



## oyHEALthy Brain Child Development (HBCD) Study

### EEG Acquisition Protocol

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## INTRODUCTION

This manual provides information about EEG equipment, set-up, and acquisition.

**Feedback:** Please help us improve the EEG arm of the HBCD study by providing us with feedback on the protocol. We would love to hear about your experiences and ideas for improvement. To provide feedback, please email: [eeghelp@umd.edu](mailto:eeghelp@umd.edu)

**Questions** can be addressed to the Working Group members representing your site or to the HBCD EEG Group (please write to [eeghelp@umd.edu](mailto:eeghelp@umd.edu)).

**Timing of Collection.** EEG is to be collected at **Visit 3** along with: Questionnaires, Biospecimens, MRI, ERICA, and Baby Toolbox. The order of assessments should be determined by the RAs along with the participating Caregiver with consideration given to the baby's behavior, awake/nap time, feeding time, etc. For EEG, it is ideal to have a happy, fed, awake baby.

## Manual of Operations

### **Purpose Statement:**

The purpose of the Manual of Operations is to outline the operational set-up of EEG equipment. This document should be reviewed and understood prior to the EEG Acquisition Manual.

### **EEG Equipment Set-up**

Always contact [eeghelp@umd.edu](mailto:eeghelp@umd.edu) for any questions or concerns about the functionality of your equipment.

Required Equipment for each Data Collection Site:

*All equipment can be found on the Ancillary List on Confluence for links to purchase.*

Equipment	Details	Standardization
Mac (computer room)	<i>For NetStation software only, NEVER has internet (to prevent viruses)</i>	N/A
PC (computer room)	<i>For E-Prime software only, NEVER has internet (to prevent viruses)</i>	N/A
PC	<i>With internet, used for HBCD activities (BIDS Wizard), can also be used for non-HBCD activities</i>	
NetStation Software (5.4.1)	<i>EGI Netstation 5</i>	<i>Remember to fully remove your old version of Net Station <b>before</b> installing this version.</i>
E-Prime Software (3.0)	<i>Psychology Software Tools (PST) E-Prime software version 3.0 with E-Prime Extension for Netstation (EENS) version 3.0</i>	N/A
Net Amps (400)	<i>1-2 amps dependent on the data collection site.</i>	N/A
HydroCel Geodesic Sensor Nets	<i>Two types required: standard infant nets and long pedestal infant nets.</i>	<i>See "Net Types" chart below for specifics.</i>
Cedrus StimTracker	<i>Cedrus StimTracker Base model M-Pod for EGI with Medically rated 9V AC adapter</i>	<i>See "StimTracker Set-Up" below for specifics.</i>
Hypertronics-to-DB9 Cable	<i>If updating your EGI system, you will need to purchase this from MagStim or StimTracker.</i>	<i>Make sure it is plugging it into the 1-8DINS port on the amp, not the similar one right next to it</i>

R8050 Sound Level Meter	<i>Reed Instruments, Type 2, 30-100 and 60-130dB, +/-1.4 dB Accuracy.</i>	<i>Used to ensure sound is at 75 decibels (72-77 acceptable range). Used to check sound during monthly bucket testing.</i>
Behringer Personal Monitor Speakers (MS16):	<i>High-Performance Active 16-Watt Personal Monitor System.</i>	<i>Volume set at 75 decibels (acceptable range: 72-77). Bass and treble knobs face straight up (see figure in sound level meter section)</i>
TRIFIELD EMF Meter (Model TF2) ("Sniffer")	<i>AlphaLab, Inc., Detects 3 Types of Electromagnetic Radiation: Electric Field, Radio Frequency (RF) Field, Magnetic Field Strength Meter.</i>	<i>See "TriField EMF Meter (Sniffer)" below for instructions.</i>
Coleman 1000 Lumens LED Lantern with BatteryGuard	<i>Light for the participant room to use in a fully dark room.  Requires four D-cell batteries, not included with lantern.</i>	<i>All room lights are off and only lantern light is used during acquisition.  <b>Lantern is 4 ft behind participant chair.</b></i>
EGI PTZ Camera	<i>Axis M1065-L</i>	<i>To be used for Netstation participant video and audio input</i>
SanDisk Ultra USB 3.0 Flash Drive	<i>Only for EEG data transfers.</i>	<i><b>Must be wiped with anti-virus software after EVERY use to prevent virus on NetStation/E-prime computers</b></i>
15 ft USB extender cord	<i>Used to ensure that the webcam can reach the computer room</i>	<i>N/A</i>
iPad	<i>EEG Net pictures, MMN video distractor, filling out EEG Acquisition Form (on LORIS) during visits</i>	<i>N/A</i>
Walkie Talkies Motorola Talkabout T107	<i>For use communicating between control room and participant room <u>if you have two separate rooms.</u></i>	<i>Ensure that the walkie talkie is <b>set to silent mode</b> to ensure that they don't make extra noises as they are being used. <b>This must be done with every visit.</b></i>

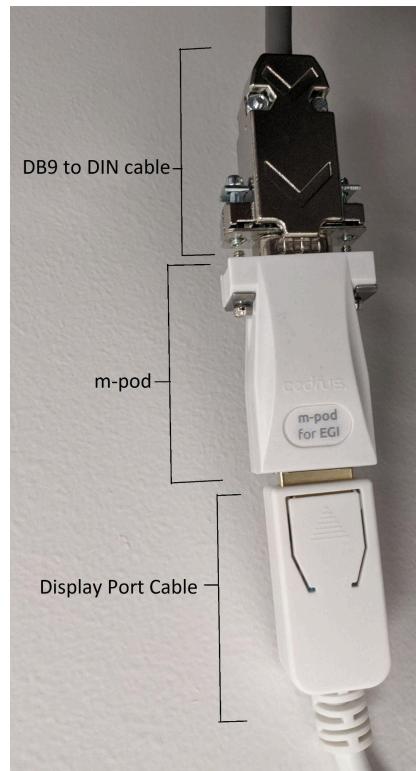
### ***StimTracker Set Up:***

Current firmware version: 2.2.7 as of Feb. 15 2023

This section provides instructions on how to set up your StimTracker with the other equipment in the EEG acquisition configuration. To find details on the digital configurations of the StimTracker see **Appendix section “Cedrus StimTracker Digital Configurations”**.

### **Physical Stimtracker Set Up:**

1. Take the power adapter and plug it into the back of the Stimtracker in the 9V port on the far left, plug it into the outlet.
2. Take your display port cable (should be the same on both sides) and plug one end into the “m-pod 1” port. The other side should plug directly into the base of the m-pod.
3. Grab your DB9 to DIN cable. Plug the DB9 side (wide rectangle portion) into the top of the M-pod and the other end into the amp at the DINs 1-8 port.
  - a. When you’re done, your m-pod and cords should look like the image below.



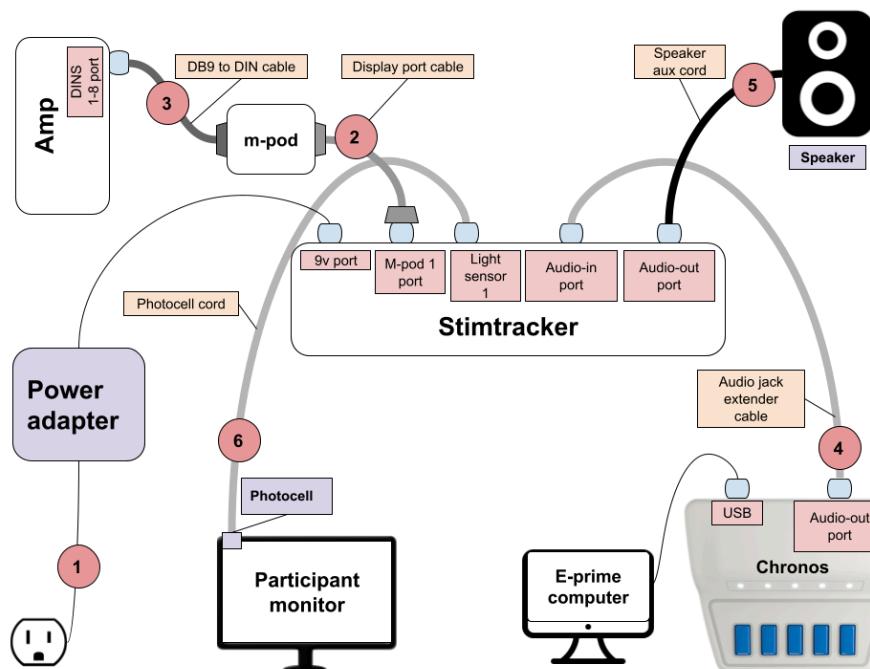
1. Take your audio jack extender cable and plug one end into the Stimtracker at the audio-in port, on the far right. The other end goes into the audio out port of the Chronos.
2. Take the audio jack from your speaker, and plug it into the Audio out port of the Stimtracker.
3. Photocell:
  - a. Take one of your photocells and plug it into light sensor 1 on your Stimtracker.
  - b. Place the photocell cord so that it runs behind the presentation monitor but can also reach the upper left hand portion of the screen.

- c. The photocell has a red plastic cover to the adhesive backing. Take off the plastic to reveal the sticky portion. The red cover on the photocell, along with extra adhesives provided with StimTracker supplies, is shown below.



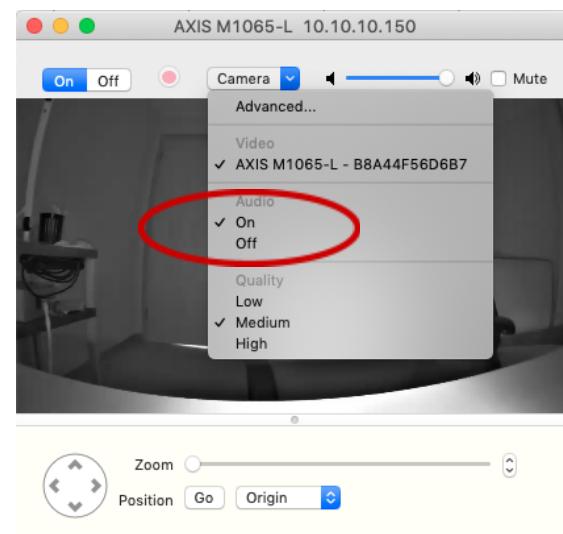
- d. Open the E-prime file for either the Face task or VEP. Start the task. There should be black and white squares present in the upper left hand area of the visual task.
- e. Place the exposed adhesive side of the photocell directly on the monitor, carefully lining it up with the square.
- f. If you look at the underside of the photocell you will see only a small portion of the smooth face contains the sensor portion. The goal is to place the sensor portion of the photocell over the small box on the screen.
- g. Once the photocell is adhered you can use tape to secure the rest of the cord to the monitor.

Here is a diagram of the full Stimtracker configuration, with steps labeled in red circles.



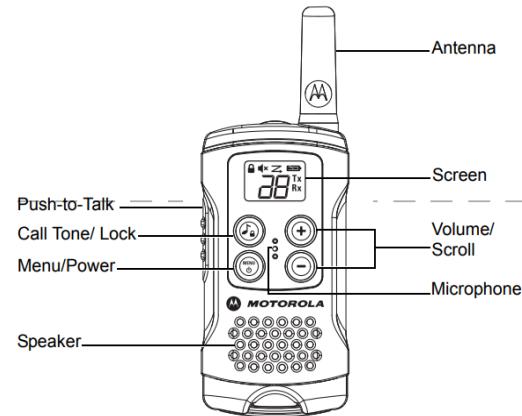
**PTZ Camera Set-up:**

1. Camera must be set-up level with infant's line of sight (need to see infant's attention to screen during tasks)
  - a. Can be mounted on top or placed under monitor on the side (not in way of iPad for MMN)
2. Attach the camera to the provided stand. Then, using the cord and power box, plug the camera into the power strip.
  - a. If you have enough cord length, plug the end of the power cable through the conduit and into the control room.
  - b. Otherwise plug the camera into the powerstrip located in the participant room.
3. Take the provided ethernet cable and plug one side into the camera and take the other side and route it through the conduit and plug it into the ethernet port on the portbox (box located below monitor switcher).
4. Open Net Station
  - a. Under the menu bar at the top of the screen, select the preferences submenu.
    - i. Select Video input as PTZ
    - ii. Make sure "Show "Not Recording Video" warning" is also selected
  - b. If plugging in the camera prompts a login:
    - i. User: root
    - ii. Password: geodesic
5. Once the camera is plugged in and the video connection is stable, physically orient your camera such that you can easily see the face and eyes of the infant when sitting in front of the monitor.
  - a. You can place the camera on the table top directly under the participant monitor, or placed on top of the speaker.
  - b. TIP: if the camera seems to have a hard time balancing with the provided stand, feel free to use velcro strips or tape to secure the bottom of the camera and/or its cords into its place on the table.
6. Once your camera is physically set up, you click on the video feed window located on the tool panel on the bottom of the Net Station screen.
  - a. In the camera drop down menu, make sure audio is selected to be ON. And turn your volume bar up. This allows you to hear what is occurring in the participant room. You can also toggle different zoom and position settings at the bottom.



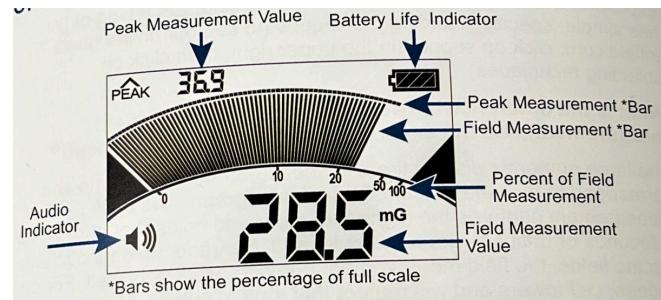
### Walkie Talkie Set-up:

1. To start, press and hold the + volume button as you turn on the walkie talkie with the power button. This turns off the roger beep (the noise each time you finish pressing the button to talk). **You will have to press the + and power button together every time you turn them on so it does not beep.**
2. Once both walkie talkies have been turned on, hold down the push to talk button on the left hand side to transmit to the other radio as you are talking. Once the button is released, you can receive signals from the other walkie talkie.
3. Make sure both walkie talkies are on the same channel. Press menu/power button to enter the menu. The current channel will show up as a blinking number. Press + or - to change channels. To select a channel, press the push to talk button.



### TriField EMF Meter (Sniffer):

1. **Instructions:**
  - a. Use the instruction booklet to set up your sniffer (battery, lighting & sound set-up features).
  - b. Turn the switch to "Standard ELEC" to turn it on.
  - c. Hold the bottom half of the sniffer close to your body and keep it level, so that the top of the sniffer box is facing the wall. (Ensure your hands are not covering the top of the meter).
  - d. Your body is acting as a shield from the potential electrical field on the other side of you, so holding the sniffer against your body ensures the electrical noise being picked up is from the wall you are pointing towards only. (the person holding the sniffer should not have any electronics on their body).
    - i. Move slowly, stop frequently to accurately measure each area.
      1. Note: any movement, breathing, etc will affect the electrical noise measurements, consider this when measuring!
      - ii. **Make sure you face every wall, plus ceiling and floor with the sniffer.**
      - iii. When measuring: hold still for 10 seconds in your position before taking down the measurement (to settle noise affected by movement). Take the highest and lowest measurement to average as your final measurement for each area of the room.



- iv. Ideally, no area of the room should reach above 2 V/m. Anything under 2 V/m = room is good!
  - v. If you need to use a room with electrical noise above 2 V/m, arranging the room so that the amp, cords, and cord to the participant monitor are as far away as possible from the area of noise is best!
1. **Tips:**
    - a. Make sure to point the sniffer in all directions – it will be helpful to know if you’re above or below a copy machine or refrigerator, for instance
    - b. We recommend you verify external noise every month or at least once a quarter, particularly if there are changes within your building
  - ii. You preferably do not want anything plugged into wall sockets in the room for acquisition except of course the monitor which will present the stimuli (and the amp).



#### **Sound Level Meter:**

1. Turn the meter on.
2. Use the F/S button to change the mode to FAST.
3. Use the A/C button to change the mode to dBA.
4. Stand in the same position as the high chair to get a reading that reflects the position of the infant to the speakers.
5. Click the Max/Hold button
6. Hold the sound meter steady and take note of an average of readings, since the readings may slightly fluctuate depending on the exact environment.
7. If the readings are outside the recommended range (72-77dB) first ensure that the treble and bass knobs are facing straight up (see image below). If the volume is still out of range after this, adjust the volume knob of speakers until the measurements are within range.



*The sound levels of the speakers in the EEG room should be checked monthly to ensure that the volume is correct.*

### ***Monthly Sound Check***

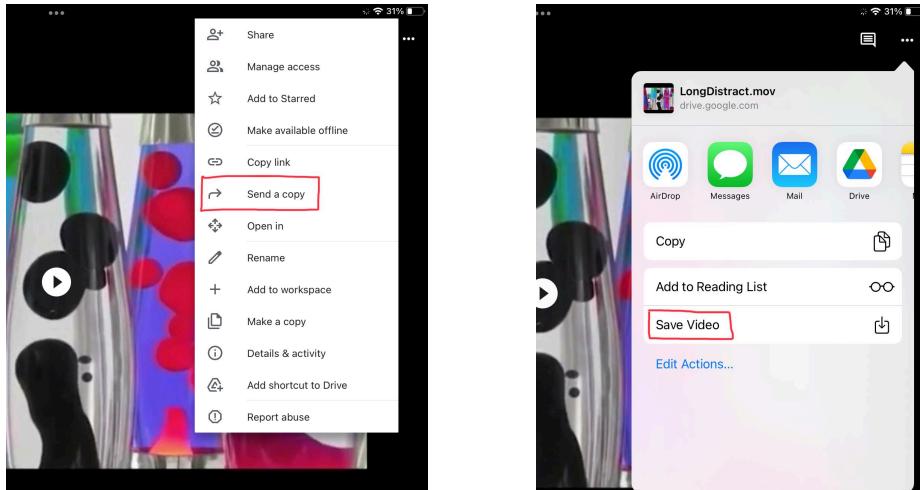
#### **To test the sound levels for the EEG room:**

1. Navigate to the HBCD-EEG-Soundcheck folder within the HBCD tasks folder on the E-Prime computer
2. Open the file check1\_ba\_only and begin the task
3. Follow steps 1-6 from above and adjust the volume knob of the speakers if needed
4. Once you have an accurate average reading, press ctrl + alt + backspace to close the task
5. Open the file check2\_da\_only and begin the task
6. Follow steps 1-6 from above and adjust the bass, treble, and volume knobs of the speakers if needed. The sound levels for each file should be within 1.5 decibels of each other. If the sound is outside of the recommended range (72-77dB) adjust the volume knob. If the sound is within the recommended range but the sound files are not within 1.5dB of each other, adjust the bass and treble knobs
7. Once you have an accurate average reading, press ctrl + alt + backspace to close the task
8. Upload your sound level readings to the LORIS form

#### ***Setting up iPad with MMN Video:***

1. The “Long Distract” video for MMN is on Confluence within the Tasks Google Drive folder.
2. Click on the video and then click the three dots in the upper right corner. Select “send a copy”. Then click “save video”.

3. There should be a box that says preparing to export. The download will probably take at least 20 minutes.
4. When the download is finished, there should be a pop up asking if drive can add to your photos. Click “Okay”. Go to photos and make sure the video is there.
5. For visits, open the photos app and play the video from there.



6. (Reminder: during visit, iPad needs to be on airplane mode, not plugged in, and full screen brightness)

### **Net Types:**

Net requirements for each Data Collection Site.

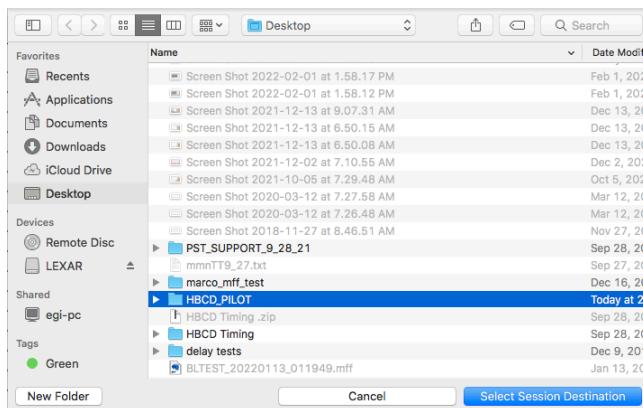
Net Type:	Size (centimeters):	Quantity:
Standard HCGSN 130: 128 ch infant	38-40cm 40-42cm 42-43cm 43-44cm 44-47cm 47-51cm 51-54cm	1 1 2 2 2 2 1
Standard HCGSN 130: 128 ch adult small	54-56cm	1
Long Pedestal HCGSN (not needed until 12mo)	44-47 cm 47-51cm 51-54cm	1 1 1
Total Nets:	15 nets	

### **NetStation Workplace Template**

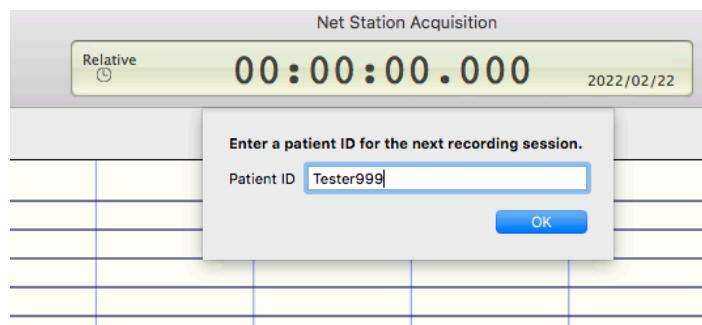
NetStation Workspace is a set group of Netstation settings that stay in effect across acquisition sessions, allowing the experimenter to use a **consistent configuration every session**.

This template is specific to the HBCD study parameters. If your NetStation will **only** be used for HBCD, this template should be put in place and **never changed**. If your NetStation is used for other studies as well, changing the template per study session is necessary!

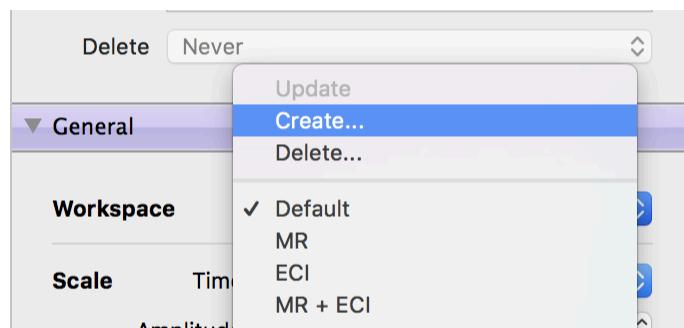
1. Create a folder somewhere on your Mac where you would like all the participant EEG files to be saved. It is recommended that this is on the computer's Desktop or Documents location. For this example we have created a folder named "HBCD Pilot" and have placed it on the computer's desktop.



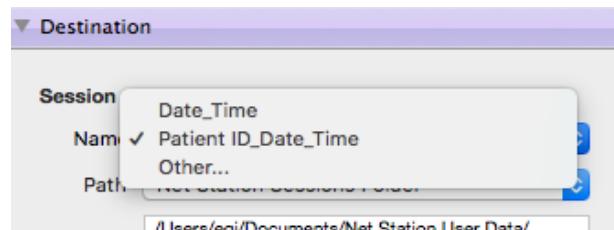
2. Open up NetStation Acquisition. Enter a sample participant number, what is entered will not matter for these purposes. I:e:: "Tester999". Click "OK".



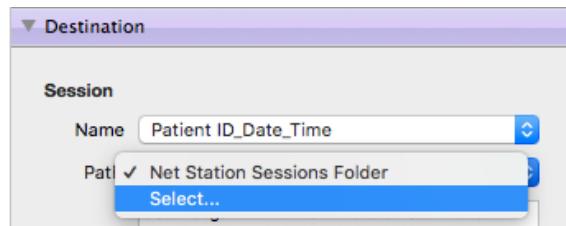
3. On the right side of the screen, navigate to the "General" section of the side panel and click on the Workspace dropdown icon.
4. A menu should appear. Click "Create...".



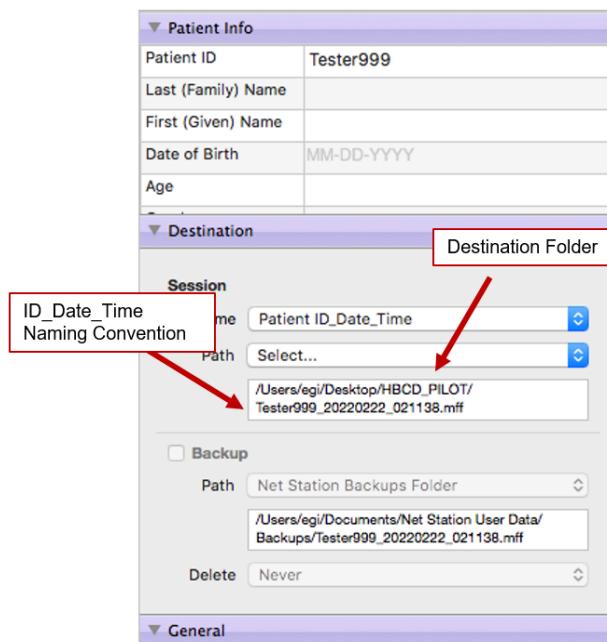
- a. An entry space will appear, here you will choose a name for your workspace configuration. In this example we will use “HBCD\_SITE\_ID” as the name. This will establish a template name under which we will save all of our acquisition configurations.
5. In the side panel Navigate to the Destination section.
- a. Under the Name field click the dropdown menu and select “Patient ID\_Date\_Time”



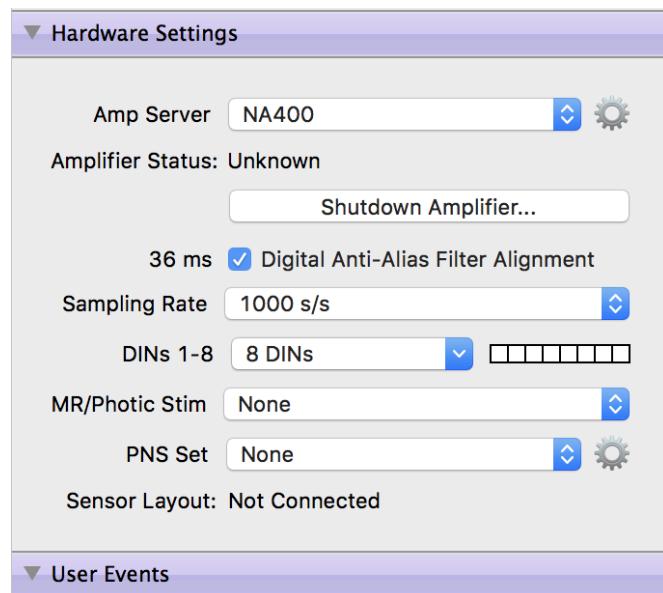
- b. Just below the Name field, find the Path field, click the drop down menu and click “Select...” A file navigator will open in another window. Choose the folder you have designated as your destination folder. Then click “Select Session Destination” at the bottom right. This will tell Net Station to automatically save your files to this location.



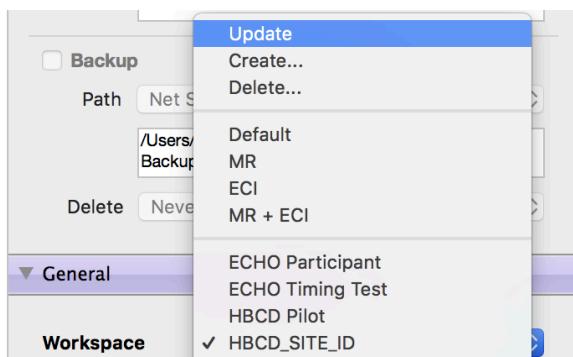
When you are done, you should see the file path reflect the configurations as shown below



6. Navigate to the Hardware Settings section
  - a. Under “sampling rate” click the dropdown menu and select 1000 s/s
  - b. Under DINs 1-8 click the dropdown menu and select 8 DINs



7. You also want to confirm that your PTZ camera is properly configured to record audio and video. The PTZ settings get captured in the workspace parameters even though they do not have a section in this NetStation panel. Full PTZ instructions are included in the Manual of Operations section.
8. All other settings not outlined here can be left at their default settings. Once all the appropriate settings have been entered, the workspace needs to be saved. To do so, navigate back up to the General section and click on the dropdown menu for “workspace”. At the top of the menu, click update.
9. Now the workspace should be configured, and these settings saved. Before starting acquisition, just make sure the appropriate workspace is selected and all of these settings above should be activated.



