Entrainment Project Experiment Tracking Form (EEG+EMG+GSR)

|  |  |  |
| --- | --- | --- |
|  |  |  |
| Sinha Lab |  | Participant ID: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Participant Age: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| CO: 6941400 |  | Testing Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Time: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| IRB #: 1404006353 |  | Experimenters \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Participant Handedness:\_\_\_\_\_\_\_\_\_\_ |

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Experiments** |  | **Equipment used** |
|  |  |  |  |
|  | \_\_\_\_\_\_\_\_ Passive listening | Array: | A B (New) |
|  | \_\_\_\_\_\_\_\_ Tap along | Channels: | 32 64 |
|  | \_\_\_\_\_\_\_\_ Free tap | Cap Size: | Green/Yellow Yellow Red |
|  | \_\_\_\_\_\_\_\_ Contingency | Externals: | 1 2 3 4 5 6 7 |
|  |  | GSR: | Y N |
|  |  | Bucket test: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
|  |  |  |  |

**Head Measurements**

**Behavior Codes (start/end) for Notes**

      F6/F7 – Eyes looking away or eyes closed  
      F8/F9 – Body moving, talking, laughing, sneezing, yawning  
      F10/F11 – Taking a break OR Misc Behavioral (Other) \*make note

      Head Circumference:       \_\_\_\_\_cm  
      Nasion to inion:           \_\_\_\_\_cm  
      Left to right preauricular:   \_\_\_\_\_cm

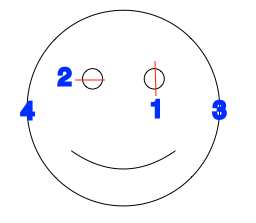
###### **Check During Run:           Notes (indicate which experiment/electrodes if any issues):**

Offsets:           Good     >40 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Noisy signal:       No Yes Some \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Electrode drift:   No Yes Some \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Many blinks:       No Yes Some \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Body motion:     No Yes Some \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Att/Beh Prob:     No Yes Some \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
Problems with stim presentation, equipment, file saving, etc: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Anything else to consider in analysis? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

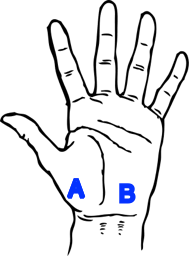
#### Sensor Placement

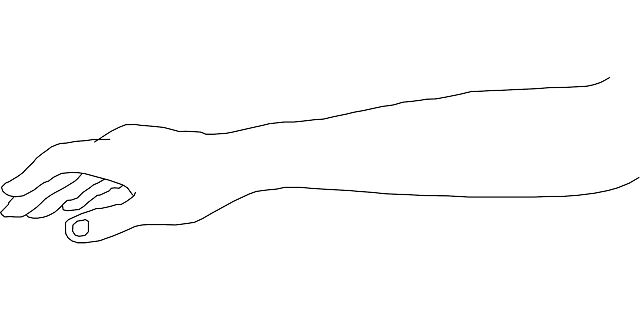
* Odd numbers always on LEFT side of participant (except EMG on tapping hand)
* Align ocular electrodes (1 & 2) with pupils
* Mastoid electrodes (3 & 4) on bone behind lower ear
* GSR on non-dominant (non-tapping) hand
* EMGs on tapping hand/arm (dominant)



