UNIVERSITY OF SUSSEX

Centre for Consciousness Science

EEG/ECG Training Manual

GENERAL WORKING PROCEDURES

DIAL 3333 IN CASE OF EMERGENCY

NEAREST FIRE ALARM:	**Corridor**
NEAREST FIRE EXTINGUISHER:	**By Lift**
NEAREST EYEWASH BOTTLE:	**Bookcase**
NEAREST FIRST AID STATION:	**By Lift**
NEAREST EYE WASH STATION:	**By Lift**

WORKING WITH PARTICIPANTS

- *ILLNESS.* If either you or your participant is suspected of being ill, the research booking should be cancelled and, if possible, rescheduled. Please advise participants not to attend if they feel ill prior to the session.
- *FRAGRANCE-FREE.* You should ensure a fragrance-free environment for the comfort of participants since you will be in such close proximity. Avoid using strong scents on the day and of course be aware of personal hygiene!

WORKING ALONE

- *REDUCING RISK.* If you suspect you are working alone in the building, there are two things you can do to minimize risk:
    - 1) call security (3333) to inform them of your location and how long you expect to be working
    - 2) call an independent party and inform them of your location and how long you expect to be working.
- Either party can then call to check on you during your time in the lab and you should remember to call relevant parties when you are leaving.

- *WEEKENDS.* Give special consideration to these issues at the weekend, when it is more likely that you will be working alone.

HANDLING MONEY

- *REDUCING RISK.* Make sure that the cash tin is always securely stored. Whenever possible, prepare payment without the participant present to maintain security,

both of the cash tin and participants' paperwork. **EMERGENCY PROCEDURES**

DIAL 3333 IN CASE OF EMERGENCY

There is a phone located under the TMS within the testing room

IN ALL CASES OF DOUBT OR WHEN SYMPTOMS PERSIST, ALWAYS SEEK MEDICAL ATTENTION

KORSOLEX USE

KORSOLEX – Always keep the container lid tightly closed when not in use!
(ALWAYS wear lab coat, eye goggles and chemical gloves when using)

INGESTION	*If swallowed, may irritate mouth, throat and intestinal tract. Ingestion of glutaraldehyde may cause nervous system effects including nausea, dizziness, headache, and drowsiness.* **If ingested, call 3333 immediately, requesting an ambulance**. Induce vomiting only if advised by appropriate medical personnel. Never give anything by mouth to an unconscious person.
EYE CONTACT	*Causes severe irritation with possible burns.* Check for and remove contact lenses. Flush thoroughly with water for at least 15 minutes, lifting upper and lower eyelids occasionally. Get immediate medical attention (eye wash station).
SKIN CONTACT	*May cause skin irritation.* Remove contaminated clothing. Flush thoroughly with mild soap and water. If irritation occurs, get medical attention.
INHALATION	*Vapours may cause irritation of the nose, throat and upper respiratory tract. Repeated inhalation of glutaraldehyde vapors may cause asthmatic symptoms in some individuals, including cough, wheezing and difficulty breathing.* Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.
SPILL	Dilute with water, absorb with an inert dry material (towels), sweep up and place in suitable container for disposal (standard bin). Wash spill area with soap and water.

KEY ANT EEG SAFETY PROCEDURES

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Consumables disposal

- Disposables such as **cotton wool**, **alcohol pads** and **stickers** can be disposed of in the regular waste.
- **Syringes** and **blunt needles** should be disposed of in a Sharps Box
- Please let the lab manager know when the Sharps Box is full

KORSOLEX use

- Always wear **lab coat**, **eye goggles** and **chemical gloves** when handling Korsolex
- Korsolex is replaced by the Lab Manager every 28 days
- **DO NOT replace Korsolex yourself.**
- See **Korsolex Log** next to sink for replacement dates.
- DO NOT use Korsolex if it is past the deactivation date.

