**Multimodal MEG Scan @ MEG Center: Day 2**

**Created by RC 1/17/2013, updated by RC on 5/17/13**

**Paperwork:** Consent, Participant Info Sheet, Pre-Test, Post-Test, MEG Metal Screen, MEG Cleanup Checklist, Payment Certificate

**At LNCD:**

1. Greet subject
2. Give parent appropriate forms (if necessary).
3. Walk up to the MEG center together (parent can wait in Starbucks/ Lobby)

**Materials for MEG**

* Consent Form
* Participant Info Sheet
* Pre-Scan Questionnaire
* MEG Run Sheet #1 – Run Sheet(located at MEG Center)
* MEG Run Sheet #2 – head origins (located at MEG Center)
* Post- Scan Questionnaire
* Payment Sheet and WePay Card
* MEG Cleanup Checklist

**At MEG Center**

1. **Go into Reading Room (TJ’s office) and sign out the MEG card key (don’t forget to sign it back in and drop off the key at the end of the visit.**
2. Ask the subject to “de-metal”: empty pockets, remove jewelry, watches, wallets, beepers, phones, hairclips, piercings, bras with underwire or plastic hooks). If the subject has makeup on, have them wash it off.
3. In Control Room: Give the subject foot-covers (located behind the MEG door). Walk the subject to the MEG room and have them sit down slowly. Pump the subject’s seat up using the foot pump until the subject feels the back and top of his/her head touching the machine. Ask the subject to sit quietly in the machine and relax. Let them know that we will come back to get them in a couple of minutes.
4. Login to the MEG Acquisition computer
   1. Login: **luna666**
5. Go to Applications> Neuromag> Acquisition
   1. Project: luna (not luna\_pilot)
   2. Subject information:

* Sub first name: LUNA ID
* Sub last name: DATE (ex. 20130517)
* Sub birthdate: 01/01/1901
  1. Click ‘Load Settings’ in the top left tab and choose: WM\_Luna
  2. Click ‘Go’ button to do initial measure of subject and make sure subject is readable by the machine
  3. Choose, ‘Scales’ to glance through channel pages
  4. Optional: Change the colors of the waves by clicking on ‘Selection’< ‘colors’
  5. If data is clean, proceed to preparation. If not, take the subject out and de-metal again. If the source of artifact is unknown, terminate the scan. MAKE SURE SUBJECT DID NOT FORGET TO TAKE OFF SMALL JEWELRY OR METAL BRA
  6. Press ‘STOP’ on Acquisition window and go get subject out of the chair.

1. In Preparation Room:

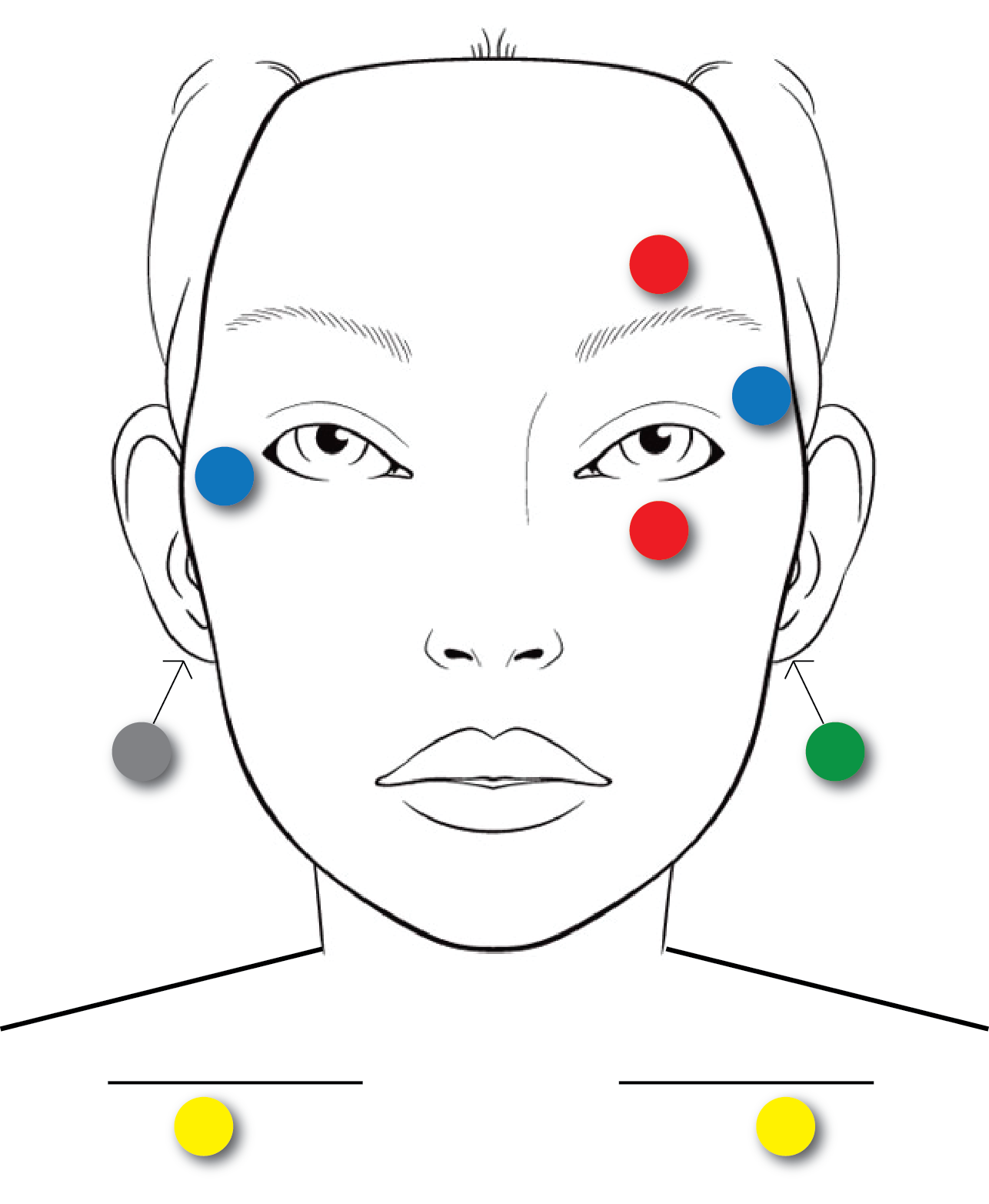
Pull chair away from counter and have subject take a seat. Let them know we will be using some conductance cream to rub their skin and attach some electrodes to their face, clavicles, and behind the ears. Let the subject know that we will be attaching four coils to their head using glue and an air gun (also, reassure the subject that the glue will be removed using acetone).