**External Electrodes (1-4)**

**GSR Sensors (A, B)**





**External Electrodes (5-6)**

**Tapping Electromyography (EMG)**

5” from wrist

**7**

**6**

**5**

# Protocol

## Prior Preparation

* Read & be prepared to talk about consent form to participant

#### Scheduling

* For Sinha lab EEG room, schedule experiments at: <https://calendar.google.com/calendar?cid=MW5qcWdoa29oZDBpcWh0bDYzYmhzbzhnN3NAZ3JvdXAuY2FsZW5kYXIuZ29vZ2xlLmNvbQ>. Use participant IDs in event name and invite other members of team to calendar invites.
* For McGovern EEG Lab, schedule at scantime.mit.edu, including prep/clean time
  + Scantime instructions: http://mcgovern.mit.edu/images/stories/mri\_scheduling\_20120928.pdf
  + **Reserve Prep Room too** for the time that it will be used (near end of the session, ~30 min)
* Create calendar event in GoogleCal, invite all involved, list experiments/timing in notes section. Only put participant time in this calendar.
* Cancel 72 hours before to free up unused slots. If within 72 hours or less, "release" by sending e-mail over listserv (EEG-users@mit.edu). Write time/reason for release (e.g. participant cancellation).
* When booking large amounts of time (>5 hours) for piloting/experimental design, consider emailing eeg-users group to let people know. If possible, offer that if anyone needs to use it for an experiment, we can work out a schedule that works for others.

#### Testing

* Generate stimulus and listen to it end-to-end.

## Materials to bring

#### Scheduling

* Consent on clipboard
* Participant ID and folder
* Laptop for assessments and stimulus presentation
* Flash drive (or Google Drive access)
* [[[more]]]

## Setup Before Participant Arrives

* **Set up recording rig (see attached instructions)**
* Plug in booth camera
* Check nothing else is plugged into outlet the booth is plugged into (prevents noise in recording)
* Open experiment template on laptop Garageband, load newest stimulus into stimulus track
* Make sure stimulus WAV file and accompanying MAT file are saved as  
  *Entrain\_<id>\_stimulus.wav* and *Entrain\_<id>\_stimulus.mat*
* **Put laptop and phone on “do not disturb” and airplane mode.**

#### Turn on

* Acquisition monitor (never install or download anything without checking with Annie; could disrupt other labs’ setup.)
* Intercom Speaker, booth camera monitor
* Load configuration file: **TAP.cfg**
* Fan, LED lights (keeps participants alert but also increases heat), and monitor in booth
* Connect fresh battery to AD Box, charge other one during recording
* Strap battery and AD box to the stool
* New battery is always on the charger when the lab is not in use. (The old battery should still be plugged into the charger when you are using the new battery to serve as backup when necessary.) The battery age is marked on the belly side, and the old battery is also marked by a green electrical tape.

#### Testing

* Test sound by playing stimulus from Garageband.
* Test tap recording and stimulus re-recording by recording and then listening back to both tracks.
* Check audio level in booth (DETAILS TO FOLLOW)

**Electrode Prep**

* Take out electrodes (AVOID CONTACT WITH METAL)
* Fill red bucket with deoinized water and add ~¼ teaspoon of non-iodized salt
* Soak eeg electrodes incl 8 externals for 5min in deionoized water (bucket test), put into correct sized cap (after subject arrives)
* During soaking, run one-bucket test: test electrode noise, test shorted noise (amplifier noise), diagnose system faults
  + CM in Range light is on and not flickering
  + With scale to **100uV/div** and reference to **None**): signal should be relatively flat or start noisy and become relatively flat within 5 minutes
* **Test synchronization signal by playing stimulus in Garageband and observing Aux activity.**
* Make sure electrodes soak for entire 5 minutes even if testing takes less. Soak for no more than 5 minutes to avoid electrode damage.
* Run two-bucket test?: test environmental noise, test test inter-channel gain accuracy, absolute gain changes over time
* Add GSR gel to GSR electrodes
* Prepare 4 pieces of tape, put on side of table
* Prepare small drop of nu-prep, gauze, and q-tip
* Put electrodes on sticker sheet, fill with small amount of gel
* Fill syringe with gel (1 for 32 channels), put out prep materials (gauze, Q-tip), add gel to EX flat electrodes
* Towel on back of booth chair
* Insert electrodes in cap (start with red, yellow, green and black sections) (RED label (wire side) for 32 channels, BLACK label for all 64 channels)

## After Participant Arrives

*Never leave subject alone in booth; if you need to go to bathroom, someone else should stay w/ them*

* Ask subject to use restroom and wash hands first
* Go through consenting process with subject: Voluntary, Confidential, Tasks, Do they have any questions, If they want to participate sign form

