WU-Minn HCP MEG Initial Data Release: Reference Manual

Appendix II – HCP MEG Protocol Standard Operating Procedures

4 March 2014

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Session MEG: MEG Scanning Standard Operating Procedure

Version 2.3
Effective Dates: <u>Oct 29, 2013</u> to *[date of issuance of a revision]*
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The procedures in this SOP should be followed exactly. If changes to the SOP are needed, please send suggested edits to T. Nolan, T. Kiser, L. Larson-Prior and S. Curtiss

I. Scope

This standard operating procedure (SOP) begins with registering the participant at the scanner computer, logging in, preparing the scanner room for the participant, and positioning the participant in the scanner. The SOP then describes the procedures and quality control (QC) metrics that will be performed during the MEG scan session for each participant, comprised of resting-state and task-evoked MEG scans. Part or all of this SOP may also be used if a participant needs to be re-scanned because of issues with scan quality. The output of this SOP will be scan data that will be uploaded to ConnectomeDB. Comments that are entered into the Session Data Sheet may also be entered into ConnectomeDB.

II. Procedures and quality metrics:

MEG Detailed Scanning SOP

1. **Prepare control room prior to arrival of participant**

    1.1. Check the MEG scanner Computer

    - ♦ Both of the screens (Acquisition GUI and Traces) should look normal. Click on the MEG scan computer screen, select "MSI" if you don't see the expected windows already.

    - ♦ Ensure that you have enough disk space for a full day's data collection.

    1.2. Check the E-Prime computer

    - ♦ Ensure that Participant Display is on.

    - ♦ Set screen resolution to 1024x768 pixel, cloned.

    - ♦ Set projector as the primary display and the control room monitor as the secondary display

    - ♦ Ensure that Participant Display switched via BOTH olive-green KVM boxes to "HCP"

        - Log in

- ♦ Right click to switch the USB "ghost" on the taskbar to Active
- ♦ Open scripts directory, shortcut on the desktop "MEG_HCP phase2"
  - Shortcuts to the eRun files are numbered in the order that they should be run.
  - E-Prime Scripts are listed on the data sheet in the order that they should be run.
  - Full E-Prime 2.0 Pro script names are: **Photodiode_test.es2, Photodiode_Parallel.es2, fixdot.es2, WM_for_MEG_run1_of_2.es2, WM_for_MEG_run2_of_2.es2, MEG_StoryMath.es2, MEG_Motor.es2.**
  - There are also practice E-Prime scripts to be run when appropriate.
- ♦ Test and confirm normal operation of the button box in Notepad.

1.3. Confirm the intercom and IR-TV function normally.

1.4. Register new patient:

- ♦ Participant ID: To run any scans, you will need an access code unique to each participant. This will already exist, confirm with the HCP research coordinator. Access codes can be reused for all sessions of the same participant.
- ♦ Go to New Patient. Fields required are:
  - *PT ID*: HCP ID Designation (e.g., **CP123401**)
  - *Family Name*: **HCP**
  - *Birthdate*: True date of birth is disallowed by IRB. Type the DOB as **01/01/1985**
  - *Gender*:   Select participant's gender
  - *Given Name*: **phs2pt**[###] where the participant number is sequentially incremented for this project.
  - *Middle name* & *Comment* are optional fields and should be left blank
  - Click "Save" at the top left to close the window.
  - Your new patient should now be at the top of the left column.
- ♦ Check the box to the left of your PTID, right click, and POST SELECTION.
  - This should enable the buttons "Digitize" and "Acq"
  - MEG Acquisition scan names are: [**HCPd2RNois, HCPd2PNois, EEG_5coils, HCPtestHS, HCPd2Rest, HCPd2WkMem, HCPd2StoryMath, HCPd2Motor**]. Confirm all of these are on the list, you will select them later.

2. Prepare scanner room prior to arrival of participant

2.1. Locate and collect necessary supplies:

- ♦ Fresh linens (sheet, washcloth, blanket, rolled towels for neck and lumbar support).
- ♦ Otic insert box should be available, to choose a good fit with the participant.
- ♦ Leg cushion wedge, lumbar pillow
- ♦ EEG/ECG/EMG materials (including 16 electrodes)
- ♦ Corrective Optics are in a briefcase near the E-Prime console.

2.2. Projector:

- ♦ Turn on projector using the wireless remote, and return the remote to the top of the panel. Confirm that the projector displays the cloned E-Prime PC desktop.

2.3. Physiological monitors:

- ♦ Ensure the EEG leads are plugged in for appropriate recording
- ♦ Get out EEG supplies: NuPrep, Ten20 paste, silk tape, marker, electrodes
- ♦ If you need to unplug another experiment's EOG/ECG leads hang them on the wall hooks
- ♦ ECG (one pair) /EOG (two pairs)/EMG (four pairs) sensors

2.4. Prepare scanner bed

- ♦ Press both buttons simultaneously to raise the bed until the audible alarm signals that you've reached the correct (scan) height.
- ♦ It should be set at correct height for empty room scan, and can be lowered slightly after that to allow participants to climb up, then raised again into proper scan position.
- ♦ Prepare dewar gantry: use inner button to tilt, outer button to pull. Dewar should be pulled as close as possible. In proper position, it should be one fingerwidth away (allowing for hair etc) from the bed.
- ♦ Complete pre-scan QC, set the dewar and bed, close the door and collect **HCPd2RNois** (empty room) scan using the participant's CP# so that it can be easily associated in the database. The empty room data should be collected before subject comes to SLU.