1. Open fire cabinet in front of the room using key located above the box attached to the wall. Grab collodion glue bottle and acetone container.
2. Pour collodion into clear glass ashtray. Pour a small amount of conductance cream onto a paper towel. Have Q-tips, pieces of clear tape, conductance cream, and gauze squares ready for use during preparation.
   1. **4 HPI Head Coils** (2 over frontal area and 2 over posterior area with distance apart. Should be placed flat against the surface of the skull with hair parted):
      * 1. Dip a gauze square into the ashtray of collodin
        2. Place the gauze square over the coil with the flat side of coil touching the skin.
        3. Step on the pedal of the air gun and dry the gauze square over the coil (Move your fingers around so you won’t stick to the wet gauze.)
        4. Make sure the gauze firmly secures the coil to the skull.
        5. Repeat this for the 3 other HPI coils.
        6. Put the excess collodion back to the bottle from the tray. The fluid is expensive and dries up quickly.
   2. **4 EOG Facial Electrodes** (2 red vertical above and below left eye & 2 blue lateral at upper left side of left eye and lower right side of right eye):
      * 1. Clean the skin to improve conductance: Squeeze out cleansing gel on paper towel
        2. Apply gel to q-tip and scratch area where electrode will be placed (until skin is slightly pinkish)
        3. Take electrode and fill the small cavity on top with conductance gel
        4. Put electrode on area just cleaned. Secure with tape
        5. Pull back electrode wires over top of ears
        6. Place 2 red electrodes above and below left eye
        7. Place 2 blue electrodes: 1 at the upper left side of left eye and 1 at lower right side of right eye
   3. **2 EKG Electrodes** (2 yellow underneath the collar bones)

Using the same procedure as the EOG Facial Electrodes, place the 2 yellow electrodes underneath the left and right collar bones.

* 1. **2 Grounding/ Reference Electrodes** (2 green and grey electrodes behind ears)

Using the same procedure as the EOG Facial Electrodes, place the green grounding electrode behind the left ear and the grey reference electrode behind the right ear.

* 1. Bundle the wires: HPI coils should be taped together and go over the right shoulder. The other electrodes should go over the left shoulder. Secure, loosely, to the shoulders with tape.