### Set Up the Participant

* Measure head size ASAP
* Attach GSR sensors to palm (non-dominant hand)

### Prepare and place electrodes/cap onto subject

* Place cap electrodes (Array A or B, note which) into cap that fits participant as soon as possible (2nd person can even do during consenting).
* Skin Prep: 1) Clean (nu-prep), 2) Wipe (gauze), 3) Place (electrode); keep Q tip and gauze in your hand
* Clean skin (nu-prep); place **mastoid** electrodes (EX3, EX4)
* Place **cap** (size limits on label); Measure Cz (front/back, L/R) and center cap on head
  + Align Cz to be in the center both front-to-back and ear-to-ear
  + Inject gel into electrodes until just filling reservoir (don’t overfill or gel will drip on participant)
  + Any electrolyte bridge to CMS/DRL will mess up signal – don’t overfill electrodes near them
* Clean skin (nu-prep), place **Tapping (arm) Electrodes** (EX5 through EX7),
* Clean skin (nu-prep); place vert. and horiz. **EOG elctrodes** (EX1, EX2) near eyes (do last to prevent discomfort)
* Wrap DRL and CMS cord around other leads 5-7 times to minimize loop pickup area
  + CMS should be in the middle of the electrode array
  + CMS/DRL should be within 2 inches of each other
* Ask participant to walk slowly to booth
* Use Actiview to show subject their EEG when they wiggle mouth or head (use black box to switch to acquisition computer and drag Actiview off screen to right) - mostly for kids but can do with adults if time allows
* Ask participant to turn off phone or leave outside
* Inform participant that they will be on camera in the booth, “we will be able to see and hear you, and to talk to you via the microphone. We ask that you try to stay as still as possible during the experiments, and try not to talk to us unless you need to stop the experiment. You can talk between experiments and reposition your body as needed.”
* Actiview buttons: "Start" (check signal here), "Start File", "Pause"(this unpauses)

### EEG Booth

* Battery on
* “CM in range” light on (not blinking)
* Check - can participant hear you through intercom?
* Click “Start”
* Check offset potentials (impedence) (below 40).
* If >40, add more gel, twist electrode until >40. If that doesn’t work, take electrode out of cap and brush **very** gently with toothbrush in Sinha Lab drawer, then replace and add new gel.
* Check if you see EMG with tapping to make sure hand posture and electrode location is good

### Start Experiments

* Remind participant to:
  1. Stay still,
  2. Not talk during experiments unless something is wrong/they need to stop,
  3. Not touch electrodes,
  4. Try to stay awake and focus on the video or sounds
* For NAP experiment, inform subject that there will be silent sections and to try not to laugh
* Click on “Start File” in Actiview
* Pull up files, enter participant ID
* Click on “Paused” to begin data acquisition
* Start recording in Garageband to start stimuli
* During experiments: monitor participant on screen throughout, take notes, and press **trigger keys** to indicate behavior or noise/drift in electrodes
* To take a break…
  + **Pause Garageband with space bar**
  + **Press F10 to mark break**
  + **Pause EEG by pressing “Pause Save”**
  + **…**
  + **Restart EEG by pressing “Paused”**
  + **Press F11**
  + **Press R to restart Garageband recording**
* To stop data collection, click on “Pause Save” and then “Stop”

### Save EEG data files as

* *Entrain\_< id>.bdf*

### Export Garageband files

* Save entire file as *Entrain\_<id>.band*
* Press “solo” button on “tap” track. Go to “Share > Export Song to Disk” and export to WAV file called *Entrain\_<id>\_TAP.wav*
* Unclick “solo” button on “tap” track and press “solo” button on “rerecord” track. Go to “Share > Export Song to Disk” and export to WAV file called *Entrain\_<id>\_RR.wav*

### After Experiments End

### Stop recording before taking out electrodes from AD box

### Ask participant to stay seated while you unplug equipment, unplug EX1-8 individually, by holding base of plug)

### Ask participant to stand and walk slowly to wooden chain

### Ask if they would prefer to remove adhesive sensors themselves or have help from you with alcohol swab. Ensure participant does not pull electrodes by the wire.

