EEG EQUIPMENT : STANDARDIZATION PROTOCOL

TIMING
Although standardization across EGI equipment is a touted characteristics of the system, regular testing of the timing is important and will aid in analysis (or in the elimination of variable that might confound analysis). Of importance, different monitors may have slightly different refresh rates or delays and thus accounting for site specific “delays” between the Eprime code and the NetStation flags will be important.

AV timing test
- In months June – Dec 2013, please conduct the standard EGI timing test for both visual and auditory modalities using the AV timing tester device. This includes a 1 hour visual test and a 1 hour auditory test.
- In months Jan 2014-end of data collection, please conduct the standard EGI timing tests quarterly (Jan, April, July, Oct).
- Please name files with test and date (audio_Site_060113; visual_Site_060113).
- Use Timing Test Exporter (located in the Applications/ Net Station folder), to analyze the timing from STM+ to DIN.
- Export the file to text and email to sjwebb@uw.edu.
- Timing tests should be kept on file locally as well as at SCRI.
- Paradigm timing tests.
- Each Paradigm has a timing test version. These will also need to be run during the development phase to confirm that Eprime – NetStation signal timing are maintained.

Timing Test log: See GOOGLE DRIVE “Ace Girls AV Timing Test”. Please include variables: Site, Experimenter initials, Test type, Date, File Name, Range offset, Mean offset, Notes

NETS
Net use length varies based on # & type subjects and experimenter experience. Regular testing of nets and tracking of bad electrodes and repairs is critical to insuring correct working equipment.

Please provide information about the nets that are in use for your site.
Nets: See GOOGLE DRIVE “Ace Girls Net list”. Variables include: Site, Net Size, Net ID#, Purchase Date, Repair History, Net notes.

Net Bucket Tests. Bucket tests of active nets should be done monthly to insure that the nets are in good working order. Please follow EGI specifications. Please use the following table (or similar) for tracking.
Budget Test: Please keep log at local location. Please annotate /Net Notes/ column on GOOGLE DRIVE “Ace Girls Net list” if there are changes or repairs made to nets.
SESSION PROTOCOL

SESSION ORDER
- First measures to be completed are those related to qualification: ADOS, IQ, ADI
  - Time between diagnostic measures and last experimental measure is 6 months.
- EEG and FMRI protocols will be counterbalanced.
  - Time between EEG and FMRI protocol is 2 weeks – 3 months.

The following actions are expected to occur for the EEG protocol.

ACTIONS & SPECS
1. Consent (Visit 1, Diagnostic Clinician)
   a. Explain EEG & Show net as needed
   b. Perform EEG desensitization or exposure as needed.
   c. Perform room familiarization as needed.
   d. Provide with social script or support info as needed.
2. Previsit
   a. Reboot both Eprime and NetStation computers prior to start of visit.
   b. Prepare Net Station computer for collection.
      i. Info needed for NetStation session template: ID# (XXX.0X), site, age (years), gender, net serial number.
   c. Prepare Eprime computer for collection
      i. Info needed for Eprime paradigms: ID# XXX.0X
   d. Prepare log for collection
   e. Prepare any support devices (checklists, social scripts, etc)

<table>
<thead>
<tr>
<th>Boston</th>
<th>Seattle</th>
<th>New Haven</th>
<th>LA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participant</td>
<td>Flexible. Subject in Chair</td>
<td>Subject in chair in left corner of room.</td>
<td></td>
</tr>
<tr>
<td>Seating</td>
<td>with arms in front CENTER</td>
<td>Table in front of subject.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>of room. Small table in front of subject</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Button Box</td>
<td>EGI – 4 button</td>
<td>EGI – 4 button</td>
<td>EGI – 4 button</td>
</tr>
<tr>
<td>BA location</td>
<td>To Left of subject for Resting;</td>
<td>To Left of subject for Resting;</td>
<td>To Left of subject for Resting;</td>
</tr>
<tr>
<td></td>
<td>Behind subject for all others.</td>
<td>Behind subject for all others.</td>
<td>Behind subject for all others.</td>
</tr>
</tbody>
</table>
3. Visit
   a. Remind about EEG net & desensitization as needed.
   b. Seat participant in correct location.
      i. *XX cm from monitor.*
      ii. Button box should be on table right in front of subject.
      iii. **BA seated to left** *(Boston, Seattle)*
   c. Provide participant with checklist or other support devices for visit.
   d. Introduce BA and role during session.
   e. Measure head for net size.
   f. Net.
   g. Start protocol for collection.
      i. All directions will be provided within experiment. Experimenter will need to confirm understanding and initiate paradigms.
   h. Record attention using Eprime coding.
      i. Space bar is pressed when subject not attending; bar can be held down for as long as subject not attending (ie., does not need to be released and re-pressed for each trial).
   i. Re-running of paradigms
      i. Resting state, Biomotion, can be re-run during session.
      ii. Word segmentation may not be re-run.
      iii. **It is not recommend that Reward be re-run given the length / time.**
   j. Record performance on Logs.
   k. End session with removal of net.
   l. Proceed to additional measures.