## NetStation Experiment Filenames

These are the filename conventions for EEG data files. All files must be properly named in the exact format (case sensitive) in order to be uploaded on Bids Wizard.

Naming Parts	What it stands for	Example
PSCID	Participant ID (part 1) - accessed from Ripple	UMD0001 = University of Maryland Site, Participant 0001
DCCID	Participant ID (part 2) - accessed from LORIS	102030
Visit Label	Visit Number	V03, V04, V06 (P04 and P06 for pilot visits)
Task	Task Name	RS, FACE, VEP, MMN, EEG (electrode pictures)
Example:	[PSCID]_[DCCID]_[VisitLabel] _[Task]	UMD0001_102030_V03_RS

Experiment	Filenames
Resting State	PSCID_DCCID_V0#_RS
MMN	PSCID_DCCID_V0#_MMN
VEP	PSCID_DCCID_V0#_VEP
Face	PSCID_DCCID_V0#_FACE
Electrode Pictures	PSCID_DCCID_V0#_EEG

## Site Roles

### ***Primary Research Assistant (Primary):***

The role of the Primary RA is to lead the session for successful data collection. The primary is responsible for management of equipment, quality data collection, and following protocol.

Responsibilities Include:

- Computer room set-up/clean-up
- Running EEG acquisition
- File Transfers

### ***Secondary Research Assistant (Secondary):***

The role of the Secondary RA is to assist the Primary in successful data collection. The secondary is responsible for guiding the participant through the session, ensuring participant is paying attention to the task (distracting the participant with assigned toys), reducing artifacts from movement, and keeping the adult caregivers informed and comfortable.

**Responsibilities Include:**

- Participant room set-up
- Consent
- Capping
- Participant behavior management
- Adult caregiver communication

***Extra Research Assistant (ERA):***

The role of the ERA is to distract the participant with assigned toys during appropriate parts of the session (i.e. capping). The ERA is responsible for assisting the Secondary RA and filling out the session log sheet. (*This role can be added into Primary and Secondary roles if needed.*)

**Responsibilities Include:**

- Distraction/entertainment of participant infant
- Session log sheet
- Toy set-up/clean-up
- Cleaning net

***Adult Caregiver:***

The role of the adult caregiver(s) is to manage the participant's behavior *if* the infant has additional needs outside of ERA and Secondary RA duties (i.e. feeding, diaper change, excess crying). The adult caregiver(s) is responsible for assisting the secondary and ERA with the participant's behavior, and positioning (sitting on their lap). ***The adult caregiver(s) is required to be with the infant at all times of the visit.***

**Responsibilities Include:**

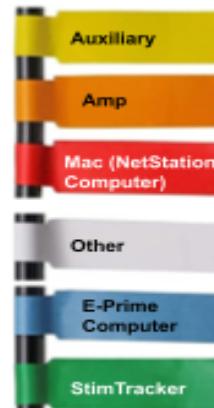
- Being with their infant at all times.
- Addressing infant's needs (feeding, changing, etc)

**Troubleshooting:**

Email [eeghelp@umd.edu](mailto:eeghelp@umd.edu) for assistance with troubleshooting.

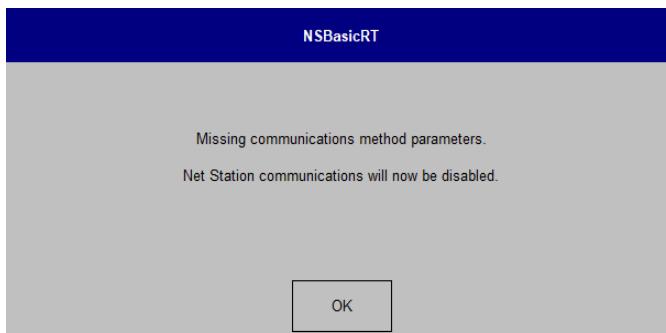
These color coded cord labels will help you identify the source of the problem if you have equipment issues. We will provide sites with these labels either by mail or during training visits. If the cord you are labeling connects to different devices on each side, label each end respective to its device.

Mac (NetStation Computer)	Red
E-Prime Computer	Light Blue
StimTracker	Green
Amp	Orange
Auxiliary (Speakers, Video Camera, chronos)	Yellow
Other	White

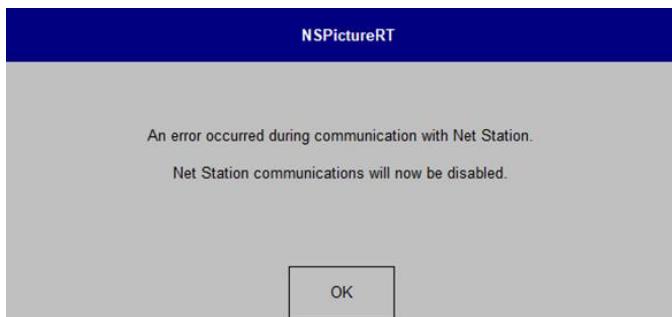


### **Common Net Station Communication Errors**

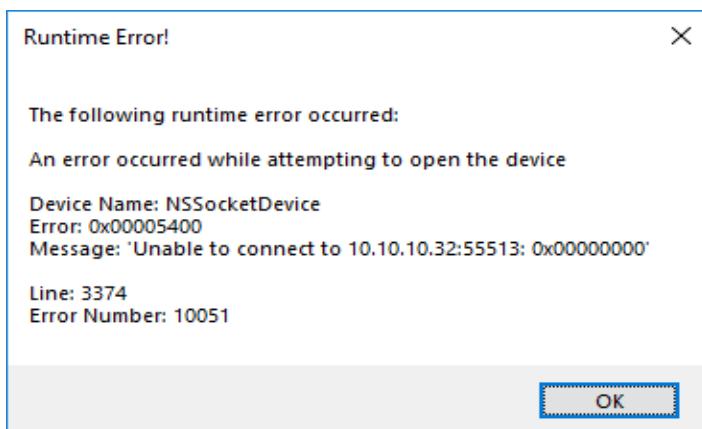
These are samples of the most common error messages that may pop up on the E-PRIME computer to let you know it is not properly communicating with Netstation.



The network connection was interrupted during the test session (e.g., the network connection from the hub/switch was disconnected)



Net Station Acquisition is not opened on the Net Station computer, or Net Station streaming is not set to "On".



An incorrect IP address is specified in Startup info, NSInit, or the Netstation.ini file.

### **Connectivity Trouble with the Amp:**

<https://www.cgi.com/knowledge-center/item/103-na-400-connectivity-troubleshooting-for-net-station-acquisition>

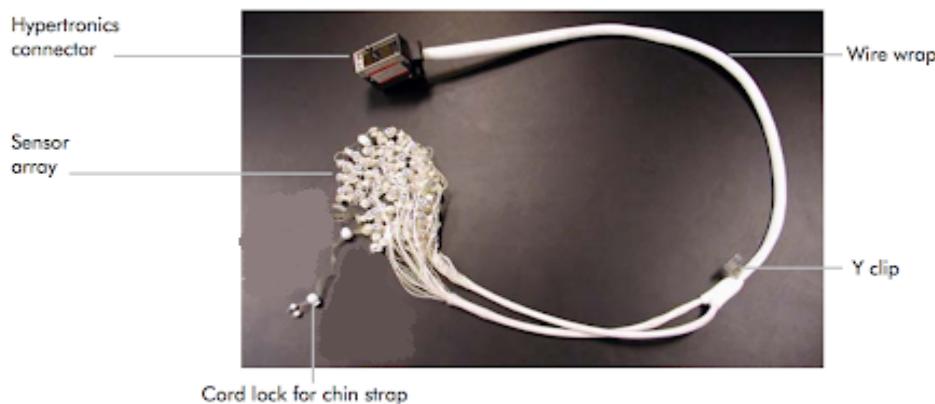
End of Manual of Operations.

## Net Training Manual

### Purpose Statement:

The purpose of the Net Training Manual is to ensure proper training and comprehension of EEG Nets, Net Use, and Net Care. This document should be reviewed and understood prior to the Acquisition Protocol.

### Introduction to the Net:



### Parts of the Net:

1. Sponges - on each electrode, soak up the solution.
  - a. Retains oils from skin/hair which is why we disinfect after every capping session, even dry-capping for training.
  - b. Retains disinfectant, meaning cleaning needs to be thorough to ensure disinfectant is not left on (will degrade the net).
2. Elastomers - elastic bands connecting electrodes.
  - a. Can snap and break, or be overstretched.
  - b. Remove all hair accessories and large jewelry from participant/infant i.e: hair clips, dangly earrings.
  - c. Capper should remove jewelry, watches, rings (anything that can accidentally be caught on elastomers) from arms/hands.
  - d. Always adjust the net in a group of electrodes, never by a single one.
3. Pedestals - plastic covering over each electrode and sponge.
4. Hypertronics Connector - box at end of net with pins sticking out.
  - a. **CANNOT GET WET.**
  - b. Pins bend easily which messes up the connection.
  - c. **ALWAYS:**
    - i. Cover with dry cloth during application
    - ii. Cover the connector in plastic bag during net cleaning
    - iii. If giving it to the adult caregiver to hold, emphasize the need for careful handling
5. Wire wrap- protection for the wires from the amp to the net.
  - a. **CANNOT GET WET.**

- b. Water can wick up the wires from the net and damage the hypertronics connector.

***Hand Placement for Capping:***

1. Remove all rings/watches
2. Hands should be “knuckles first” to avoid snagging elastomers on fingernails
3. Always have:
  - a. Chin straps laying overtop of wrists
  - b. Hands SYMMETRICALLY distanced on either side 2 electrodes away from front middle electrode (E17)
  - c. Spread fingers out evenly and maximally, while keeping fingers curved as much as possible
    - i. Create a ‘dome’ - stretch net evenly to create space for head to fit

***Net Types:***

1. Standard Net – standard sized pedestals, ideal for hair that does not impede easily reaching the scalp.
2. Long Pedestal Net – longer pedestals that allow for electrodes to reach the scalp in thick, curly hair. **Use this net when hair is thicker than the length of a pinky nail when pressed flat to the head.**

***Measurements:***

1. **Circumference:**
  - a. Take the measuring tape and place it right above the space between the infant's eyebrows
  - b. Wrap around the back of the infant's head and meet the tip of the measuring tape
  - c. Always keep measuring tape tight around the head.
  - d. Record head circumference in **centimeters** on the EEG session log. If the child has thick or curly hair, and is on the cusp of a measurement, size up.

**Net Preparation**

***Soaking Solution:***

*The net soaking solution must be made at the start of the visit to ensure the solution stays warm for the infant. There is a cheat sheet at the station.*

1. Fill the bucket with 1 Liter of distilled water.
2. Use the “Potassium Chloride” measuring spoon (2.5 tsp) to pour one scoop of potassium chloride into the bucket.
3. Use the “Shampoo” measuring spoon (1 tsp) to pour one scoop of baby shampoo into the bucket.
4. Stir the solution with the “Shampoo” measuring spoon to ensure all of the shampoo is off the spoon and the solution is mixed.
  - a. **Do not** use the “Potassium Chloride” scoop to mix the solution. This scoop must be dry at all times.
5. Once the participant arrives, microwave the water for 2 minutes to warm it.
  - a. If your bucket fits in the microwave feel free to warm the whole container. If not, a portion of the solution can be put into a microwave safe container, warmed up,

and mixed back into the bucket. (*This is optional if you do not have access to a microwave*).

6. Place a hand towel over the bucket to keep the solution warm.
7. Once a cap is selected, place it in the soaking bucket and ensure all the electrodes are submerged. The net must soak for at least 10 minutes prior to capping the participant. Replace the hand towel over the top.

*Notify the lab manager when Potassium Chloride, Shampoo, or Distilled Water are running low, to ensure no supplies run out before the next visit. Running low means that you have less than enough supplies for 2 weeks worth of visits.*

### Capping Protocol

Net placement is essential to acquiring usable data. Below is an overview of tips, examples, and instructions for placing the EGI net for both long and short pedestal nets.

#### **Measurement:**

1. Have the caregiver hold the infant on their lap with the infant facing you.
2. Have the ERA distract the infant using appropriate toys.
3. Use the measuring tape to measure the infant's head circumference. Repeat measurement if the infant is moving during measuring to ensure accurate sizing.
  - a. You can do this from the side or behind the infant if it is easier (if the infant is fussy or distracted by you).
4. Record the measurement on the EEG session log and select an infant net that is the correct size.
  - a. **Standard Nets:** Always size down. For example, if the infant's head is 43 cm, select the net that is 41-43 cm, **not** the net that is 43-45cm. However, if head circumference is 43.5 cm, then choose the 43-45cm net because it is larger than 43cm and would no longer be considered "on the border" of the two net sizes.
  - b. **Long Pedestal Nets:** Always size up. For example, if the infant's head is 43 cm, select the net that is 43-45cm, **not** the net that is 41-43cm.
5. Record the net ID number (located on the connector) on the EEG Acquisition Form during a visit, and always on the Net Inventory Log when using a net for a visit or practice.

#### **Net Inventory Log:**

*This log tracks all net usage, net issues, and monthly bucket testing. This can be found on LORIS.*

1. Every time a net is used (i.e. for a visit or capping practice) it is documented on the log: Date, Time, Study Type, RA names, and Session Notes.
2. The Session Notes section is used to keep track of impedances, and if anything arises in regards to the net (i.e. torn elastomers, missing sponges or chin strap pieces).
3. This log is also used to keep track of bucket testing of each net.

**Prior to Capping:**

1. Once a net is selected, wrap the connector in a dry washcloth.
2. Submerge the net in the soaking solution, ensuring all electrodes are submerged. Place the wrapped connector in a safe place that will not get wet/fall into the bucket. Replace the hand towel over the bucket to keep the water warm.
3. Begin the 10 minute timer for soaking.
4. Ask the adult caregiver if they would like to change the infant's diaper, feed, or anything else prior to capping.
  - a. Explain to them that it is better to do everything prior to capping, *however* you can do feeding and diaper changes with the net still on the infant (**unplugged from the amp**) if needed during the visit.

**Capping:**

1. Have the adult caregiver hold the infant on their lap with the infant facing you. Offer the caregiver an extra towel to place on their lap or across their shirt.
2. Do a quick examination of their scalp to ensure there's nothing that would affect data quality (something stuck in hair, built up hair product)
3. Dab off the excess water with a hand towel.
4. Hold the wrapped connector under your arm.
5. Have the ERA distract the infant with appropriate toys. This person should be directly behind the person capping, to ensure the infant is facing forwards for capping.
6. Create a dome with the cap using the "bear claw" technique.
  - a. Thumbs should be on the second double strapped grid from either side of the nasion electrode.
  - b. Pinky fingers should be on the lower back of the cap.
  - c. Spread your fingers as wide as possible and also use your knuckles to expand the cap.
7. Bring the net behind the infant's head and center it. Place it down onto the infant's head. Cup the infant's face with your hands as you pull down.
8. Make large scale adjustments to net placement if necessary.
  - a. When adjusting the net, make sure to **carefully grab and lift clusters of electrodes** (rather than single electrodes) to avoid damaging/snapping the elastic. We want to avoid "dragging" the electrode across the scalp, so slightly lifting the electrodes helps with that.
9. Tighten chin strap.
10. Check for net placement accuracy. Shift the net to be as accurate as possible.
  - a. Make sure bands are parallel and straightened.
  - b. Check alignment of the net. Electrodes should match the outer frame of the face, and centered between the eyebrows, aligned above the nose.
  - c. Fix the cap near the ears so the ears poke through the cap's ear openings.

**Instructions for Placing Long Pedestal Nets**

Each site in the HBCD consortium has been asked to purchase two long pedestal nets for V04-V06 in the event that a participant has thick, dense, voluminous or styled hair. These longer pedestal nets enable the recording sensors (electrodes) to reach the scalp. Proper net

placement is essential for collecting usable EEG data. For an overview of how to cap with diverse hair types, please refer to [this document](#). Below are instructions for how to properly use the long pedestal nets with diverse hair types.

You will need two RA's to properly place the net with the long pedestals, one standing in front of the infant holding the front of the net with two hands and one standing behind the infant holding the back of the net:

1. Pull the caregiver's chair out from the wall, as you will want space on either side of the caregiver's lap for each RA to stand.
2. Have the caregiver hold the infant on their lap **with the infant facing perpendicular** to the mother (see image). Offer the caregiver an extra towel to place on their lap or across their shirt.



- a. If you have a third RA present or if the caregiver is willing, it would be helpful for someone to serve as a "distractor" by showing an engaging video or toy to distract the infant and make sure that the infant's hands do not reach or pull at the net.
3. RA1 should review current hair needs.
  - a. Any hair accessories that can be removed (e.g., barrette, bow) should be removed.
  - b. Any hair accessories that cannot be removed (e.g., beads at the end of braids) should be noted so it will not interfere with net placement.

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- c. Check for non-removable pieces that might have metal in them, such as cuffs.
- d. If the infant had any pigtails, puffs, or ties in their hair for the placement of the EGI net, remove these now and distribute the hair evenly across the scalp to minimize bunching.
4. Ahead of starting the net application, RAs should evaluate the infant's hair and discuss their strategy together, out of earshot of the participant and participant's family. As some examples:
  - a. If the infant has large puffs at the front top of the head, RA's may decide to place the net in the front before pulling the net to the back.
  - b. If an infant has thick hair across the head, RA's may decide to approach the net from the top (i.e., fairly evenly considering front and back).
  - c. If an infant has thick twists or braids and a head circumference that is on the cusp of two net sizes, RA's may decide to choose the larger net size.
5. There are two approaches to holding the connector while placing the net.
  - a. The first is to plug the connector into the arm prior to placing the net.
  - b. Another approach is to have one RA wrap the connector around their shoulders or tuck into a pocket while placing the net.
6. RAs who will place the net should create a dome with the net using the "bear claw" technique. One set of hands should be towards the front of the net, the other towards the back of the net. A video of net application with 2 RAs can be found [here](#).
  - a. One RA will be responsible for the placement of the front of the net, another for the placement of the back of the net. Each should stand or kneel in front of or behind the infant, on either side of the caregiver.
  - b. The RAs should spread their fingers as wide as possible and also use their knuckles to expand the net. Stretch the net outwards to the sides gently to make space to go around the hair.



- c. Both RAs should gently pull the net out to the sides and front/back. Slide the net over the child's head with extra space on either side, aiming to pull the hair down to the sides rather than bunching it underneath the net.
- d. The RA standing behind the infant should bring the net behind the infant's head and center it on the nape of the infant's head. When complete, the RA standing in the back should indicate (i.e., verbally or through pre-established nonverbal signals) when they've properly placed the back of the net, and keep their hands in the net. This helps to maintain the shape while the RA in front of the infant places the net over the forehead.
- e. Next, the RA standing in the front of the infant should provide even stretch/tension across the net while applying the net across the top of the head and then down over the front of the infant's head. If the proper tension has been achieved, the front row of electrodes should fall just above the eyebrows.
- 7. Once the RAs remove their hands from the net, they should immediately tighten the chin strap and remove hair from the eyes and face.
- 8. Make large scale adjustments to net placement if necessary. Even with long pedestals, there may be a need to make adjustments with the hair to account for hairstyle or hair thickness. For example, braids or sections of thick hair that bunch and prevent electrodes from sitting against the skin can be gently pulled between the elastomer webbing of the net.
  - a. When adjusting the net, make sure to **carefully grab and lift clusters of electrodes** (rather than single electrodes) to avoid damaging/snapping the elastic. We want to avoid "dragging" the electrode across the scalp. As such, RAs should aim to slightly lift the electrodes off the scalp.

- b. Note: Work from the top center of the net down to the rim/edges of the net. Often, once you make sure center electrodes lay flat against the scalp, other areas will be corrected.
- 9. Next, RAs should ensure that the infant's ears are lined up with the ear holes and are not covered by hair.
- 10. Check for net placement accuracy. Shift the net to be as accurate as possible.
  - a. Make sure bands are parallel and straightened.
  - b. Check alignment of the net. Electrodes should match the outer frame of the face, and centered between the eyebrows, aligned above the nose.
  - c. Fix the net near the ears so the ears poke through the net's ear openings.
  - d. If the participant has braids, ensure that the electrodes are as close to the scalp as possible. This can be accomplished by pulling braids through the elastomers, or attempting to lay the braids down closer to the scalp.

### **Examples of Capping**

Adapted from ABC-CT Net Placement Guide.

Infant Photos courtesy of OIT V3 Participants.

*Correct net placement is essential for acquiring good, quality data that is comparable across sites and also comfortable for the infant. If proper placement isn't achieved, none of the data for that infant will be usable, so this is extremely important.*

See [Appendix](#) for examples of average and poor net placement.

### **Proper Net Placement:**

1. Net is symmetrical with the midline of sensors straight
2. Ears are correctly in the ear holes
3. Reference electrode appears to be on the vertex (REF)
4. Nasion electrode is on the nasion (#17)

### **Three types of net placements:**

1. **Excellent** - meets all criteria for proper net placement.
2. **Average** - any 1-2cm shift from proper placement (1 pinky finger width distance).
3. **Poor** - any >2 cm shift from proper placement (>1 pinky finger width distance).

### **Examples of Excellent Net Placement:**

*Figures 1-3: Excellent Front Net Placement*



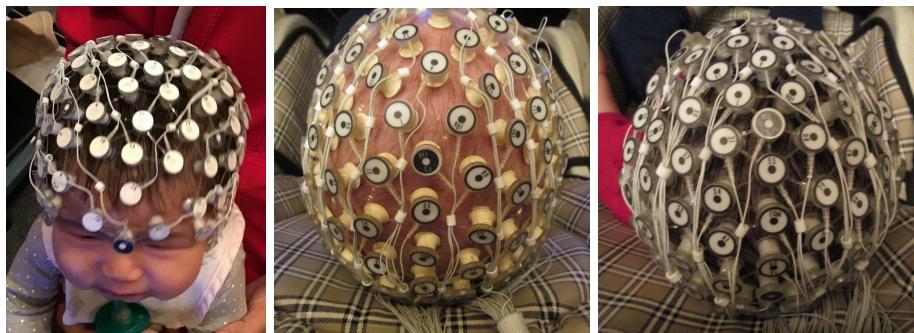
**Front Markers:**

1. Nasion electrode (#17) is centered between the eyebrows
  - a. Infant nets do not have the face straps which hold this electrode in place. Oftentimes, this electrode does not stay flush with the skin, *this is okay*, however it is still important in terms of being centered and between the brows in terms of proper electrode placement around the head.
2. Front row of electrodes (#25, 21, 14, 8) are parallel, level, and immediately above the eyebrows.
3. Midline electrodes from the nasion (#15, 16, 11, 6) are straight down the scalp, perpendicular to the eyebrows.
4. Chin strap is under the chin and secure.

**Figure 4-5: Excellent Side Net Placement:****Side Markers:**

1. Ears should fit into the ear hole properly, not squished, no electrodes on the ear itself.
2. Mastoid electrodes (#57, 100) should be behind the ear

**Figures 6-8: Excellent Back Net Placement:****Figures 9-11: Excellent Top Net Placement:**



#### *Top/Back Markers:*

1. Midline electrodes (#55, Com, 62, 72, 75, 81) should be in a straight line down the scalp.
2. Bottom row (#68, 73, 81, 88, 94) are all at/just above, and parallel to, the nape of the neck

**You should correct poor net placement if possible by adjusting the net placement. If it is not possible to achieve average or better placement, log how the placement was poor and why it was not corrected.**

#### **How to fix Poor Net Placement:**

1. Attempt to re-adjust net placement.
  - a. If markers are close to proper placement, attempt to shift the net into the correct position.
  - b. Always adjust the net by a group of electrodes, **never** a single electrode.
    - i. Grab multiple electrodes with your hand in a claw shape and “scrunch” them as a group to move them rather than picking one electrode and pulling on it (that can stretch/break that connection)
  - c. Note on the log how many adjustments were made and where.
2. Re-net the participant.
  - a. This is a last resort for poor net placement because it is likely to increase the infant’s fussiness/irritability.
3. If net placement is good, then it becomes poor during acquisition:
  - a. If possible, attempt to shift the net back into proper position in between trials. Note on the log when, how, and why you adjusted the net.
  - b. If not possible, note on the log when and why it became poor, and why you were unable to adjust it.

#### **General Capping Tips:**

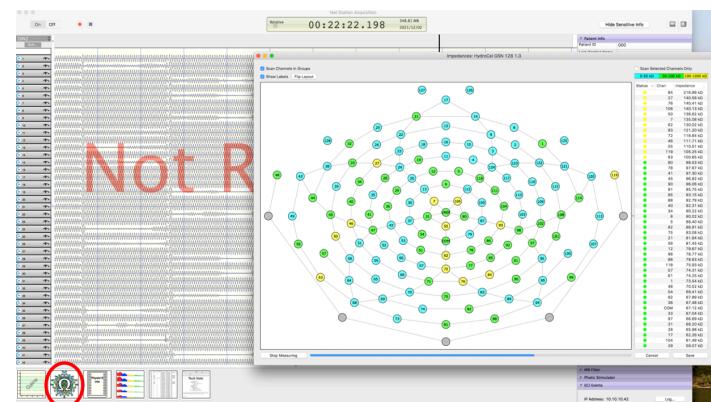
1. Hair - some infants will have more hair than others.
  - a. Use the pipette to gently push hair around to make a clearer connection from the electrode to the scalp
  - b. Use **Shea Butter Leave in Conditioner** on thick and curly hair to minimize volume and have been access to scalp
  - c. Ensure there is no hair in the subject's eyes or line of vision. This can be done with a finger or a pipette.

- Earrings - be careful not to get them caught on the net when capping.

## Impedances

*Impedances are collected prior to starting EEG acquisition. Measure gains before beginning impedances. Ideally, all impedances for infants should be <50kΩ (Blue).*

- Plug in the net and wait for gains to be measured.
- Click on the impedance icon in the lower left corner (circled in red).
- Wait for impedances to be measured, electrodes will appear blue, green, or yellow on the screen.
  - Blue = <50kΩ
  - Green = 50-100kΩ



- c. Yellow =  $>100\text{ k}\Omega$
  - d. Red =  $>1000\text{ k}\Omega$
2. Add soaking solution to the green, yellow, red electrodes using a pipette (but prioritize the red and yellow). Continue until all electrodes are blue, or until the infant starts to get fussy.
  3. Log any electrodes not blue on the EEG Acquisition Form.
  4. Note: If the net is re-capped at any point during the session, you **must re-measure impedances**. Additionally, if the visit runs long, and connectivity seems to deteriorate, you may need to re-conduct mid visit impedances.

### **Net Removal**

1. Unplug connector from amp and wrap it in the washcloth.
  - a. Hold the connector in the washcloth or place it around their neck.
2. Untighten chin straps.
3. Start with the chin straps, and grab elastomers as you work from front to back.
4. Net will essentially fall off after gathering the first half of elastomers.
5. Place it back in the solution and place the wrapped connector in a safe, dry place.

### **Cleaning Protocol**

*Use the Net Cleaning Cheat Sheet at your station as guidance.*

1. Bring the net in the soaking solution over to the cleaning station carrying the net around your neck for safety during the cleaning process.
2. Place the connector in a plastic baggie with a twist tie tied tightly around the baggie. Wrap the washcloth back over the baggie.
3. Take a clean hand towel and lay it flat on the counter.
4. Dump the soaking solution out of the bucket and fill it halfway with tap water (use distilled if you have hard water). The net should **not** be in the bucket while filling it with lukewarm water.
5. Turn the net inside out so the sponges are on the outside.
6. Hold the net by the wires coming out of the electrodes, not the cloth cord.
7. Vigorously dunk (agitate) the net in the water. Make sure all electrodes are getting submerged while dunking.
8. Dunk 10 times, then swish the net around under the water with your fingers in between the elastomers.
9. Dunk another 10 times (20 total). Empty the water and refill the bucket with 1 Liter of tap water.
10. While water is filling, lay the net on the clean hand towel on the counter, and *gently* dab the sponges on the net.
11. This is a good time to visually inspect the net. Check for damages, loose electrodes, snapped elastics, and loose strands of hair.
12. Repeat Steps 5-11 three more times (4 times total).
13. Check the disinfectant date to ensure it is still good. If expired, make a new disinfectant solution and update the expiration date **before** using it.
14. Set a timer for 10 minutes.