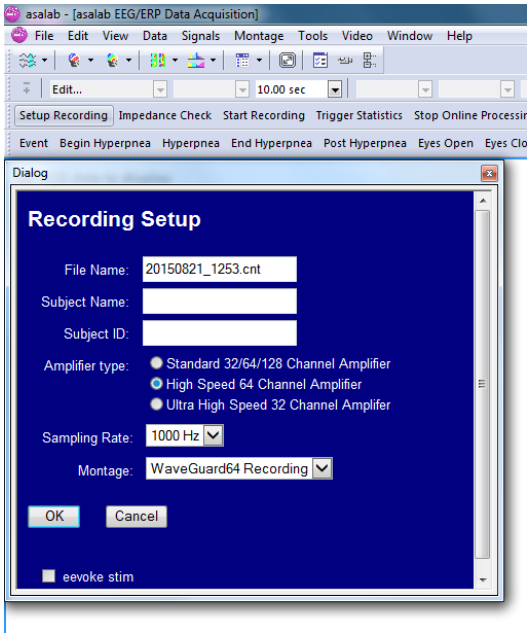
STANDARD OPERATING PROCEDURES

BEFORE SESSION

1. Advise participant to wash hair prior to arrival without applying hair products
2. Participant should wear layered clothing.
3. Check if the participant has been to bathroom.
4. Prepare on disposable towel:
    a. *syringe with gel (always fill and refill syringe without needle attached)*
    b. *stickers*
    c. *tape measure*
    d. *alcohol pads*
    e. *micropore tape*
5. Switch on power at all wall sockets
6. Make sure the cage monitor and computer are running and displayed
7. Turn on baby-bottle warmer to heat the gel; the ideal temperature has been permanently marked on the dial. DO NOT adjust the temperature.

SETTING UP THE AMPLIFIER

Do not use an operating cellular phone within 30 cm of the amplifier, the cables or the electrodes to avoid excessive noise on the signals.



Start up ASALab > Setup Recording

- Change the filename appropriately
- Sampling rate is 1000Hz (1kHz)
- The standard Montage is WaveGuard64 Recording

Make sure ANT amplifier is turned ON

Click OK

EEG should be running (but not recording)

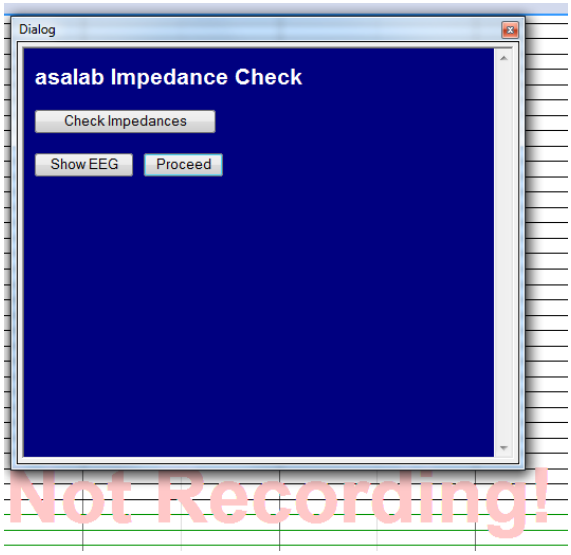
FITTING THE CAP

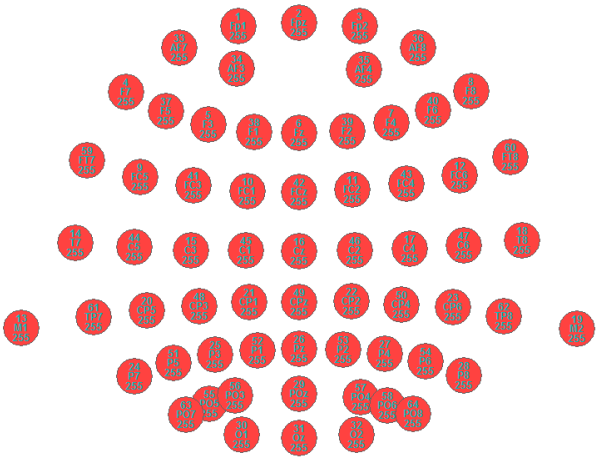
For privacy, please make sure the door is closed to the EEG area.