4. Postvisit
   a. Finalize logs & data summary
   b. Post visit system checks

5. Data processing
   a. Enter logs.
   b. Provide raw EEG data + video to LONI. (Weekly)
   c. Onsite data checks & reporting. (Monthly)
   d. Centralized data checks & reporting. (Monthly)

6. Re-testing
   a. Resting state, Biomotion can be re-run at a later date
   b. Reward can be re-run at a later date. An alternative version has been developed in this case.
   c. Word Segmentation can be re-run if session > 3 months since last exposure to EEG or fMRI.
ROLES

Roles may vary across sites; the following guidelines are based on the protocol used at SCRI. Please adapt or modify these guidelines to reflect the process that occurs at each site.

Data collection roles (SCRI)

Experimenter (SCRI)
The role of the data collection “experimenter” is to guide the participant through successful data collection. The EXP is the lead for the session and will be involved in the management of the equipment and the participant experience.

The EXP will measure and net the subject, and will be responsible for running the NetStation/Eprime system, coding for attention and logging subject behaviors.

BA (SCRI)
The role of the “BA” is to manage the subject’s behavior during the protocol to increase compliance and reduce artifact. A BA will be in proximity to the participant and will engage with the minimum amount of actions needed to keep the participant on task. This might include:

- Reminders to reduce movement of body (feet, hands, head)
- Provide schedule or checklist for measuring progress during breaks.
- Establishing rapport with subject.
- Providing snack, break, or other means of insuring participant comfort.
- Assessing participant compliance and ability to participate validly in the protocol (e.g., suggesting skipping eyes closed if behavior becomes non-compliant).

Data collection roles (New Haven)

Data collection roles (Boston)

Data collection roles (UCLA)
EEG / NETSTATION ACQUISITION TEMPLATE

Please see the Dropbox / EEG_GirlsGrant / Acquisition 050913 / for the acquisition template: Ace Girls 2; Standard 500Hz with Video-AceV2 (or zip file: Acquisition setup to send.zip).

Screen shots of acquisition template and session template are provided (Screenshot - Acquisition setup; Screenshot - Session windows.png; Screenshot - Windows.png)

Recording is at 500Hz
EQUIPMENT
<table>
<thead>
<tr>
<th></th>
<th>Boston</th>
<th>Seattle</th>
<th>New Haven</th>
<th>LA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject Monitor</td>
<td>17” Tobii</td>
<td>23” Dell</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speakers</td>
<td>2 on floor under monitor, at right and left edges of monitor</td>
<td>Central speaker under monitor</td>
<td>Central speaker behind monitor</td>
<td></td>
</tr>
<tr>
<td>Sound meter</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eprime Computer</td>
<td>Dell Precision T5500 (Eprime 2.0 professional)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
EEG PROTOCOL ORDER

1. Measure
2. Netting
3. Paradigm 1: Resting - (Fixed order)
   a. Eyes open to screen-saver video 15 sec
   b. Eyes open to screen-saver video 15 sec
   c. Eyes closed 15 sec
   d. Eyes open to screen-saver video 15 sec
   e. Eyes open to screen-saver video 15 sec
   f. Eyes closed 15 sec
4. Paradigm 2: Word Segmentation - (Fixed order)
   a. Exposure 2 min 30 sec
   b. Test 2 min 30 sec
5. Paradigm 3: Resting - (Fixed order)
   a. Eyes open to screen-saver video 15 sec
   b. Eyes open to screen-saver video 15 sec
   c. Eyes closed 15 sec
   d. Eyes open to screen-saver video 15 sec
   e. Eyes open to screen-saver video 15 sec
   f. Eyes closed 15 sec
6. Paradigm 4: Bio Motion
   a. 4 blocks
7. Paradigm 5: Resting - (Fixed order)
   a. Eyes open to screen-saver video 15 sec
   b. Eyes open to screen-saver video 15 sec
   c. Eyes closed 15 sec
   d. Eyes open to screen-saver video 15 sec
   e. Eyes open to screen-saver video 15 sec
   f. Eyes closed 15 sec
8. Paradigm 6: NON Reward
   a. 3 block 40 trials
9. Paradigm 7: Reward
   a. 3 blocks 40 trials
DATA LOGS