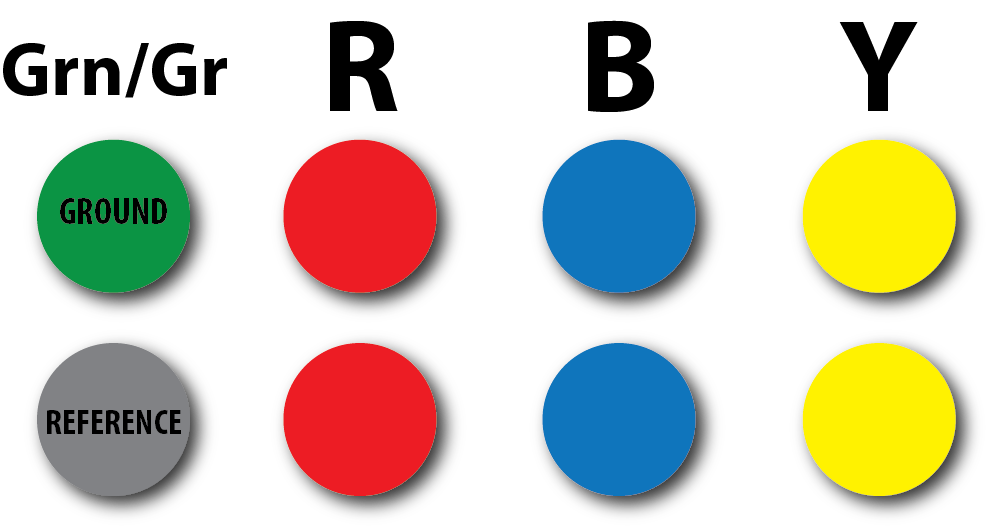
**GROUND**

**REFERENCE**

**In MRS Control Room**

1. Move the wooden chair away from the railing and ask the subject to sit
2. Place the goggles as straight as possible on the subject’s head. Tighten strap in back.
3. At Acquisition Computer: Click “**Digitization HPI**” button at the bottom and click “**coordinate head frame** **alignment**”
4. Digitization:
   * + 1. Remove the cap on the digitize pen
       2. Click the air once and listen for a beep indicating it is ready to digitize
       3. Place pen perpendicular to middle of the goggle for nasal point (#3 Nasion), click once
       4. Place pen perpendicular to left and right ears. Listen for double beep indicating digitization of cardinal marks is done
       5. Record LPA, RPA, and Nasion X,Y,Z coordinates on MEG Run Sheet
       6. Computer will accept if distance LPA and RPA x coordinate is less than 5mm
       7. Digitize 4 HPI coils. Pen has to touch skull and be perpendicular to skull
       8. Digitize extra points around head getting a total of 24 points
       9. Once you’re done with digitization, click the pen in the air away from subject. Put the cap back onto the pen and place it in holder on chair
       10. Remove goggles from subject and secure them behind the digitization machine on the table

**In MEG Machine Room**

1. Before going into MEG room, make sure you have no metal on you and that the subject’s shoes, as well as yours, are off.
2. Turn on light from switch in control room. Turn it up to 100 (TURN DOWN TO 30 BEFORE SCANNING)
3. Have subject sit in chair all the way until his back reaches back of chair
4. Pump the subject up by stepping on the paddle left to the chair until subject’s head firmly touches the top
5. Plug the HPI coils to the slot on the right side of machine. There are labels for each electrode. Plug into back end so empty pin will be at the front:
   * + Red EOGs go into EOG 61
     + Blue EOGs go into EOG 62
     + Yellow EKGs go into 63
     + Green goes into “grounding” and
     + Grey goes into “reference” labeled connections
6. Roll projection screen in front of subject and align to line on the floor
7. Give subject right hand glove and ensure that it works
8. Close MSR room door
9. Turn on projector by pressing “I” button on face of projector twice
10. Adjust light to 30
11. Click “**Go**” in the acquisition window
12. Check for bad channels and record on MEG run sheet
13. Turn on the microphone: press “T” to talk to the subject and release “T” to hear them
    1. HOLD “T” for 10 s and this will disable the continuous mic

Tell the subject to relax and let them know when we are about to start

**On the E-Prime Computer**

* + Login: **cabmsi**
  + Password: **cabmsi**

1. Select the shortcut on the desktop labeled “**All Investigator Paradigms**”
2. Open Luna folder> Select “**Multimodal WM Task**”

There are 12 runs of the Working Memory Task in the 1 E-Prime file

1. Do instructions portion without recording. Talk to subject and read instructions. Have them play practice game while you flip through channels to record bad ones to heat.
2. On Acquisition PC:
   1. Click “**go**” then “**selection”** on the left to see the list of channels
   2. Select “**tools**” from the top to open up “**squiddler”**
   3. Flip through the channels from the “**selection**” window and check for bad channels. If you see a bad channel
      * 1. Enter the channel number in the squibbler window
        2. Select “**commands**”, then “**heat sensor**”
        3. Wait for 5 seconds
        4. Select “**commands**”, then “**reset-all**”
3. After Instructions/ Practice game, open the actual E-Prime file (in appropriate version) and enter subject ID and session number. You can leave the instructions up for a minute, then hit **ENTER** to go to balloons window. Leave it here until the Acquisition computer is ready to go.

**When E-Prime task file is open and on balloons screen:**

1. Hit “**GO**” on Acquisition window when you are ready to scan
2. A window will pop out with the option “measure”

Talk to the subject and tell him/her we are about to start the paradigm. Briefly describe the instructions of the task and tell them to stay still.