3. Prepare participant for scan session

3.1 Review consent forms.

3.2 Briefly introduce the personnel, techniques and equipment used to collect MEG.

3.3 Introduce & practice MOTOR, WM, STORY/MATH tasks in control room using practice scripts, answer questions and confirm understanding, and satisfactory performance of all the tasks.

3.4 Politely request that participant try using restroom before scan session:

♦ "The scan will last over an hour. We get the best quality data if we don't need to stop in the middle of the scan. So, it would help if you tried to use the restroom."

♦ Ask participant to store belongings in control room (there is also a lockable cabinet in the bathroom.)

3.5 ***Quality check*: *Vision check.***

♦ Poor vision will have been determined previously. If corrective lenses are required, use Snellen index output from the coordinator or reassess quickly with eye chart at SLU.

♦ Select proper lenses and modified goggles from control room. Attempt to correct to 20/40 or better.

3.6 At entrance to scanner room, do head-to-toe verbal sweep for metal

♦ Metal in clothing: Look for substantial metal embedded in clothing, or metal in contact with skin. Ask as specifically and clinically as possible whether participant is wearing underwire bra. Scrub tops are available.

♦ Mouth: removable retainers/dentures/jewelry etc.

♦ Hair: Do you have anything in your hair? Hairclips, bobby pins?

♦ Piercings: Do you have piercings in your ears or tongue? Any other piercings, necklaces, or jewelry? Ask, but be considerate, regarding wedding bands.

♦ Stored items: Anything at all in your front pockets, back pockets, socks or shoes? Carrying credit cards or anything else in bra? Is anything else being stored anywhere on your person (waistband etc)?

♦ "Do you mind taking your shoes off here?" (For this session, removing shoes will help participants during MOTOR task.)

4. **Participant Scan: HCPd2PNois**

4.1 Control room:

♦ Check in via intercom / remind participant to stay still:

• "Are you doing OK? As a reminder, while you're here, I will be checking on how you are doing. Please try to keep your head as still as possible when you answer. We can hear you in the control room when the door is open, and by constant intercom when the door is closed."

• "The MEG scanner is silent while it's running, so please remember to stay perfectly still as instructed. We will let you know any time it is ok to move around, and we will give you breaks."

• "Blinks, swallows, finger and toe tapping can be seen in the data, so please try to keep as still as possible."

♦ Adjust lights for scan session (mark on dimmer outside scan room)

- ♦ Ensure participant is comfortable
- ♦ Leave the scanner room and firmly close the scanner room door to avoid RF interference from outside of room.

4.2 Load First Data Scan

- ♦ At MEG scanner computer, choose Acquisition Setup button
- ♦ Right click in "SCAN" choose "**HCPd2PNois**" first, and duration 60sec
- ♦ Start initialization. REMINDER: It takes time—DO NOT reclick.
- ♦ When you see "acquisition in progress" popup box, it has a progress bar in the bottom – Don't rely on the trace-display's timing ribbon at the bottom.
- ♦ Review the data scan for magnetic artifacts in two ways:
  - Scroll data review per training
  - Headmodel epoch review per training

4.3 Degauss participant if necessary:

- ♦ Degaussing procedure: try small degausser first, large if necessary, as shown in training.
- ♦ Ask participant to relax: "At this point, take a second to relax. Take a deep breath if you need, and try to settle down into the scanner bed."
- ♦ "Relax your shoulders, your arms, your eyebrows, your jaw, and breathe."
- ♦ If degaussing was necessary, collect more **HCPd2PNois** scans, and review for improvement. Note reasons for, and results of additional noise scans on the Session Data Sheet.

4.4 Ask participant leading questions to identify discomfort:

- ♦ "Do you feel anything that might start to get uncomfortable after an hour without moving?"
- ♦ We need to take hints about participants' comfort level; e.g. "I should be OK" means "I'm not great, but I'll try to live with it."
- ♦ Consider places to put additional padding that might alleviate pressure (under neck, small of back, elbows).

5. **Digitization: positions of 5 coils, three landmarks, and subject's head shape are digitized.**

5.1 Preparation of subject

- ♦ Set Polhemus headrest (stored on shelf) to bed (has two black cushions and a grey cube on a Y-shaped white form).
- ♦ Arrange hair so it won't tangle too badly (long hair should dangle free not run down the neck).
- ♦ Prep skin of forehead and face near ears for coils with alcohol wipe.

♦ Affix coil markers; dot the center of each with crystal violet marker THEN tape to the participant's head, applying tape completely on coil and ALSO partly on wire. Take care to orient wires away from face and take care with tape.

