



Perception and
PERLL
Learning Laboratory

LAEL's ERPs Lab

Wellcome!!!

If you are reading this you might be willing to run an ERP experiment, so please read the following instructions and guidelines.

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Part 1. PERLLab general equipment

- Neuroscan ERPs data acquisition system.
- Three caps: two with a head-diameter of 56 cm and one of 54 cm.
- Keyboard and Chronos response box
- CRT monitor
- Impedance monitor
- E-prime software for stimuli presentation (STIM-PC outside the booth; parallel port address = 0xE000, LPT3)
- Curry 7 software for data recording (ACQUI -PC outside the booth)
- E-prime software for experiment preparation and Curry 7 for data analyses (WORK-PC outside the booth)
 - STIM-PC and ACQUI -PC will only be used to run experiments whilst WORK-PC can be used to program experiments, data analyses and behavioural testing.
 - STIM-PC is connected to the CRT monitor inside the booth and to the head-box (amplifier inside the booth). STIM sends simultaneous information regarding what the participant is seeing (CRT monitor) and when this is happening in time (triggers sent to head-box).
 - ACQUI-PC is connected to head-box (input) and to impedance monitor (inside the booth). ACQUI-PC receives information from the amplifiers, which are connected to the electrodes measuring brain activity, and which receive the triggers sent by E-Prime via STIM-PC.

Part 2. PERLL general lab-user

Get Involved!

The PERLLab is open to everyone from the Department and internal/external collaborators. However, we would like to hear from you before you plan to run an experiment. Why?

Co-operation

we want to make sure that the facilities are shared equally amongst users and that there is always a co-operative spirit (bookings, testing, shared consumables, etc), ensuring that different researchers can make use of the lab in parallel without incidents.

Needs and Training

we have to make sure that there is always an EEG experienced researcher during testing avoiding any improbable but possible discomfort to participants and ensuring appropriate use of the equipment.

If you have never run an ERP study before, or you are not familiarised with Curry 7 software and E-Prime, then you will need training and assistance. We will provide this assistance on a first come first served basis, but bear in mind that we might be busy, so we will appreciate that you plan your experiment ahead, specially in cases where you have a deadline (PhD/Master dissertations, final report of grants, etc).

We do not have a research assistant for the lab. However, Aina will be helping by introducing the lab procedures to any new user and also by providing training and assistance to those that need it. If there are several researchers willing to use ERPs, small group workshops will be provided depending on the needs (data acquisition, ERPs experimental design, and/or data analyses), just contact her if you are interested! ☺

Last but not the least...Consumables

ERPs require the use of consumables (from the electrolytic gel to shampoo). The cost of consumables for each participant is 10 GBP. This will not be assumed by PERLL lab team and will be managed centrally by LAEL. Hence, you will have to apply for a grant to assume this cost, or alternately, you might apply to LAEL to fund your consumables via HoD.

It is our recommendation that as soon as you plan to run an EEG experiment you contact the members of PERLL (Panos Athanasopoulos, Patrick Rebuschat, Aina Casaponsa) via perll@lancaster.ac.uk with cc to a.casaponsa@lancaster.ac.uk. A meeting to address potential needs/training and lab procedures might follow this email. The information that we recommend you to provide in this first email/contact is the following:

Contact us

The study

- Research Aims/Hypothesis (the What and Why): which question are you trying to answer and why is this important.
- Methods (the How): Participants, experimental design, and procedure.
- Expected results (in terms of ERP components) and theoretical implications.

The researcher:

- Who is going to run the study/use lab facilities?
- ERP Experience (specify software and type of hardware):
 - Data collection:
 - Data analyses:

Funds

- Can you assume the cost of consumables (Grants, etc)?

This will serve to:

1. Receive feedback on potential drawbacks in the design or theoretical claims before collecting the data in cases where there is no substantial ERP experience.
2. You can express your experience with ERP data collection and analyses, and together we can develop a plan in cases where training and assistance must be provided.

3. You will then be introduced to lab procedures and protocols and standards of good practice.
4. We can make sure that consumable costs can be covered. In cases where the researcher does not have funds for consumables, a case should be made to HoD.
5. We can plan ahead the lab calendar, making sure that all the projects can be managed on time and efficiently.

