

Lab Manual

Preparing the Solution (before participant arrives)

1. Fill the plastic bucket with one liter of warm water (first line)
2. Add one scoop of potassium chloride with the designated measuring spoon (this spoon should not touch the water)
3. Add one scoop of baby shampoo with the spoon labeled “EGI Shampoo”
4. Mix this solution together until the KCl is dissolved (with “EGI Shampoo spoon”)

Computer Set-up (before participant arrives)

1. Turn on the Mac and the Dell computers.
2. On the Dell's desktop, go to Active experiment > Iconicity (do NOT erase any files)
 - a. Is your participant doing Iconicity 1,2,3 or 4? (keep a file of this)--(iconicity_#). Open the correct program – the icon next to the file name is a blue square with three smaller squares within it.
3. Log into the Mac computer (password:geodesic)
 - a. On the Mac, open Netstation Acquisition
 - b. Enter the participant id (iconicity_idnumber_1 for the first session, and iconicity_idnumber_2 for the second session)--make sure all labels are formatted exactly the same.
 - c. Click enter
 - d. Click “on” (to turn on the amplifier). The waves will start showing.
4. Make sure the correct settings have loaded in.
 - a. Amplitude: 30 microvolts
 - b. Filter: 0.1 Hz highpass
 - c. Sampling rate: 1000 s/s
 - d. DINs 1-8: None
 - e. TCP-IP Port: make sure 55513 is checked
5. Move the DVI setting to the Mac (for now we want the participant's screen to show what the Mac shows.)

Introduction

1. First, introduce yourself to the participant
For example: Hi my name is Mara and I am a psychology major and rising senior. I'm Kiana and I am a neuroscience major and rising junior.
2. Thank the student for agreeing to participate in the study.
3. Next, ask the participant if they have been in an EEG study before. If the student is unfamiliar with the process, explain this component in greater detail.
Basic explanation: We will be placing a net that contains a bunch of sponges over your head. This will allow us to measure your brain activity. We have done this before so feel free to ask any questions.
4. Once the participant understands the study, they will receive two consent forms. Ask them to look it over and answer any questions that they may have.
5. If the student agrees to the conditions, ask them to sign both pieces of paper. Save one of the consent forms (in the completed consent folder). The second consent form is for the student to keep.
6. Finally, make sure that the student understands that they are free to leave the study at any point in time.

Measuring head for net

1. Explain to the participant that you will be taking a few measurements of their head. This is to ensure that the right sized net is used. (all measurements in cm)
 - a. Circumference (start from **nasion** and go around top of **inion** – measurement should encircle the widest part of the head.)
 - b. Based on the measurements below, choose the appropriate net.
 - i. Small → 53.5-55
 - ii. Medium → 55.5-58
 - iii. Large → 58.5-above
2. Wrap the **square hydrocell connector** in a towel to protect the pins inside.
3. Place the net into the prepared solution. Dunk it up and down several times, and let it soak for 5 minutes, making sure all electrodes are submerged.
4. The next two measurements will go over the top of the participant's head:
 - a. Ear to ear. Start at one place on one ear and measure to the same place on the other ear. A good landmark is the **preauricle** – the dent formed between the top of the ear and the bump. Mark the midpoint of the measurement at the top of the participant's head with red pencil.
 - b. Inion to nasion. Measure from back to front and mark the midpoint of the measurement at the top of the participant's head with red pencil.
5. Finally, mark a dot that lines up with both markings at a right angle. It should be in the exact center on the participant's head. Lightly scrub away the other red dots on the head.

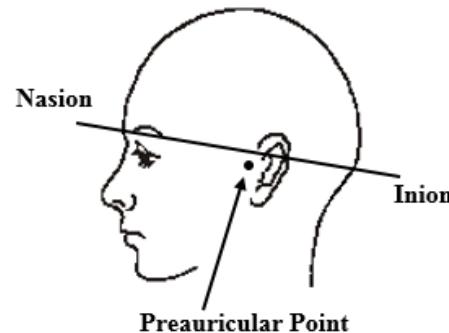


Figure 1 Head landmarks

Preparing the participant

1. Place a few towels on the participant's shoulders to ensure that they remain dry once the net is placed on their head
2. Give the participant the connector wrapped in the towel and gently tap the net side to side against the insides of the bucket before removing it

Placing the net

6. Place both hands inside the net and hold them as if you were holding a basketball
7. Find electrode 17, and place your thumbs 2 sponges away on either side. They should sit right behind the bands on the outside of those sponges. This part goes right over the participant's forehead.
8. Have somebody else help place the net from the back
 - a. The person in the back will hook their index fingers in the net from inside out to slide the back of the net onto the participant
2. Make sure that **REF** is right on the red wax dot and that the horizontal piece of plastic is on the nasion.
3. If any large net adjustments need to be made, use all ten fingers to gently scrunch the net forwards or backwards. Make sure the net is correctly positioned over the participant's ears.

