) to stimulate their nerves and muscles.





Device Controls:

The knob located on the right side of the HHI acts as both the ON/OFF switch and intensity control. The knob is in the OFF position when it is pointed toward the upper right of the HHI (see diagram). An audible click occurs when you turn the knob clockwise, indicating you are turning ON the device, and the power LED will turn green. The same knob controls stimulation intensity. To increase the strength of stimulation sent to the Minion, turn the knob clockwise following the arrow direction printed around the knob. DO NOT make this adjustment in large incrementsbefore testing the strength of stimulation using the EMG input from the Master. To decrease strength of stimulation, turn the knob counterclockwise towards the OFF position.

Unit Layout

1. Master Input Port
2. Activity Level LEDs
3. Minion Output Port
4. Power Indicator
5. Power and Intensity
6. USB Type-C Port
7. Sensitivity Adjustment
8. Smartphone Output Port
9. Battery Compartment Door
10. 9V Battery

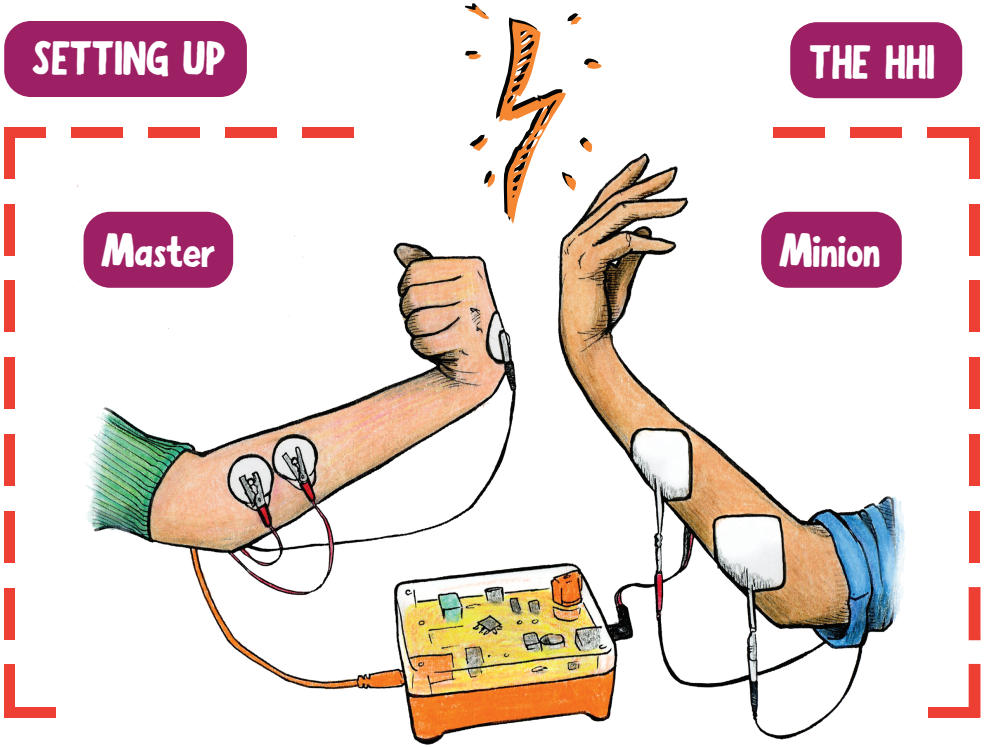
Specifications:

Power supply: One 9V battery
Pulse output stage: Constant current source
Pulse DC component: NO
Pulse amplitute: Adjustable from 0 - 42mA, 95V max
Typical stimulation load resistance: 500-2000ohm
Pulse Waveform: Biphasic pulses
Pulse frequency: 30 Hz
Pulse Width: 250 sec.

This device complies with the following standard(s):
Standard: FCC CFR 47, Part 15, subpart B: 2017, Class A
Standard: ICES-003, Issue 6: 2016 (updated 2019) for Infomation Technology Equipment (including Digital Apparatus), Class A

FC ICES-003

SETTING UP THE HHI



Master:

Insert the battery following the indicator on the inside of the battery comparment.
Place two Master electrode pads on your lower inner forearm and a third pad on the back of your hand. take the orange cable and connect its two red clips to the pads on your forearm. Connect the remining black clip to the electrode on the back of your hand, to act as the ground. connect the orange cable into the orange jack on the HHI device, labeled “Master”. Locate the Power/Intensity Knob on top of the HHI device. Turn the knob clockwise until you hear a click, indicating the device is turned on. Now, when you flex your muscles, you should see the LED bar located on the front of the HHI device light up from green to red. The button on the back of the HHI device is for adjusting thresholds and sensitivity of the LED bar. The more you toggle and increase this setting from green to red, the more difficult it becomes for the signal to cross the threshold and stimulate the Minion.

Minion:

First, make sure the device is turned off and that the Master is connected. Plug the black cable into the black jack (labeled “Minion”), opposite of the orange jack/cable. Place two Minion electrodes on the inner forearm near the elbow of the Minion as see in the above photo. Connect the black plug to the lower electrode (nearest to the elbow) nd the red plug to the upper electrode (nearest to your hand). Now, turn on the device but leave the intensity low. The input user (the Master) should flex, making sure to light up the red LED to reach the threshold. Slowly turn up the intensity by turning the knob until the Minion’s arm moves. If you have trouble, try extending your forearm out at 90 degrees, but be sure to keep it relaxed. The amount of movement is based on the stimulation current (controlled by turning the Power/Intensity Know) and the threshold (set with the button on the back of the HHI device). If a user is not comfortable with the stimulation, do not increase the intensity. If stimulation is felt but movement is not achieved, try rearranging electrode placements.