15. During the first 2 minutes, continuously dunk/agitate the net in the disinfectant solution.
16. After 2 minutes, let it soak in the disinfectant for the remaining 8 minutes. Place the lid over the top and place the washcloth-wrapped connector to the side.
17. Keep the timer with you to ensure the net is not in the disinfectant for longer than 10 minutes (this can irreparably destroy the electrodes).
18. After 10 minutes, take the net out of the disinfectant, and repeat Steps 5-12 (agitate and dab the net with fresh tap water and a new, dry hand towel).
  - a. Note: If there are still bubbles or cloudy water in the bucket after the 4th time rinsing, continue to repeat Steps 5-11 until the **water is clear and free of bubbles. Remaining disinfectant will harm the electrodes and participants in future uses.**
19. Take the plastic baggie off the connector, place them back in the drawer to reuse, and wrap the connector in the washcloth again.
20. Clean up the cleaning station.

***Disinfectant Solution:***

1. Disinfectant solution is good for 2 weeks from the date it was made.
2. Always check the expiration date before using the solution to clean a net.
3. Dump out expired solution in the sink.
4. Add 1 Scoopful of Disinfectant Solution into the bucket (the spoon for the disinfectant is labeled).
5. Add 2 Liters of distilled water.
6. Mix the solution thoroughly.
7. Update the expiration date for 2 weeks after today's date.
8. Ensure the lid is placed securely on the bucket.

***Bucket Testing:***

*Nets need to be tested monthly to ensure all electrodes are working properly.*

1. Fill a large bucket with 5-6 liters of distilled water and add 1 scoop of potassium chloride per liter of water.
2. Fill a soaking solution bucket with 1 liter of distilled water and 1 scoop of potassium chloride (no shampoo).
3. Place both buckets outside of the EEG room.
4. Review the net inventory log and select all nets that have been used since the last bucket test. Mark a highlighter line under the last net on each page to indicate which nets were tested in this bucket test session.
5. Grab all nets that need to be tested.
6. Submerge nets in the large bucket, making sure that their connectors are kept dry wrapped in hand towels.
7. Soak the nets for at least 10 minutes.
8. Open Net-station on the Mac: any session type is fine (we won't be saving the Net Station file).
9. Remove a net from the bucket and inspect it. Look for the following:

- a. Broken wires (Be extra vigilant as these will not show up on the Net Noise or Impedance tests)
  - b. Missing pedestals, sponges, beads, or chin strap pieces
  - c. Torn elastomer
  - d. Connector pins that are bent
  - e. Elastomer loops
  - f. Green build up on pins
10. Record the Net ID and observations on the Bucket testing log.
11. Place the inspected net in the soaking solution bucket, bring it into the EEG room, and plug in the net.
12. Squeeze V-Ref and COM while the net is submerged under water
13. ALWAYS measure Net Noise first: Tools -> Show Net Diagnostics
- a. The Net Noise test is the system measuring deviation in a signal that should have no deviation
  - b. **Acceptable RMS Values:** (measures the effective differences between the individual channel and the whole net)
    - 1. **1  $\mu$ V – 10  $\mu$ V:** electrodes showing sufficient performance (if the net is functioning well, all electrodes will fall within these parameters)
    - 2. **10  $\mu$ V – 100  $\mu$ V:** electrodes showing poor performance
    - 3. **> 100  $\mu$ V:** electrodes possibly needing to be replaced
14. If all of the electrodes are in the green threshold box, repeat step 14 to get 3 successful tests and move onto step 16. **If there are electrodes that are out of the acceptable range, proceed with steps a-c.**
- a. Change the net position & squeeze the sponges in the bad electrodes so that they fill with water.
    - i. If several electrodes are bad, squeeze the sponges for V-Ref and COM also.
  - b. Re-test the net two more times, making note on the bucket testing log of which electrodes are bad each time.
  - c. If electrodes are bad for 2 of the 3 tests, they should be reported for replacement.
15. Measure Impedances: Tools -> Impedances
- a. The Impedance test is measuring the resistance of the electrode to the current.
16. If any electrodes have an impedance measurement above 10, squeeze their sponge and allow impedances to refresh 2 more times. Record the bad electrodes for all 3 trials. Report any electrodes that are bad for 2 out of 3 impedance tests.
17. Repeat net inspection, Net Noise test, and Impedance test for all nets, ensuring all results are recorded on the bucket testing log.
18. Clean nets after testing using the cleaning protocol (only first 4 rounds, no disinfectant). Hang nets back up after they are clean.
19. Place a post it note stating “Needs to be fixed” on the connector pieces of the nets that need fixing. This allows RA’s to know which nets not to use during visits.
20. Report to the person in charge of electrode changes which nets need to be examined. Ensure all details are on the bucket testing log for them to reference.

## LORIS Net Inventory Entry

The LORIS team has worked to create a consortium-wide Net Inventory on LORIS, which will be used to monitor monthly bucket testing, use, and repair of nets. We are asking all sites to enter the net IDs, size, purchase date, warranty date, and associated site for each of their nets to this log. Below is an instruction sheet for entering the net information to LORIS.

**Please read the entirety of the instructions before entering any net information.**

Instructions for Net Entry to LORIS:

1. Log into your LORIS account as normal at <https://prod.hbcd.msi.umn.edu/>.
2. At the top of the screen, hover over the “Equipment QC” dropdown and then click on “Net Inventory”.
3. Click the “New Net” button at the bottom right of the page.
4. For each net used by your site for the HBCD study, enter the Net ID, Size, Site, Warranty date and Purchase Date.
  - a. **NOTE:** You will not be able to enter the letter included in the serial number/net ID. Instead, just enter the 6-digit serial number without the letter preceding it. Please input the serial number for the net ID, not the REF number displayed above
  - b. **NOTE:** For the moment this iteration of the Net Inventory is **not editable**. Please **double check** that you have correctly entered the fields here before clicking “Save”, as we will not be able to edit the net inventory until a future release of this page.
  - c. The warranty date can be calculated as the purchase date plus however long of a warranty your site purchased.
  - d. Once you’ve filled out and **double checked** these fields, click “Save” in the bottom left of the pop up window. You will see a green “Net successfully registered.” pop up at the top of the window.
5. After you click “Save” on the previous net and see the “Net successfully registered.” pop up, you will be able to enter each additional net in the same window by repeating the above steps in the same window.

## Bucket Testing in LORIS:

The LORIS team has put together an interface for sites to complete monthly bucket testing and sound checks. Below is a set of instructions for completing bucket testing and sound checks on LORIS.

1. Go to <https://prod.hbcd.msi.umn.edu/> and log in using your LORIS credentials. This will take you to the Main LORIS page.
2. In the top middle tab, under “Equipment QC”, click “Bucket Testing”. This will take you to the bucket testing page.
3. In the top left corner of this page, click the “Pending Bucket Testing” tab. This will bring you to a page listing all of the nets that have been used in the last month and will need to be bucket tested.

- a. Please note: due to the recency of the dashboard, you will not yet have the option to bucket test nets that have not been used in a visit in the last month. The interface will soon be updated with a function for this case.
- 4. At the far right of each net entry under “Actions”, there is a “Start” button. Click this button to start bucket testing a net. This will bring up a window containing measures for Net Noise, Impedances, and a Visual Inspection of each net.
- 5. Bucket test as usual, and enter each trial measurement under these entries. For instructions on bucket testing, see page 32 of the [Official EEG Acquisition Manual](#).
- 6. When finished, click “Save” at the bottom of the tab. This will return you to the “Pending Bucket Testing” tab.
- 7. Repeat steps 3-5 for each net, until all nets pending bucket testing have been completed.

Once you have completed all pending bucket testings for the month, you will also need to complete a monthly sound check. Here are instructions for completing monthly sound checks on LORIS.

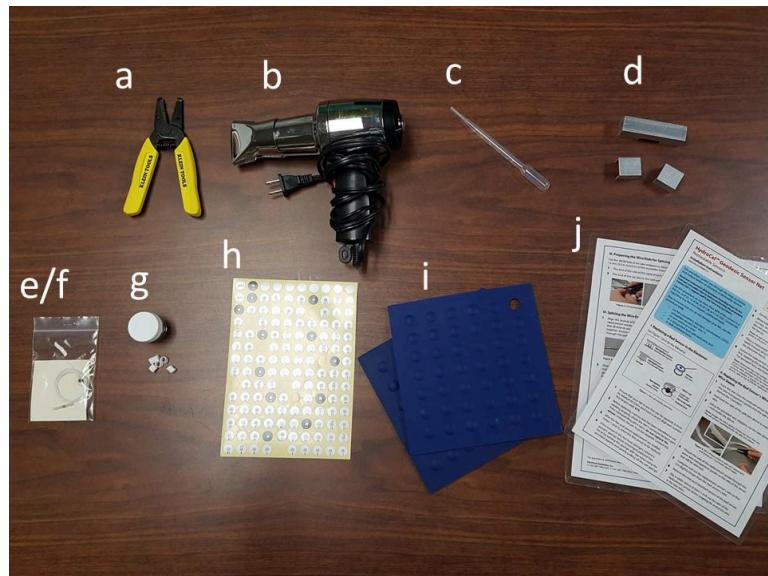
1. Go to <https://prod.hbcd.msi.umn.edu/> and log in using your LORIS credentials. This will take you to the main LORIS page.
2. In the top middle tab, under “Equipment QC”, click “Sound Level Report”. This will take you to the sound check page.
3. In the bottom right, click “New Report”. This will open a tab with entries for site, date, and decibel measurements for “BA” and “DA” sounds.
4. Sound check as usual, and enter each measurement under these entries. For instructions on sound checking, see page 12 of the [Official EEG Acquisition Manual](#).
5. When finished, click “Save” at the bottom of the tab. This will return you to the “Sound Level Report” tab.

### Changing Bad Electrodes:

\*[Electrode Replacement Video Link](#)

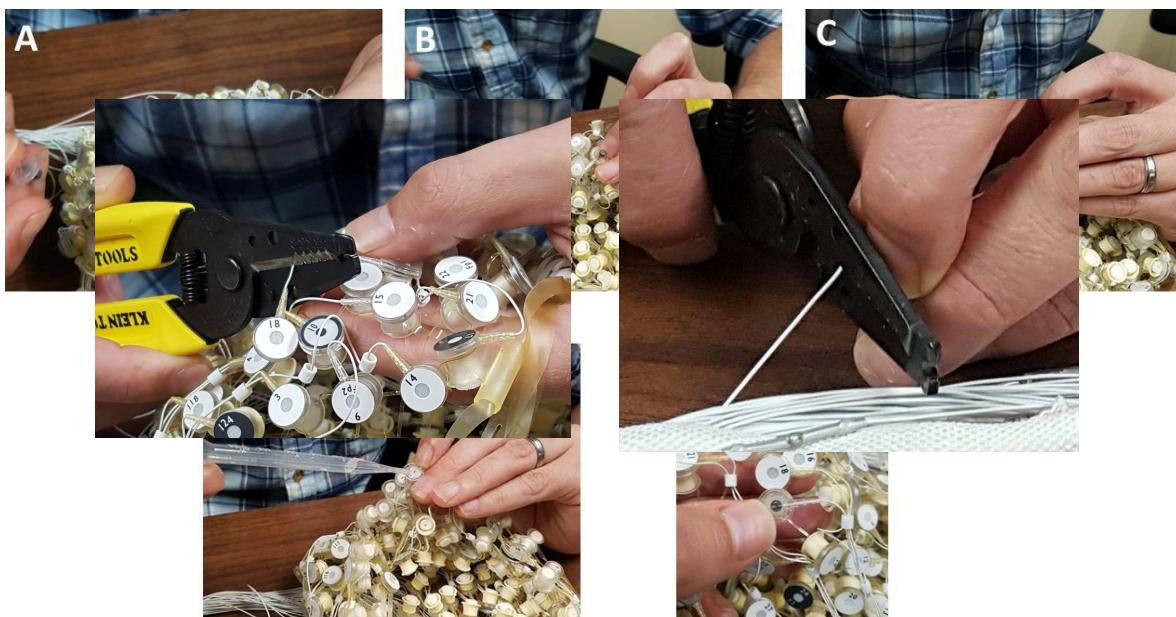
#### Supplies:

- a. Wire strippers
- b. Heat gun
- c. Pipette (syringe)
- d. Metal pedestal
- e. Replacement electrode(s)
- f. Tyco solder sleeve(s)
- g. Replacement sponges
- h. Replacement stickers
- i. Heat resistant pad(s)
- j. EGI Instructions



1. Use the Bucket Testing Log to find the bad electrodes and any other issues.
2. Find the net and sensor to be replaced.
3. Collect all necessary supplies from the list above.
4. Take out the new electrode from the package to be ready for use.
5. Remove the sponge from the bad electrode before removing the pedestal. To do this, **first wet the sponge** with water using the pipette. Then gently remove the wet sponge from the pedestal (you can use your fingers).
6. Gently remove and **save the pedestal for later use**. **You will need this later for the replacement electrode.**
7. Pull out the old electrode from the eyelets of the elastomer bands of the net. **Be careful to maintain the layered order of the elastomer band (A)**. Leave the wires in place for now and replace with the new electrode (B/E).
8. Secure the new electrode in place with the pedestal that was removed earlier. Insert a new dry sponge over the new electrode and press it into the pedestal firmly (C). While holding the sponge firmly in place add a little bit of water to the sponge using the pipette (syringe) so the sponge absorbs the water and expands, securing the electrode in place (D). See picture below. Electrode 18 is being replaced.

**Note:** *Do not remove the old electrode wire or cut the old electrode wire at this time.*

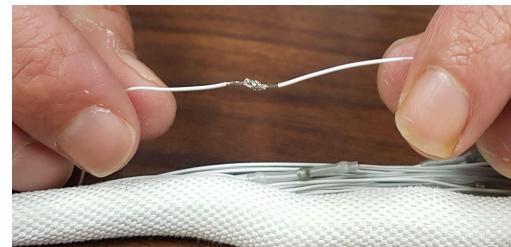


9. Trace the wire from the bad electrode back through the net holders (rings) and back into the split wire sleeve (the part that holds the electrodes in place and keeps the wires from being tangled) and then feed the new electrode wire through the same path as the old one.
10. **Double check that it is on the same path. Cut off the old electrode near the sensor and feed the wire through the net holders (rings) back to the sleeve.**
11. Peel back the split wire sleeve.

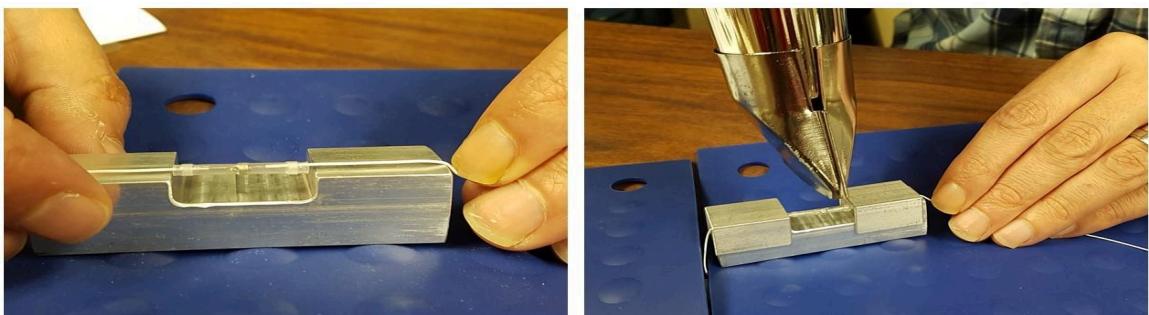
12. Using the wire stripper, cut the wire attached to the bad sensor about 1 inch inside the split wire sleeve.
13. Compare and cut the replacement sensor's wire so that it is slightly longer than the old bad electrode wire.
14. Remove the wire of the old electrode and dispose.
15. **Slip a solder sleeve onto the new electrode wire before using the wire stripper to strip the end of the new electrode wire.**
16. Use the 26/28 hole in the wire stripper (the second/third hole down from the top of the wire stripper as shown below). **Without cutting the electrode wire**, remove/strip a half inch of the insulation from the end of the wire of the replacement electrode. Repeat for the end of the wire that comes out of the split wire sleeve.



17. Align both of the stripped wires (the new electrode wire and the one that comes out of the split wire sleeve) so that they are roughly parallel and carefully twist them together and create a small ball in the center of the new connection.
18. Slide the solder sleeve over the new connection so that the plastic part of the solder sleeve is fully covering the exposed wires and the silver section in the center of the solder sleeve is in the middle and covering the small ball that was created when twisting the wires together.
19. Isolate the wire with the new connection from the other electrode wires and place a heat resistant pad over the net and other wires. Place the wire with the new connection over the center of the metal pedestal and align the edges of the plastic connector wire so that none of the plastic is touching the metal. Ensure that the solder sleeve is centered over the new connection between the wires created earlier. Secure the electrode wire in place with the 2 metal pieces that are found in the metal pedestal bag. See picture below.
20. Again, ensure that the heat resistant pad fully covers the net and other electrodes wires. Use a second heat resistant pad if needed.
21. Using the heat gun: **CAUTION**
  - a. The heat setting of the gun is **HOT! Do not touch the tip.**
  - b. Avoid charring/burning the solder sleeve.



- c. Only heat the solder sleeve, NOT the wire on either side of the metal pedestal. Heat can damage the sensor wires.



22. Use the heat gun with the nozzle attached. At about 1 inch distance from the solder sleeve, carefully heat the solder sleeve (moving side to side) until the internal solder melts around the twisted wires and the glue rings at each end of the solder sleeve melt around the insulation of the wires. This takes roughly 20 seconds.
  - a. After the sensor wire is soldered, make sure that a soldered connection has formed at the center of the solder sleeve around the twisted wires. Make sure that the solder sleeve has sealed the wires by looking at both ends of the solder sleeve. This protects the wires from moisture. If the connection has not been soldered sufficiently, reheat. Again take care doing this and do not char or burn the solder sleeve.
23. Turn off the heat gun and set aside away from the net. Allow the heat gun to cool.
24. Wait for the heated solder sleeve, metal pedestal to cool.
25. After the solder sleeve has cooled, carefully tuck the soldered sensor wire back into the split sleeve.
26. Make sure to place the correct sticker onto the new electrode in the net.
27. Hang the net back up and return supplies.
28. Notify the team that all bad electrodes/net issues have been fixed, and that the nets can be used again.



End of Net Training Manual.

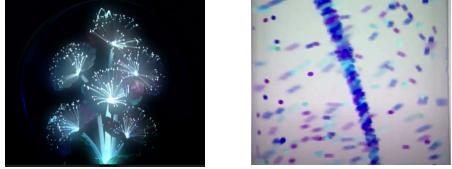
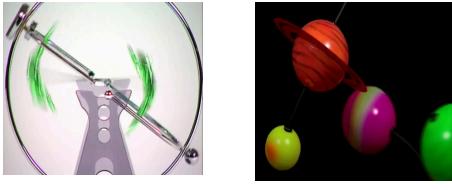
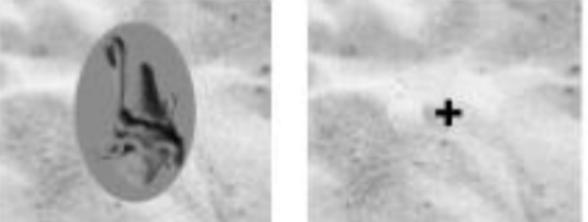
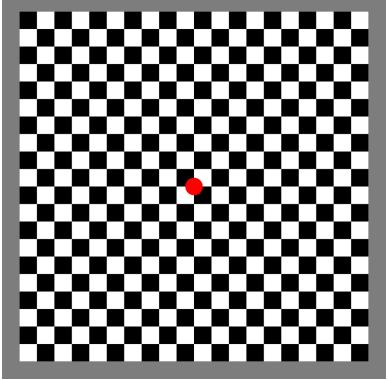
## EEG Acquisition Protocol

### Purpose Statement:

The purpose of the EEG Acquisition Protocol is to detail the experimental tasks and to outline the necessary set-up and steps for collecting EEG data.

### V03 Task Overview:

There are 4 tasks that the infant will engage in during EEG Acquisition. Each task has its own E-prime file.

<p><b>Video Resting State:</b> A silent video with a variety of colorful and abstract toys and visuals on screen.</p> <p>I</p>  	<p><b>Face:</b> Variety of images of faces and objects presented in black and white.</p>  
<p><b>MMN:</b> An auditory presentation of human syllables including “ba” and “da”</p> <p>Visuals: Video played on iPad as distractor. Brightness all the way up, airplane mode, not plugged in.</p>	<p><b>VEP:</b> Flashing black and white checkerboard</p> 

**Outline of Task-Specific Parameters:**

Task (Duration in Mins)	Task Administration Notes	Flags (NetStation) (E-Prime)
Video Resting State (3:00)	Runs for 3 mins uninterrupted. No additional action needed.	DIN3 Bgn+ /TRSP
MMN (11:30)	Runs for 11:30 mins (V03) or 8:30 mins (P04/P06). Press 'p' to pause the MMN. Press the <b>spacebar</b> to leave the pause screen and return to the task.	DIN2 Bgn+ / TRSP Stms
Face (4:30)	<p>Press the <b>spacebar key</b> to move on to the next trial image. (do not hold down space bar)</p> <ul style="list-style-type: none"> <li>- Spacebar should be pressed when the infant is looking at the screen. Use the video camera footage to determine infant's eye gaze.</li> </ul> <p>Press the 'a' key to <u>queue up</u> the in-experiment attention-getter. The attention getter will then appear after the current slide is terminated. Press the <b>spacebar key</b> to terminate the attention-getter and resume the experiment.</p>	DIN3 Bgin /TRSP Stm+, ITI+, fix+, dist
VEP (1:00)	<p>Runs for 1 minute uninterrupted. No additional action needed.</p> <p>Infant's attention should be on the screen.</p>	DIN3 Bgn+ / TRSP Ch1+, Ch2+

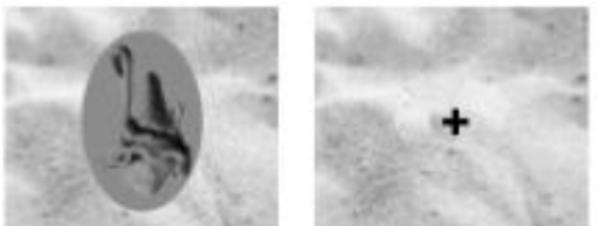
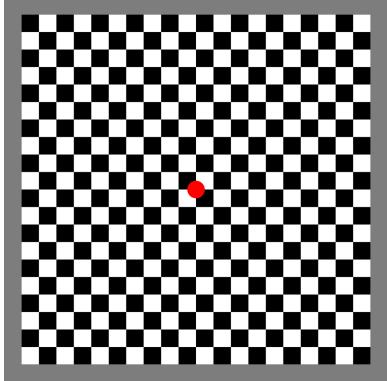
**Explanation of flags**

Flag	Meaning
Bgn+ / Bgin	start of task
Bas+	baseline start
TRSP	contains additional information about the stimulus (ex- what face image was shown in face task)
Stms	E-Prime flag for MMN stimuli
paus	Pause flag for MMN
DIN2	StimTracker auditory flag
Stim+	E-Prime flag for face task stimuli

ITI+	inter-trial time for face task
Dist	distractor/attention grabber
DIN3	StimTracker flag for visual stimuli
Ch1+/ Ch2+	Checkerboard 1 and 2 for VEP

**V04/V06 Task Overview:**

There are 4 tasks that the infant will engage in during EEG Acquisition. Each task has its own E-prime file.

<p><b>Video Resting State:</b> A silent video with a variety of marble run and construction visuals on screen.</p>  	<p><b>Face:</b> Variety of images of faces and objects presented in black and white.</p>  
<p><b>MMN:</b> An auditory presentation of human syllables including “ba” and “da”</p>   <p>Visuals: Updated video played on iPad as distractor. Brightness all the way up, airplane mode, not plugged in.</p>	<p><b>VEP:</b> Flashing black and white checkerboard</p> 

***Outline of Task-Specific Parameters:***

Task (Duration in Mins)	Task Administration Notes	Flags (NetStation) (E-Prime)
Video Resting State (3:00)	Runs for 3 mins uninterrupted. No additional action needed.	No DINs Bgn+ / TRSP
MMN (8:30)	Runs for 8:30 mins. Press 'p' to pause the MMN. Press the <b>spacebar</b> to leave the pause screen and return to the task.	DIN2 Bgn+ / TRSP Stms
Face (4:30)	<p>Press the <b>spacebar key</b> to move on to the next trial image. (do not hold down space bar)</p> <ul style="list-style-type: none"> <li>- Spacebar should be pressed when the infant is looking at the screen. Use the video camera footage to determine infant's eye gaze.</li> </ul> <p>Press the 'a' key to <u>queue up</u> the in-experiment attention-getter. The attention getter will then appear after the current slide is terminated. Press the <b>spacebar key</b> to terminate the attention-getter and resume the experiment.</p>	DIN3 Bgn / TRSP Stm+, ITI+, fix+, dist
VEP (1:00)	Runs for 1 minute uninterrupted. No additional action needed.  Infant's attention should be on the screen.	DIN3 Bgn+ / TRSP Ch1+, Ch2+

***Explanation of flags***

Flag	Meaning
Bgn+ / Bgin	start of task
Bas+	baseline start
TRSP	contains additional information about the stimulus (ex- what face image was shown in face task)
Stms	E-Prime flag for MMN stimuli

paus	Pause flag for MMN
DIN2	StimTracker auditory flag
Stim+	E-Prime flag for face task stimuli
ITI+	inter-trial time for face task
Dist	distractor/attention grabber
DIN3	StimTracker flag for visual stimuli
Ch1+/ Ch2+	Checkerboard 1 and 2 for VEP

**General EEG Acquisition Rules:**

1. The goal is to reduce artifacts caused by movement and to increase time spent attending to the stimulus.
2. You should not be more interesting than the stimulus, use attention-getters as infrequently as necessary, and as best as possible keep your face out of the eyesight of the child.
3. Be prepared to switch methods if the infant is becoming habituated and an attention-getter is becoming less effective.

**EEG Acquisition Form**

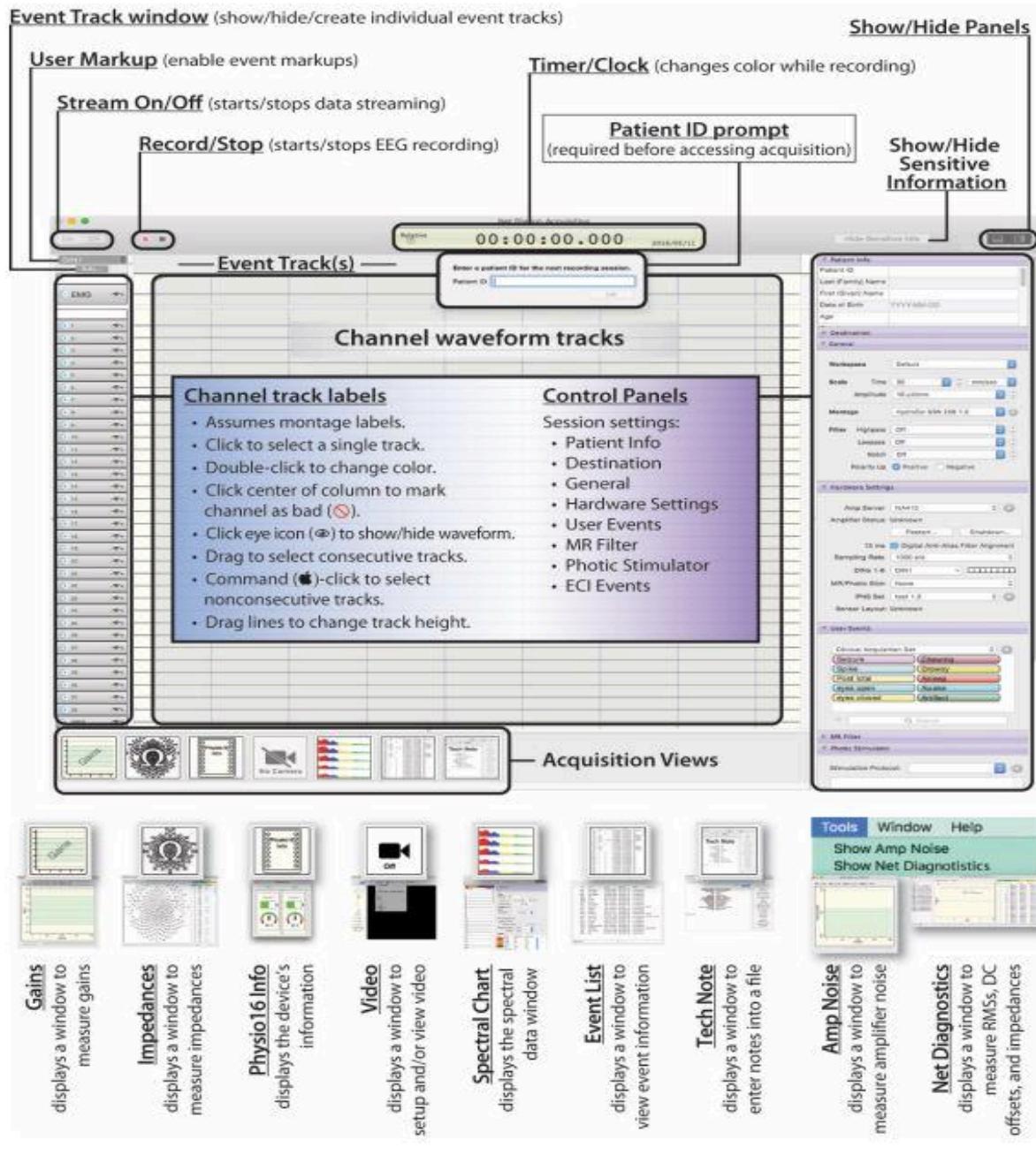
This form is to document information collected during the EEG visit. This includes participant information, EEG variables, infant temperament, any issues or notes from the visit. Consistent, accurate reporting allows for participant-specific and site-specific variables to be accounted for during analyses.