4. Adjust the strings to have a comfortable, but snug fit on the participant's face. It is very important for the chin strap to be tight (if it is not, bad data will be collected)
5. Use the curved pipettes to part the hair around each sponge to ensure that each sponge is on the scalp – try to do this quickly to prevent the hair from absorbing all the liquid from the electrodes.
6. Give each sponge a light scrub in a circular or side-to-side motion, but do not press downwards on the sponge. This is called **seating the electrodes**.
7. Once you feel this has been done to the best of your ability, make sure the participant is still holding the square hydrocell connector and walk them to the testing chamber.
8. Make sure that the front of the chair is directly behind the pink tape on the floor.
9. Carefully attach connector to the arm piece (inside the chamber). Tighten the knob on the arm to lock the connector in place.
10. Next, click the ohm (Ω) symbol at the bottom left to view **impedances**
 - a. A bunch of colored impedances will pop up
 - b. You do not want to start the study until all impedances are blue. The kilo-ohm value associated with each impedance can be found on the right side of the screen. Try to get all numbers to be 40 or less.
 - i. Continue using curved pipettes to part the hair and get sponges closer to the scalp
 - ii. Use a pipette to add a small amount of the solution directly to the sponges
 - iii. Make sure to not add too much solution, to avoid the formation of **salt bridges** and solution dripping onto their face
 - c. Next, click save at the bottom right (after you reseat and adjust)
 - d. Tell the participant to blink or clench their jaw so they can see what happens to the brain waves. Ask them to be as still as possible during the study.
 - e. Move the **DVI setting back to the Dell** so the participant sees the E-Prime experiment as it runs.

Pre-study instructions

1. Prepare the participant for the study and let them know the following: "Now you will watch videos of Japanese words and translations, your task is to try to learn as many of the words as possible. You will hear a Japanese word repeated two times. Next, you will see a fixation cross, followed by an English word. These steps will be repeated throughout the study. You can click any one of the buttons in front of you and the videos will begin."
 - a. **Blink anytime except for when you see the white fixation cross and the English word. Blinking during the video is fine.**
 - b. **Try not to blink immediately after the English word comes up.**
 - c. Tell the participant that both experimenters have sat through this study and that it can be difficult, but that it is important to try their best
 - d. Ask them to sit as still as possible and to not cross their legs during the study
 - e. Encourage them to learn the words since they will be receiving a post study quiz
 - f. **Note to experimenter → if the participant is blinking at inappropriate times, go in and try to emphasize importance of the instructions**

Running the study

1. In E-Prime on the Dell, click the button that has the running man without the yellow arrow on it.
2. Enter the subject number.
3. Enter session 1.
4. The demo period will start (the Mac screen will turn pink momentarily to signal that recording has begun)
5. The next part of the experiment resumes when the experimenter clicks the keyboard
6. Everything saves automatically
7. When the first session ends, click “Start a new study” and input the correct info on Netstation
8. Measure the impedances one more time before the second half of the study.
 - a. Only focus on readjusting the red/yellow impedances
4. For the second half of the study, click the running man again and input the correct information (i.e. session 2)
5. After the second part of the study is completed, click ‘Quit net station’ which is the leftmost option.
6. NEVER click the center option; we always want the amp to stay on.

Post Study

1. When both of the studies are completed, walk into the chamber and let the participant know that they are done with the study and that you will be taking the net off
 - a. Gently roll the net backwards
 - b. Be careful to not pull the participants hair or yank the sponges off, as they might be tangled in the participants hair
2. Let the participant know that they will be taking a post-test on another Mac in the larger lab room.
3. Inform the participant that they will be hearing each word three times and that they cannot listen to the audio clip more than once. The experimenter will play the next clip once the participant is ready.
4. Once the test is completed, hand the participant a debrief form to read over and sign (1 copy for experimenter and 1 copy for participant)
5. Give the participant 10 dollars and have them sign a money form to confirm they received compensation (1 copy for experimenter and 1 copy for participant)
6. Thank the participant and ask if they have any last questions before they leave.