- Using **tape measure**, measure participant nasion (bridge of nose) to inion (bump at back of head). Ask the participant to hold the tape measure at the nasion to help you. Make a note of this distance.
- Measure head circumference and select cap size (if participant is close to a boundary, select smaller cap size)
    - Large 56-61cm (blue trim)
    - Medium 51-56cm (red trim)
    - Small 47-51cm (yellow trim)
- To monitor eye movements in your experiment, you will also need to attach bipolar HEOG and VEOG electrodes. These and other sites should be cleaned before attaching the electrodes, first with neuprep and then an alcohol wipe (be gentle; neuprep is quite abrasive). Sites cleaned should include VEOG, HEOG, forehead and mastoids. Once these sites have been cleaned, attach stickers to the 4 external electrodes, making sure the white tab of the sticker is parallel to the wire. Then place a small amount of gel in the middle circle of each of the 4 external electrodes using a syringe. Finally, place the 4 electrodes with the tab (and lead) hanging down on the HEOG and VEOG locations, making sure the participant is looking straight ahead. VEOG electrodes should bisect the pupil vertically, HEOG electrodes should bisect the pupil horizontally.
- Now you should fit the cap. Ask the participant to look up at the ceiling, place the front of the cap on the forehead and ask the participant to hold it in place and slowly bring their head down.
- Fit **cap** symmetrically and ensure that *Cz* is halfway between nasion and inion measurement.
- Also measure centrality laterally from the 'tragus' on each ear, Cz should be half of this distance. Pierced in the picture below.

Click on **Check Impedences**

This will show a top view of the electrode cap and the next task is to turn all the red circles into blue circles (i.e., lower impedences):

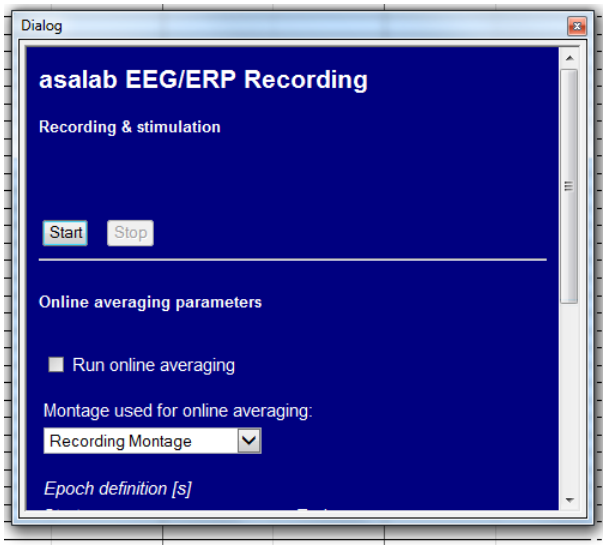




- To insert the warm **gel**, part hair by moving syringe in a left to right motion, insert gel at the same time as drawing syringe upwards, to leave a column of gel.
- DO NOT grind away at the scalp if it is not turning blue! Impedances will often lower as a function of time. If not, the issue is usually you need a little (though not much more) gel.
- Be gentle, if participants bend their head away from you, this is a sign that you are being too aggressive with your abrading!

The current configuration on the amplifier with this montage is:

	Red	**Black**
Channel 65 (HEOG)	To right of right eye	To left of left eye
Channel 66 (VEOG)	Below left eye	Above left eye



Click Start

The 'Not Recording!' prompt should disappear and the background of the EEG display should turn yellow. **This means you are recording.**

ECG Procedure

Background Information

ECG (electrocardiogram) measures the electrical activity of the heart muscle. As such, it is a much stronger signal than that measured by EEG. Familiarize yourself with the usual profile of an ECG signal (https://en.wikipedia.org/wiki/Electrocardiography) and the Triangle of Einthoven (https://en.wikipedia.org/wiki/Einthoven's_triangle). For the vast majority of our uses in cognitive neuroscience we are most interested in the largest positive peak in the ECG signature, the R wave. All other ECG signature landmarks (e.g., the t-wave, commonly associated with systole) can be computed/measured from the R-wave. In our lab's experience, the R-wave is easily measured by attaching electrodes to the wrists (just behind the back of the hand), but occasionally it might be preferable to measure the ECG from electrodes attached to the chest (for example, when participants must make extensive arm or hand movements). Please note, for obvious reasons of participant privacy, placement of electrodes on the wrist rather than chest is preferable. It is unlikely that hand/wrist movements such as button pressing, wrist flexion, etc. will interfere with ECG measured from the wrist. It is your job as a researcher to pilot your own experiment and verify this before participant recruitment.

In short: place ECG electrodes on the wrists rather than the chest unless the latter is absolutely vital. If a decision is made to measure ECG from the chest, this must be verified by a senior Sackler researcher (post-doc or above).