The EEG Acquisition Form is on LORIS and completed throughout the ongoing EEG session.

## Net Station Acquisition Interface:

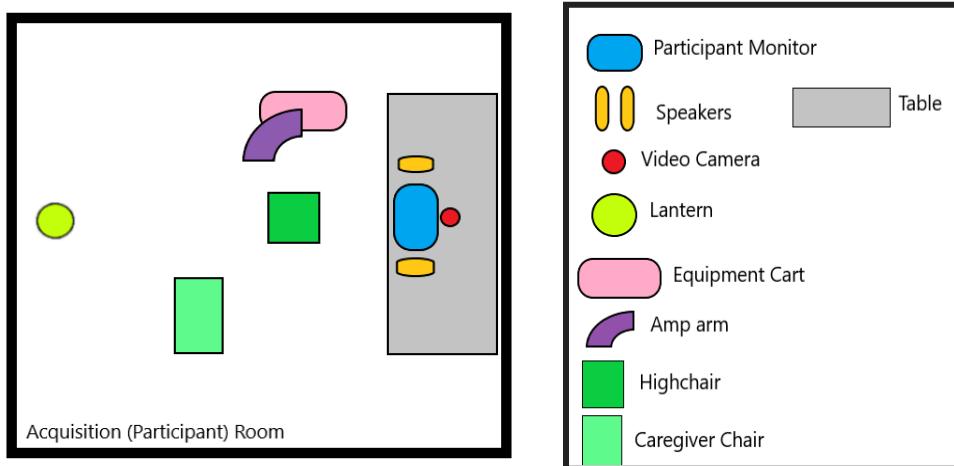
### 3.1 Acquisition Interface

The Net Station Acquisition interface is used for acquiring EEG and PNS data.



**Acquisition Room Set-up:**

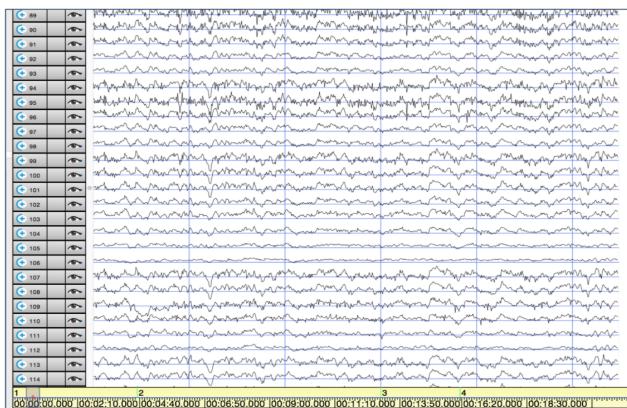
	Position in Room:
High Chair	60cm away from the monitor (measured at inner side of highchair's lap table) - you can <b>set up a string 60cm to use for quick measuring before each visit</b> 71cm height from ground (measured up to the seat, not top of highchair)
Secondary RA	On the side of the highchair, in front of the baby, on the side of the monitor. (squatting/sitting on floor)
Extra RA	In Computer Room or Behind highchair (out of baby's view)
Adult Caregiver	In the chair behind the highchair.
Lantern	Placed 4ft behind the participant chair
Computer Monitor	On table, centered in front of highchair
Table for Monitor	71cm height
Video Camera	Placed to ensure all of infant is in view (not just face)
Speaker	60 cm distance from highchair, on either side of participant monitor

**Monitoring Data**

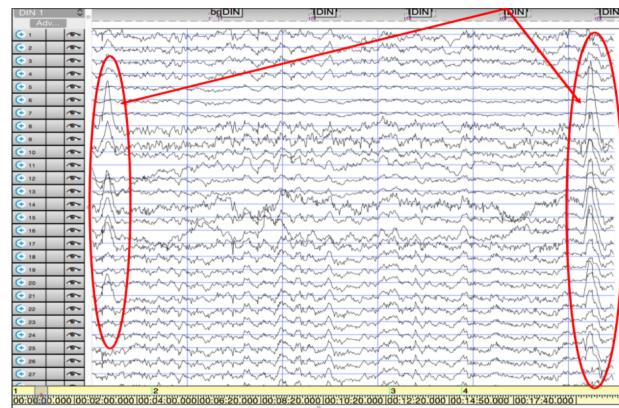
The Primary RA is responsible for monitoring the following parts of EEG Acquisition:

1. NetStation and E-Prime are running correctly, including StimTracker DNS and E-Prime event flags.
2. Monitoring infant attention during the tasks through the video recording in NetStation.
3. Watching the collection of EEG data for unusual EEG activity and if applicable noting observations on the Acquisition Form.
4. Communicating with the secondary RA and ERA in order to collect high quality data.

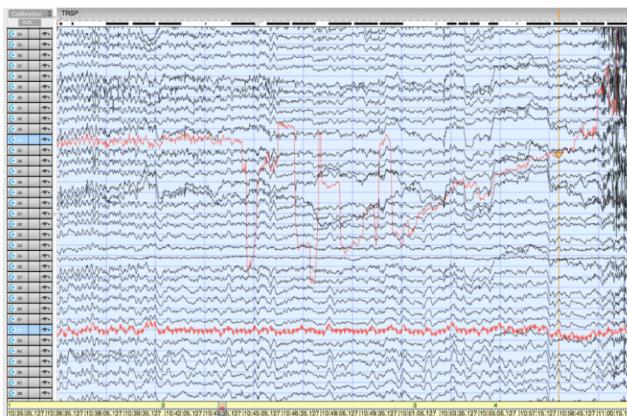
**Examples of EEG Data during Acquisition:**



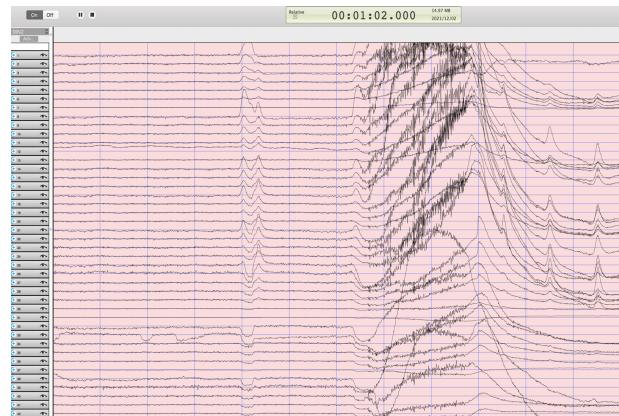
F.1. Example of Good Data.



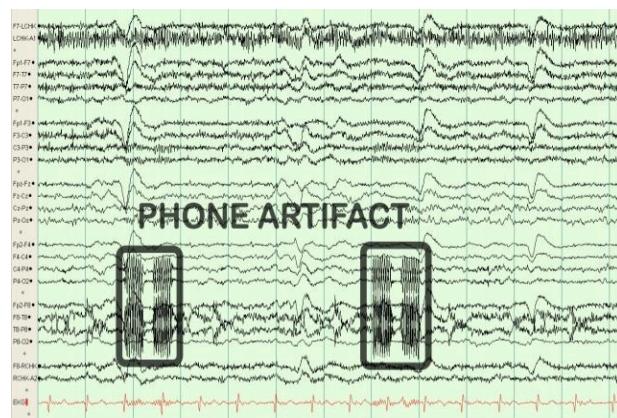
F.2. Example of Eye Blinks.



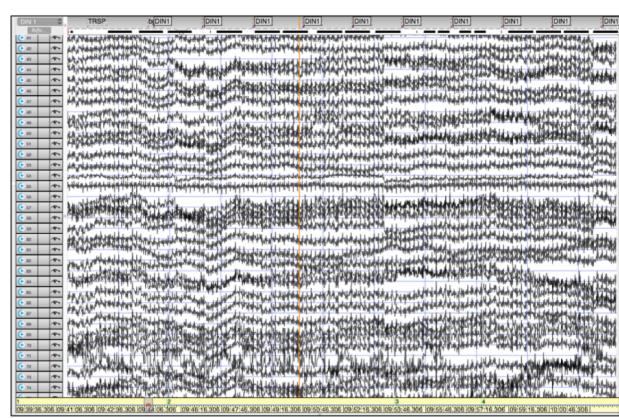
F.3. Example of Good Data with Bad Electrodes (in red).



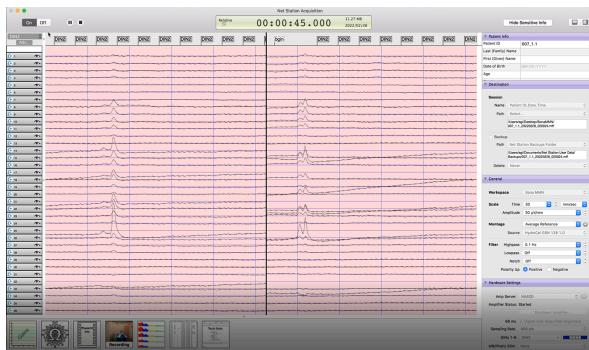
F.4. Example of Excessive Movement.



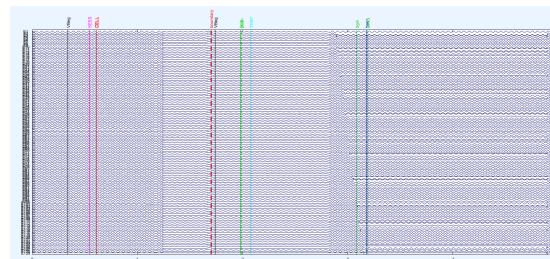
F.5. Example of a Phone Artifact.



F.6. Example of Bad Data.



F.7. Example of DIN flags (at top of screen).



F.8. Example of open impedances

## Monthly Reporting

1. Bucket Testing
  - a. Follow the [bucket testing protocol](#) to test all nets used in the last month.
  - b. Input results to LORIS:
    - i. Log into your LORIS account as normal at <https://prod.hbcd.msi.umn.edu/>.
    - ii. At the top of the screen, hover over the “Equipment QC” dropdown and then click on “Net Inventory” to navigate to the specific net.
    - iii. Report any issues, repairs, etc.
2. Soundcheck- Check that “ba” and “da” are the same decibel level.
  - a. If this is the first time, install and run EEG soundcheck files. Directions on [confluence](#).
  - b. Follow the [monthly soundcheck](#) directions in the audiometer section of protocol.

End of EEG Acquisition Protocol.

## Full Visit Protocol

### Necessary Materials:

Computer Room:	Participant Room:
<ul style="list-style-type: none"> <li>- PC with E-Prime software and monitor</li> <li>- Mac with NetStation software</li> <li>- Switcher box</li> <li>- Walkie Talkie</li> <li>- Assigned USB drive (data transfer)</li> </ul>	<ul style="list-style-type: none"> <li>- Participant monitor</li> <li>- EGI amp and arm</li> <li>- EEG Net</li> <li>- ECG wire and sensor sticker</li> <li>- StimTracker</li> <li>- Adult chairs</li> <li>- Infant highchair</li> <li>- Bucket with soaking solution</li> <li>- Tape measure</li> <li>- Pipettes</li> <li>- Cotton hand towels and washcloths</li> <li>- Lantern</li> <li>- Walkie talkie</li> <li>- Video Camera (recording session)</li> <li>- Speakers</li> <li>- Toys for distracting infant</li> <li>- iPad</li> </ul>

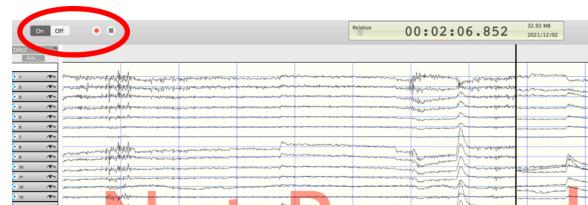
### Visit Preparation: Computer Room

#### Start-Up Checklist:

1. Mac/PC - power on, log in
  - a. PC: open file explorer and navigate to the task files, **DO NOT OPEN YET**
2. Switcher Box - turn on, ensure switcher box is lit up for "Mac" so impedances will show on Participant Room monitor
3. Video Camera - (on NetStation) ensure angle is set properly for highchair view
4. Visit Run Sheets - have visit run sheets on hand for reference during the visit
5. Walkie Talkies - turn on, in silent mode, and on the same channel as the Participant Room walkie talkie
6. Tablet - Prepare EEG Acquisition Form on LORIS for use during session

#### Starting the Mac:

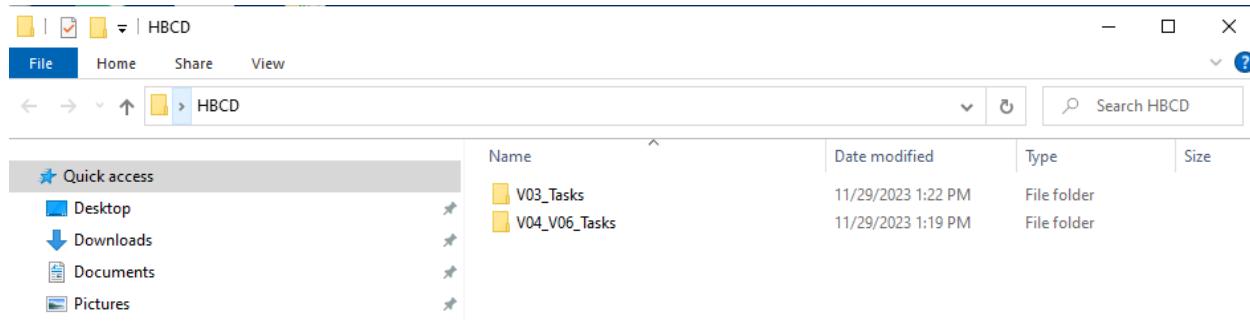
1. Log into the Mac computer
2. Open Netstation Acquisition. Turn the session "ON".
  - a. Remember, E-Prime will trigger the recording, so don't click the "record" button manually.



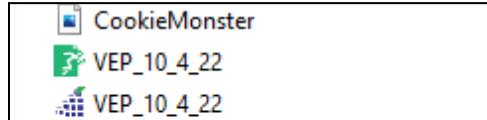
3. Enter the file name for the task you are about to start:
  - a. **[PSCID]\_[DCCID]\_[VisitLabel]\_[TASK].mff**
    - i. Tasks: RS, FACE, VEP, MMN
  - b. **NOTE:** NetStation auto-appends the Date and Time, DELETE THIS PART OF FILENAME
4. Use the switcher box to switch between computer displays.
- a. Mac is displayed first for impedances, then switch to E-prime PC for tasks
5. Video Camera - (on NetStation) ensure highchair is in view

### **Starting the PC:**

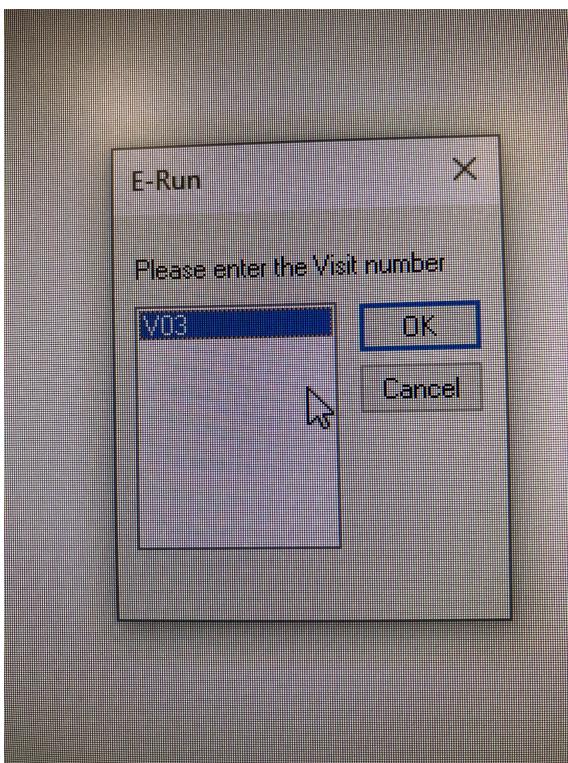
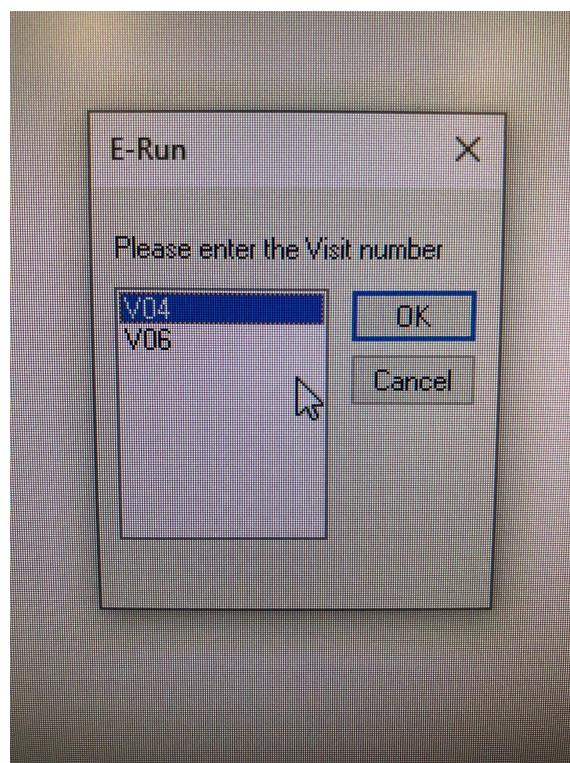
1. Log into the PC computer.
2. Open file explorer to folder with task files.
  - a. Below is a photo of the file structure - one folder to be used for V03 visits, and another to be used for V04/V06 visits. RAs should select the V04/V06 folder.



- b.
3. When ready to start, open the E-prime file that has the **green** icon for that task (example below).



- a. **You do NOT need to select “record” in NetStation on the Mac prior to beginning the task**
- b. **Do NOT open E-prime until after NetStation is already running, and after the impedances window has been saved and closed**
- c. Each task initializes with a dropdown menu to select which EEG Acquisition visit is taking place (V03/V04/V06).

**V03:****V04/V06:**

- d. RAs should select the visit number corresponding to the visit they are completing and press okay.
- e. An initialization window requesting the DCCID will appear. **Enter the participant's DCCID. This is an essential step to ensure that the e-dat and .txt files are properly saved.**
- f. An initialization window requesting which session number this is will appear. Enter the run for this task (1 for first run, 2 and so on for reruns of the same task).
- g. After the drop down menu, a screen reporting which task has been selected will be presented in the E-prime task.

**V03:**

You have selected V03 MMN  
Press SPACE to begin the task

**V04/V06:**

You have selected V04 and V06 MMN  
Press SPACE to continue

- h. The RA will be asked to confirm the visit selected by pressing space to continue on to the task. After pressing space, the task will begin.
  - i. If you've selected the wrong task, press "ctrl + alt + backspace" to exit out of the selected task and reselect the intended task.
4. Use the switcher box to switch participant monitor from Mac to PC view (switching from showing impedances window to showing E-prime task).

## Visit Preparation: Participant Room

### **Start-Up Checklist:**

1. Speakers - turn on and ensure at 75 dB SPL (acceptable range of 72-77 dB SPL)
  - a. measured from the position of the baby's chair using the Sound Meter.
2. Chairs - high chair in front of monitor (60cm away), adult chair out of infant view on the side or in back
3. Cart supplies - towels/washcloths, pipettes, ecg sticker/wire
4. Arm - correct configuration to reach the highchair
5. Toys - approved toys within reach
6. PC monitor- turn on
7. Walkie talkie - make sure it is on the correct channel, and on silent mode.
8. Bucket with soaking solution
9. Turn on lantern (you can keep room lights on until acquisition begins, then it must only be the lantern light)

## Participant Preparation

### **General Tips:**

1. Ask caregiver if the infant needs to be changed and/or fed **prior** to the EEG net
2. Try to minimize the number of people in the room during EEG acquisition
3. Ensure that adult caregivers and experimenters do NOT bring their phones or any other electronics (i.e. Apple watch) into the participant room while EEG is in progress.
4. For instructions and an overview of how to cap with thick, curly, or styled hair, please see [this document.](#)

### **Explaining the Net:**

1. Explain to the adult caregiver the 3 types of reactions that infants have to the net:
  - a. *"There are 3 reactions babies have during capping. 1) they don't notice it's on their head, and we are able to spend a moment fixing the placement, 2) they are fussy/crying but calm down once we get started, 3) the baby gets fussy/cries and has trouble calming down, this is normal and completely fine."*
2. Explain to the adult caregiver how you're going to put the net on
  - a. *"This is the EEG hat. It has been soaking in warm water with baby shampoo so that it's soft and comfortable. When I'm putting the hat on, please hold onto XXX's hands until I've got it adjusted and remember to try to keep his/her hands away from the net throughout the activities today."*

### **Thick/Curly Hair Tips:**

\*\*  [Coarse\\_Curly\\_Hair\\_Tips.pdf](#)

1. Use Shea Butter Leave in Conditioner - massage into hair to minimize volume and have easier access to scalp
2. **Size UP** for nets to give extra room for hair volume
3. Use pipette to move hair out of the way for electrodes to touch scalp (can thread hair out of net elastics to give more scalp access)

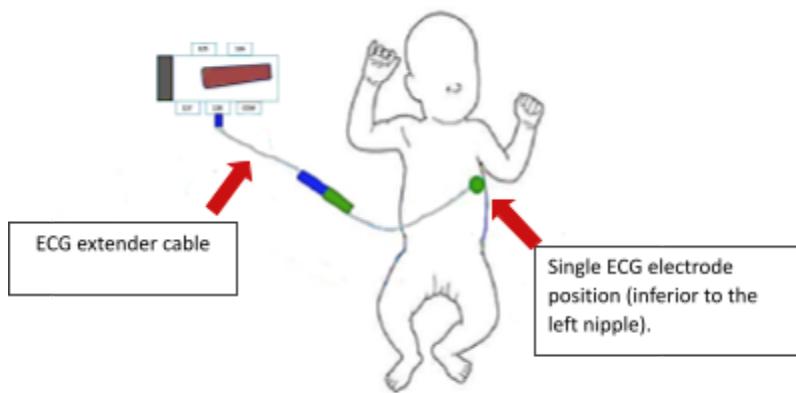
4. Coordinate with caregivers ahead of time (what hairstyle, options for EEG)
5. Consider finding a volunteer that can do braids to assist in visits

**Measurements:**

1. Have the adult caregiver hold the infant on their lap with the infant facing you.
2. Have the ERA distract the infant using appropriate toys.
3. Use the measuring tape to measure the infant's head circumference.
4. Select an infant net, record the head circumference and Net ID on the EEG Acquisition Form. (**Always** size down for standard nets).
5. Wrap the connector in a washcloth.
6. Submerge the net in the soaking solution.
7. Place the wrapped connector in a safe place that will not get wet/fall into the bucket.  
Replace the hand towel over the bucket to keep the water warm.
8. Begin the 10 minute timer for soaking.

**ECG Electrode Sticker:**

1. Electrode Stickers are ONE TIME USE. The connection wire is reusable for each participant. Keep supplies (electrode stickers) in a dry sealed location to ensure quality is kept, especially once a box (which contains multiple electrodes) is open.
2. Have the caregiver hold the infant or lay them down on the table.
3. Attach the sticker to the wire (button snap) BEFORE placing on the infant's chest.
4. Have the caregiver lift the infant's shirt up to access their chest.
5. Secondary RA places one ECG electrode sticker onto the infant's chest, inferior to their left nipple.
6. Connect the ECG extension cable into port 128 on the EEG net connector.



**Capping:**

See [Capping Protocol](#) within Net Training Manual for more details on capping technique. Additionally, for instructions and an overview of how to cap with thick, curly, or styled hair, please see [this document](#).

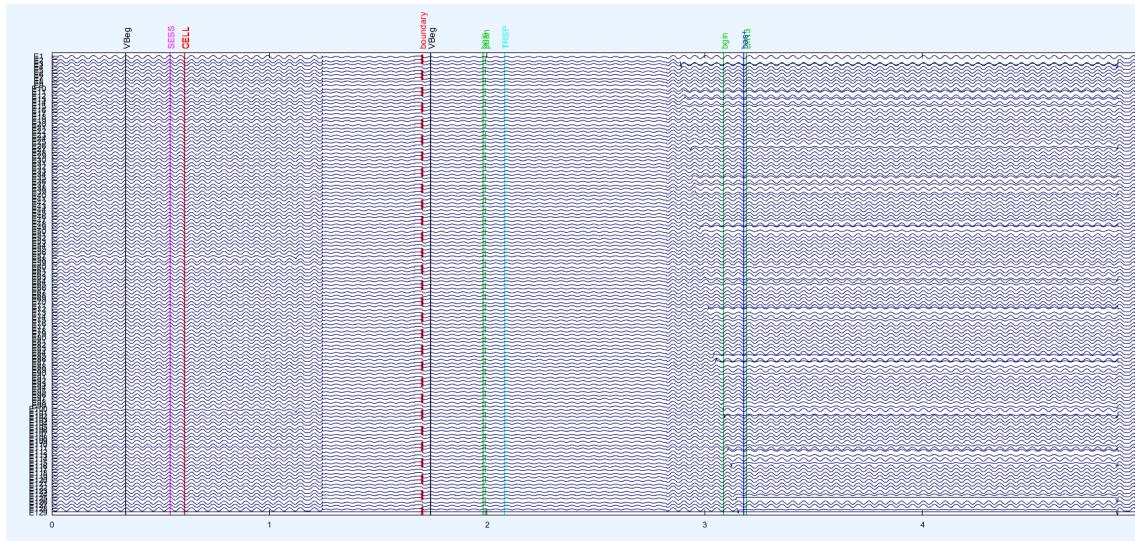
1. Have the adult caregiver hold the infant on their lap with the infant facing you.
2. Hold the connector under your arm.

3. Have the ERA distract the infant with appropriate toys. This person should be directly behind the person capping, to ensure the infant is facing forwards for capping.
  - a. For a list of suggested distractor videos, see appendix.
4. Create a dome with the cap using the “bear claw” technique.
5. Bring the net behind the infant’s head and center it. Place it down onto the infant’s head. Cup the infant’s face with your hands as you pull down.
6. Check for net placement accuracy. Make large scale adjustments if necessary (hold clusters of electrodes when shifting).
7. Tighten and adjust straps.
8. If necessary, shift the net (minor adjustments) to be as accurate as possible.

## **EEG Acquisition: Computer Room**

### ***Impedances:***

1. Open the impedances window on NetStation and use the switcher box to have the impedance window mirrored to the participant monitor. Once impedances are done, **save** and close the impedances window.
  - a.
  - b. Please make sure to close impedances before beginning the EEG recordings. If impedances are left open during the EEG recording, NetStation records the impedances rather than real brain activity. If impedances are open, the NetStation recording will look like the image below.
  - c. If a NetStation recording looks like the image below during a visit, stop the task and close impedances. First, re-open impedances, measure and save them, and be sure to close them. Then begin a new NetStation recording without open impedances, and restart the EEG task.



### ***Starting a Task on a PC:***

1. After the impedances window is saved & closed, and you are ready to begin the task, use the switcher box to switch the participant screen to the E-prime computer screen.