1. Click “**Measure**” and the machine will tell you if it accepts the HPI position. Write down the head coordinates on the MEG Run Sheet
2. Click **Accept** if program suggests “Accept”
3. Click “**Record Raw**” + “**cHPI**”
4. E-Prime: Click **ENTER** to run task

During Scan: Routinely flip through channels to inspect data quality. Watch for alpha waves (indication of sleeping subject) and high frequency muscle tensions (indications of subject being uncomfortable). Write down bad channels and notable artifacts to MEG run sheet.

**At the end of the trial**

1. When E-Prime script ends, click “**stop**” on acquisition window
2. Talk to subject and tell him/her to relax
3. A window will pop out asking you to save the file:

Click on the filename box, enter **lunaID\_run#\_wm\_raw**

\*If you noticed a bad channel, you can only fix it when its not recording:

* Go to channel number in squiddler window
* Select “**commands”,** then “**heat sensor”**
* Wait for 5 seconds
* Select **“commands**”, then “**reset-all”**

\*If you noticed a channel that dropped out (not visible on screen anymore)

* Click **“XY”** under channels window
* Adjust “**Offset**” in squiddler window
* When channel is visible in “**XY**” window again, you’re channel is recovered

1. Keep going through until run 12.

Between runs, leave E-Prime at Balloons window and just hit enter after you click “**Record Raw+ cHPI**” in Acquisition computer

1. After all runs are complete, tell the subject : “You’re all done with the task. We’re going to turn off the projector and ask you to close your eyes and stay still for the next five minutes. We will come get you after five minutes”.
2. **REST:** Turn off the projector by pressing “O” button twice. Leave the lights at 30 and ensure that the projector is off by looking at the camera view of the room.
3. Hit “**Go”** and “**Measure**”. Write down head coordinates. Press “**Accept”**, “**Record Raw”,** and **“cHPI**”. Use stopwatch to collect 5 minutes of rest data. Click “**Stop”** when finished and save as “**lunaID\_rest\_raw”**
4. Inform the subject that you are coming in to get them. Unhook electrodes from machine, remove glove from subject, move projector back to its position against the wall, and press the pedal to release the subject chair. Ask subject to get up slowly and walk them back to the preparation room for cleanup.
5. **EMPTY ROOM DATA:** Make sure the door to the MEG is closed and leave the lights at 30.
   1. Press “**Go**”, hit “**Measure**”, select “**Reuse head coordinates**”, click “**Record Raw**” and **“cHPI**”
   2. Collect at least 2 minutes of empty room data.
   3. Hit “Stop” and save as: **lunaID\_emptyroom\_raw**
6. Exit Neuromag and log off the acquisition computer by right-clicking on the desktop
7. Turn off lights to MEG room by turning dial to 0
8. Turn off microphone unit by pressing “**Off”**
9. Save files on E-Prime computer to your USB and log off cabmsi (save the instructions Edat + Txt and task Edat+Txt)
10. Turn off lights behind the computers to whole MEG control room

**Clean up**

1. Disconnect coils and EOG/EKG/ground and reference electrodes
2. Clean up the subject in Preparation Room:
   1. Using a wet towel, pull of the tape and electrodes gently. Clean off the gel as well
   2. To remove HPI head coils, use acetone (stored in fire cabinet next to door) on a cotton ball.
   3. Clean electrodes off by washing the heads with a toothbrush and water
   4. Disinfect electrodes and coils with disinfecting fluid placed under the table in a large bucket
   5. Rinse electrodes and coils with warm water then dry with paper towel
   6. Lay out the clean, untangled electrodes on the bed in preparation room
   7. Clean table and ashtray and put the bottles back into the fire cabinet
3. While the subject is being cleaned off, complete post-test questionnaire and give the subject the WePay card ($75 for a completed MEG visit).
4. Make a copy of the MEG run sheet for the MEG center and drop it off in waiting room where consent copy was dropped.
5. Put the Collodion and acetone back into fire cabinet, lock, and put key back to its position
6. Make sure all items on MEG cleanup checklist are crossed off and lock up preparation and MRS rooms.
7. Make copies of consent and run sheets in reading room, leave copies for TJ, and sign out the card key and replace.

**Back at Lab**

1. Check subject in to Database.
   1. LNCD Database 🡪 Scheduling 🡪 Appointments 🡪 Multimodal 🡪 Select Subject’s Scan Appointment 🡪 Check In
      1. Verify that the proper tasks and questionnaires are selected.
         1. MM Pre-Post Scan\_2
         2. Spatial Working Memory
      2. Submit subject data: export edat files and save all 6 files (2 Edat, 2 txt, 2 text\_ex)
2. Put in the scan log – B:\\bea\_res\Multimodal\Multimodal\_Scan Log\_MEG\_Year2