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TITLE:

Simultaneous Application of Transcranial Direct Current Stimulation During Virtual Reality Exposure.

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KEYWORDS:

transcranial direct current stimulation; virtual reality; clinical trial; posttraumatic stress disorder; tDCS; noninvasive brain stimulation; neuromodulation; fear; extinction; habituation; emotional memory; skin conductance response.

SUMMARY:

This manuscript outlines a novel protocol to allow the simultaneous application of transcranial direct current stimulation during exposure to warzone trauma-related cues using virtual reality for veterans with posttraumatic stress disorder.

ABSTRACT:

Transcranial direct current stimulation (tDCS) is a form of non-invasive brain stimulation that changes the likelihood of neuronal firing through modulation of neural resting membranes. Compared to other techniques, tDCS is relatively safe, cost-effective, and can be administered while individuals are engaged in controlled, specific cognitive processes. This latter point is important as tDCS may predominantly affect intrinsically active neural regions. In an effort to test tDCS as a potential treatment for psychiatric illness, the protocol described here outlines a novel procedure that allows the simultaneous application of tDCS during exposure to trauma-related cues using virtual reality (tDCS+VR) for veterans with posttraumatic stress disorder (NCT03372460). In this double-blind protocol, participants are assigned to either receive 2 mA tDCS, or sham stimulation, for 25 minutes while passively watching three 8-minute standardized virtual reality drives through Iraq or Afghanistan, with virtual reality events increasing in intensity during each drive. Participants undergo six sessions of tDCS+VR over the course of 2-3 weeks, and psychophysiology (skin conductance reactivity) is measured throughout each session. This

allows testing for within and between session changes in hyperarousal to virtual reality events and adjunctive effects of tDCS. Stimulation is delivered through a built-in rechargeable battery-driven tDCS device using a 1 (anode) x 1 (cathode) unilateral electrode set-up. Each electrode is placed in a 3 x 3 cm (current density 2.22 A/m^2) reusable sponge pocket saturated with 0.9% normal saline. Sponges with electrodes are attached to the participant's skull using a rubber headband with the electrodes placed such that they target regions within the ventromedial prefrontal cortex. The virtual reality headset is placed over the tDCS montage in such a way as to avoid electrode interference.

INTRODUCTION:

Posttraumatic stress disorder (PTSD) is a chronic and disabling condition that is especially prevalent among veterans. Despite its prevalence and devastating impact, many who receive evidence-based psychotherapy for PTSD have significant residual symptoms[1]. The synergistic application of non-invasive brain stimulation together with PTSD-focused principles of psychotherapy presents an opportunity to improve therapeutic gains and lower PTSD-related burdens.

A core component of PTSD is the inability to inhibit a maladaptive fear response[2-3]. Pathologically elevated activity in the amygdala and dorsal anterior cingulate cortex, regions that facilitate the fear response, has been consistently reported in PTSD. This is alongside reduced activity in the ventromedial prefrontal cortex (VMPFC), a region thought to down-regulate the fear response[3-7]. Accordingly, increasing endogenous VMPFC activity during the processing of fear-inducing stimuli may be a promising method to improve inhibition of fear and the effectiveness of exposure-based treatments.

Exposure-based psychotherapies, a first-line treatment for PTSD, aim to facilitate corrective learning by teaching patients that the hazardous experience (i.e., the cause of their PTSD) is no longer present or threatening in their current environment[8-9]. Emotional engagement in PTSD therapy is a crucial component of success[10] but is hampered by patients wanting to avoid experiencing distressing emotions and the presence of comorbid psychiatric disorders. One appealing approach to maximize and track emotional engagement over sessions is using immersive and contextually relevant virtual reality (VR) environments[11-12]. VR implementation is supported by prior data indicating that VR could generate efficacy rates comparable to those observed with standard cognitive-behavioral interventions[11,13-14]. VR has the additional benefit of providing a standardized environment for treatment development for specific hypothesis testing.