Disinfecting the Net

Instructions on the inside of black cabinet, Geodesic Sensor Net: Rinsing/Disinfecting Tips

Analyzing data

1. In the main Mac in the larger lab room, go to Finder.
2. Go to Iconicity > Experimental Data. Create a new folder for the participant and name it the same way you named their trial on Netstation (e.g., iconicity_idnumber_sessionnumber)
3. In the Sessions folder, search for the participant’s file using the name you input for them on Netstation.
4. Move sessions 1 and 2 into the folder you just created.
5. Open “Net station tools”

6. Go to the iconicity folder in tool sets
7. Drag the 2 sessions into left top corner INPUT FILES, click iconicity script under "tools", and click RUN
8. Open brain waves by pressing file with "ave." from folder
9. Set amplitude to 1 microvolt
10. Set "time to be fit"
11. Under categories you can choose the conditions for viewing

Opening segmented files to look at individual trials

Backing up data

All steps together

Computer set up

1. Turn on the Mac and Dell computers.
 2. On the Mac computer, open Netstation Acquisition.
 3. On the Dell computer, open the iconicity folder (do NOT erase any files)
- a. Is your participant doing iconicity 1,2,3 or 4? (keep a file of this)--(iconicity_#). Open the correct program – the icon next to the file name is a blue square with three smaller squares within it.
4. Enter your patient id (iconicity_idnumber_1 or 2)--make sure all are formatted exactly the same.
 5. Click enter
 6. Click "on" (to turn on the amplifier). The waves will start showing.
 7. With the DVI setting on the Mac, click the ohm symbol at the bottom left for impedances.
 8. A map with a bunch of colors will popup (blue is ideal)
 9. After reseating and adjusting electrodes, click Save.
 10. Tell the participant to blink or clench their jaw to see what happens
 11. The correct experimental presets are in the workspace called "Default 2" under the General tab in NetStation
 12. After you fix the net, move the DVI back to the Dell.
 13. Click the running guy in E-Prime (NOT THE ONE WITH THE ARROW).
 14. Enter the subject number (id or the number)
 15. Next, enter session number (always 1 first)
 16. The demo period will start (the Mac screen will turn pink to indicate start of recording)
 17. The next part of the experiment resumes when the experimenter clicks the keyboard
 18. Everything saves automatically
 19. When the first session ends, click "Start a new study" and input the correct info on Netstation
 20. For second half of the study, click the running man again and input the correct information (i.e. session 2)
 21. After the second part of the study is completed, click 'Quit Netstation' which is the leftmost option.

Tags:

Bgin:beginning of exp

GSS_, NGSS, GNS_, or NGNS: END of video, aka onset of the “click to advance” response screen. 1100 ms before this tag is the beginning of baseline for the trial, and 1000 ms before this tag is the onset of the English word.

TRSP: trial ending

GLOSSARY

DVI – controls what appears on the monitor in the testing chamber. Setting it to Mac will show the NetStation screen, and setting it to PC will show the E-Prime screen (see Fig 2)

Impedances – measured in kilo-ohms. They’re a measure of signal quality for each electrode and the kilo-ohm value should be as low as possible (<40 kohms). They should all be blue before starting the experiment.

Inion – the protruding bump at the base of the skull

Nasion – the point between the eyes that’s right above the bridge of the nose – usually it looks like a dent when viewed from the side.

REF – the most important electrode on the net. It must align with the center marking you made on the participant’s head. All other electrodes are tied to this one, so make sure it is soaked well with solution even if the impedance is blue.

Salt bridge – occurs when electrolyte solution forms a connection between two electrodes and contaminates the signal. Avoid this by applying small amounts of solution directly to sponges, making sure not to allow it to drip on the scalp, where it will spread.

Square hydrocell connector – the box at the end of the cable attached to the net. This plugs into the arm piece in the testing chamber. The copper pins inside are very sensitive, so make sure never to touch them or get them wet (see Fig 3)

Seating electrodes – positioning all electrodes on the participant’s head. First pass (~5-10 minutes): part the hair around each electrode to ensure direct contact with the scalp. Second pass (25 minutes max): connect the net and look at impedances. Apply solution *directly to the sponge* on any electrode that is not blue on the screen, replace electrode, and scrub in side-to-side motion.



Figure 2 DVI box



Figure 3 Square hydrocell connector