- Coil 1 – in front of participant's LEFT tragus

- Coil 2 – in front of participant's RIGHT tragus

- Coil 3 – center of forehead near hairline, be certain it will get totally inside the dewar

- Coil 4 – left side of forehead near hairline in line with Coil 3

- Coil 5 – right side of forehead near hairline in line with Coil 3
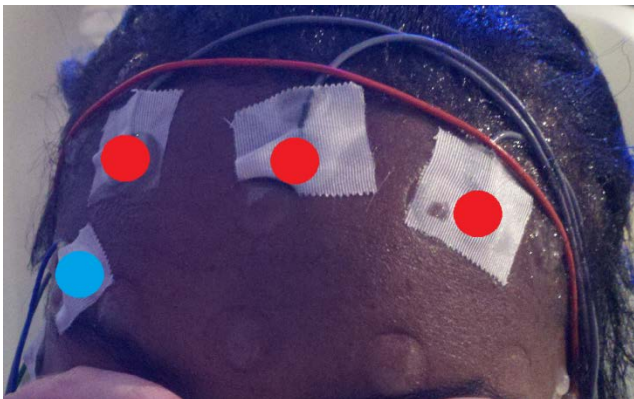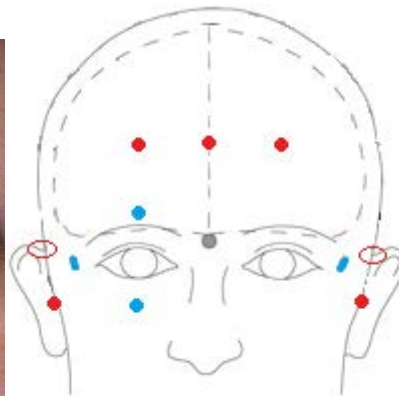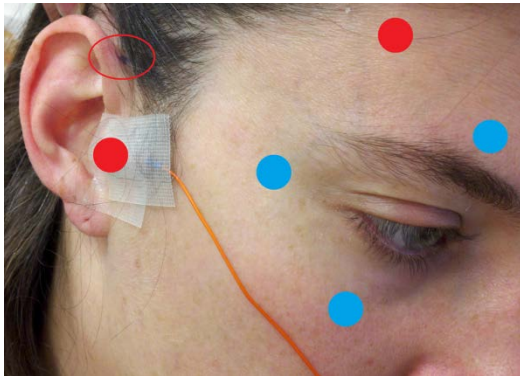
The peri-auricular point where the ear folds to the scalp (red oval in photo) is touched with the stylus perpendicularly to the scalp a few times to be used for registration to the MRI structural scans.

Vertical eye leads (blue dots in photo) are applied above and below participant's right eye, centered on pupil (channels 3 & 4). Horizontal eye leads (blue dot) are applied about 1cm lateral to the participant's outer canthus of each eye (right as in photo, left not shown, channels 5 & 6).

Five MEG position-sensor coils are affixed to the head between 1 and 5 cm from the hairline: at each tragus, midline above nasion, and above each eyebrow (as in red dots in photos).

EMG (electromyography) electrode stickers are applied to the participant's skin as in the photos below. The participant is asked to perform the practiced motion to determine best placement and the sensor is placed on the muscle that moves most.

Sensors are placed on the lateral superior surface on the extensor digitorum longus muscle (orange ovals) and near the medial malleolus of each foot.
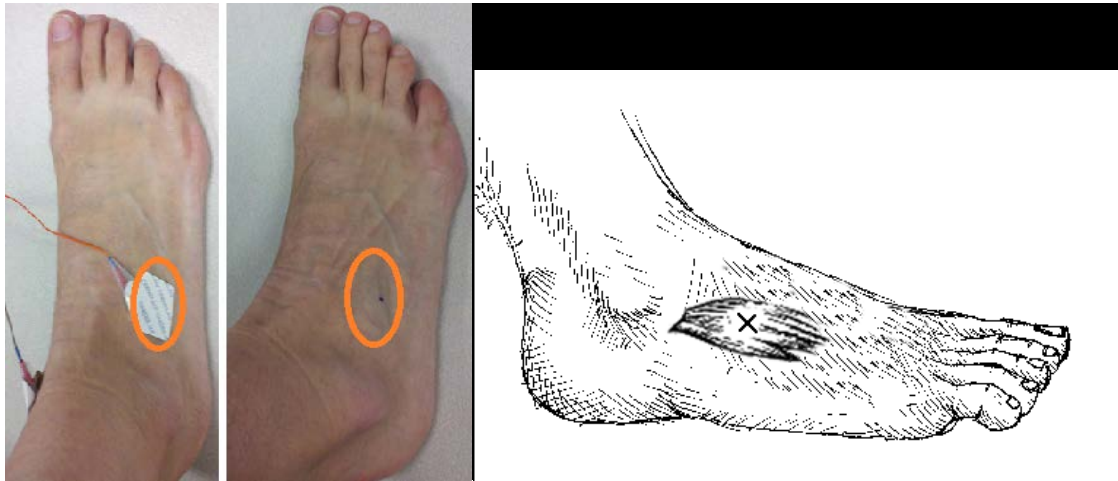
Sensors are placed on the first dorsal interosseus muscle between thumb and index finger, and the styloid process of the ulna at the wrist of each hand.