The VR environment furthermore allows for the integration of adjunctive non-invasive brain stimulation methods, such as transcranial direct current stimulation (tDCS). tDCS alters cortical excitability via subthreshold modulation of neuronal resting membrane potentials using a weak (typically 1 – 2 mA) constant electrical current[15]. Stimulation is typically provided over a 20 – 30-minute period. Effects of tDCS are dependent upon the current polarity. Although an oversimplification, in theory, positive current flow (i.e., anodal stimulation) increases the likelihood of neuronal depolarization, whereas negative current flow (i.e. cathodal stimulation)

decreases the likelihood of neuronal action potentials[16-17]. As such, tDCS readies the brain for subsequent responses to external stimuli to facilitate learning and memory[18].

tDCS has a favorable safety profile as a low risk technique that is well tolerated and associated with minimal side effects[19-20]. tDCS is also inexpensive; tDCS devices cost around $9,000 compared to >$70K for clinically available non-invasive brain stimulation methods, such as transcranial magnetic stimulation. tDCS devices are also portable, as they are battery powered, as opposed to needing a dedicated electrical circuit. This portability allows use in any office location or room, including at home. These factors enable tDCS to be used in combination with therapeutic interventions including VR and existing models of PTSD treatment. Flexible use may be particularly important in the new landscape delivering psychiatric care and non-invasive brain stimulation in the post-COVID19 world.

The protocol detailed below is designed to integrate tDCS during VR administration (tDCS+VR) in individuals with warzone-related PTSD in order to augment anxious habituation. The VR sessions allow for the exposure to trauma-related events to be standardized across participants to ensure a consistent content for this habituation. Participants undergo six sessions of tDCS+VR over the course of two to three weeks, with each session consisting of three identical VR drive-throughs. Six sessions were selected to approximate the duration of VR in Rothbaum et al.[14] and Difede & Hoffman[21]. This number of sessions showed efficacy in typical, non-VR treatment studies (*e.g.* Bryant et al.[22]) and was further informed by feasibility data from the prior pilot study[23]. Throughout each session, psychophysiology (i.e. skin conductance) is measured. This allows for testing of within and between session changes in hyperarousal to virtual reality events and adjunctive effects of tDCS. tDCS intensity is set at 2 mA and is delivered through a built-in rechargeable battery-driven stimulator that provides a constant, direct current using a 1 (anode) x 1 (cathode) unilateral electrode set-up. Each electrode is placed in a 3 x 3 cm (current density 2.22 A/m^2) reusable sponge pocket saturated with 0.9% normal saline. Sponges with electrodes are attached to the participant's skull using a rubber headband with the anode placed over Fp1 and AF3 regions and the cathode over PO8 of the 10 – 20 EEG electrode coordination system in order to target the ventromedial prefrontal cortex while preventing cathodal stimulation over the prefrontal cortex. Similar electrode montages, aimed to target the VMPFC, have been used to modulate the extinction of conditioned fear responses by our lab[24,25] as well as others[26]. The virtual reality headset is placed over the tDCS montage in such a way as to avoid interference with tDCS electrodes. tDCS should start during the initiation of VR[23] and continue throughout. Participants return for 1- and 3-month post-treatment assessment visits to assess longer-term effects of tDCS+VR on changes in symptoms of PTSD, depression, anxiety, and anger as well as improvements in sleep and quality of life. Hypotheses to be tested are 1A) the prediction that active tDCS+VR, compared to sham+VR, results in greater change on PTSD symptoms and quality of life/social function at end of treatment, and 1B) sustained change at 1- and 3- months post-treatment, and 2) that change in psychophysiological responses, reflective of habituation, relates to changes in PTSD symptoms and quality of life/functioning differently after active tDCS+VR versus sham+VR. This clinical trial is registered under ClinicalTrials.gov Identifier: NCT03372460.

PROTOCOL:

Eligible participants sign written, informed consent prior to the start of any research procedures. Research is performed in compliance with institutional, national and international human research guidelines. All methods described have been approved by the Institutional Review Board of the Providence VA Medical Center.