### Remove externals, GSR electrodes

### Place electrodes on table to deal with after participant leaves

### Remember at the end

### Ask subject questions to fill out reporting form/

### Payment

### Record subject ID in subject ID spreadsheet

## Cleanup Instructions (Sinha Lab ActiveEZ Electrodes)

### In the EEG Room

* Clean GSR electrodes by wiping down with alcohol + gauze, replace in GSR box on shelf
* Take out split bucket and place a fresh towel on either side. Take out a third towel for drying.
* Place electrodes (including external electrodes but not GSR electrode), EEG cap, and chin strap in one side and the end of the wires in the other side, wrapped up to keep them dry.

### Take the following items with you into the Prep Room

* Split bucket with electrodes, cap and chin strap
* Empty bottle(s) for distilled water
* Red bucket in which electrodes were soaked
* **Key** for Prep Room
* ID to re-enter EEG room
* **Lock EEG Lab behind you**

### In the Prep Room: Cleaning Electrodes

* Before taking out electrodes from the split bucket, place the plastic tray (found across from the sink) on the counter to avoid the electrodes coming into contact with the metal counter.
* Keeping ends of wires wrapped in towel in opposite side of split bucket, take out electrode heads wrapped in towel and place them on towel on plastic tray. Place red bucket labeled electrode washing (can be found next to plastic tray) into sink. Ensure that electrodes remain in the bucket at all times and do not touch metal sink.
* Wash electrodes thoroughly under deionized water (right tap). Use pressure from stream to remove all gel in the electrodes. (Separate, untangle, and wash each group of electrodes e.g. red, green etc.)
* Check that each electrode is clean. If you are cleaning up alone, after each set of electrodes have been cleaned, dry each one and check that each is clean before placing them on towel. Ensure that no gel is remaining in any electrodes.
* After all electrodes have been checked, take out glass bowl from drawer and place the electrodes into bowl. Take spray bottle with disinfectant (hydrogen peroxide in fume hood) and spray electrodes from all sides (about 3 or 4 sprays). Set timer for 1 minute and allow electrodes to soak in disinfectant.
* After 1 minute, rinse electrodes once more in sink with deionized water. Rinse bowl.
* Wrap rinsed, disinfected electrodes in a clean (gel-free) towel and place them in split bucket.

### In Prep Room: EEG Cap and Chin Strap

* Take out blue bucket (labeled: “Cap Washing: Before Disinfectant”) for washing cap and chin strap. Place cap and chin strap inside bucket and place bucket in sink.
* For washing cap and chin strap, regular tap water should be used (left tap). Do an initial rinse with warm (not hot) tap water to remove large bits of gel.
* Fill bucket with warm water and add a small drop of dish detergent (located in drawer below counter).
* Wash cap and chin strap in bucket and ensure that all gel is removed from cap. Use pressure from water stream again if necessary.
* Place cap and chin strap into glass bowl and repeat same procedure as above using disinfectant. (Spray inside of cap and chin strap and leave them to soak in disinfectant for 1 minute.)
* After 1 minute, rinse cap and chin strap in sink once again with tap water.
* Dry cap and chin strap in towel and place them in split bucket. **Be careful to avoid contact of metal chin strap snaps with electrodes.**

### In Prep Room: Other

* Empty salt water from red bucket (electrode soaking), used in EEG room for bucket test, into sink.
* Fill empty bottle brought from EEG room with de-ionized water (right tap).
* Place glass bowl and detergent into drawer where they were found.
* Replace red and blue buckets along with plastic tray back into fume hood across from sink.
* Lock door behind you when leaving (bring key!)