- Using NuPrep on cotton swab at site to prep, apply ECG to bilateral collarbone, or to lower chest per training if cardiac signal is poor. Plug touchproof connectors into headbox channels 1&2.

- Using NuPrep on cotton swab at site to prep, apply two pairs of EOG electrodes using Ten20 and tape.

  - Vertical eye leads applied above and below participant's right eye, lined up with pupil. Plug into channels 3 & 4.

  - Horizontal eye leads about 1cm lateral to the participant's outer canthus of each eye. Plug into channels 5 & 6.

- Using NuPrep on cotton swab at site to prep, apply Ground electrode to participant's collarbone, and plug into GND channel.

- Using NuPrep on cotton swab at site to prep, apply Reference electrode to participant's collarbone, and plug into REF1 channel.

- Using marker, make small dots at the nasion, left periauricular join, and right periauricular join per training.

- Route wires so they won't interfere with headrest or electrodes.

  - Take care with orientation of the wire coming off each sensor. Avoid cables going under participant's arms or getting caught in track next to bed.

  - Ensure the impedances are below 20kOhm. Note any electrodes that refuse to come down in the session data sheet.

  - View a MEG montage that lets you inspect these electrode signals to confirm they're clean and strong.

- When all electrodes look good, help participant to guide their head and shoulders onto the Polhemus head rest without putting too much pressure on the head rest itself.

5.2 Click Digitize at the scanner computer

♦ Select montage [HCP]

♦ Click Start (at the bottom).

5.3 First section: Specific points

♦ Enter LPA (on your left peri-auricular mark) by clicking the stylus button when in position normal to and in contact with the head, as cued by the monitor in the control room.

♦ RPA (on your left peri-auricular mark)

♦ Nasion (on your mark)

♦ Coil 4

♦ Coil 5

♦ REPEAT.

5.4 Second section: Headshape

♦ Trace best you can inside hair, DO go between headrests.

♦ Try not to press too hard: may cause discomfort and loss of patience, but also the coils in relaxed position won't match what you pressed.

♦ Yes, you will tangle the hair. You can click "off" on your stylus, shake free, touch the head somewhere else (since you mustn't lift) and click "on" again to continue.

♦ Trace around eyes very gently; skin is sensitive. Make tiny circles to get forehead & cheek shapes.

♦ Trace straight down nose a few times into phrenum to get a good profile there, but since skin is soft use judgment: how much pressure, how many points, how much time etc.

5.5 Third section: Coils

♦ Enter coil1, coil2 coil3, coil4, coil5, doubleclick with stylus, click once more to accept.

5.6 QA

♦ Digitization result should be ≤0.5 on the screen. Triple click to go back.

♦ Pressing tape around the coils sometimes helps, but you may need to re-digitize.

♦ If there's softness between skin & scalp then digitization can be off; try not to press but do trace as well as you can.

5.7 Reposition participant

♦ Ask participant to sit up, slowly, slightly, remove Polhemus headrest, adjust the Dewar, assist the participant all the way into position.

♦ Help them to lower themselves SLOWLY and scoot to the proper place, crown touching but not pressing into the dewar.

- ♦ Confirm that coils are still ok, adjust if necessary.

- ♦ Have the participant lift their legs. Place the covered leg cushion beneath their knees and ensure position is comfortable. Inquire about support for their lower back, heels, and neck. Ask them if they are comfortable, or if they need more support.

- ♦ Ensure that head is placed optimally

  - ♦ Position head in scanner: Participant should be resting comfortably, as far in as they can. The scanner opening will be somewhere near their eyebrows.

  - ♦ Ensure the coils taped to the forehead are all entirely within the dewar.

  - ♦ NB: Tell participant "From this point forward, we want you to keep your head as still as possible"

- ♦ Explain how we communicate with participant

  - • Reiterate [per 4.1] that participant should stay still, express complaints for comfort and temperature, and that the scanner is silent so they should attend HCP staff cues for start & stop.

  - • HCP staff in control room should speak with participant via intercom before tech in scanner room leaves.

6. Participant Scans: Resting State

6.1 Position mirror and photodiode light sensor

- ♦ Align mirror over the patient's head, holding the post carefully as it's unwieldy and top-heavy. Mind the wires.

- ♦ Photodiode light sensor should be positioned at upper right hand corner of display (as seen by tech in control room; actual photodiode flicker should be hidden from the participant's view by the photodiode positioning ribbon) and trigger from this sensor is required for MEG tasks (except for Story/Math task).

- ♦ Confirm Photodiode function (E-Prime **Photodiode_Parallel.es2**) in:

  - • Projector screen

  - • MEG equipment room

  - • MEG trigger channel (run **ClinRNois** then View RealTimeDisplay as EMGHandFoot. Discard this recording.)