DOCUMENTS: Google Drive “ACE GirlsGrant EEG”

<table>
<thead>
<tr>
<th>Name</th>
<th>Document</th>
<th>Date</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEG Log Descriptive</td>
<td>EEGLog-All_060113 (first page)</td>
<td>5/30/13</td>
<td>V1</td>
</tr>
<tr>
<td>EEG Log Forms</td>
<td>EEGLog-All_060113 (second page - end)</td>
<td>5/30/13</td>
<td>V1</td>
</tr>
<tr>
<td>EEG Log abstract form</td>
<td>EEGLog_abstract form_060113</td>
<td>5/30/13</td>
<td>V1</td>
</tr>
</tbody>
</table>

The goal of these documents is to collect information during the EEG session that will allow the data to be properly identified (descriptive information) and quantified by the collection site. The information to be scored during the session provides valuable information about the behavior of the subject during the paradigms. Consistent reporting of this information will allow for participant as well as site specific variables to be analyzed and accounted.

Comments are included in the EEG Log Descriptive Form and Log Forms in order to map the information on the form to the data dictionary (abstract form). For use of the logs with subjects, print without comments.

DESCRIPTIVE
The descriptive variables are included in order to match the EEG files with the reported subject characteristics. Given that file mis-naming does occur, inclusion of ID, Date, Gender, Age and Subject’s clothing will allow EEG videos to be correctly linked to other variables in the study in the case that an error does occur.

Additionally, variables about the session (experimenter initials, BA initials, Session order) will be evaluated in regard to their influence on the data.

Participant specific EEG variables (head size, net size and number, net fit, protocol, BA and parent location) will be used during analysis to look at
- the effect of head size on EEG,
- to make sure the relation between head size and net size is similar across sites,
- to account for any variability or similarity in nets (e.g., consistent bad channel),
- that the reasons for protocol deviations are similar across sites,
- and the influence of the location of the BA/Parent on lateralization of EEG activity.
Lastly, it is important that medication use be assessed at each session as participants will differ on the types of medication used, medication use may differ across days of the week or during school/on school days, and the time from medication to the EEG session may be a variable of interest.

**NET FIT QUALITY**

<table>
<thead>
<tr>
<th>Poor (1)</th>
<th>Average (2)</th>
<th>Excellent (3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RENET</td>
<td>Offset: Front Back Right Left Other</td>
<td></td>
</tr>
</tbody>
</table>

**TIME**

Please mark the start time of the paradigm in hours: minutes am/pm.

**VARIABLES TO ASSESS** across the paradigms – the same table of variables (and options) are used for each paradigm in order to systematically code for attention, movement, positive emotion, negative emotion, EEG quality and artifact. Descriptions are provided below of the behaviors that are characterized by these variables.

- **Attention**: participant actively engages in the task by visual fixation on the monitor or on the visual stimulus of interest.
  - 0% reflects lack of attention or participant attending away from paradigm;
  - 100% reflects total attention.

- **Movement**: participant engages in physical movements such as hand, head or body movements that cause visible change in EEG signal.
  - 0% movement reflects a still, calm body with no movement impact on EEG;
  - 100% reflects continuous body movements that alter EEG signal.

- **Positive Emotion**: participant shows positive affect during the paradigm such as smiling, laughing, positive verbal comments (“I like this”; “that was fun”; “I like you”). Comments do not need to be about the paradigm, per se, but suggest that the participant is in a pleasant, enjoyable state.
  - 0% positive emotion means that the participant did not engage in any displays of positive affect. This could be because the participant was neutral in affect or negative in affect.
  - 100% positive emotion means the participant engaged in continuous displays of positive affect.

- **Negative Emotion**: participant shows negative affect during the paradigm such as frowning, scowling, crying, tension, negative verbal comments (“When will this be done?” “This is boring.” “I don’t like the hat.”). Comments do not need to be about the paradigm, per se, but suggest that the participant is in a negative state.
0% negative emotion means that the participant did not engage in any displays of negative affect. This could be because the participant was neutral in affect or positive in affect.

100% negative emotion means that the participant engaged in continuous displays of negative affect. If 100% is chosen, then it would be expected that 0% positive emotion was displayed.

*Of note, Positive + Negative emotion does not need to = 100%, as many participants will not show affect. So it would be possible to have a subject show 25% positive affect + 25% negative affect and un reported 50% neutral.*

**EEG:** Quantification of the EEG signal during the block that suggests the presence or absence of data that can be used for analysis.