### Before leaving, take the following things back to the EEG room

* Split bucket with electrodes, cap and chin strap
* Filled bottle with distilled water
* **Key for Prep Room**
* Red Bucket for electrode soaking

## Clean Up: Misc

### EEG Booth

* Turn off AD Box
* Replace Sinha Lab speaker/audio cable

### For EEG Lab

* Fill in electrode/cap usage Excel spreadsheet on acquisition computer (we are activeEZ)
* Upload all files to Google Drive shared data folder

### Clean Up EEG Room

* Break down and pack up recording rig
* Dirty towels to MRI waiting room linen bin in closet
* Replace fresh towels in booth (on chair) and on prep table
* Throw away syringe and trash
* Remove tally from whiteboard inventory for any used up disposables
* Return Prep Room key to hook
* Spray and wipe EEG prep table with disinfectant

### Before you leave

* Put everything back in its place

#### Turn off

* Booth Lights (all)
* Fan
* AD Box
* Speaker for intercom
* Unplug camera
* Monitors (all 4)
* Don't turn off PCs, but do log off
* Connect battery that was just used to charger on shelf
* Take USBs
* Transfer updated stimulus, config, and data files through google drive to macbook
* ALWAYS save data to flash drive or Google Drive right away when done because someone could always delete any file on the EEG Lab PCs. EEG Lab computers are not backed up automatically.
* Doors to booth are left open
* E-mail steve/Annie/listserv with any problems
* DO NOT LEAVE WITH CLEANING ROOM KEY

#### General Guideslines/Info

* The battery age is marked on the belly side, and the old battery is also marked by a green electrical tape.
* If you get locked out of a space, try asking Atsushi (corner office at end of hall), Ramika (facilities office at other end of hall), or Steve (office near door to elevator). If no one is in their offices, you will need to call MIT police to be let in. Call the non-emergency line.

**SETTING UP AUDIO INPUT/ OUTPUT FOR ENTRAINMENT STUDY**

1. **Connect the red box (Focusrite) to laptop using appropriate USB cable.**
   1. (Laptop should not be charging unless necessary)
2. **Check levels of the dials and lights**
   1. Left (rerecord) and middle (tap) dials should be turned all the way up
   2. Right dial (all the way down) should not matter
   3. Little upper right dial (45 degrees/ 2:00)
   4. 48V and direct monitor lights should not be on (should be dark) - BAD THINGS WILL HAPPEN IF DIRECT MONITOR LIGHT IS ON
   5. ‘Inst’ (instrument) lit up under the left and middle dial
3. **Connect cables to the box**
   1. Connect splitter cable (Focus Rite Sound and EEG in) to the box [[[wait – all right-hand signals should come from back of Focusrite for volume control!!!?]]]
   2. Connect Tap out cable to the box
   3. Connect Re-record cable to box (Loop)
   4. **Run input cables to booth ports 10, 11, and 12**
4. **Inside the booth**
5. Connect Cables 10 (box device), 11 (audio, to speaker), 12 (tap recording)
6. Place tap block on chair/lap pad
7. Put the box device (E1) (connected to device input cable - 10) on the floor next to the chair
8. Plug in device power cable to wall port by TV
9. CAREFULLY plug clear 5-pin DIN cable into the 7-pin biosemiactive-two port
10. **Press buttons to turn on battery and light.** (The light keeps the battery awake!)

**USING GARAGE BAND FOR ENTRAINMENT STUDY**

**\*\*\*TURN OFF WIFI ON COMPUTER/ DO NOT DISTURB/ ETC.\*\*\***

1. Open Garage band three-track template
2. Save as *Entrain\_<id>.band*
3. Find stimulus .wav file on computer, drag stimulus .wav file into middle track
4. Click on red circle (record circle) on the left side of the top and bottom track to get them to flash (ready to record)
5. Drag the play head to the beginning of the stimulus (if needed)
6. Turn off the 1,2,3,4 and the metronome in upper right
7. Press record circle (at top) or “R” to start recording – will start playing
8. Space bar to stop the recording, “R” or circle to restart.
9. Immediately “file>save file”
10. Save the top and bottom tracks as .wav files
    1. Solo re-recording
       1. Share > Export song to disc > .Wav, uncompressed 16 bit *Entrain\_<id>\_RR.wav*
    2. Solo the other track (bottom)
       1. Share > Export song to disc > .Wav, uncompressed 16 bit *Entrain\_<id>\_TAP.wav*