  - • Adjust room light level with dimmer outside the scanner room door to the marked setting.

6.2 Give participant a blanket:

- ♦ Ask the participant if they want a blanket or a lighter sheet. Pull blanket to cover bare arms or bare feet, and tuck lightly underneath the body. Check comfort.

6.3 First Headshape check per training: **HCPtestHS**. Reposition participant if necessary.

♦ Leave room and ensure that scanner room door is firmly closed

Note: For resting state scans, E-Prime starts first, then MEG starts. Finish MEG collection before exiting E-Prime. This will keep trigger-events out of the data.

6.4 Run E-Prime script: **FixDot.es2**

♦ Start E-Prime script and be sure fixation cross is on

♦ Reiterate "Please do your best to keep still, stay awake, look at the fixation, and we'll check with you in about six minutes"

♦ Keep E-Prime script running while you start first **HCPd2Rest** scan

♦ In MEG scanner computer,

- Choose Acquisition Setup button, click "real time display", choose montage to view.

- Right click in "SCAN" choose MEG scan name per the Session Data Sheet.

- When you're ready, click "Start initialization" near the bottom of the screen.

- When pre-scan coil results are complete (about 20 seconds), ACQUIRE DATA box pops up and beeps.

- By intercom, instruct participants "Please open your eyes, remember to hold your head still during the scan."

- Click "OK"

♦ **Quality check:** Excessive movement or coil deviations

- Visually monitor participant's movement on trace window. If excessive movement is observed early in the scan and doesn't cease, abort the scan, and communicate with the participant. Then start the scan over.

- Note all issues, including the time they occurred, with movement (cough, sneeze, feet tapping, singing, etc) and any other scan issues (traffic above, abort and restart clock-times) in Session Data Sheet.

- Coils are auto-collected before and after every scan, (~1min), confirm they're ok.

♦ E-Prime Script will keep fixation cross on screen until you abort [CTRL + ALT + SHIFT].

♦ At end of every E-Prime script, a screen reads "Please continue to hold still". This is an indication, in long scans, when to stop acquisition and collect post-scan coil data.

♦ When coils have completed MEG collection, on EPRIME PC, click space to end the E-Prime script cleanly.

♦ Upon E-Prime exit, tell the subject in person or via intercom "please keep your head still but relax for a moment while we get ready for the next scan."

6.5 Repeat for second **HCPd2REST**.

6.6 Repeat for third **HCPd2REST**.

7. Participant Scan: Working Memory

7.1 Give button box[es] to participant

♦ Explain button box and how to hold it (be sure participant can see it during explanation)

♦ Place button box in participant's hand so that it can be comfortably reached, tape cord if needed.

Note: In TASK scans, MEG starts first, then E-Prime starts and runs until its final hold slide. Push [SPACE] to exit E-Prime, then "Stop acquisition," to ensure all trigger codes are sent to MEG. MEG scan is <u>not</u> completed until about 90 seconds later, after final coil position check.

7.2 Scan procedure:

♦ Instruct participants "Please open your eyes, remember to hold your head still during the scan."

♦ Choose Acq Scan Type **HCPd2WkMem**, initialize and Acquire Data.

♦ Once scan is recording, doubleclick the shortcut to load E-Prime script for the task on the Session Data Sheet.

♦ Enter participant's ID and correct run number when prompted.

♦ Read instructions aloud to participant during 1st run of the task. (Skip instructions before 2nd run of task). Remind them to keep their head still.

♦ Monitor E-Prime performance feedback screen, camera, lumitouch box, and scanner console for QC issues.

♦ Do not talk to participant during task performance. Speak to participant after each scan run to ensure they are still OK and let them hold head still but relax.

7.3 Run each task in order, checking in with participant between types.

7.4 If scan is aborted very early (due to scanner, E-Prime, or performance issues), run MEG and E-Prime again before proceeding to next task

♦ Be sure to note any short scans/reruns on Session Data Sheet.

7.5 Follow E-Prime instructions to get to the instructions screen.

♦ "Please read silently to yourself while I read these instructions aloud."

- Read instructions verbatim.

- Remind participant to open eyes, relax their body and jaw, and lay still, we'll check on you in about ten minutes.

- Move to "Get ready" screen by pressing Spacebar, if indicated.

- THEN click <CTRL + 7> to begin a countdown & start task performance.

- At end of every E-Prime script, a screen says "Please continue to hold still". This is an indication, in long scans, when to stop acquisition and collect post-scan coil data.

  - Click "Stop Acquisition" to proceed to coil check on MEG scan computer.

  - Click <SPACE> to end cleanly on EPRIME PC.

  - When coils have completed per MEG console, tell the participant the scan has stopped.

7.6 Post scan QA

- If one or more coils have gone bad, press, review, reapply.