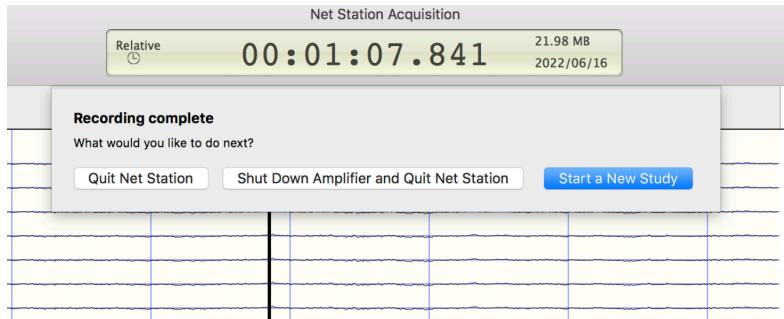
2. Open the E-prime file with the green icon (**Tip: use this shortcut to put tasks on the desktop for easy access**)
  - a. Check that NetStation is set up and running before starting the E-prime experiment, otherwise E-prime will not establish communication with the Mac
3. E-Prime will ask for certain parameters:
  - a. LORIS ID : Enter in the participant's LORIS Enter participant ID number
  - b. Session number: If this is the first time you are running the task for this participant, enter 1. If you run the task again later in the session, you will update the session number to correspond to the number of the run.
  - c. If you get a warning that a file is going to be overwritten - choose NO and double-check the ID and session number, this means a file was already named with this entry info.
4. If you see an error before the tasks start, this may mean that E-prime is not connected to NetStation, and you will have to restart both NetStation and EPrime.
5. Once the file loads, it will take you to a welcome screen (A picture of a cartoon with the instructions to click the space bar to begin). This is your last chance to check that everything and everyone is ready before the task starts.
6. Once the task starts, ensure flags are appearing on NetStation at the top of the screen.
7. Ensure that you move your cursor off the screen so the infant can't see it.
8. If you need to end a task prior to completion:
  - a. **STOPPING A TASK:** ctrl+alt+backspace
    - i. Click to **manually end recording on NetStation** (only MMN will auto-stop recording)
  - b. This will interrupt the task where you currently are. What has already been completed will still be saved as a file. If you end here, make sure to mark acquisition notes as "incomplete".
  - c. If you start that task over, make sure to add the appropriate suffix to the filename i.e: "run-2"

#### ***Monitoring the Data:***

1. Note which channels have an unusual amount of noise.
2. Watch data for excessive movement and any other artifacts.
  - a. Highlight a channel to analyze the noise level by selecting the corresponding number on the side of the screen (turns it from black to red).
  - b. Hide a channel by selecting the eye button next to the corresponding number.
3. If all channels have bad data, try re-wetting electrodes "REF" and "COM". This often fixes the issue.
4. If you're noticing a lot of eye blinks, check for drips on the participant's face.
5. Always use the **PC to control the progression of the tasks** if needed (more details about proper pausing in *Task Hierarchy*). **Never hit pause on the Mac**, this pauses the EEG recording, not the task.

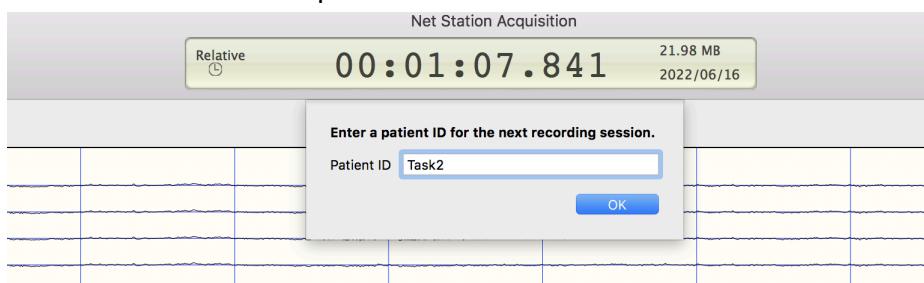
**Transitioning Between Tasks and Finishing Acquisition:**

1. When the first task is completed, you will see the end screen (A picture of a cartoon with the instructions to click the spacebar to finish). Pressing the spacebar will signal the ending of the recording. The E-Prime file will automatically close out.
2. Netstation will automatically open a dialog box as seen below:



Click the button marked “Start a New Study”. This will allow you to start a new recording in a new file, without having to completely shut down Net Station.

3. A field will appear similar to when you first opened Net Station. Here you will put the file name of the second task. Then press “OK”.



4. Net Station is now ready for the next task.
  - a. The new filename should appear on the right hand side of the Net Station screen.
  - b. Note: the time stamp at the top will reflect the run time of the task just completed. The counter will restart when the next task is started on the E-Prime computer.
5. Now you can start the next task in E-Prime (green icon), enter the participant ID, and run the task. You will also see the Net Station recording signal start.
6. You will repeat the above steps as you transition from one task to the next.
7. When the final task is completed. You will click “Quit Net Station” button instead of “Start a New Study” on the Recording Complete dialog box (pictured in step 2). Your final task recording will be saved and Net Station will shut down. When you look in your Net Station output folder you should see an individual .mff file for each task.

**EEG Acquisition Log:**

1. Log into LORIS on iPad.
2. Click “Begin Participant Workflow” on the right side of the page.
3. Scan participant QR code badge.
4. Click “EEG Acquisition Form”.

5. Fill out the form throughout visit
6. ERA codes performance of each task
  - a. Full completion - experiment ran through entirely
  - b. Partial - if participant did not complete all blocks of each task
  - c. Did not run - if you did not run experiment at all, if participant had to leave, if computer/software had issues running.
7. Click "Save" when completed.

### **EEG Acquisition: Participant Room**

1. Run impedances
2. Take all **5** net placement photos on the iPad (front, back, both sides, top of head)

*In all tasks, remember the following:*

1. Infant is sitting still, quiet, facing the screen.
2. Infant on Adult Caregiver's lap: need to remain as still and quiet as possible.
  - a. *Do not let the adult bounce or move to the rhythm of the sounds*
3. Infant's ears are not covered or pressed against anything.

Task	Toy Type:	Screen Attention?
<b>RS</b>	None	No
<b>Face</b>	Teething Toys Only	Yes
<b>VEP</b>	None	Yes
<b>MMN</b>	Video on iPad, Silent Toys	No

### **Soothing Infants - Best Practices:**

1. Build rapport with infant and caregiver prior to visit starting. This will increase your chances of successfully soothing the baby to continue acquisition.
2. Hold infants hands/feet to minimize movements and calm them down if fussy during tasks.
3. Coming at the infant's face with a tape measure can be scary, so going from the back is a good option. Pay attention to how the parent reacts to their child's fussiness. Be positive and encourage the mother and the infant. Have another person distract the infant if needed.
4. Explain to the parent how you will handle a situation in which the baby starts crying during the task: (silent soothing is OK during tasks, anything further needs to be done during a BREAK between tasks).
  - a. First, you will try to soothe the baby without using any words or sounds.
    - i. You can try to distract the baby silently using your hands, holding their hand/foot, using a silent toy.
  - b. If the baby does not stop crying, signal to the parent that they can try to soothe their baby silently - move next to baby, use the methods listed above.

- c. **MMN:** Explain to them that we are interested in the infant's reactions to the sounds and we would not like for them to unintentionally give them ideas of when the different sounds are happening.
    - i. They should remain as still as possible and not bounce or move to the rhythm of the sounds.
  - d. Seating position options if the baby is upset: 1) highchair, 2) caregiver's lap, 3) on chest of caregiver with baby's head over shoulder (see #5).
    - i. Caregiver's lap: baby's head cannot be leaning on their chest (might pick up on their heart beat)
5. If infant is extremely upset, not calming down, very attached to caregiver, have the caregiver sit with their back to the monitor and have the infant against their chest with the infant's head over the caregiver's shoulder facing the monitor (burping position). This position is calming for the infant, and increases the chance of completing acquisition if the infant won't sit calmly on their own.
- 6. In general, we do not recommend using a pacifier during EEG acquisition. However, if the infant is extremely upset and you will not be able to move forward with data collection otherwise, we do recommend a pacifier be used.**

### **Ending Participant Assessments:**

#### ***Net removal:***

1. Untighten chin straps.
2. Start with the chin straps, and grab elastomers as you work from front to back.
3. Net will essentially fall off after gathering the first half of elastomers.
4. Unplug connector from amp and wrap it in the washcloth.
5. Place it back in the solution and place the wrapped connector in a safe, dry place.
6. Offer the adult caregiver a towel to dry off their infant's hair



#### ***ECG Sticker Removal:***

1. Remove wire from connector port.
2. Ask the caregiver if they would prefer to remove the sticker from their infant since they are very sticky. (Secondary RA can also do it, be gentle)
  - a. Use adhesive remover wipes to make it less sticky before removing
3. Secondary RA unsnap the button to remove the wire from the sticker. Dispose of the sticker and save the wire.

#### ***Conclusion of Visit:***

1. Give the infant their "compensation" toy.
2. Walk the adult caregiver back down to their car.

#### ***Clean the Net:***

Follow instructions in the Net Training Manual - [Cleaning Protocol](#).

**Clean the Rooms:**

1. Put all the dirty towels in the laundry basket. If they are exceptionally wet, let the air dry before placing them in the basket.
2. Sanitize all surfaces, door handles, computers, toys, chairs, and other items.
3. Throw out all trash in both computer and participant rooms.
4. Put away all supplies and toys in the proper place.
  - a. Plug in walkie talkies and iPad.
5. Replace supplies needed before the next visit.

**Net Photos from iPad:**

1. Plug the iPad into a computer with internet access.
2. A pop-up will appear on the iPad screen that says “Allow this device to access photos and videos?” Click allow.
3. Find the iPad in the computer devices. Transfer photos off of iPad and into the appropriate folder (ensure photos are deleted off of iPad)
  - a. Folder name: [PSCID]\_[DCCID]\_V03\_EEG
4. To zip folder: select photos, right click, press “send to” to open the list of options, and click compress.
5. Upload to LORIS with BIDS Wizard instructions below.

End of Full Visit Protocol.

**Pilot Run Sheets:** to have on hand for each RA, reminding them of next steps during a visit.

**Cheat Sheets:** to be hung up in the appropriate locations for reference as needed.

**Primary RA Run Sheet:****Pre-visit Checklist:***In the Computer Room*

1. On the Mac:
  - a. Open the console so that you can report any errors that occur.
  - b. Open NetStation Acquisition.
    - i. Under Patient ID, enter the name of the file **[PSCID]\_[DCCID]\_[V03]\_[TASK]**. DELETE the Date and Time
    - ii. click "OK"
    - iii. Turn "ON" NetStation (on/off switch in upper left corner)
    - iv. Video Camera
      1. In the bottom window of the Netstation you should see the live image of what will be video recorded. Click on it and make sure that it is placed at eye level of the infant.
      2. If you are seeing other live feed or no image at all change the video camera input (drop down menu in upper right corner) to the PTZ Camera.
      3. The video automatically records in sync with the EEG recording.
2. PC:
  - a. Open the folder with E-prime task files, do not open a file yet.
  3. Switcher Box is on Mac display.
  4. StimTracker is on.
  5. Speakers are on (participant room).
  6. Walkie talkies in silent mode (by holding power and + at the same time)

**EEG Acquisition: Starting**

1. **Do not click the red "record" button manually, launching E-prime will trigger the start of recording in NetStation.**
2. Wait for walkie talkie from Secondary RA to tell you when to open/close impedances, start each task
3. Open Impedances. Save and close window when done before starting E-prime task.
4. Switch monitor display to E-Prime computer and begin the task.
5. Open E-Prime first file.
  - a. Reminder to enter participant ID, keep remaining inputs as default
6. During the trials, keep an eye on infant and make sure NetStation and E-Prime are running smoothly.
  - a. Keep an eye on individual channels, especially later in the session.
  - b. Ensure that you move your cursor off the screen so the infant can't see it.
  - c. Confirm that appropriate flags are coming in on NetStation

Task	Task Administration Notes	Flags (NetStation) (E-Prime)
Resting State	Will play 3 mins uninterrupted. No additional action needed.	DIN3 Bgn+, Bas+, TRSP
MMN	Wait for RA to walkie talkie that they are ready to start MMN. It will play 11:30 mins for the V03 task, and 8:30 for the V04/V06 task.  Press 'p' key to pause the task if needed for breaks.	DIN2 Bgn+, TRSP Stms
Face	Press the <b>spacebar key</b> to progress to the next element <u>when infant is looking at screen</u> .  Press the 'a' key to <u>queue up</u> the attention-getter. Press the <b>spacebar key</b> to play the attention-getter.	DIN3 Bgin, TRSP Stm+, ITI+, dist
VEP	Make sure the infant is content and looking at the screen before starting.  Once started, it will run 1 minute uninterrupted. No additional action needed.	DIN3 Bgn+, TRSP Ch1+, Ch2+

### Transitioning Between Tasks:

1. First Task Completed: Press the spacebar to signal the ending of the recording. The E-Prime file will automatically close out.
2. Netstation will automatically open a dialog box: Click "Start a New Study".
3. Enter the file name of the second task. Then press "OK".
4. Net Station is now ready for the next task.
  - a. The new filename should appear on the right hand side of the Net Station screen.
  - b. Note: the time stamp at the top will reflect the run time of the task just completed.  
The counter will restart when the next task is started on the E-Prime computer.
5. Start the next task in E-Prime (green icon), enter the participant ID, and run the task.
6. Repeat these steps for each task.
7. Final Task Completed: Click "Quit Net Station" instead of "Start a New Study" Your final task recording will be saved and Net Station will shut down. When you look in your Net Station output folder you should see an individual .mff file for each task.

### Post-Visit Checklist:

#### *In Computer Room*

1. Transfer EEG Files
  - a. Use assigned USB.
  - b. Open up "data" on the Mac desktop.
  - c. Select the data files you just collected and compress (zip) files
  - d. Drag the zipped files into the flash drive folder.
  - e. Transfer net photos from iPad to PC with internet (put in a folder, zip)
  - f. Transfer EEG files on the flash drive to BIDS Wizard on a PC with internet.
  - g. Delete files off USB, wipe USB with antivirus software.

**Secondary RA Run Sheet:****Pre-Visit:**

2. Prepare materials:
  - a. Measuring tape, pipettes, towels
  - b. ECG sticker and wire
3. Participant Room:
  - a. Highchair in front of monitor (use 60cm string)
  - b. Adult chair on side (2 if both caregivers are coming)
  - c. Cart supplies:
    - i. 1 hand towel, 2 washcloths, pipettes
    - d. Attention-getter toys
    - e. iPad with MMN video loaded (airplane mode, not plugged in, full brightness)
4. Soaking Solution:
  - a. Prepare this when the ERA goes to get the family from the parking lot.
5. Walkie talkies in silent mode (by holding power and + at the same time).

**Introduction:**

1. *"Hi thank you for coming in today, my name is \_\_\_\_\_ I will be one of the Research Assistants during your visit today."*
2. *"Today will be an EEG and ECG (brain activity and heart rate) portion of the study. Before we continue I am going to come around and measure baby \_\_\_\_\_'s head circumference so that we can get the EEG cap set up.*
  - a. *"If you can please back up in your chair and have baby \_\_\_\_\_ sitting on your lap facing me."*
  - b. Tell the ERA the measurements in cm to get the net started.
3. *"The EEG net is similar to a swim cap. The sponges are soft and squishy. The net has been soaking in salt water and baby shampoo so it is comfortable for the baby."*
  - a. 3 typical reactions to the net:
    - i. *"Some babies will not be bothered at all.*
    - ii. *Some babies will fuss but then forget.*
    - iii. *Other babies will not like the net at all and have trouble calming down – this is completely fine! All reactions are normal and we are prepared with toys to help"*
4. *"We can always take breaks as needed"*
5. *"You will be in the room for the entire duration of the study. The entirety of the visit should last approximately an hour."*
6. *"The visit will be video recorded for later coding and analysis."*
7. Ask caregiver if the baby is using a highchair at home yet.
  - a. Yes, highchair: *"That's great! We will start baby \_\_\_\_\_ in the highchair, but if they start to get fussy, we can pause and switch to your lap."*
  - b. No, not yet: *"Okay, great! We will have baby \_\_\_\_\_ sit on your lap during the 4 tasks.* (Have the caregiver hold the baby away from their chest (baby can't lean up against them) and hold them up/still. Ask them to be as quiet and still during tasks, can interact during breaks between tasks.

- c. Explain 4 tasks that will be on screen
- d. *"There will be 4 different tasks on the computer screen that your baby will see. They vary with different moving images, sounds, faces, and a rotating checkerboard. Some of them require the baby is looking at the screen, some don't. So you'll see me use toys at times as a way to guide the baby's attention to the screen"*
- 8. *"During the 4 tasks, we ask that you are as quiet and still as possible."*
- 9. Ask the caregiver if they need to change, feed, or anything else prior to starting the session. Let them know we can pause for this if necessary during acquisition.
- 10. Ask them to leave all electronics outside of the testing room

### In Participant Room

1. Escort the family to the room.
2. Put on ECG sticker (**button snap the wire first**)
3. Cap the infant after the 10 minute timer goes off.
  - a. Quick examination of scalp to ensure nothing is in hair (ex: built up hair product)
  - b. ERA uses distractor toys during this.
4. Have caregiver place infant in highchair; **CHECK INFANT IS BUCKLED IN** or have infant on caregiver's lap
  - a. Plug in the net and ECG wire
    - i. ECG wire goes in 128 middle port on net connector
5. Net Photos on iPad (front, both sides, back, top)
6. Walkie talkie: ready for impedances window (after net is plugged in)
7. Impedances - pipettes with soaking solution
8. Remind caregiver to be quiet and still during tasks, can interact with baby, ask questions during breaks between tasks
9. Walkie Talkie: when ready for each task to begin
10. Prep caregiver on task & timing during break prior to each task
11. **MMN**: turn off monitor and place iPad with video in front of monitor.
  - a. **Do not block camera**
  - b. Walkie talkie that you are ready for it to begin, then play video (starts before MMN sounds)

Task	Toy Type:	Screen Attention?	Timing:
RS	No toys	No	3 min
Face	Teething Only	Yes	4:30min
VEP	None	Yes	1 min
MMN	Video on iPad Silent Toys	No	11:30min

**Conclusion of Visit:**

*Net and ECG removal:*

1. Untighten chin straps, remove net from front to back.
2. Unplug connector from amp and wrap it in the washcloth. Unplug ECG wire.
3. Place it back in the solution and place the wrapped connector in a safe, dry place.
4. **CAREFULLY** remove ECG sticker from infant's chest (they are very sticky!)
  - a. use adhesive remover pads to reduce stickiness.
5. Offer the adult caregiver a towel to dry off their infant's head.
1. Infant gets a toy.

**Post-Visit Checklist:**

1. Disinfect all surfaces, toys, table, chairs
2. Gather the subject's folder (with all the materials), and file accordingly.

**Extra RA Run Sheet:**

**Pre-Visit Checklist:**

1. Baby proof area
2. Toys for introduction/capping distraction
3. Set-up EEG Acquisition Form (paper or LORIS on iPad)
4. Get family from parking lot

**During Introduction:**

1. Prepare Net:
  - a. Get the correct net size and begin soaking for 10 minutes. Use the timer.
  - b. Always size down for nets if on the border of two
  - c. Ensure you have an infant net
  - d. Write head circumference and net ID on EEG Acquisition Form
  - e. Fill out **Net Inventory Log** for the net you selected
2. Distract/Play with infant

**During EEG Acquisition:**

1. Capping:
  - a. Use attention-getter toys to distract infant while Secondary caps
2. Impedances:
  - a. Assist Secondary RA if necessary
  - b. Record non-blue electrodes on EEG Acquisition Form (red/yellow)
3. Record session info on Acquisition Form as session goes on

**Post-Visit Checklist:**

1. Walk the family back down to their car
2. Clean the net and put it back into proper place

## CHEAT SHEET

### **EEG Acquisition - Computer Room:**

1. **FIRST** Open NetStation **THEN** set it to “On” (NOT “record”) **FINALLY** start E-Prime task
2. Task/file name is entered into NetStation Patient ID field following naming convention

[PSCID]_[DCCID]_[V0#]_[Task]	Ex: UMD0001_102030_V0#_RS
------------------------------	---------------------------

3. 8 Din and 1000Hz sampling rate are selected on the NetStation workspace panel
4. Once E-Prime has started, flags are appearing at the top of the NetStation viewing screen

### **Troubleshooting Common Errors:**

- “Missing Communication “ error on E-Prime →
  - Quit E-Prime (ctrl +alt+backspace), stop recording on NetStation, restart both applications. Then follow data acquisition steps from the beginning, making sure NetStation status is “ON” not “Record” prior to initiating the E-Prime task.
  - If you have not started data collection you can keep the original filename.
- If NetStation **flags** are not coming through:
  - If you don’t see DINs check: 1) that the Stimtracker is on 2) the NetStation Panel is set to 8 DIN 3) that the threshold values match what is in the operation manual 4) (for visual) that the photocell is properly attached
  - If you don’t see E-Prime flags: likely a communication error see bullet above
- If the **waveforms** seems abnormal or the data seems full of artifacts check:
  - 1) No additional electronics in the room 2) the cables between the net and net connector are not twisted 3) the infant is securely situated and additional movement is minimized (distractor in room can use toys to help keep baby situated)

### **If NetStation crashes or if the baby needs a break:**

1. Close NetStation Session (quit NetStation)
2. Disconnect net from amp (remove net as well if needed)
3. Allow participant and adult caregiver to do what is needed (i.e. feeding, diaper change, calming down)
4. Record on the EEG session log:
  - a. Which blocks were not run yet, why the session was stopped.
5. Place the net back in the soaking solution if it was removed
6. Restart NetStation and start a new session with the correct ID and new filename.
  - a. File 1: PSCID\_DCCID\_V0#\_Task\_run-1.mff
  - b. File 2: PSCID\_DCCID\_V0#\_Task\_run-2.mff
7. Reapply net and run impedances again.
8. Record on EEG session log:
  - a. When the session restarted, that you redid impedances, etc.
  - b. If break is in the middle of a task block and you cannot wait:
9. Advance to a block break

### **Net Cleaning Cheat Sheet:**

1. Wrap connector in plastic bag and wash cloth.
  2. Dump out used capping solution.
  - 3. 4 Rounds:**
    - a. Fill bucket halfway lukewarm tap water (distilled if you have hard water)
    - b. Dunk net 20 times
    - c. Visually inspect net
    - d. Pat dry on hand towel
    - e. Refill bucket with fresh water
    - f. Repeat 4x
  4. Start 10 min timer
  5. Agitate (dunk repeatedly) net into disinfectant solution for 2 minutes
  6. Soaking net in disinfectant remaining 8 minutes
  7. Repeat Step #3
- 

### **Soaking Solution:**

1. 1 Liter distilled water
2. 1 scoop Potassium Chloride (2.5 tsp)
3. 1 scoop Shampoo (1 tsp)
4. Stir together using **shampoo** spoon

### **Disinfectant Solution:**

1. Good for 2 weeks
2. 1 tbsp of Disinfectant Solution (Control III concentrate)
3. 2 Liters of distilled water
4. Mix thoroughly

Update the expiration date for 2 weeks after today's date

## Data Upload and QC Metrics

### Data Upload

We strongly recommend that RAs upload the data and the EEG acquisition form *immediately following each visit*, to prevent data loss. If possible, the data collection RAs should do the upload, as the flag information provided by the BIDS Wizard is meant to help RAs troubleshoot technical issues promptly and effectively.

#### \*[Troubleshooting Bids Wizard Document](#)

1. Download the new BIDS Wizard [here](#). Updated 2/22/2023.
  - a. The computer running the bids wizard needs to have [Matlab Runtime v9.3](#) installed.
2. On the Mac, zip together all of the MFF files from the visit (right click, “compress” file. There should be one MFF file for each of the completed tasks.
3. Drag the zipped file onto a “clean” USB.
  - a. Clean USB = USB is wiped using antivirus software after **EVERY USE**
    - i. Standard anti-virus software such as Windows Default Virus Scan or Fireeye will work. Sites should ask their IT Departments what software is recommended for them to use.
    - ii. All files deleted off USB after transfer, then wiped with software.
4. Eject the USB from the computer.
5. Insert the USB into the file transfer computer (PC with internet).
6. Open the USB and unzip the MFF files by right clicking, then selecting “Extract All”.
7. Files must be named in this format EXACTLY in order to be uploaded:  
[PSCID]\_[DCCID]\_[V03]\_[taskName].mff

### Instructions for uploading files to the BIDS Wizard

#### 1. Getting started.

There are two instances for data upload in LORIS - pilot (<https://pilot.hbcd.msi.umn.edu/>) and main study (<https://prod.hbcd.msi.umn.edu/>). When you go to upload data for the V04 or V06 pilot you will need to upload your data through the Bids Wizard to the main production version of LORIS: <https://prod.hbcd.msi.umn.edu/>, NOT the pilot version of Loris. Instead of V04 or V06, the visit number in your file names will need to be changed so that they say P04 or P06.

#### 2. Configuration.

Below is what the screen will look like once you have logged in to the instance of LORIS you are working with. The PSCID is the lettered site code and 4-digit number from Ripple (ex. YIUMD0010) and the DCCID is the 6-digit participant # (ex. 144696) which can be found on LORIS.

Leave the Biological Sex and Handedness of the Candidate as ‘n/a’. The Site and Project will auto populate once you have entered the PSCID and DCCID information. Select the session number.

### 3. Adding Data

All of the EEG data must all be located within the same folder on your PC. Each individual task and run should be labeled as follows:

- **Resting State:** PSCID\_DCCID\_Session\_RS.mff
- **MMN:** PSCID\_DCCID\_Session\_MMN.mff
- **FACE:** PSCID\_DCCID\_Session\_FACE.mff
- **VEP:** PSCID\_DCCID\_Session\_VEP.mff

For example, a set of real EEG files would look like this:

```

📁 YIUMD0010_144696_V03_RS.mff
📁 YIUMD0010_144696_V03_VEP.mff
📁 YIUMD0010_144696_V03_FACE.mff
📁 YIUMD0010_144696_V03_MMN.mff
  
```

If there are multiple runs of the same task then the files should have the extension run-1 and run-2 on the end (see below).

PIARK0005_701406_V03_FACE_run-1.mff	7/20/2023 10:32 AM	File folder
PIARK0005_701406_V03_FACE_run-2.mff	7/20/2023 9:51 AM	File folder
PIARK0005_701406_V03_MMN_run-1.mff	7/20/2023 9:51 AM	File folder
PIARK0005_701406_V03_MMN_run-2.mff	7/20/2023 9:51 AM	File folder
PIARK0005_701406_V03_RS_run-1.mff	7/20/2023 9:51 AM	File folder
PIARK0005_701406_V03_RS_run-2.mff	7/20/2023 9:51 AM	File folder
PIARK0005_701406_V03_VEP_run-1.mff	7/20/2023 9:51 AM	File folder
PIARK0005_701406_V03_VEP_run-2.mff	7/20/2023 9:51 AM	File folder

To add a task's data, click on the “Choose Task Run” and when the file explorer appears select the appropriate folder. If you are adding multiple runs, click the “Add Run” button and repeat the process. If you did not collect a specific task then click the “Excluded” button. A text box will appear where you must write a short note explaining why the task was skipped. For example, “The baby fussed out” or “Ran out of time”.

The capping photos should be uploaded as a zipped file named ‘PSCID\_DCCID\_Session\_EEG’ with the photos inside.

**Stimuli files refers to the .edat3 and corresponding text files for each task which can be found on the Eprime computer. They should be found in the same folder as the E-run file you use to start a task during a visit. The first number in the file names should be the DCCID. Each run of each task should have both an EDAT3 file and a Text Document.**

You can add all of the stimuli files at once by clicking the first file, holding down the shift key and clicking the last file so that all the files are highlighted. Then click the “add” button. NOTE: these files could be called EDAT3, or E-DataAid 3.0 Files. Both are fine.

144696_V03_MMN-1.edat3	3/9/2023 11:24 AM	EDAT3 File
144696_V03_MMN-1-Export	6/12/2023 1:36 PM	Text Document
144696_V03_RS-1.edat3	7/28/2023 3:51 PM	EDAT3 File
144696_V03_RS-1-Export	7/28/2023 3:51 PM	Text Document
144696_V03_VEP-1.edat3	7/28/2023 3:57 PM	EDAT3 File
144696_V03_VEP-1-Export	7/28/2023 3:57 PM	Text Document
144696_V03_FACE-1.edat3	8/8/2023 11:31 AM	EDAT3 File
144696_V03_FACE-1-Export	8/8/2023 11:31 AM	Text Document

Name	Date modified	Type	Size
144696_V03_RS-1	7/28/2023 3:51 PM	E-DataAid 3.0 File	11 KB
144696_V03_RS-1-Export	7/28/2023 3:51 PM	Text Document	6 KB
144696_V03_VEP-1	7/28/2023 3:57 PM	E-DataAid 3.0 File	33 KB
144696_V03_VEP-1-Export	7/28/2023 3:57 PM	Text Document	83 KB
144696_V03_FACE-1	8/8/2023 11:31 AM	E-DataAid 3.0 File	23 KB
144696_V03_FACE-1-Export	8/8/2023 11:31 AM	Text Document	56 KB
144696_V03_MMN-1	3/9/2023 11:24 AM	E-DataAid 3.0 File	677 KB
144696_V03_MMN-1-Export	6/12/2023 1:36 PM	Text Document	63 KB

After attaching each of these file types, click the ‘convert to SET’ button in the bottom left of the window.