Part 3. Preparation of your experiment

Make sure you print Document 2 (from Appendix) and sent it via e-mail to perll@lancaster.ac.uk with cc to a.casapponsa@lancaster.ac.uk for lab records. Once this has been received we will create a folder in STIM and ACQUI PCs for your experiment and give you access to view the lab calendar. We will also make sure that by the end of your experiment consumables costs are transferred to LAEL' consumables account.

Please follow Document 3 (a printed copy will be on the lab) to code participants' ID. This way it will be easier to report the number of participants per year, and plan ahead consumables.

1.1. Experiment programming

Program your experiment in WORK-PC using E-Prime and Chronos response box (in case you need it). There is an E-Prime User-Guide available in the lab cabinet. We recommend that you set up E-Prime Experiment-Display to “use output Display resolution” (not that in the booth there is a CRT monitor). Upon completion of the programming we will transfer the experiment into STIM-PC and help you to set up the triggers and ports.

1.2. Pilot your experiment

Before starting booking participants you have to make sure everything is working property (ports and targets correctly coded in your scripts, etc). The only way to ensure this is running a pilot. If you have run out of friends willing to volunteer don't worry, you don't actually need a real participant (you can also be your own pilot). Run your experiment and make sure that your stimuli are property displayed in the booth, response box working, etc. Once you have run the experiment until the end check the following:

- a) Your experiment actually runs in the EEG lab (including response box) ...life is full of surprises!

b) The output files contain the information that you need to analyse the data (both behavioural and EEG files), and that triggers are correctly encoded.

c) Check output timings...(E-prime is full of surprises too!). Make sure the output of E-Prime and the output from your EEG file match.

1.3. Participants' bookings

To book participants please contact Aina (a.casapponsa@lancaster.ac.uk) who is currently managing all the bookings of the lab. Furthermore, we are currently developing a participants' database that might help you with the recruitment.

1.4. Running your own experiment

Start up

- Turn on all machines: First turn on STIM-PC and then ACQUI-PC; otherwise ACQUI-PC might not detect the amplifiers.
- Put a towel on the chair to protect it. Fill up two syringes with electrolyte gel.

Participant Preparation

- General instruction: A participant is NOT equipment. You need to be extremely careful when getting the participant ready, particularly when physical contact is necessary. Wash your hands carefully prior to any contact with the participant. Make sure you ask the participant if everything goes well every time you make a new step towards the preparation of the experiment.

- Measure participants head circumference using the tape measure (front-head to back at the occiput) and choose appropriate cap size. Make sure the cap is clean and reasonably dry (can be damp) and that no dry gel remains on the electrodes. Plug the cap connector in the head-box. DO NOT FORCE THE CONNECTOR.

- Important: Control all inclusion/exclusion criteria for your experiment (handedness, normal vision/audition, dyslexia, epilepsy, etc.). Make sure the

participant wants to proceed with the experiment. For visual experiments: Make sure the participant is not at risk of EPILEPSY from personal medical history. In the case of an epileptic participant, DO NOT proceed with a visual experiment (explain to the participant that there are some risks involved). Check that the participant is not allergic to ALCOHOL (this is rare but happens). Inform the participant of the completely security of the system in terms of electrical current transfer. Ask the participant to sign the consent form if they wish to proceed.

- Invite participant to wash his/her hair with baby shampoo – specify they have to scrub their scalp thoroughly. Have the participant dry their hair – it is not necessary to dry it completely but it must not be wet (just slightly damp). Ask the participant whether he/she wants to go to the toilet as it is more convenient before the experiment starts.
- Sit the participant comfortably in the chair. Ask the participant to move forward and place the chest belt around and above the chest, attach it in the back using the Velcro strap. Do not tighten it too much. Ideally when pulled gently upwards, the chest belt should reach the lower part of the throat. Place a towel on participants shoulders.
- Put Alcohol and a tiny bit of gel on cotton wool and ask participant to scrub their forehead thoroughly in order to degrease it as well as above and under the left eye and on temples. Advise the participant to close their eyes while manipulating alcohol. **MAKE SURE NO ALCOHOL GETS IN THE EYE.** Follow the same procedure for the mastoids.
- Place two double-sided electrode stickers on the plastic adaptor of two free electrodes (left mastoid: online reference; right mastoid: re-refernce) and stick them on the left and right mastoids of the participant.
- Once the cap is connected to the head-boxes and the forehead of the participant is degreased, stand on the side of the participant, apply the three fronto-polar (FP) electrodes on the forehead (at middle height) and pull the back of the cap gently towards the occiput (back of the head) so that it covers the scalp entirely. Then pull the lateral straps and get the ears in the devoted holes. Make sure the cap is