  - Distances should be .15 or so (but below 0.5 is ok)

  - Goodness of fits should be .99 or .98 or you need to try again

7.7 **Quality check:**

- Ensure that any abnormalities, issues, or atypical occurrences for each scan are documented in detail on the Session data sheet.

7.8 REPEAT for run2.

8. **Participant Scan: Story/Math (Language Processing)**

8.1 Pre-scan procedures

- Check Headshape per training: **HCPtstHS**

- In the scanner room, use the remote to turn off the projector.

- Supply the participant with otic inserts, help them apply them properly. You may need to tape them to the head, and the tubes to the bedside. Ensure button box and audio are operating properly.

- Check participant comfort.

8.2 Scan procedure:

- Instruct participants "Please open your eyes, remember to hold your head still during the scan."

- Choose starting level for math (generally 10) and story (generally 2) and run # (1, 2, or other) and note on Session Data Sheet

- Choose Acq Scan Type **HCPd2StoryMath**, Initialize and Acquire Data.

- Once scan is recording, doubleclick the shortcut to load eRun script for the task on the Session Data Sheet.

- Enter participant's ID, correct run number, story level and math level when prompted. Also note these numbers on the Session Data Sheet.

- Read instructions aloud to participant during 1st run of the task. (Skip instructions before 2nd run of task). Remind them to keep their head still.

- Progress to "Get Ready" screen

- Do not talk to participant during task performance. Speak to participant after each scan run to ensure they are still OK.

8.3 Run each task in order, checking in with participant between types.

8.4 On second run, indicate new level for math and story, and run number on the Session Data Sheet

8.5 Monitor E-Prime performance feedback screen, camera, lumitouch box, and scanner console for QC issues

8.6 If scan is aborted very early (due to scanner, E-Prime, or performance issues), run MEG and E-Prime again before proceeding to next task

- Be sure to note any short scans/reruns on Session Data Sheet.

- Example: If **HCPd2StoryMath _run1_of_2** was aborted after participant completed 20% of task, start E-Prime with **unique** run number (since run 2 is still in the queue, use run 3), and run new scan immediately.

8.7 Follow E-Prime instructions to get to the instructions screen.

- Read instructions verbatim.

- Remind participant to open eyes, relax their body and jaw, and lay still, the scan lasts about seven minutes.

- Move to "Get ready" screen by pressing Spacebar, if indicated.

- THEN click <CTRL + 7> to begin a countdown & start task performance.

- At end of every E-Prime script, a screen says "Please continue to hold still". This is an indication, in long scans, when to stop acquisition and collect post-scan coil data.

- When coils have completed per MEG console, click **SPACE** to end the E-Prime script cleanly on EPRIME PC.

8.8 Post scan QA – if one or more coils has gone bad, press, review, reapply.

- Distances should be .15 or so (but below 0.5 is ok)

- Goodness of fits should be .99 or .98 or you need to try again

8.9 ***Quality check:*** Ensure that any abnormalities, issues, or atypical occurrences for each scan are documented in detail on the Session data sheet.

8.10 REPEAT for run2.

9. Participant Scan: Motor Task

9.1 Allow participant to relax, remove shoes and sit up for a few minutes.

9.2 Apply alcohol wipe, and the NuPrep + cotton swab to prep muscle body sites per training. Apply EMG electrode stickers, and then tape Grass electrodes to the tabs of the stickers. Plug touchproof connectors into headbox channels per Session Data Sheet:

- ♦ Left hand, channel 31+/-
- ♦ Right hand channel 32+/-
- ♦ Left foot, channel 63+/-
- ♦ Right foot channel 64+/-

9.3 Help participant return to a good position in the dewar.

9.4 Turn projector back on and ensure correct display.

9.5 ***Quality Assurance:***

- ♦ Ensure the impedances are below 20kOhm. Note any electrodes that refuse to come down in the Session Data Sheet.
- ♦ Repeat practice of each motion independently to
  - ensure good sensor placement,
  - ensure participant motion is isolated and correct (e.g. don't move arm or wrist),
  - ensure EMG signals on MEG record are strong and on the correct channels.

9.6 Motor task is two sets of 15 minutes each. Ensure participant comfort.

9.7 ***Quality check:*** Ensure that any abnormalities, issues, or atypical occurrences for each scan are documented in detail on the Session data sheet.

9.8 REPEAT for run2.

10. Ending Procedures

10.1 Move the screen and IOD photodiode out of the way carefully.

10.2 Help participant support their head as you move the dewar gantry back (outer buttons) so the participant can sit up SLOWLY, there are a LOT of wires). Remove extra support pillows so they can sit up, swing their legs sideways, and put shoes back on.

10.3 Remove all attached equipment.

- ♦ LPA, RPA, and nasion marks may require alcohol wipes.
- ♦ Administer Participant Satisfaction Survey.

10.4 When ready to transfer data, regress up the participant's arrow chain, and "POST Selection" to include all scans including aborted ones.

♦ Uncheck the PTID, then right click "POST PATIENT" again to unpost it, to close the scan session (this is really a toggle).