After it finishes running the “convert to SET” stage, a screen will appear which will show all of the checks which have been run on the data. **If any of the checks have a red X next to them, then they have been failed and you need to read what the problem was.** Some failed checks might require that you write an explanation. If your data fails a check and you do not understand why, email us at [EEGhelp@umd.edu](mailto:EEGhelp@umd.edu) immediately.

#### 4. EEG to BIDS.

When the wizard progresses to the next window, enter your name in the “Prepared by” text box, and then press the “convert to BIDS” button at the bottom left of the window.

#### 5. Validate and Package.

The final stage of the bids wizard uploads the EEG data to LORIS and any Personal Identifiable Information to a secure server at the University of Minnesota. The stage can take up to an hour or so depending on the size of your files, your internet connection, and computer.

## LORIS Dashboard Instructions

The LORIS team has put together an automated dashboard for sites to be able to stay up to date with their progress and data quality across EEG visits. Please note that the EEG Core at Maryland will no longer be providing QC information after each upload. Instead, sites should now log into LORIS to receive visit by visit feedback. Below is a set of instructions on how to access and read this feedback dashboard.

1. Go to <https://prod.hbcd.msi.umn.edu/> and log in using your LORIS credentials. This will take you to the Main LORIS page. **Note: if you do not have a LORIS login, please notify us immediately.**
2. In the top middle tab, under “Electrophysiology”, click “Electrophysiology Browser”. This will take you to a page containing all of your site’s Main Study V03s and Pilot V04s/V06s.
  - a. For each upload, under the “QC” column, there will be information about each task’s passing status and Capping Quality.
  - b. For each upload, under the “Acquisition” column, any important notes about the visit will be listed.
3. In the far right of the row pertaining to the upload, click on “View Raw”, under “Actions”. This will bring you to a dashboard containing passing status and QC notes at the top.
  - a. Below the traditional QC information, a further breakdown by task exists with an EEG signal viewer, a preprocessing summary, a bad electrode map, file downloads, ERP plots, and acquisition details for the upload.

## EEG Dashboard Field Descriptions and Diagram

The “View Session” page contains EEG quality control information including the capping quality rating and each task’s passing status (based on number of retained trials). The capping pictures are reviewed by the EEG Core to assess quality (“excellent”, “average”, or “poor”). A task is passed if it is preprocessed successfully and enough data were retained to meet the EEG Core’s quality checks. For RS, VEP, and MMN, this threshold is 45 trials. The threshold for FACE is 30 trials.

Below the “Session” section, there is a further breakdown by task including acquisition notes, Capping Quality rating, and a report on performance for each of the tasks. See below.

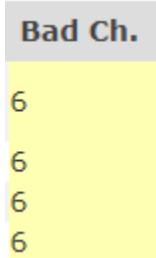
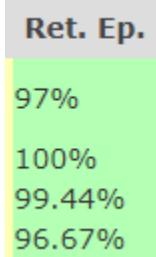
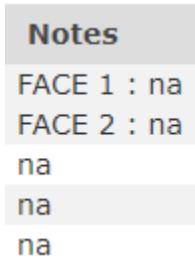
Session

Acquisition Time	Insertion Time	Acquisition Notes	QC	Tasks Report						Actions	
2024-03-20 22:19:42		<b>RA Session Notes:</b> baby did good, little bit of crying throughout tasks	Capping Quality: Excellent	Task	QC	Bad Ch.	Ret. Ep.	Line Noise	Notes	<a href="#">Acquisition Form</a>	<a href="#">Edit QC</a>

The Tasks Report table displays the following data:

Task	QC	Bad Ch.	Ret. Ep.	Line Noise	Notes
FACE	✓	6	97%	Excellent	FACE 1 : na FACE 2 : na
MMN	✓	6	100%	Excellent	na
RS	✓	6	99.44%	Excellent	na
VEP	✓	6	96.67%	Excellent	na

For the Tasks Report, there are a number of metrics reported for each task:

<b>QC:</b> The passing status for each task.	<b>QC</b> 
<b>Bad Channels:</b> The number of bad electrodes for each task.	<b>Bad Ch.</b> 
<b>Retained Epochs:</b> The percentage of epochs retained for each task. <u>Note:</u> the specific number of epochs retained can be found below in the “Summary” section.	<b>Ret. Ep.</b> 
<b>Line noise:</b> Rating of the line noise level for each task.	<b>Line Noise</b> 
<b>Notes:</b> Notes from the BIDS Wizard upload.	<b>Notes</b> 

If you would like more information about how many trials were retained, look at the epochs retained after processing under the “Summary” section for each task. See below.

**Epochs Retained:** Total number of epochs retained for a given task.

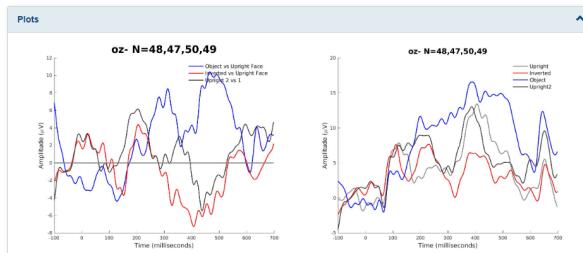
<b>Epoch Retained Total Count</b>	358
---	-----

The breakdown for tasks has further information including a plot of the EEG signal, a summary of preprocessing metrics, a map of any bad electrodes, file downloads, plots of Event Related Potentials, and details about the EEG acquisition. See below.

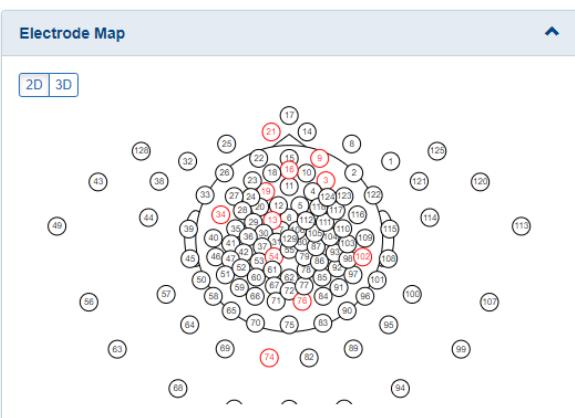
**Summary of preprocessing metrics:** Bad electrodes (electrode names and count), Total Epochs Retained, Percentage of Epochs Retained, Line Noise.

Summary	
<b>Sampling Frequency</b>	1000
<b>EEG Channel Count</b>	128
<b>EOG Channel Count</b>	0
<b>ECG Channel Count</b>	1
<b>EMG Channel Count</b>	0
<b>Reference</b>	Cz
<b>Powerline Frequency</b>	60
<b>Bad Electrodes</b>	E4,E10,E14,E25,E85,E100
<b>Bad Electrodes Count</b>	6
<b>Epoch Retained Total Count</b>	358
<b>Percentage of Retained Epochs</b>	99.44444444444444
<b>Line Noise</b>	0.96322850

**Plots of Event Related Potentials:** ERPs available for FACE, MMN, and VEP.



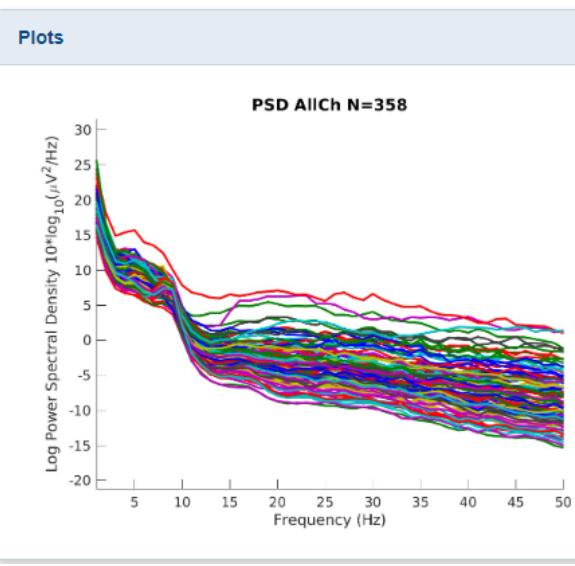
**Map of any bad electrodes:** Bad electrodes highlighted in red. Note: this section is currently non-functional, but will be fixed in the coming weeks.



**File downloads:** File downloads for the Raw File, Electrodes, Channels, and BIDS.

File Download	
EEG Raw File	<a href="#">Download</a>
Electrodes	<a href="#">Download</a>
Channels	<a href="#">Download</a>
Events	<a href="#">Download</a>
Annotations	Not Available
All Files	<a href="#">Download</a>
	<a href="#">Download</a>

**Plot of the EEG signal:** Channel spectra available for RS.



**Further details about the EEG acquisition:**

Task name, description, and duration.

Acquisition Details for Recording	
Task Name	FACE
<b>Task Description</b>	This task consists of two blocks, one in which the participant views 50 upright faces and 50 inverted faces and in the second block there are 50 upright faces and 50 abstract objects. The stimuli are presented for 500 ms with a jittered 600-700ms interstimulus interval, but are progressed by the experimenter based on the infant's attention to the computer screen. Attention getters are triggered by the experimenter as necessary to keep the participant's attention oriented to the screen. This task does not change across visits (V03, V04, and V06). The tasks can be found on Github: <a href="https://github.com/ChildDevLab/Tasks">https://github.com/ChildDevLab/Tasks</a> The scientific description for each task can be found on Github: <a href="https://github.com/ChildDevLab/Tasks">https://github.com/ChildDevLab/Tasks</a> Additional information about the EEG acquisition can also be found: <a href="https://hbcdstudy.org/study-protocols/">https://hbcdstudy.org/study-protocols/</a>
<b>Instructions</b>	
<b>Recording Type</b>	n/a
<b>Recording Split Count</b>	n/a
<b>Recording Duration</b>	432.421
<b>Epoch Length</b>	
<b>Subject Artifact Description</b>	
<b>Head Circumference</b>	
<b>Placement Scheme</b>	n/a
<b>Ground</b>	n/a
<b>Trigger Channel Count</b>	0

## Appendix

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**EEG Acquisition Checklist:****HBCD EEG Session**

1. Date: \_\_\_\_\_
2. Participant ID: \_\_\_\_\_
3. Sex: \_\_\_\_\_
4. Experimenter initials: 1- \_\_\_\_\_ 2- \_\_\_\_\_ 3- \_\_\_\_\_
5. Testing room \_\_\_\_\_
6. Head circumference (cm): \_\_\_\_\_
7. Net ID# \_\_\_\_\_
8. EKG collected? Yes No
9. Confirm participant is 60cm away from monitor \_\_\_\_\_

**NET PLACEMENT**

1. Net Placement: excellent average poor
2. LEFT ear fits in net's ear hole & no electrodes on the ear? yes no
3. RIGHT ear fits in net's ear hole & no electrodes on the ear? yes no
4. Electrode CZ (middle, top of head) has firm contact with scalp? yes no
5. Frontal electrodes begin at eyebrow level? yes no

**EEG ACQUISITION**

1. Were there any bad electrodes during impedances? Yes No
  - a. If yes: Please list all bad electrodes: \_\_\_\_\_
2. Paradigm Order: \_\_\_\_\_
3. EEG Start time \_\_\_\_:\_\_\_\_
4. EEG End time \_\_\_\_:\_\_\_\_

**Resting State EEG**

1. Resting State EEG Acquired? Complete Incomplete Not Started
  - a. If "incomplete", why? infant fussed out technical problem other: \_\_\_\_\_
2. Resting State EEG Mood Rating (1-5, 1: screaming, fussed out; 5: very calm the whole time): \_\_\_\_\_
3. Notes: \_\_\_\_\_  
\_\_\_\_\_

**VEP Task**

1. VEP Acquired? Complete Incomplete Not Started
  - a. If "incomplete", why? infant fussed out technical problem other: \_\_\_\_\_
2. VEP Mood Rating (1-5, 1: screaming, fussed out; 5: very calm the whole time): \_\_\_\_\_
3. Notes: \_\_\_\_\_  
\_\_\_\_\_

**Human Faces Task****Block 1:**

1. Inverted or Objects (circle)
2. Faces Task Acquired? Complete      Incomplete      Not Started  
a. If "incomplete", why? infant fussed out technical problem other: \_\_\_\_\_
3. Faces Task Mood Rating (1-5, 1: screaming, fussed out; 5: very calm the whole time): \_\_\_\_\_
4. Notes: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Block 2:**

1. Inverted or Objects (circle)
2. Faces Task Acquired? Complete      Incomplete      Not Started  
a. If "incomplete", why? infant fussed out technical problem other: \_\_\_\_\_
3. Faces Task Mood Rating (1-5, 1: screaming, fussed out; 5: very calm the whole time): \_\_\_\_\_
4. Notes: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**MMN Task**

1. MMN Task Acquired? Complete      Incomplete      Not Started  
a. If "incomplete", why? infant fussed out technical problem other: \_\_\_\_\_
2. MMN Task Mood Rating (1-5, 1: screaming, fussed out; 5: very calm the whole time): \_\_\_\_\_
3. Notes: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**General session notes** (e.g. any details important for data preprocessing, i.e. what was the technical error, did you have to restart NetStation/E-Prime, issue with net, issue with DINS/flags):

---



---



---



---

I certify that there are no Personally Identified Information (PII data) included in any text on this form. (PII data includes parent and child names, birthdates, contact information, addresses).

## Examples of Capping

Adapted from ABC-CT Net Placement Guide.  
Infant Photos courtesy of OIT V3 Participants.

**Correct net placement is essential for acquiring good, quality data that is comparable across sites and also comfortable for the infant. If proper placement isn't achieved, none of the data for that infant will be usable, so this is extremely important.**

### Proper Net Placement:

5. Net is symmetrical with the midline of sensors straight
6. Ears are correctly in the ear holes
7. Reference electrode appears to be on the vertex (REF)
8. Nasion electrode is on the nasion (#17)

### Three types of net placements:

4. **Excellent** - meets all criteria for proper net placement.
5. **Average** - any 1-2cm shift from proper placement (1 pinky finger width distance).
6. **Poor** - any >2 cm shift from proper placement (>1 pinky finger width distance).

### Examples of Excellent Net Placement:

Figures 1-3: Excellent Front Net Placement



### Front Markers:

5. Nasion electrode (#17) is centered between the eyebrows
  - a. Infant nets do not have the face straps which hold this electrode in place. Oftentimes, this electrode does not stay flush with the skin, *this is okay*, however it is still important in terms of being centered and between the brows in terms of proper electrode placement around the head.
6. Front row of electrodes (#25, 21, 14, 8) are parallel, level, and immediately above the eyebrows.
7. Midline electrodes from the nasion (#15, 16, 11, 6) are straight down the scalp, perpendicular to the eyebrows.
8. Chin strap is under the chin and secure.

*Figure 4-5: Excellent Side Net Placement:**Side Markers:*

3. Ears should fit into the ear hole properly, not squished, no electrodes on the ear itself.
4. Mastoid electrodes (#57, 100) should be behind the ear

*Figures 6-8: Excellent Back Net Placement:**Figures 9-11: Excellent Top Net Placement:**Top/Back Markers:*

3. Midline electrodes (#55, Com, 62, 72, 75, 81) should be in a straight line down the scalp.
4. Bottom row (#68, 73, 81, 88, 94) are all at/just above, and parallel to, the nape of the neck.

**Examples of Average Net Placement:**

Average Placement: Any 1-2 cm shift away from “excellent” net placement (1 pinky width distance).

Figures 12-14: Average Front Net Placement:



**Issue:** The nets are too high. Electrode #17 is too far above the nasion. The front row of electrodes (#25, 21, 14, 8) are parallel and level, however they are not immediately above the brows.

Figures 15-17: Average Front Net Placement



**Issue:** The nets are too low and skewed to the side. Figure 15) Electrode #17 is on the brow, and skewed to the side. The two outermost electrodes of the front row (#25, 8) are on the brow as well. Figure 16) Electrode #17 is too low and skewed, touching the brow as well as electrode #25 touching the side of the brow. Figure 17) is skewed to the side (seen by following the nasion #17 through the midline electrodes. Electrode #25 is on the brow.

**Importance:** increases the uncomfortability of the net which is likely to increase fussiness/crying from the infant. Also can increase blinking/muscle artifacts in the data.

Figures 18-19: Average Side Net Placement:



**Issue:** Ears are not fully in the ear hole, ears are squished by the net.

**Importance:** Increases discomfort of the net which is likely to increase fussiness/crying from the infant.

Figure 20: Average Side Net Placement:



**Issue:** The electrode #44 is too far off of the preauricular point.

**Importance:** This could cause inaccurate data.

Figure 21: Average Side Net Placement:



**Issue:** Hair is not moved out of the way around the ear.

**Importance:** This can increase discomfort which can increase fussiness/crying from the infant. This can also interfere with the signal of electrodes from around the ear.

*Figures 22-23: Average Back Net Placement:*



**Issue:** Both nets are skewed to the side, seen by the midline of electrodes. Figure 22) skewed to the left, Figure 23) skewed to the right.

**Importance:** This can cause many electrodes to be in the wrong points on the head, causing data to be inaccurate.

*Figure 24: Average top net placement:*



**Issue:** center line of electrodes are slightly not straight down center of scalp. See “Ref” electrode, which is too far back and not in the center point of the scalp.

**Importance:** This can cause many electrodes to be in the wrong points on the head, causing data to be inaccurate.

### **Examples of Poor Net Placement:**

#### **Poor Placement:**

5. Any >2 cm shift away from “excellent” net placement (>1 pinky width distance).
6. **Front:** shifts **upward** (too high on brow).
7. **Side:** one side is higher than the other.
8. Any placement that interferes with the infant’s ability to see clearly, any placement increasing the uncomfortability of the net.

#### **Poor Placement Affects Data:**

1. Net placement is significantly different from proper placement, and therefore electrodes are in significantly different areas on the scalp.
  - a. This data is not valid to be compared to data from other subjects and will not be processed.

*Figures 25-27: Poor Front Net Placement:*

**Issue:** Nets are placed way off the nasion. Figures 24 & 25) Electrode #17 is too far high on the forehead, the front row of electrodes are too far away from the brow, and not parallel. Figure 26) The net is far too low. Electrode #17 is on the infant's nose, and the front row of electrodes are on the infant's brows.

**Importance:** This can cause most of the electrodes to be in the wrong points on the head, causing inaccurate data that cannot be compared to other subjects. Figure 26 can also block vision as well as increase uncomfortability leading to fussiness/crying.

*Figures 28-29: Poor Front Net Placement:*

**Issue:** The nets are both places too low, and skewed. Figure 27) Electrode #17 is not on the nasion, the front row of electrodes are on the brow, and the midline is skewed to the infant's right side. Figure 28) Electrode #17 is not on the nasion, The front row of electrodes are on the brow, and the net is skewed to the infant's left side.

**Importance:** Electrodes in the wrong points lead to inaccurate data. Electrodes on the brow, or lower can block vision, and increase uncomfortability from the net, which can lead to increased fussiness/crying.

*Figures 30-31: Poor Side Net Placement:*

**Issue:** The ears are not in the ear holes. Figure 29) The ear is fully under electrodes. Electrode #114 is not on the preauricular point. Figure 30) The ear is squished in the net.

**Importance:** Squished ears can cause uncomfortability leading to fussiness/crying. Electrodes not on the proper points of the head can lead to inaccurate data.

*Figure 32: Poor Top Head Placement:*

**Issue:** The midline electrodes are skewed to the right side of the infant's head.

**Importance:** This can cause most of the electrodes to be in the wrong points on the head, leading to inaccurate data.

*Figure 33: Poor Back Head Placement:*

**Issue:** Electrodes are bunched up and not on scalp

**Importance:** Lack of data from electrodes in the back of head.

**You should correct poor net placement if possible by either adjusting the net placement or re-netting. If it is not possible to achieve average or better placement, log how the placement was poor and why it was not corrected.**

***How to fix Poor Net Placement:***

4. Attempt to re-adjust net placement.
  - a. If markers are close to proper placement, attempt to shift the net into the correct position.
  - b. Always adjust the net by a group of electrodes, **never** a single electrode.
    - i. Grab multiple electrodes with your hand in a claw shape and “scrunch” them as a group to move them rather than picking one electrode and pulling on it (that can stretch/break that connection).
  - c. Note on the log how many adjustments were made and where.
5. Re-net the participant.
  - a. This is a last resort for poor net placement because it is likely to increase the infant’s fussiness/irritability.
6. If net placement is good, then it becomes poor during acquisition:
  - a. If possible, attempt to shift the net back into proper position in between trials.  
Note on the log when, how, and why you adjusted the net.
  - b. If not possible, note on the log when and why it became poor, and why you were unable to adjust it.

## Configuring Mac for Ease of Use:

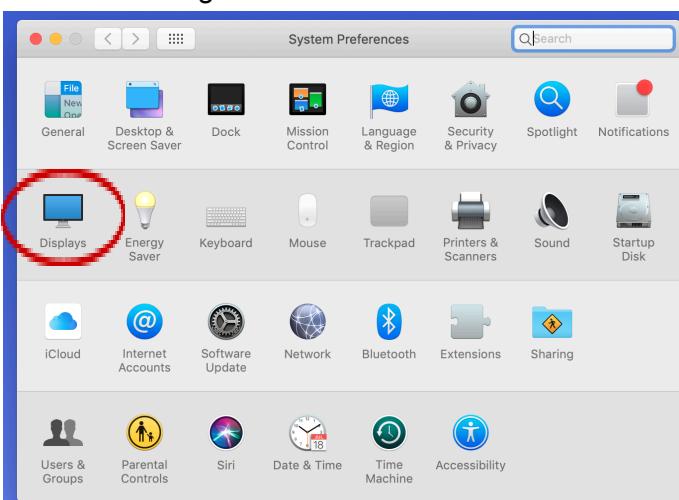
Screen Mirroring: In order to project the Mac's screen directly to the participant monitor for impedances, it is easiest to have your Mac's display set to mirroring. Instructions on how to do so are below:

1. With your participant display switcher set to Mac, open system preferences.



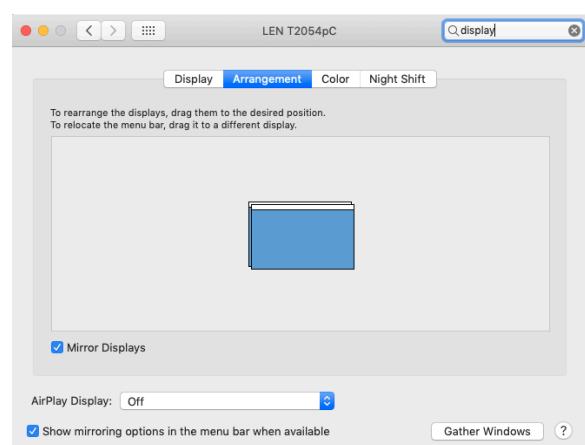
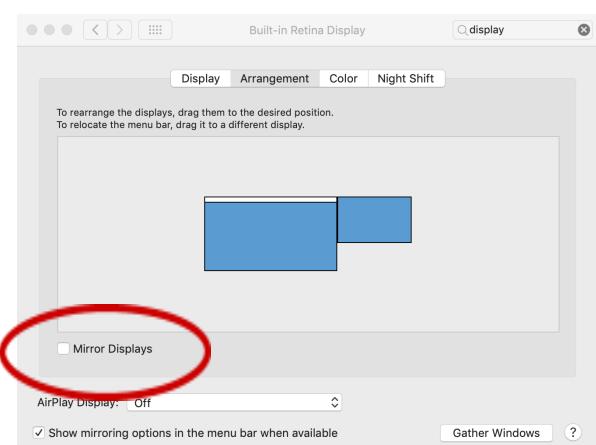
2. click "Displays".

- a. Note, if your participant monitor is not set to the Mac, your Mac may not detect the appropriate monitor settings.



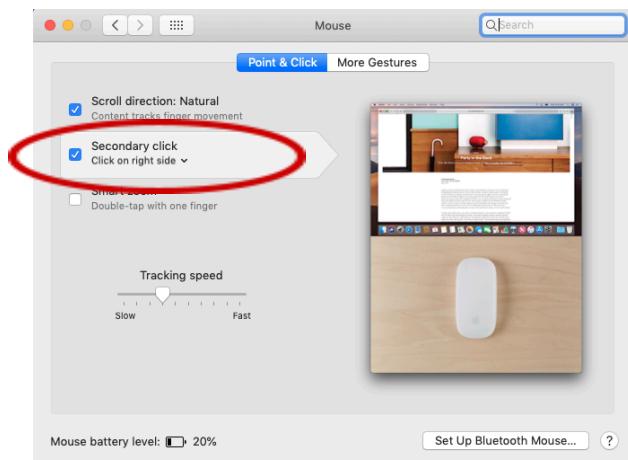
3. Navigate to the header that says "Arrangement".

4. In the bottom left hand corner of the screen select the check box for "Mirror Displays". The settings should go from the image below on the left to the image on the right.



Right Click Apple Mouse: The Mac comes with a wireless Apple Magic Mouse. For many, the default right click function is not intuitive as it does not mimic traditional mice. You can fix that with the following steps:

1. Open system preferences, and click on "mouse".
2. In the header that says "Point & Click", make sure the check mark for "Secondary click, click on right side" is selected. This should allow you to use the mouse with traditional right click abilities.

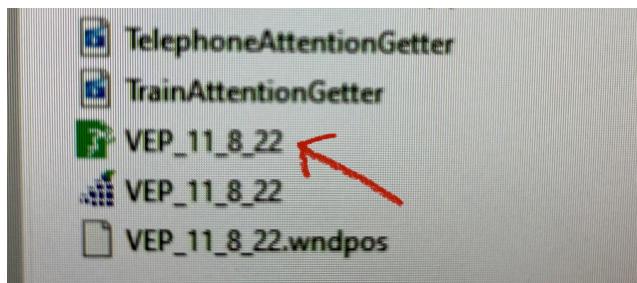


### Desktop Icon Shortcut Setup

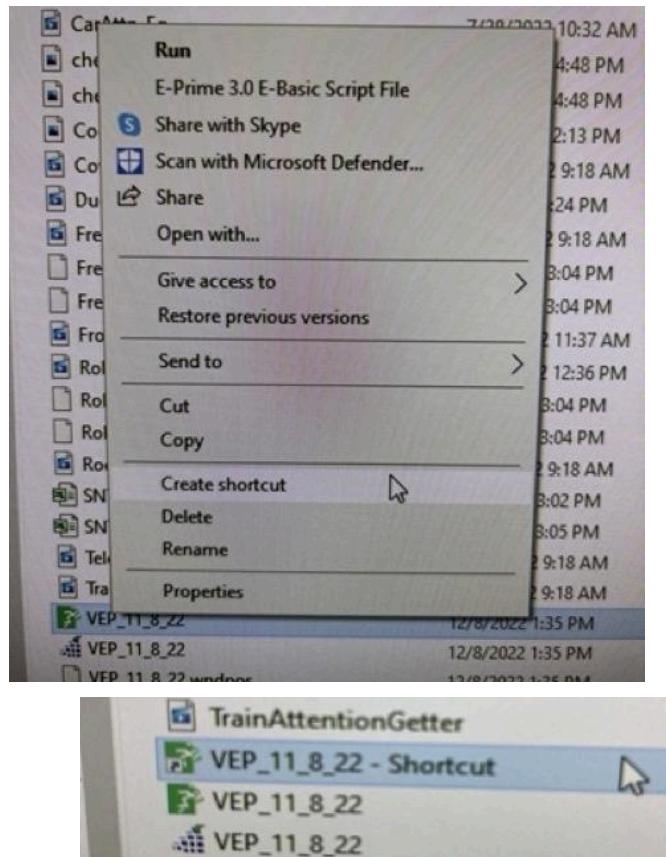
Using shortcuts creates an icon on the desktop that will run the task directly. This will allow you to navigate to each task easier instead of opening the task folders and having to look through all the files.