symmetrical with respect to the midline of the head. Then make sure the cap is not too far backward or forward. Once the cap is satisfactorily placed, fix the lateral straps onto the chest belt using the clips. Check the position again and check that the cap is pressed against the scalp as well as possible.

- Place two double-sided electrode stickers on the plastic adaptor of two free electrodes (vertical electro-oculogram electrodes, VEOG) and stick them above and under the eye of the participant. DO NOT STICK ONTO THE EYE BROW. Do the same for the other two free electrodes (horizontal electro-oculogram electrodes, HEOG). Make sure the adaptors coincide with the central hole of the sticker. Connect the upper VEOG electrode onto channel 33, lower VEOG electrode onto channel 34 on head-box, the left HEOG electrode onto channel 35 and the right electrode onto channel 36. Make sure the participant is comfortable. If available launch a DVD or CD on STIM-PC to entertain participant during gel application (see below).

- **Calibration and Impedances**

- Launch Curry 7 in ACQUI-PC. Go to Amplifiers>Load Set Up. Open XX. Then, go to Amplifiers>Impedances. Using the range button set the scale between 50 and 0 kΩ.

Gel Application

- Take a cotton bud, remove the cotton on one end and use this end to move the hair gently on one side of each electrode hole you work on prior to degreasing and gel application.

- Do inform the participant that you are going to degrease each electrode site with alcohol and put gel in each hole, let him/her know all he/she has to do is relax, be patient and complain if he/she experiences any discomfort.

- First prepare the ground, the reference (left mastoid) and one electrode next to CZ. As long as the chosen electrode is not below 11 kΩ (Green colour on the screen), carry on working on the THREE electrodes by degreasing and gently

scrubbing the scalp with the cotton end of the cotton bud. Put just enough gel to fill in the electrode hole. All you want is the gel to touch the scalp and touch the electrode on the other side. You do not want gel spreading under the cap towards the other electrodes. Once the chosen electrode is “green” (ideally below $5\text{k}\Omega$), you are ready to prepare all other electrodes including the EOGs.

- Work on the electrodes one-by-one, making sure each one is “blue” before you move to the next one. In order to make this very fast, apply alcohol with the one cotton bud, inject a small amount of gel and then scrub the scalp by rolling the cotton bud between your thumb and index finger while pressing against the scalp. **MAKE SURE YOU ROLL FORWARD AND BACKWARD AND NOT ALWAYS IN THE SAME DIRECTION TO AVOID CATCHING THE HAIR AROUND THE COTTON BUD.** As soon as the electrode flickers in the blue range, stop. Just fill up the electrode hole and wait, it should stabilize in the “blue”, if not scrub again.
- If you have proceeded fast enough, you can leave the participant have a rest for ten minutes, for instance until the film ends (gel stabilisation and impedance self-lowering). When the impedance scale is lowered to $[30 - 0]$ $\text{k}\Omega$, all electrodes should be blue at least. Ideally, all electrodes should be below $5\text{k}\Omega$. If the VEOG electrodes don’t go down, check they are effectively connected to the headbox (!). Allow half an hour to 45 minutes to finalise cap preparation. If you reach 45 minutes, stop as soon as you can (as soon as all electrodes are below $10\text{k}\Omega$). With training, gel application should take no more than 20 minutes.

Experiment Start-Up

- Once the cap is ready, ask whether the participant would like to go to the toilet. You may unplug him/her and let them go to the toilet. When they are back, sit them comfortably again, plug the connectors in and plug the VEOG again. Set the keyboard/response box on the participant’s lap. Dim the lights in the room according to participant’s comfort. **IMPORTANT:** Turn off AC from outside to booth.
- For visual experiments: check distance to the screen using the tape measure.