10.5 Get auxiliary data output from E-Prime onto USB.

11. Notify Research Coordinator at the East Building if re-scan appointment is needed

Note: MEG cannot follow MRI scans (residual magnetization affects noise).

12. Clean up for next session after participant leaves. Soak electrodes in warm soapy water. Move linens to laundry. Wipe down bed, buttons, otics, coils, dewar surface. Clean goggles with glass-wipes and return to suitcase.

13. Upload Data to IntraDB

13.1 Ensure that all data has reconstructed (is it listed in Patient Browser?)

13.2 ***Quality check:*** Session Data Sheet

♦ After data upload to IntraDB, transpose notes from Session Data Sheet and survey into notes fields

♦ Change usability field to "Unusable" for any certain unusable images (scanner crashed, aborted scans, wrong sequence run, scan was re-run and replaced with later scan, etc.)

13.3 E-Prime Output Files

III. Staff training and error prevention measures

Before independently performing the procedures described in this SOP, HCP staff members will be trained as follows:

- Read this SOP.

- Observe the procedures, when performed by trained study staff or an HCP investigator, *two times*.

- Follow the procedures under the direct supervision of trained study staff or an HCP investigator *two times*.

IV. Internal HCP auditing

Internal HCP audits of the procedures in this SOP are recommended to include the following steps:

- Review two randomly-selected MEG Session Data Sheets. Verify that all required fields have been filled out on each MEG Session Data Sheet and that in each case what on

the MEG Session Data Sheet conforms with the note fields for the same MEG session in intraDB.

- Observe at least 2 operators performing 2 or more scans each, to check for adherence to the SOP and consistency between operators.

- Discuss with HCP staff which aspects of procedure are difficult to follow as stated in the SOP, and modify SOP or retrain HCP staff members as necessary.

V. Related SOPs:

- **MEG Empty room scans** (describes once-daily QC procedures)

VI. Document control

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Document approval: This SOP requires the approval of the responsible investigator, as do any changes thereto.

This SOP has been approved by: Dr. Linda Larson-Prior
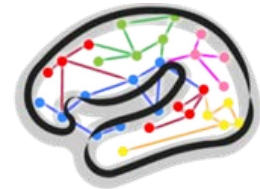
MEG Session Data Sheet

Human Connectome Project

MEG session

Data Sheet

Version 2.12

Effective Dates: <u>Oct 29, 2013</u> to *[date of issuance of a revision]*

Author(s): LLP, TSN, TK

Participant ID: CP__ __ __ __ __ __

Phase II participant number: phs2pt __ __ __

Today's Date: _____

Team members present (initials sufficient) _____

1. Empty Room Scan: (5:00 duration: **PRIOR TO PT ARRIVAL**   acquisition name: **HCPd2RNois**)
   Notes: _____
   _____
   _____
   _____

2. Test Photodiode trigger, Impedance meter, sounds through otic tubes, button box, light levels, screen resolution.   Confirm cabling between interfaces:
   a. Y/N   Monitor & projector match: power, receiving images, resolution pixels,
        set "clone", "primary display = projector"
   b. Y/N   Audio is on and levels are ok and otic tubes are clean & ready
   c. Y/N   E-Prime runs, E-Prime sends output to audio, display, and trigger-channel
   d. Y/N   Two KVM switches set to "HCP"
   e. Y/N   Impedance meter seems to be working, maintain impedance below _____kOhm
   f. Y/N   Parallel port is plugged in and sending triggers
   g. Y/N   Room lights set to the mark
   h. Y/N   E-Prime script: **Photodiode_test.es2**
   i. Y/N   E-Prime script: **Photodiode_Parallel.es2**

-- **Participant Arrival time: _____ (am/pm)**

3. Participant Consents obtained (mark X)   ☐ SLU MEG   ☐ WashU MEG
   a. Copy of WashU consent will be stored at SLU.

   b. Make copy of SLU consent to send back to WashU.

4. Practice E-Prime in control room (keyboard button 7,8) :
   ☐Work Memory
   ☐Story Math
   ☐Motor

   Practice Notes: _____
   _____
   _____

5. Participant demetal, restroom, belongings, hairbrush, vision check.
   Notes: _____
   _____
   _____

6. Patient Noise Scan: (0:60 duration,   acquisition name: **HCPd2PNois**)
   Notes: _____
   _____
   _____

7. Degauss?   ☐Yes, once   ☐Yes, twice   ☐No
   Notes: _____
   _____
   _____

8. Participant Headshape & 5 coils Digitization   acquisition name:**EEG_5coils**
      Touch marks and coils in this order: L-PA, Rt-PA, nasion, 4, 5 (repeat)
      Trace headshape in lines or small circles
       – including around eyes, and along midline nose, back of head between headrests
       – BE SURE to click off before moving off the head to adjust stylus/cord
             Touch marks and coils in this order 1, 2, 3, 4, 5, **accept**.
   Digitization Notes: _____
   _____
   _____
   _____