For each task:

1. Go into the folder where you keep the task.



2. Right click on E-Run task icon (green running person named with task and date).
3. Right click the icon and select "create shortcut". A second file should show up next to the original with the same name but "shortcut" added at the end.

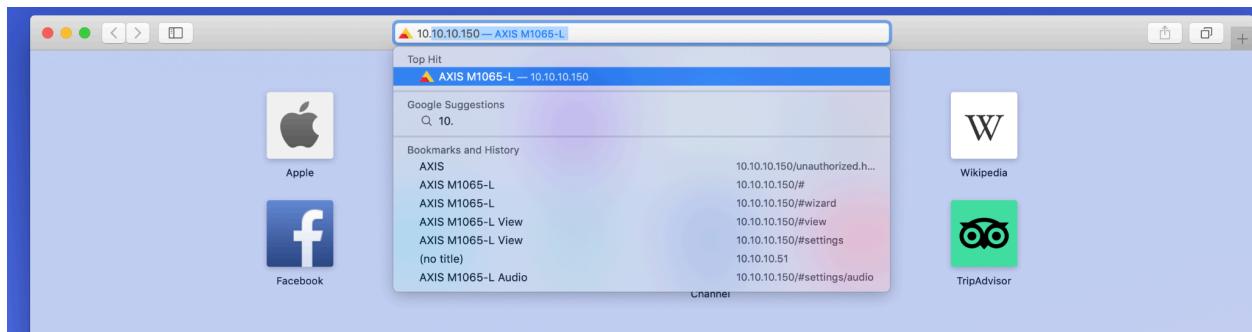


4. Drag the shortcut to the desktop.

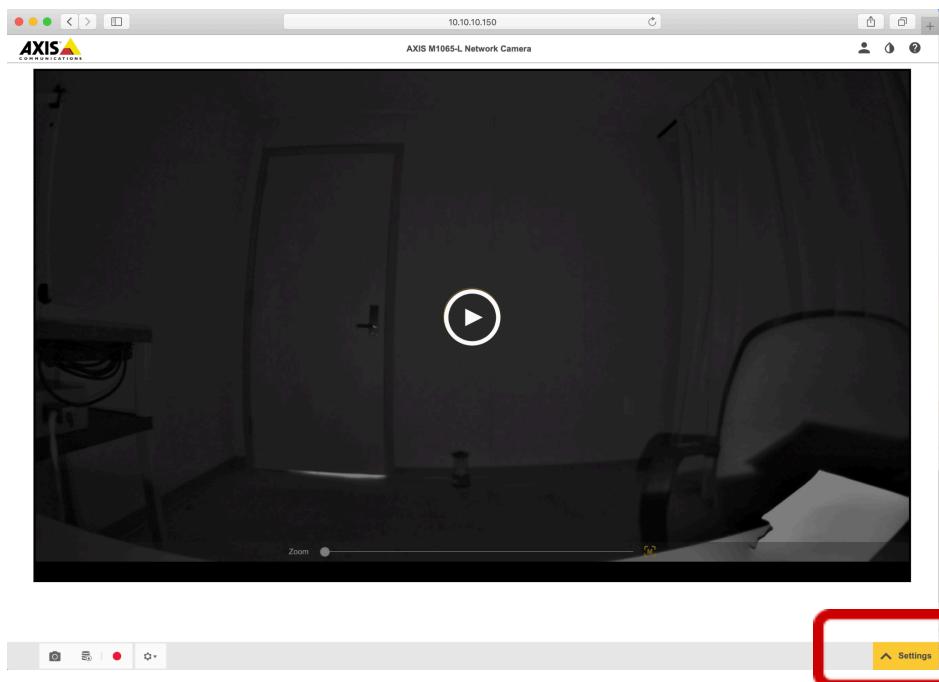
## PTZ Audio Troubleshooting

If receiving audio through the PTZ fails to work after setting up your camera as instructed above, please follow the alternate steps below to activate the sound settings.

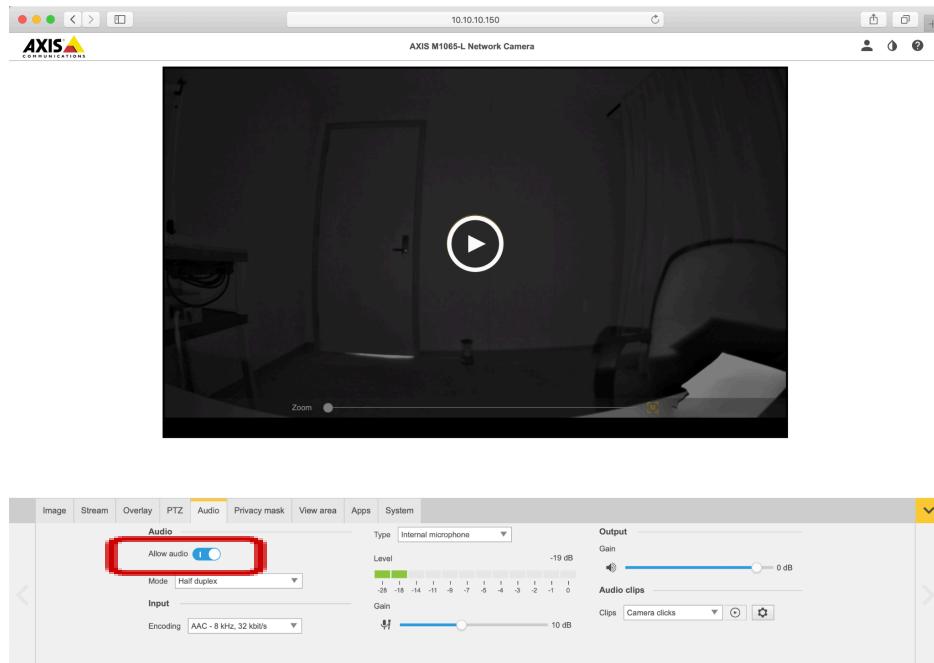
1. Open up the safari browser, NOTE: your computer should **NOT** be connected to the internet. This will act as a portal to connect to the PTZ camera.
2. In the search bar: type 10.10.10.150 which is the IP address for the PTZ camera



3. It will ask for a username and password:
  - a. Username: root
  - b. Password: geodesic
4. You will see a live feed of your camera. In the bottom right corner, click the settings button.



5. At the bottom, navigate to the Audio tab.



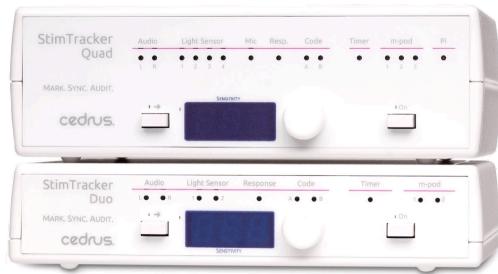
6. Make sure “Allow audio” is enabled.

## Stimtracker Configuration:

Last updated: 2.7.23

### Contents:

- Stimuli Parameter Configurations
- Xidon2 Download
- Signal Mapping
- Signal Settings
- Polarity and Logic
- Setting Stimuli Threshold
- Summary of Configurations



### Stimuli Parameter Configurations

The StimTracker has a variety of settings that need to be customized to detect and relay information in a manner that is optimum for our stimuli, equipment, and system parameters.

#### Xidon2 Download:

Xidon is a companion program by Cedrus that allows you to configure the Stimtracker. Once the settings are made in the Xidon app, they are saved in the flash memory of the StimTracker and will remain as you have set them until you update them again in the app. For using this program and setting up the StimTracker, this will work best with a laptop with internet connection.

You can download the program here:

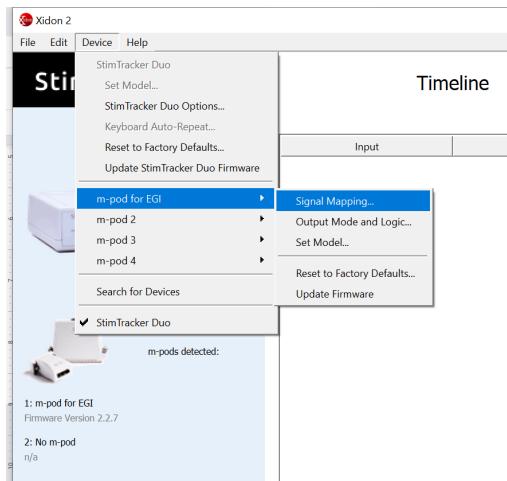
<https://cedrus.com/support/xid/xidon.htm>

Note: general Stim Tracker configuration through Xidon is possible on both Apple OS and Windows, but if you need to upgrade the firmware of your Stim Tracker and/or m-pod , you will need to use the Windows version of Xidon on a PC.

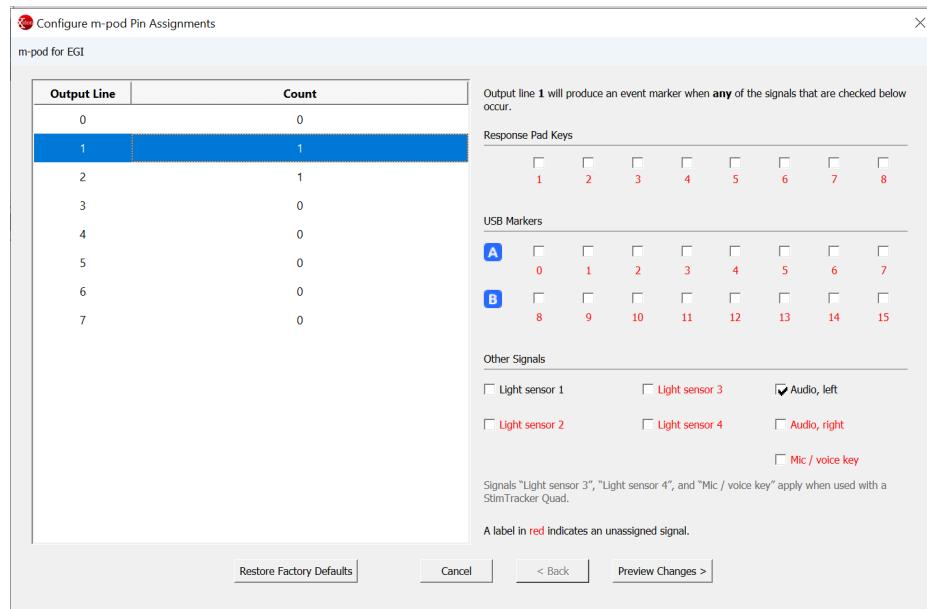
#### Signal Mapping:

This allows the Stimtracker to categorize its different input and output signals based on assigned mappings. It allows us to uniquely track the different modalities (audio vs visual) of the stimuli as they are being registered through the device, and eventually relayed to NetStation.

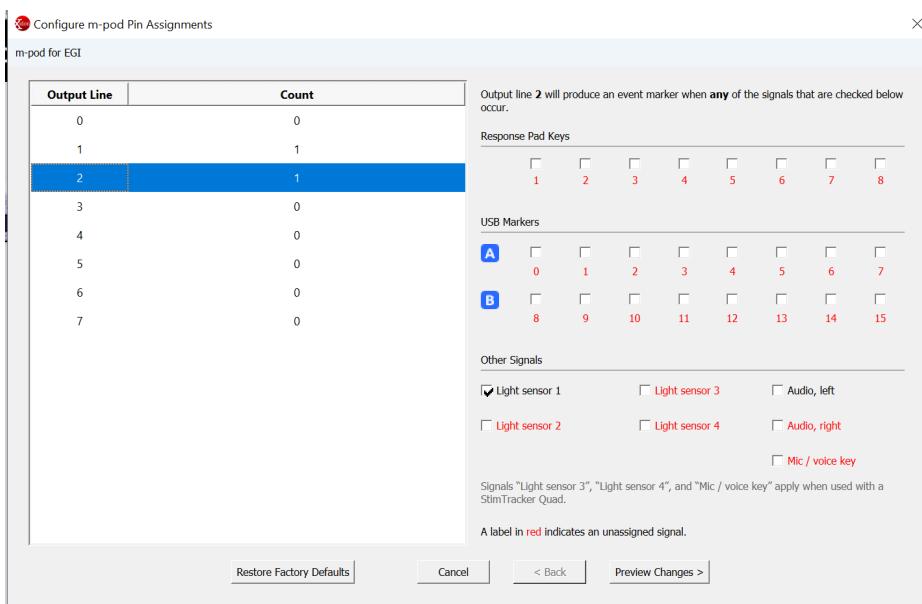
1. Navigate to the menu bar and click > devices > m-pod for EGI > signal mapping.



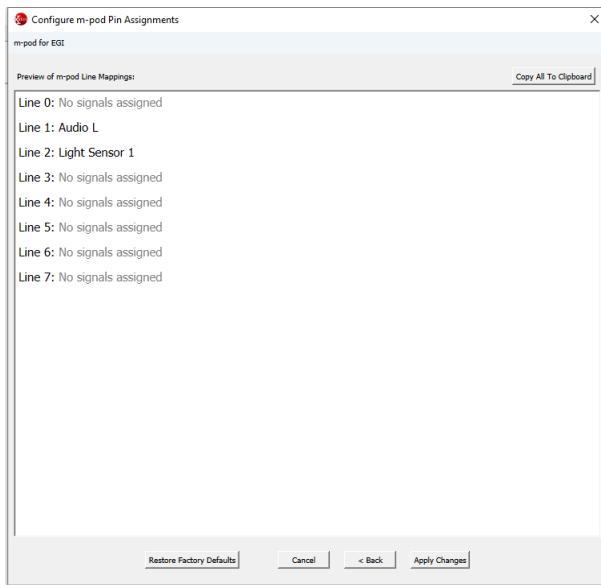
2. Select the row for output 1. On the right under “Other Signals” Click the checkmark for “audio left”. Response Pad keys and USB markers should be left blank.
  - a. Because we are presenting audio through both speakers, audio direction doesn’t matter, you only need to map “Audio, left”.
  - b. Your settings should match the screenshot below:



3. Select the row for output 2. On the left under “Other Signals” Click the checkmark for “light sensor 1”. Response Pad keys and USB markers should be left blank.
  - a. Similarly to audio, we are only mapping one light sensor
  - b. Your settings should match the screenshot below:



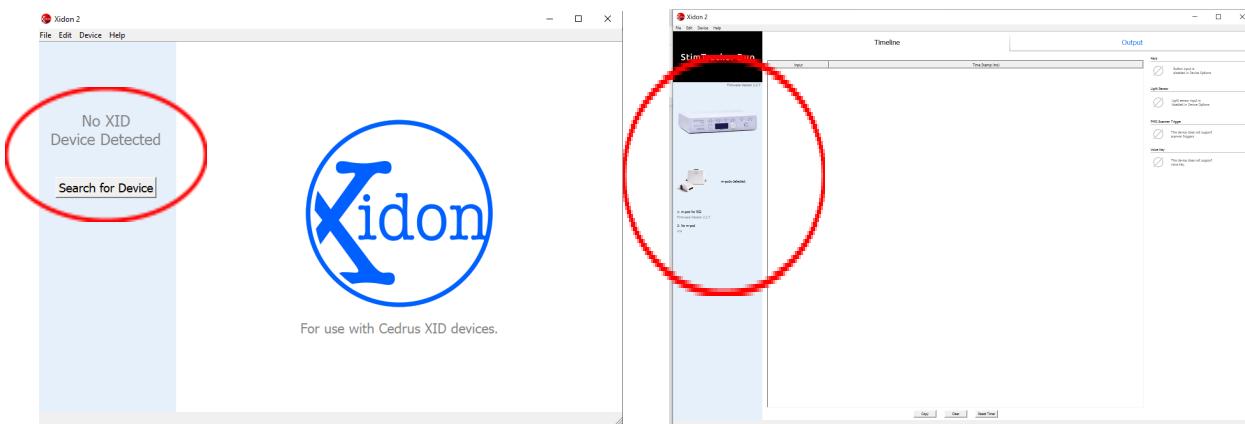
- No other output is being mapped. Press preview changes, it should look like the image below. After confirming your settings, click apply changes.



### Signal Settings:

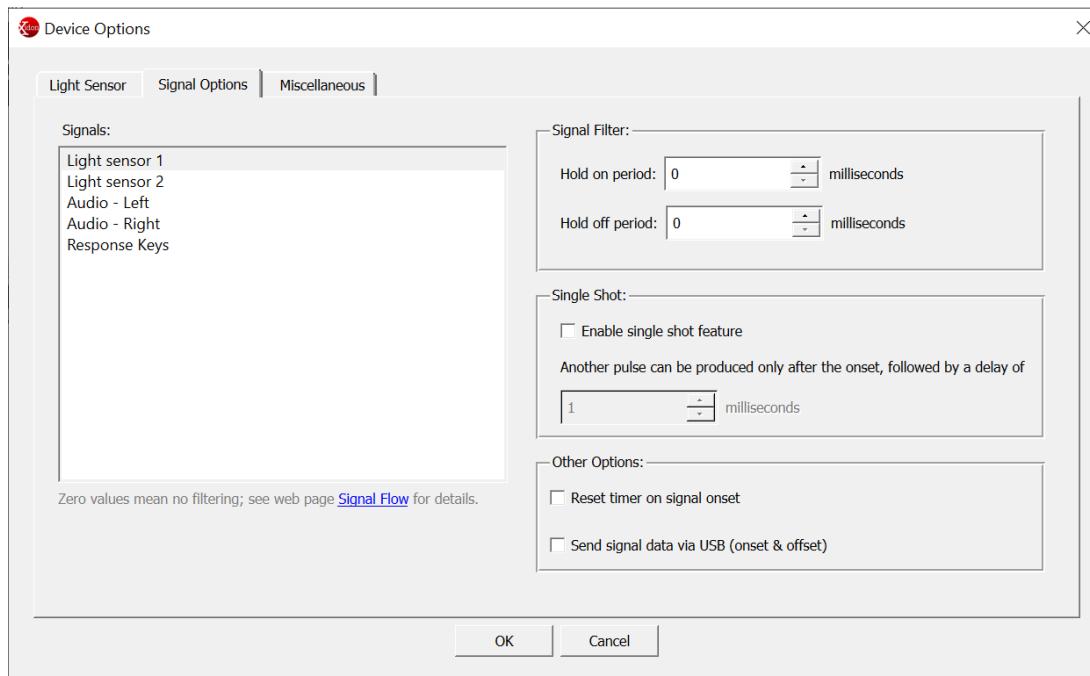
This section pertains to further configurations of the signal detection for the different stimuli modalities.

- Open Xidon2 onto a laptop with an internet connection.
- Use the USB to Stimtracker cord that came in the box, to connect the device to your laptop.
- Open Xidon2. On the left you will see “search for devices” click it, your devices should automatically pop up. It should show the Stimtracker and the m-pod for EGI like below.



- From the Menu bar navigate to > device > stim tracker duo options.
- Click the center tab (signal options).

- b. For both light sensors (1 & 2) and both audios (Left & Right) select the settings that match the screenshot below:

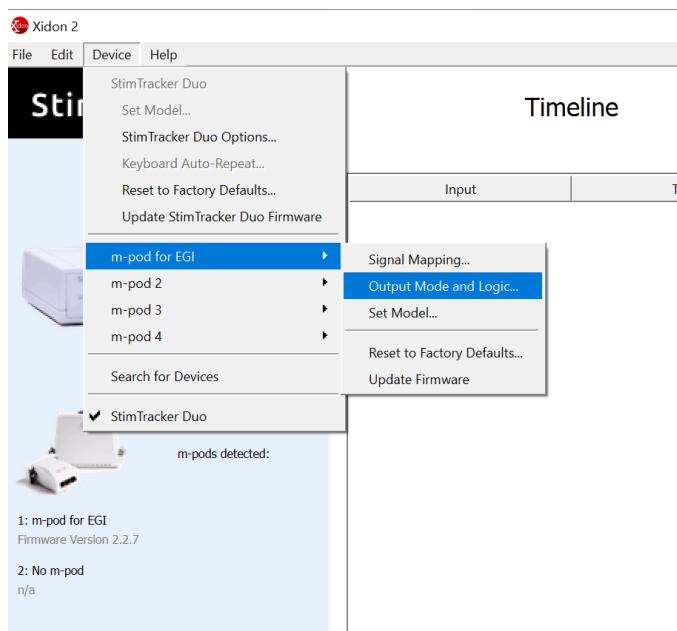


- c. When all the settings are complete for all 4 of those signals, click OK.  
d. No actions are needed for any of the other tabs of the Device Options window.

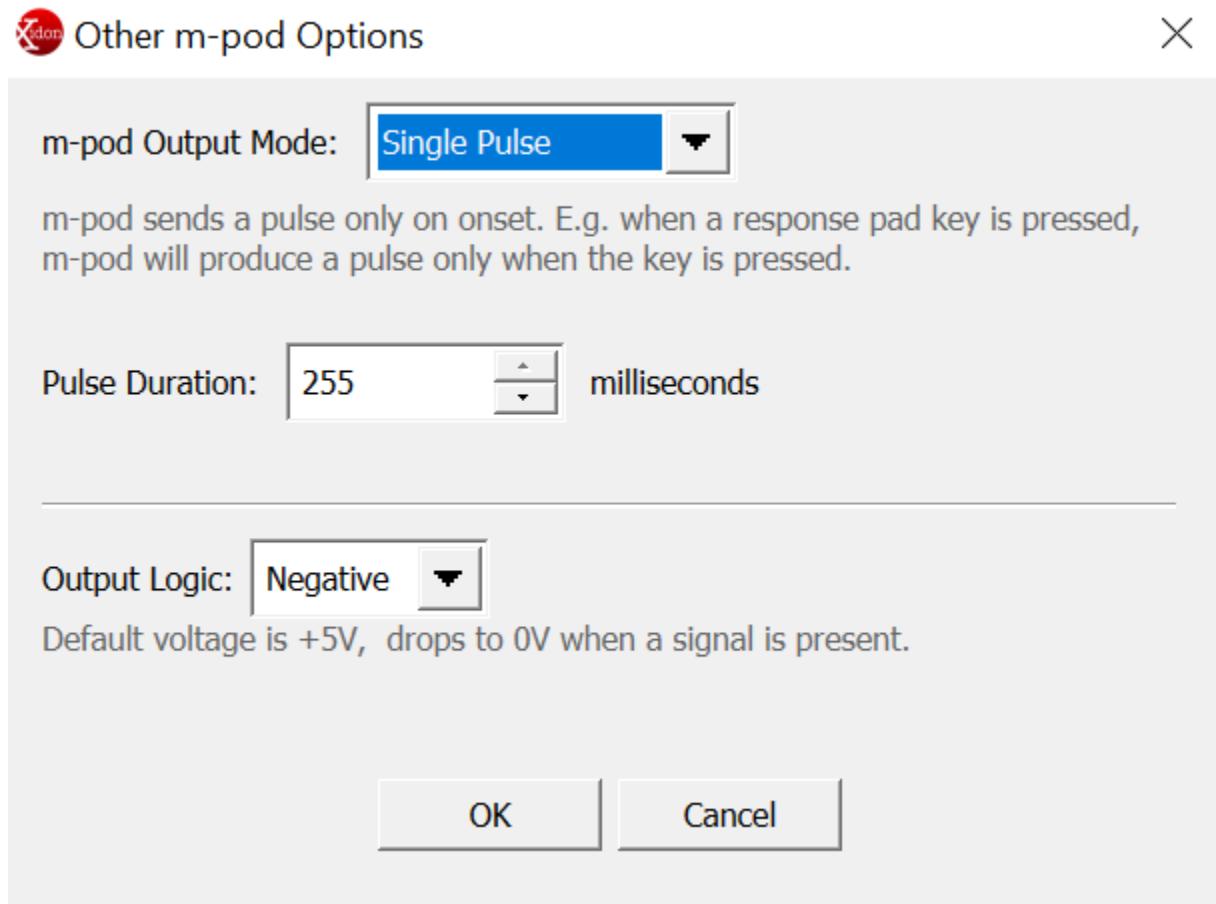
### Polarity and Logic:

This allows us to specify how we would like the StimTracker to relay outgoing signals to be read by NetStation.

1. Navigate to the menu bar and click > devices > m-pod for EGI > Output Mode and Logic.



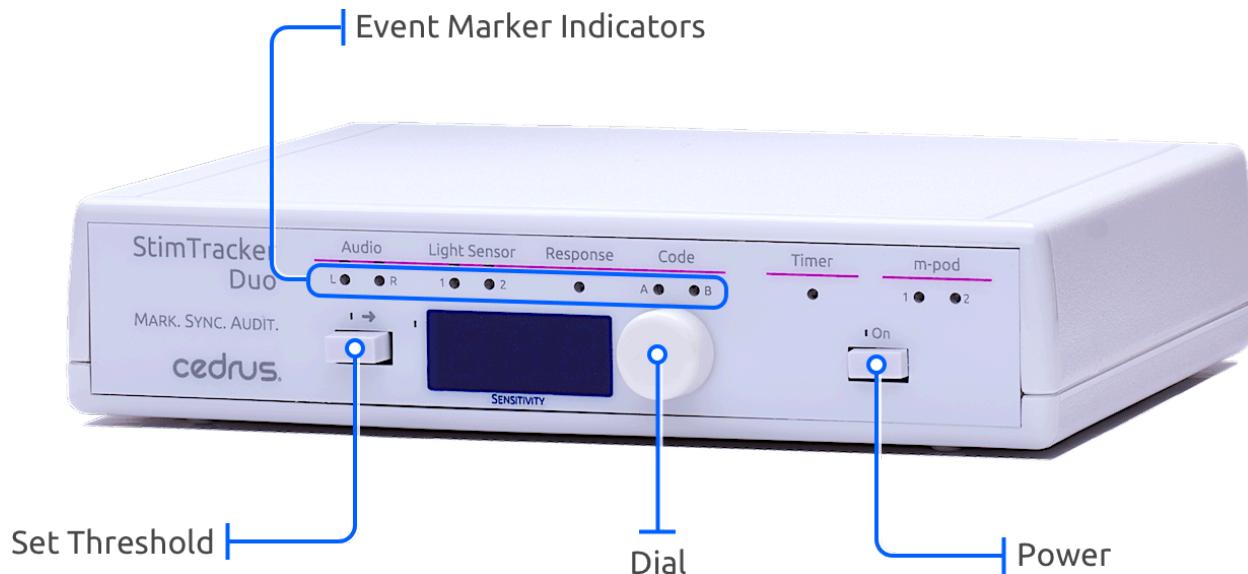
2. In the window that opens, select the settings that match the screenshot below:



3. Once the settings are confirmed, click OK.

### Setting Stimuli Threshold:

To optimally detect the stimuli being transmitted through the computer for the audio we will need to set a threshold for the event markers on the Stimtracker. This can be done with the controls on the face of the Stimtracker.



1. Power your StimTracker on
2. Audio threshold:
  - a. Press the set threshold button once. The light for the left audio event marker indicator should turn blue.
    - i. Using the dial, turn the threshold to 50.
  - b. Press the threshold button again. The light for right audio should turn blue.
    - i. Using the dial, turn the threshold to 50.
  - c. Once the threshold is set it will automatically save when left inactive for 30 seconds.
  - d. While a task with sound is running these LEDs should flash blue in sync with the sound coming through the speaker, as well as produce DIN2 flags on NetStation.
    - i. If a threshold of 50 does not produce these results, see the section titled "Note for the Auditory Threshold" located at the end of this section.
3. Light sensor threshold:
  - a. Press the set threshold until the light for light sensor 1 is blue.
    - i. Using the dial, turn the threshold to 50.
  - b. Press the threshold button again. The light for light sensor 2 should turn blue.
    - i. Using the dial, turn the threshold to 50.
  - c. Once the threshold is set it will automatically save when left inactive for 30 seconds, no further action is needed.

- d. While a visual task is running these LEDs should flash blue in sync with the changing of the black and white square located under the photocell, as well as produce DIN3 flags on NetStation.

Note for the Auditory Threshold:

50 has been selected as it is predicted to be an ideal threshold value for the detection sensitivity of the StimTracker, however it is a starting value. The ultimate goal is to have the StimTracker in sync with the presentation of the sound stimuli and the event flags coming in from the E-Prime computer. Thus, slight tweaking of the threshold (say from 50 to instead 47 or 52) may render best results.

The best way to confirm this is by checking:

1) That the blue audio LED lights on the face of the StimTracker flash on and off in sync with the presentation of the sound through the speaker.

- If the LED light is on too long (or during moments no sounds are being presented), or has an unbroken stream of blue light (no flashing) you likely need to turn the threshold value up.
- If the LED light is not flashing enough, try turning the threshold value down.