- No Data (did not complete due to participant or equipment) or Poor (artifact contaminated data) will not be analyzed.
- Questionable data should will be reviewed by the data analysis team and a determination of Analysis (yes – data should be included in post-processing) or No-Analysis (no- data should NOT be included in post-processing) should be made. Data will be recoded to POOR if not included in analysis.
- Good or Excellent data will be included in post-processing steps.

Additional values that reflect data artifact classes are included after each table. These include Net Error (net not working properly; fit change), Exp Error (experimenter causes error in the paradigm or subject), System Error (NetStation/Eprime error that may impact the files), Talking (participant [or experimenter] talking), Chewing (participant mouth or jaw movements), Eye Movements (excessive blinks or horizontal eye movements that are regularly visible in signal); Eye movements would only be identified IF the movements are such that they are likely to impact post processing (e.g., participant blinks on every trial or consistently looks to find BA or parent in room).

**QUANTIFICATION OF VARIABLES**

- 0% - never occurs
  - 0% attention = participant does not attend or comply with the protocol
  - 0% movement = participant does not have physical movements that impact the EEG signal
- 25% - happens rarely or ~ 25% seconds of the protocol
  - Quantification may be in seconds (i.e., the participant only attended for 5 seconds of the 15 seconds of resting) or in trials (the participant only attended for 25% of the trials in the block of the biomotion). As all of the trial based paradigms will provide counts of attended trials (based on the absence of the space bar press during the protocol) at the end of the block, this can be used as a quantification metric.
- 50% - half of the time
- 75% - most of the time
- 100% - all of the time
NET FIT QUALITY
Please quantify net fit at the end of each paradigm. The same quantification is used as in the start of the session.

DECISIONS FOR DATA ANALYSIS
Please make a final determination as to the usefulness of the data for post-processing and analysis

- Data – data is available and should be included in post-processing. This data, overall, should be of good or excellent quality such that there is enough trials or artifact free periods for abstraction.
- Questionable – data is of mixed quality. Data of questionable quality will be used for post-processing but will be reviewed by senior EEG analyst.
  - Please quantify is the data is questionable due to any or multiple reasons
  - Quality of EEG signal
  - Attention
  - Refusal
  - Did not understand task or behavioral directions
- No Data- data should not be included in post-processing as artifact or other variables make the data invalid or unlikely to produce good signal : noise.
  - Please quantify is the data is not usable due to any or multiple reasons
  - Quality of EEG signal
  - Attention
  - Refusal
  - Did not understand task or behavioral directions
- IF the participant’s behavior is such that a second run of the EEG might provide better signal quality, please check "Re-Run" and identify whether or not it should be attempted Today (at the current session) or if the participant should be invited back. This will allow the analysis team to "look" for additional data from this participant prior to post-analysis. It is assumed that if the paradigm is re-attempted at the current session, an additional log for that paradigm will be included and entered. Of note, the only paradigms that can be “re-attempted” are those that were not conducted on that day (i.e., participant had to leave early or couldn’t tolerate session length) or ones in which re-exposure would not influence the results (biomotion, resting). Word segmentation and Reward/Non-Reward may not be re-run if the subject has exposure to more that 50% of the paradigm.

PARADIGM SPECIFIC VARIABLES
1. Please confirm order : the default order will be in bold but alternative or deviations in order may be included.
2. Resting 1, 3, 5. Under decisions for analysis, Eyes Closed and Eyes Open are reported on separately.
3. Word Segmentation 2: Please include information from debriefing. Questions are listed on the log and should be asked exactly as written.
4. Bio Motion 4. Please note that motion of feet, legs, and arms or any imitation of point light displays is of importance. An additional section for comment on movement or motion is provided.

5. Reward 6. Please code what the participant’s reward choice was.

**BEHAVIORAL MANAGEMENT OF PARTICIPANTS**

The goal is to have the participant engage in the paradigms – with limited artifact to the EEG. Breaks may be taken between paradigms and within paradigms EXCEPT for the word segmentation, which must be run through from exposure to test with minimal break.

Compliance includes:
- Sitting still: hands folded on table top (or visible to EXP)
  - “Quiet body.” “Sit still as a statue.” “No moving.”
- Feet still: on foot still or flat on floor.
- Body still: comfortable placement in chair
- Oral: No talking during experiments; Conversation limited to breaks between or within paradigm.
  - “Save your words for the break.”
  - “No talking now. Wait for the break.”
  - “Time to listen” (word segmentation)
  - Reduction (or silence) during the word segmentation is critical.
- Pay attention: Visual fixation on the computer screen.
  - “Watch the screen/tv/computer.” “Eyes forward.”