9. Headshape test: acquisition name: **HCPtestHS**
   Notes: _____
   _____
   _____

_____

10. Apply eye, reference, ground and ECG electrodes

    Notes: _____

    _____

    _____

    _____

11. Rest MEG: 20 min. Verbally remind patients to get comfortable, relax and be still via intercom. *Start E-Prime script first, and when fixation "+" appears, start 4D acquisition. Stop 4D file first, then stop E-Prime.* MEG should record NO triggers during Resting State scans.

    a. Confirm trigger on discard-scan **Clin_RNois** (Real Time Display set to EMG-HandFoot)

        i.   Y/N   E-Prime script: **Photodiode_test.es2**

        ii. Y/N   E-Prime script: **Photodiode_Parallel.es2**

    b. Resting State 1: (6:00 duration,   E-Prime: **fixdot.es2**   acquisition name: **HCPd2Rest**)

        Notes: _____

        _____

        _____

        _____

    c. Resting State 2: (6:00 duration,   E-Prime: **fixdot.es2**   acquisition name: **HCPd2Rest**)

        Notes: _____

        _____

        _____

        _____

    d. Resting State 3: (6:00 duration,   E-Prime: **fixdot.es2**   acquisition name: **HCPd2Rest**)

        Notes: _____

        _____

        _____

        _____

12. Working Memory Task: Give participant button box.

    NB: MEG should record **before** & **longer than** E-Prime from now on.

    NB: Verbal reminder at start of each scan to lie still until told that scan has completed.

    a. **HCPd2WkMem** 1   (10 min)

        E-Prime: **WM_for_MEG_run1_of_2.es2**   (spacebar, {CTRL 7})

Start 4D first, then E-Prime. When complete, stop E-Prime first, then stop acquire-data and collect coils.

Notes:_____

_____

_____

b. **HCPd2WkMem** 2 (10 min)

E-Prime: **WM_for_MEG_run2_of_2.es2**

Start 4D first, then E-Prime. When complete, stop E-Prime first, then stop acquire-data and collect coils.

Notes:_____

_____

_____

TURN projector OFF – do not move screen.

Give participant otic inserts, return to position, confirm button box positioning & participant comfort.

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13. **HCPtstHS** Headshape test notes _____

_____

14. Language Processing Task: **HCPd2StoryMath 1** (7 min)

Turn off projector in scanner room. Apply ear inserts.

Start 4D first, then E-Prime. When complete, stop E-Prime first, then stop acquire-data and collect coils.

Note math level# 10 start ___end

story level# 2 start ___end

run# 1

Record final math level & story level, enter for run2

E-Prime: **MEG_StoryMath.es2** (practice, run1, run2 all from one E-Prime script)

Start 4D first, then E-Prime. When complete, stop E-Prime first, then stop acquire-data and collect coils.

Other notes:_____

_____

_____

_____

_____

15. **HCPd2StoryMath 2** (7 min)

E-Prime: **MEG_StoryMath.es2** (practice, run1, run2 all from one E-Prime script)

Note math level# (from final level in run1) ___ start ___end

story level# (from finishing level in run1) ___ start ___end

run#   2

Start 4D first, then E-Prime. When complete, stop E-Prime first, then stop acquire-data and collect coils.

Record final math level and story level before quitting E-Prime

Other notes:_____

_____

_____

_____

_____

BREAK FOR MOTOR TASK SETUP (Setup takes about ten minutes)

Take button box away, leave otics taped in place until later

Apply leads: 63 LEFT FOOT, **64** RIGHT FOOT, **31** LEFT HAND, **32** RIGHT HAND.
EMG_HandFoot Electrodes test ☐
Setup start time:_____   **Setup complete:_____**

16. Motor Task MEG: setup

Coils still ok? Y/N _____   EEG Impedances ok? Y/N _____

e. **HCPd2Motor run 1** (14 min)

Start 4D first, then E-Prime. When complete, stop E-Prime first, then stop acquire-data and collect coils.

E-Prime: **MEG_Motor.es2** (MEG display EMG_HandFoot)

Notes:_____

_____

_____

_____

_____

_____

f. **HCPd2Motor run 2**   (14 min)

Start 4D first, then E-Prime. When complete, stop E-Prime first, then stop acquire-data and collect coils.

E-Prime:**MEG_Motor.es2**   **(MEG display EMG_HandFoot)**

Notes:_____

_____

_____

_____

_____

_____

17. Post-Scan participant notes: **Participant Stop time:_____ (am/pm)**

_____

_____

18. Post Scan scan/software/hardware/staff/taxi notes: **Participant Departed:_____ (am/pm)**

_____

_____

_____

_____

_____

_____

19. Data Offload complete: (mark X)
      ☐ Transfer headshapes to RAID

      ☐ Transfer E-Prime outputs to USB

      ☐ Transfer E-Prime outputs from USB to RAID

      ☐ Transfer raw wholedata to RAID

      ☐ Transfer from RAID to ftp

      ☐ Photocopy of WashU consents arrives with participant to be filed at SLU

      ☐ Photocopy of (SLU consents, satisfaction survey, this doc) returns to WashU after session