- Give instructions. Take your time. Make sure the participant has a clear idea of what to do and how movement affects EEG. Make sure (s)he is OK. Close the door. Go to acquisition room.
- Launch E-prime stimulation file on STIM-PC. Close impedance measurement and start acquiring mode on ACQUI-PC. Look at on-line activity. Check ocular movements are recorded and not too variable. Check for noise (50 Hz). Make sure you name the file with the same name as the participant file in E-Prime.

Cap Removal

- Once finished STOP RECORDING. Say thank you for participation in your study. Before you do anything, unplug HEOG and VEOG. Then, unplug the cap. Undo the straps. Pull the straps towards the top of the head and remove the cap gently as some hair may be caught in the electrode adaptors. Remove electrodes adaptors from HEOG and VEOG locations and remove stickers. Don't remove stickers too slowly as it might hurt, the faster the better. Invite participant to have a hair rinse or a hair wash, as preferred.

Participant debriefing

- Once the participant's hair is satisfactorily clean and dry, have him/her sign the receipt for cash (if any). Ask the participant if everything was all right, if they have any comments or questions. Make sure you give them all the information they want about the experiment once it is over.

Data Backup

- Copy the participant's data as a folder with experiment code and a folder with participant code onto Toshiba's external drive. Write the list of files that are in the folder in lab records notebook.

Laboratory Clean up and Check Out

- Make sure no cotton wool, no wiping paper or cotton bud, etc. are left dirty everywhere. Throw away all used disposable items. DO NOT THROW AWAY

ELECTRODE ADAPTORS; THEY ARE PATENTED AND COST A LOT OF MONEY! Clean the trolley, the tables and around the chair (gel dries hard and looks untidy). Rinse the syringes. Make sure used towels are on their way to the washing machine. Soak the cap in warm water in a washing basin with a drop of anti-bacterial washing up liquid (just a drop). Clean each electrode with the toothbrush. Rinse the cap. MAKE SURE THE CONNECTORS DON'T GET WET. Rinse the cap and hang it to allow drying. Once everything is back in order, you may turn off the computers (shut down) except if another experiment is coming up. If you have an experiment on the next day, you can leave the amplifiers on all night. Make sure you turn off all lights and close the doors before you leave. Put the towels into the washing machine. If you are the last one of the day to run participants turn on the washing machine, so that towels are clean and dry for the next day.

Document 1. PERLLab records (to be filled by PERLL)

Date:

Researcher:

Supervisor:

Experiment Name:

Experiment Code (PERLL):

Accepted/Date: Y/N

Training: Y/N

Assistance: Y/N

Consumable costs: Y/N

Comments:

Document 2. Experiment Form (to be filled by the researcher)

Please print and fill the following form for lab records. This should be saved into lab cabinet (experiment records folder).

1. Profile

- Experiment Name:
- Experimenter Name/Department:
- Supervisor/Academic lead/Department:
- Researchers involved (add all researcher/students that will be handling EEG equipment):
- External Grant : Y/N
 - Funding Body
 - Amount (EEG consumables -10 GBP x participant):
 - Projec title
 - Grant costing code:
- Internal Grant: Y/N
 - Amount (EEG consumables -10 GBP x participant):
 - Grant costing code:
- LAEL consumables funding: Y/N
 - Amount (EEG consumables -10 GBP x participant):
 - LAEL costing code:

2. Ethics

- Ethics FASS/LUMS (please add a copy alongside this form):

Project Name & PI:

Date of acceptance:

Code:

3. Participants

- Profile:
- Number:
- Inconvenience allowance:

Comments:

Name/Signature:

Date:

A0000XX00X0000: letter-lab-identifier per year (A=2017)/participant lab number (starting at 1001) Gender/Handedness/Age/participants'native language (E=English)/two optional numbers to code counterbalance-lists for participants / two numbers to code your own number of participant.
e.g.: F18E01A1001: Female, 18 years old, English native, list 1, and then A1001 would refer to the first participant of the lab in 2017.

Document 3. Participant records