2) Looking at the Net Station event list as the auditory task is playing and watching to see that one DIN2 is being inserted for each stms flag that appears on the screen.

### **Summary of Configurations**

Input Thresholds:

Audio L and R = 50

Light Sensor 1 and 2 = 50

Stim Tracker Signal Mappings:

Output 1 = Audio L

Output 2 = Light sensor 1

StimTracker Device Signal Options:

All 4 (Audio R, Audio L, Light sensor 1, Light Sensor 2):

Hold on period = 0ms

Hold off period = 0ms

Output Logic (m-pod configuration):

Output mode: Single Pulse

Pulse duration: 255ms

Output logic: negative

## V04-V06 Net Application Distractor Resources

Infants and toddlers in the V04 to V06 age range can be particularly difficult to work with when it comes to quality EEG data collection. The EEG Core has created a list of resources and activities that can be used for distraction during EGI net application for these visits. Each site may choose their preferred method for distraction during EGI net application.

### Foods:

- Cheerios
- Puffs - These are good options as they meet all dietary restrictions and potential allergies. Below is a list of options recommended by the EEG working group.
  - <https://mummums.com/collections/baby-mum-mums-1>
  - <https://myserenitykids.com/collections/grain-free-baby-puffs>
  - [https://www.amazon.com/Happy-Baby-Organic-Superfood-Assortment/dp/B017DC7M8U/ref=sr\\_1\\_1?adgrpid=1330410500066976&hvadid=83150925706676&hbmt=be&hvdev=c&hvlocphy=92275&hvnetw=o&hvqmt=e&hvtargid=kwd-83151577131169%3Aloc-190&hydadcr=2950\\_13572459&keywords=happy+baby+organic+puffs&qid=1707161414&s=baby-products&sr=1-1](https://www.amazon.com/Happy-Baby-Organic-Superfood-Assortment/dp/B017DC7M8U/ref=sr_1_1?adgrpid=1330410500066976&hvadid=83150925706676&hbmt=be&hvdev=c&hvlocphy=92275&hvnetw=o&hvqmt=e&hvtargid=kwd-83151577131169%3Aloc-190&hydadcr=2950_13572459&keywords=happy+baby+organic+puffs&qid=1707161414&s=baby-products&sr=1-1)
- When scheduling, you can also let the caregiver know what food you are planning on having available and let them know that they can alternatively bring in their infant's food of choice.

### Toys/Videos:

- The EEG Core has selected a set of longer, more engaging distractor videos geared toward participants in the 9 months to 2-and-a-half year range. Sites should feel free to use any and all of these videos during EGI net application. :
  - Baby's First Year's capping video - [https://drive.google.com/file/d/1xTHW9E-DL\\_X6\\_jvn-jWpu-QI1bbfXENa/view](https://drive.google.com/file/d/1xTHW9E-DL_X6_jvn-jWpu-QI1bbfXENa/view)
  - Bluey - <https://www.youtube.com/watch?v=qj3e-lsXLsI>
  - Muppets - <https://www.youtube.com/watch?v=sCmKw-Zqbj0>
  - Old Winnie the Pooh - <https://www.youtube.com/watch?v=hIT839x7WpU>,  
[https://www.youtube.com/watch?v=ACjLq\\_tyaoQ](https://www.youtube.com/watch?v=ACjLq_tyaoQ),  
<https://www.youtube.com/watch?v=-SwWL5xCzhM>
  - Nursery rhymes - <https://www.youtube.com/watch?v=5gZOYKHxwyQ>
- Puppets
- Bubbles

### Activities:

- Ask the caregiver to hold the infant's hands and dance with them.
- Smartphone apps - only to be used on the recommendation of the caregiver.
  - Bubble popping app
  - Fishing app
- Coloring books - this is best for participants in the older age range.

## **Recommendations for Older-V04/V06 EEG**

As V06 Piloting begins, new approaches may help to successfully collect quality EEG data from participants in the 15-to-30-month age range. Participants in this age range tend to be more squirmy, stubborn, resolute, mobile, and often fussy than younger participants. The EEG Core at the University of Maryland has put together a document of resources and suggestions for dealing with the challenges of EEG visits with participants in the V06 age range.

### **Before the visit:**

- Ask the caregiver to practice putting on hats with their child before the visit. This will get the child accustomed to putting on and taking off a hat so that placing the EEG net is not such a novel experience in the lab.
  - We suggest a tight, knit beanie as this is most similar to the EEG net.
- Ask the caregiver if the child has any favorite snacks and if they would be willing to bring in some of these snacks. These can be used for incentivizing, soothing, and encouragement throughout the visit. They should be small, bite-sized, and not require a lot of chewing.
  - We suggest:
    - Cheerios
    - Puffs - These are good options as they meet all dietary restrictions and potential allergies. Below is a list of options recommended by the EEG working group.
      - <https://mummums.com/collections/baby-mum-mums-1>
      - <https://myserenitykids.com/collections/grain-free-baby-puffs>
      - [https://www.amazon.com/Happy-Baby-Organic-Superfood-Assortment/dp/B017DC7M8U/ref=sr\\_1\\_1?adgrpid=1330410500066976&hvadid=83150925706676&hvbmtn=be&hvdev=c&hvlocphy=92275&hvnetw=o&hvqmt=e&hvtargid=kwd-83151577131169%3Aloc-190&hydadcr=2950\\_13572459&keywords=happy+baby+organic+puffs&qid=1707161414&s=baby-products&sr=1-1](https://www.amazon.com/Happy-Baby-Organic-Superfood-Assortment/dp/B017DC7M8U/ref=sr_1_1?adgrpid=1330410500066976&hvadid=83150925706676&hvbmtn=be&hvdev=c&hvlocphy=92275&hvnetw=o&hvqmt=e&hvtargid=kwd-83151577131169%3Aloc-190&hydadcr=2950_13572459&keywords=happy+baby+organic+puffs&qid=1707161414&s=baby-products&sr=1-1)
  - Ask the caregiver about the child's most consistent meal and nap times. It is best to schedule the visit around these times so that the child does not get overly fussy or tired during the EEG visit.
    - During the visits, do your best to be cognizant of the child's meals or nap time.
    - Don't cap within an hour of either meals or naps, but especially not within an hour of the child needing to sleep.

### **At the visit, before and during capping:**

- One of the biggest challenges with children of this age is their developing agency and ability to communicate their personal boundaries. It is not uncommon for kids in this age range to be opposed to EEG net application and contest net application or tear at the net after it is placed on their head. Ensuring that the child is as comfortable with you and the visit procedure as possible will encourage better success in EEG acquisition.

- Upon arrival, allowing the child time to acclimate to the space. To do so, give the caregiver and child time and space to settle down, eat, or play with toys in the lab space before beginning the EEG visit.
- It may be best to begin the visit addressing both the caregiver and the child as you explain the EEG procedure, so that they both feel respected and autonomous.
- It may help the child be more comfortable with/excited about capping to allow them to touch the cap and to see others getting capped before them. One of the RAs or the caregiver could be capped beforehand to show the child that it's fun/safe. The child may also be given a plastic pipette and fresh water to play with.
- A few approaches may help with net application for children:
  - Allow the child to sit in the position of their/their caregiver's choosing (ex. caregiver's lap, highchair, or small chair) for net application.
  - Give the participant a large toy that will require both hands to keep a hold of. This will keep the child's hands occupied during net application.
    - For example, foam building blocks:

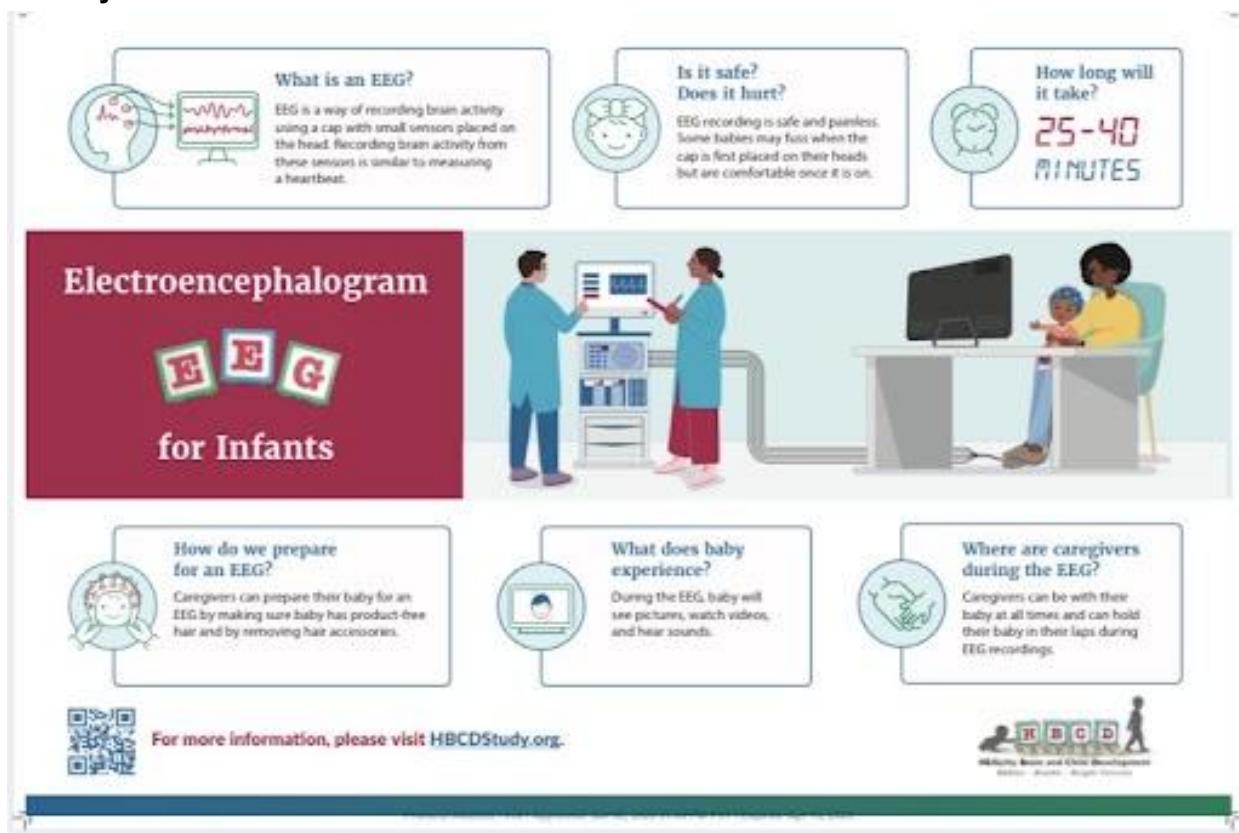


- If the child is sitting in the caregiver's lap, you may ask the caregiver to *gently* hold the child's hands. If the child is upset or is pushing back, then let go.
- Put a hairdresser cape on the child to keep them from tearing at the net.
  - [https://www.amazon.com/Ramede-Professional-Cutting-Closure-Dinosaur/dp/B0C6JT5Z61/ref=sr\\_1\\_8?dib=eyJ2ljoIiMSJ9.zyyXSbzs4N59RdRMc5lj0qsTL0WGnfSaaGAc6F0Rhldr5KKslH0Y-6ZNkHMF5l7Usqyl7Qs9pKEGX9qlW7otZUJgszJJZmmAK1Mp-iZwwJdMnssbmw-MzkI2hkV44V-HYILdtJi0utfJuwwqCtuXyWZ-NAXuMeJiX3b4kmZXQ4SPkTH5lv-P7Zo6JGLFLHultzDyAjwTleJPqBwHy982ok40Y9oemzscdIIUX\\_qE9pzTzy1aDNx4JC0S2H4wilsZy\\_QuSyUc1Aei31Lvo7ivKOdiUpjO6cQM-TngJhOh6qQ.YQc4X1AHXI5AO9nzSawJ7c5u\\_8gtbXNekT4CvC3 AGE&dib\\_tag=se&hvadid=651151527817&hvdev=c&hvlocphy=9060031&hvnetw=g&hvqmt=e&hvrand=348076278193701353&hvtargid=kwd-408601263102&hydadcr=23883\\_13665801&keywords=kids+capes+for+haircuts&qid=1711383297&sr=8-8](https://www.amazon.com/Ramede-Professional-Cutting-Closure-Dinosaur/dp/B0C6JT5Z61/ref=sr_1_8?dib=eyJ2ljoIiMSJ9.zyyXSbzs4N59RdRMc5lj0qsTL0WGnfSaaGAc6F0Rhldr5KKslH0Y-6ZNkHMF5l7Usqyl7Qs9pKEGX9qlW7otZUJgszJJZmmAK1Mp-iZwwJdMnssbmw-MzkI2hkV44V-HYILdtJi0utfJuwwqCtuXyWZ-NAXuMeJiX3b4kmZXQ4SPkTH5lv-P7Zo6JGLFLHultzDyAjwTleJPqBwHy982ok40Y9oemzscdIIUX_qE9pzTzy1aDNx4JC0S2H4wilsZy_QuSyUc1Aei31Lvo7ivKOdiUpjO6cQM-TngJhOh6qQ.YQc4X1AHXI5AO9nzSawJ7c5u_8gtbXNekT4CvC3 AGE&dib_tag=se&hvadid=651151527817&hvdev=c&hvlocphy=9060031&hvnetw=g&hvqmt=e&hvrand=348076278193701353&hvtargid=kwd-408601263102&hydadcr=23883_13665801&keywords=kids+capes+for+haircuts&qid=1711383297&sr=8-8)
- Encourage the child to close their eyes during or count down with the child to net application.

- After capping, cheering or providing rewards such as stickers or snacks may provide encouragement for the child.
- Flexibility with how to keep the child engaged and comfortable is key. Have as many distractor options on hand as possible to be able to try different approaches based on the participant's needs and preferences.
  - For a list of suggested toys/videos, foods, and activities, please refer to the [Net Application Resources](#) document.
- Ultimately, **it is best to move forward with a visit with a less than optimal capping job than to not run the visit.**

**At the visit, during the tasks:**

- EEG data collection and visits overall consistently go best when the EEG portion of the visit is completed first.
- The [Net Application Resources](#) document above outlines suggested toys/videos, foods, and activities for EEG in this age range.
- The participant can wear a hairdresser's cape to keep them from tearing at the net.
- Do your best to make the visit as fun, flexible, and engaging as possible based on the child's needs. The child will be much less likely to take issue with the EEG procedure if they feel comfortable, autonomous, and are having fun. A few helpful strategies for keeping the tasks engaging are below.
  - Use high fives or other hand games to redirect the child's hands from the net rather than directly removing their hands.
  - Give the child something to hold at all times.
  - Blowing bubbles does particularly well as a silent distractor for children in this age range.

**EEG Flyer:****Pause/Stop/End Visit Protocol**

As a part of a multimodal longitudinal study, tactfulness and empathy in interacting with participants and caregivers is key to collecting substantial quality data and to ensuring families feel comfortable and motivated to return for future visits. The EEG Core at Maryland has put together a set of guidelines for when to pause, stop and take a break or end the visit.

**When to pause the task.** During the presentation of the tasks, you may want to pause to soothe or reorient the infant. There is a pause function that can be used for the MMN and Face task (press the "P" key for MMN, or refrain from manual spacebar progression for Face). When taking brief pauses to soothe the infant, the task can be left open so that it can be resumed when the infant is calm or attentive again. The following are situations in which the pause should be used:

- Infant is briefly (less than 1 minute) crying.
- Infant is crying or visibly upset, but is being soothed by the caregiver while staying in the high chair or in the caregiver's lap.
- Infant is moving around a lot.

**When to stop the task.** The infant is very upset and will need to be held or fed by the caregiver to calm down. In this case, the task should be quit (Ctrl + Shift + Backspace) altogether to allow for a more substantial break:

- The baby fussed out for longer than 10 minutes and needs time to be soothed by the caregiver.
- The baby needs a nap.
- The baby needs feeding and will take longer than 10 minutes.
- The baby needs a diaper change.
- You need to take the EEG cap off for any reason.
- Any time the caregiver requests, take a pause or stop the visit. This could be a good time to reset by feeding, changing or giving the infant a nap.
- When resuming EEG data collection after stopping, do not restart the previous task. Instead, move on to the next task or to the second half of the face task, if appropriate.

**When to end the visit.**

- The infant, even after taking a substantial break, is still inconsolable.
- The caregiver is visibly or vocally uncomfortable with continuing with EEG data collection.
- See the [Fuss Out Protocol](#) for procedures in the event that an EEG visit has to be ended early.

**Fuss Out Protocol**

If the infant fusses out during a visit:

- **Always fill out the acquisition form in LORIS**, even if you are unable to cap the participant.
- If no data at all are able to be collected, ask the caregiver if they are able to reschedule the EEG visit for another time.
  - No data collection refers to there not being any recorded EEG for any of the four tasks. For example, if the baby does not allow the cap to be applied, if the baby fusses out before RS is started, or if there are technical issues which prevent data collection.
- If any data have been collected (even partial resting state!), do not ask the caregiver to reschedule.
- If the baby fusses out part way through the tasks, it is permissible to reschedule the EEG for another time if the caregiver specifically asks to bring the baby back to re-attempt it, unprompted by the EEG staff.
  - In the case of a rescheduled visit where some data was collected previously, only run tasks which have not been started.
  - For example, if in the first visit you started but did not finish resting state and the caregiver requests to reschedule the visit, at the next visit you should skip resting state and move directly into the next task.

**Short and Long Form EEG Scheduling Scripts:****Long Form:****Supplement 1: Script for Scheduling EEG V04-V06:****English**

**RA:** During your visit to the lab, we would like to collect a measure of brain activity called EEG to look at how your child's brain is functioning. To look at your child's brain activity, we will place a soft, stretchy cap specially designed for children to wear on their head. The cap that we will use is very safe for your child to wear. We have used it hundreds of times with children your child's age.

Before you and your child's visit, I would like to ask you a few questions about how you usually style your child's hair in order to understand how the EEG cap might fit. Specifically, we would like the cap to fit close to the head, like a swim cap or tight winter cap, and have as much direct contact with the child's scalp as possible. Is that okay with you? (*If 'No': Skip to 1.2.1.1.3, and schedule as usual around the family's availability.*)

1. **'Yes':**

Great! My first question is whether you currently or usually style your child's hair in a hairstyle that lasts for multiple days or weeks at a time? Like braids or locs. Thinner braids or cornrows may be fine since the scalp is exposed. Or does your child usually wear styles that would prevent the cap from sitting against their head and scalp? This would include styles that have accessories like beads or large ties.

1.1. **'No':** Okay, great, then the cap should fit over their hair (*Skip to 1.2.1.1.1*).

1.2. **'Yes':**

Good to know! When we put on the EEG cap, it needs to sit tightly against your child's head, and the beads or large ties may get in the way. So, if possible, we would like to schedule your visit at a time right before you restyle your child's hair. We understand this isn't possible for all styles, do you think that would be possible for your child? (*If 'No': Skip to 1.2.1.1.3, and schedule as usual around the family's availability.*)

1.2.1. **'Yes':**

Great! When thinking about your visit, it would be easiest if you were able to have your child's hair down during the visit. Do you think that would be possible? (*If 'No': Skip to 1.2.1.1.3, and schedule as usual around the family's availability.*)

1.2.1.1. **'Yes':** Perfect.

1.2.1.1.1. Before we can place the EEG cap on, we have to soak it in mild saltwater with a little bit of baby shampoo. We recommend that you wash your child's hair within a day or two after the visit to get the saltwater out. Do you think that would be possible with your child's schedule?

1.2.1.1.2. **'Yes':**

Great! When we call a day or two before to confirm your visit, we will be sure to remind you not to style your child's hair in any special way and have them wear an easy style (like down or in a ponytail) with no product. [Continue to schedule visit around when child's hair will be ready to be restyled].

1.2.1.1.3. **'No':**

Okay, no worries. On the day of your visit, we can show you the cap, give you more information, and decide together what the best approach is for applying the EEG cap [Proceed to schedule as usual around the family's availability].

**Short Form:****Supplement 2: Short Script for Scheduling EEG V04-V06:****English**

1. **RA:** We would like to collect a measure of brain activity called EEG to look at how your child's brain is growing. To look at your child's brain activity, we would place a soft, stretchy cap specially designed for children on their head. The cap that we will use is safe for your child to wear and does not send anything into your child's brain. Before you and your child's upcoming visit, I would like to ask you about how you usually style your child's hair in order to understand how the EEG cap might fit. Is that okay with you?
  - a. **IF YES:** How does your child usually wear their hair or how they may have it styled when you visit? (RA note: If examples are needed, you can say: Which of the following best describes your child's usual style?
    1. Close-cut (buzz-cut, fade, waves, Caesar-cut, etc.)
    2. Down or out
    3. Ponytails, buns, or puffs
      - a. **IF Ponytails, buns, or puffs:** Discuss whether the caregiver can avoid use of accessories or remove them on the day of the visit. Also consider sending styling suggestions.
    4. Braids (this could be their own hair or feed-in)
      - a. **IF BRAIDS:** Good to know! If you'd like, we can try to schedule around a time when their hair is out or down. Or, we can proceed with the visit with their hair in that style. What do you think?
    5. Locs
      - a. **IF LOCS:** Good to know! We can make sure to try to work around their locs to get the best measure or we can talk about it more on the day of your visit. What do you think?
    6. Other
      - a. How do you think a cap (like a swim or shower cap) would fit against their head with this style?

- ii. **IF YES:** Is there anything else you would like us to know about your child's hair?
- iii. **IF CAREGIVER STILL SEEMS INTERESTED.** Perfect. Additionally, the EEG cap is soaked in mild salt water with a little bit of baby shampoo. We recommend washing your child's hair within a day or two after the visit. Does this sound okay?
- b. **IF NO:** Okay, no worries. On the day of your visit, we can show you the cap, give you more information, and decide together what the best approach is for applying the EEG cap.

#### **FAQs:**

##### **EEG Equipment/Supply Questions:**

- 1. What is the link to a baby doll for training?**
  - a. You can use any realistic-sized baby doll. This is the one the UMD site uses:  
[https://www.amazon.com/dp/B07QP9WPJT/ref=cm\\_sw\\_r\\_api\\_i\\_WK5TX2N3SXS\\_HPFMB5ZAR\\_0](https://www.amazon.com/dp/B07QP9WPJT/ref=cm_sw_r_api_i_WK5TX2N3SXS_HPFMB5ZAR_0) The smallest net size (38cm) is slightly big on her head.
- 2. Where to position the PTZ camera?**
  - a. We recommend that you mount it on the plastic rim of the participant computer using the clamp that comes with the camera. Otherwise, it is fine to put the camera on the table, but it should be slightly to the side so the MMN iPad does not block it.
- 3. When/how to shut down the amp?**
  - a. Avoid shutting the amp down if possible. If it is necessary, you'll need to power down the amp via Netstation, then turn off both your Netstation and Eprime computers, and then turn off the power going into the amp. You should turn off the amp's power by flipping the switch on your isolation transformer (white box connected to a gray box which is connected to the amp). When it comes time to turn everything back on you should be able to simply turn on your transformer, and then power up your computers.
- 4. Do nets need to be disinfected after bucket testing?**
  - a. Nets need to be rinsed with water to rinse off the saline. There is no need to use disinfectant on nets after bucket testing since they were not on a person. Disinfectant is only necessary after the net has been worn by a participant.
- 5. I'm running out of Potassium Chloride/Control III/ other net supplies! Where can I get more?**
  - a. You can put in an inquiry with the MagStim representative below and they can send you a quote for all additional supplies.
    - i. If your site is East of the Mississippi River: Trey Avery  
[treyavery@magstimgi.com](mailto:treyavery@magstimgi.com)
    - ii. If your site is West of the Mississippi River: Suhas Vinchurkar  
[vinchurkar@magstimgi.com](mailto:vinchurkar@magstimgi.com)

##### **EEG Protocol Questions:**

- 1. Responsibilities of primary RA vs secondary RA vs undergrad RAs?**

- a. We divided primary and secondary RA responsibilities based on primary - computer person, and secondary - baby/family interaction person. Capping can be done by any RA, and the roles between each RA can be altered per site for whatever is best for them. The one strong recommendation we do have is to not have undergraduate RAs cap, due to the nets being fragile and expensive. We do have undergrads assist in distraction for capping, and in making solution and cleaning the net.

## **2. Where can I find the DCCID on LORIS?**

- a. At the top, go to Candidate → Access Profile → type in the PSCID in the search box → the participant's profile will come up and the DCCID will be listed.

### **EEG Acquisition Questions:**

#### **1. Alternative to filling out the Acquisition Checklist on LORIS?**

- a. Use a printed version of the Checklist and transfer the information over to LORIS in post-visit. The checklist is available in the manual's appendix and on Confluence. It is good practice to have a stack already printed to use when needed.

#### **2. Teething toys?**

- a. For the Face task only, if the baby is fussy/crying, you can allow them to use a teething toy/pacifier in their mouth to calm them. No toys should be used for Face as a distractor since we have the distractors built into this task. The reason the Face task can allow for teething unlike the other tasks is due to the difference in underlying neural processes that we are examining during face processing. For this specific task, teething does not negatively impact the data being collected.

#### **3. Can we schedule a redo of a participant that does not complete all 4 tasks?**

- a. Not for official piloting. For official piloting, if you collect any data (even just partial of 1 task), upload what you have to Bids Wizard for that participant. If you are unable to begin acquisition and did not collect any data from any task, then you can reschedule a second attempt with that pilot participant.

#### **4. I'm having technical problems with my EEG system! What should I do?**

- a. First take a screenshot/picture of any errors or warnings you see as soon as you see them.
- b. Next, check the EEG troubleshooting guide to see if the problem you are encountering is listed there:
  - i. <https://docs.google.com/document/d/19T72HblwVLcqP8swK3LYBS9IYlmD8xKDTAeK43ta4g/edit?usp=sharing>
- c. If your issue is not listed in the above document, contact [eeghelp@umd.edu](mailto:eeghelp@umd.edu). Please include pictures and/or a very detailed description of your issue.

### **EEG Task Questions:**

#### **1. What is the order of tasks for piloting?**

- a. Resting State is always first. The remaining 3 can be in any random order, since it will be randomized through Ripple for the official data collection. We suggest rotating the 3 tasks to ensure piloting is also randomized.

**2. What should we enter in the fields for E-Prime?**

- a. Session number is always 1, unless you rerun a task, in which case it would be = 2 (for the second run).
- b. LORIS ID: (NEW field) enter the participant's 6 digit numerical ID.

**EEG Data Upload Questions:**

**1. Pilot LORIS URL?**

- a. <https://pilot.hbcd.msi.umn.edu/>

**2. Current version of Bids Wizard?**

- a. [Bids Wizard 1.0.17](#) is the most up to date version since 11/15/22.

**3. Criteria for Official Pilots?**

- a. Sites have to collect 3 babies with at least 3 tasks with at least 30 artifact-free trials per condition.
- b. For example, to have a successful baby, you would have to have a baby with a successful VEP (>30 trials), MMN (>30 trials standard, >30 trials deviant), and FACE (>30 trials upright-inverted paired, >30 trials upright-object paired >30 trials inverted, >30 objects), even if RS was not successful (<30 epochs).
  - i. Any combination of the 3 tasks criteria listed above (>30 trials/epochs per condition) would count as a successful baby. Moreover, across all three or more babies, they would have to pass those criteria (>30 trials/epochs per condition) at least once for each of the four tasks.

**4. Where does the data go once uploaded?**

- a. The EEG data goes to LORIS and any identifiable information (such as the pictures and video) goes to a database at UMN. As far as access to the data, each site has access to their own uploads and members of the Data core and UMD EEG team have access to all the uploaded files. The UMD EEG team has been preprocessing the data and looking at the capping pictures for quality control.

**5. Reuploading data on the BIDS Wizard?**

- a. In case of a re-upload (if there was a problem with the original upload), the original EEG data with that ID will still be available and will be labeled as archive. So both uploads will be stored separately. This is in the works and will be coming in future versions of LORIS.

**6. How to de-identify a participant's data files? (only when specifically requested by the EEG data team!)**

- a. First, make a copy of any files you would like to de-identify.
- b. For mff files: open the folder and delete the two files that are MOV files. This removes the video recording from the data.
- c. For net photos: create a folder with an empty text file in the folder. Zip the folder and name it PSCID\_DCCID\_V03\_EEG. This allows you to upload an empty zip file to complete the Bids Wizard upload without including participant photos.

**Miscellaneous:**

**1. Decorating the EEG room?**

- a. You are more than welcome to add wall decals and other decor to the room in order to make it more child friendly. The only preference we would have is that there is no decor around the participant monitor to not distract the infant away from the screen.