In all cases, the participant should be informed in advance how and why ECG will be measured (i.e., at the point of participant recruitment using written information sheets). ECG should also be outlined in the Instruction and Consent forms explicitly. Participants should also be asked verbally when they arrive that they understand ECG will be measured and how this will be done. In all situations, the participant's comfort must be maintained. If a participant objects to ECG measurement, the measurement should be abandoned. This level of care is to ensure the safety and comfort of both participant and researcher.

ECG measurement:

The basic procedure for ECG measurement is simple. The "electrodes" are simple sticky pads with a press-stud backing (see images below). To ensure a good signal, the areas where the electrodes will be applied should be cleaned using alcohol wipes. The electrode pads can then be applied. The two ECG electrode leads should then be attached to the sticky pads. In all cases, the red lead goes to the participant's left electrode site, the black to the right. The participant should do all of these stages after the researcher has demonstrated the procedure. If the ECG electrodes are applied to the chest, the researcher must leave the EEG booth to allow privacy. Please note, the profile of the ECG signal seen in the EEG software will be inverted compared to most ECG images you will see, because by default the EEG software plots negative voltage upwards on the Y-axis. Overleaf is an image of ECG application procedure.

Clean the skin areas with an alcohol wipe

Attach sticky electrode pads to bony part of the wrists

Attach electrode cables gently to the pads.
Red on the left, black on the right.

POST-EXPERIMENT

- Make sure you have stopped recording in ASAlab.
- Firstly, detach the cap and ocular electrodes from the amplifier. Take the participant outside the faraday cage and in front of the mirror by the sink. Take of the cap. Allow participant to remove the ocular electrodes themselves (the stickers are very strong). MAKE SURE they use the white tabs on the sticker to remove them and NOT the wires.
- Place cap and electrodes in a **bowl** and ensure connectors are well protected from water using the zip-loc bag. Place these away from the area the participant needs to use to clean themselves.
- Allow the participant as much time as they need to wash their hair.
- Some participants may need help washing their hair etc

BEFORE YOU LEAVE….

Please leave the lab ready for the next person to use. If you arrive and find the room untidy or equipment stored inappropriately, inform the Lab Manager or you WILL be blamed!

- Disposables such as **cotton wool**, **alcohol pads** and **stickers** can be disposed of in the regular waste. Gel from **syringe** can be squeezed onto the **disposable towel**, which can be thrown in *regular waste*
- **Syringes** and **blunt needles** should be placed in a Sharps Box
- The Sharps Box must be returned to Life Science Stores when full
- Participant's towel should be placed in the laundry bag
- Wash hands

CAP CLEANING

Prepare:

- container of Korsolex
- chemical gloves
- eye goggles
- lab coat
- disposable towel
- Timer
- washing up liquid

Always wear lab coat, eye goggles and chemical gloves when handling Korsolex

- Check the deactivation date of the Korsolex. If outside of the deactivation date you will need to contact the lab manager: D.schwartzman@sussex.ac.uk Tel: +44-1273-67-8213
- Clean external electrodes separately using just cold water
- Clean cap under tap using cold water. All electrodes and cap holes should be free of gel (you can use a syringe or waterpik and squirt water through the cap holes- make sure you do this underwater!)
- Rinse cap and electrodes with water

Replace **lab coat**, **eye goggles** and **chemical gloves**
Place the cap inside the Korsolex bucket.
Make sure the connectors are SECURE OUTSIDE the bucket.
Ensure all parts of the cap are covered and submerge for *5 minutes* using **stopwatch**
Thoroughly rinse the cap with cold water 3 times for a minute each, every time using fresh water from the tap.

AND FINALLY….

- Place electrode cap on wig-stand and drop-down electrodes on coat rack
- Ensure that the connectors are higher than the caps and away from water / moisture
- Make sure you note which cap you used and record any problems in the log next to the entrance of the Faraday Cage.
- Contact lab manager if you have any issues with the recording or equipment; please let him know if we are running low of any consumables.

Make sure you turn the heater off

BACK UP YOUR DATA!

CONFIRMATION
EEG/ECG SOP

NAME: _____

I CONFIRM THAT I HAVE READ, UNDERSTOOD AND, WHERE APPROPRIATE, SIGNED THE FOLLOWING DOCUMENTS:

SCCS TRAINING MANUAL _____

OUT OF HOURS DETAILS _____

KORSOLEX SAFETY DATA SHEET _____

SCORED 100% ON EEG LAB QUIZ _____

SIGNATURE: _____ DATE: _____

Please email a signed copy of this page to the lab manager: d.schwartzman@sussex.ac.uk