NOTE: The tDCS+VR protocol requires two dedicated research staff members. One staff member is the VR Controller, who operates the VR and administers the VR stimuli at the various time-points outlined below. The second study staff member operates the computer on which the psychophysiology is collected.

1. Screening, Diagnostic Interviews, and Magnetic Resonance Imaging

1.1. Recruit participants consisting of male and female veterans, with a specific focus on Operation Enduring Freedom (Afghanistan), Operation Iraqi Freedom, and Operation New Dawn (Iraq) based on the following eligibility. Inclusion criteria: (1) diagnosis of chronic PTSD with trauma related to warzone experience, (2) age between 18-70 years, and (3) if in treatment, symptomatic despite ongoing stable treatment regimens for at least 6 weeks prior to study procedures. Ongoing medications and psychotherapy are allowed to continue unchanged during the study. Exclusion criteria are as follows: meet established safety criteria for magnetic resonance imaging (MRI), as MRI procedures are a component of this study, and include cardiac pacemaker, implanted device (deep brain stimulation) or metal in the brain, cervical spinal cord, or upper thoracic spinal cord, pregnancy or planning to become pregnant during the study. Additional tDCS-specific exclusions are skin lesions at the site of stimulation that may alter impedance (e.g., vascular moles or angiomas). Other exclusion criteria are lifetime history of moderate or severe traumatic brain injury (TBI); current unstable medical conditions; current (or past if appropriate) significant neurological disorder, or lifetime history of a) seizure disorder b) primary or secondary CNS tumors c) stroke or d) cerebral aneurysm, any primary psychotic disorder, bipolar I disorder, active moderate/severe substance use disorders (within the last month, excluding nicotine/caffeine), active suicidal intent or plan to attempt suicide within 6 months as detected on screening instruments or in the investigative team's judgment.

NOTE: Participants for this study were recruited from the Providence VA.

1.2. Obtain written informed consent prior to the initiation of any study procedures.

1.3. Administer diagnostic interviews and questionnaires to verify diagnosis and assess severity of PTSD using the Structured Clinical Interview for DSM 5 (SCID-5)[27], the Clinician Administered PTSD Scale (CAPS-5)[28], and the PTSD Checklist for DSM5 (PCL-5)[29].

NOTE: Administration of the SCID-5 further allows the detection of any comorbid diagnoses that may preclude study exclusion criteria outlined above. Additional assessments, such as the Quick Inventory of Depressive Symptomatology Self-Report (QIDS-SR)[30], are up to the individual research teams depending on hypotheses.

1.4. Screen participants for safety to undergo tDCS and MRI based on the exclusion criteria listed above.

NOTE: Pre-screening MRI safety forms can be obtained from www.MRIsafety.com

1.5. Schedule participants to complete six VR sessions over the course of two to three weeks, such that participants complete a VR session approximately every other weekday.

2. Randomization

2.1. Prior to initial study implementation of tDCS+VR, retrieve active tDCS and sham codes from the tDCS device manual and input them into a randomization program to ensure blinding of tDCS+VR or sham+VR administration.

2.2. Using the randomization program, create randomization urns by assigning participants to receive either active tDCS or sham during virtual reality based upon sex (male; female) and PCL-5 symptom severity (low; high).

NOTE: The randomization program should generate a tDCS device code that can subsequently be entered into the tDCS device to ensure the tDCS administrator remains blinded to whether active or sham stimulation is applied. As such, this is a double-blind protocol where both participants as well as tDCS administrators are blinded to stimulation status.

3. tDCS Device Set-up

3.1. Program the tDCS device with the following parameters and settings, listed under 3.1.1 and 3.1.2, by pressing both keys on the left side of the tDCS device to save each setting.

3.1.1. Setting A: 30 s ramp up to 1 mA intensity, 1 mA stimulation for 30 s, and ramp down to off over 30 s.

3.1.2. Setting B: 30 s ramp up to 2 mA intensity, 2 mA stimulation for a duration of 25 min, and a 30 s ramp down to off.

3.2. Set the tDCS device to **study mode**, or other double-blinding feature, following tDCS device instructions.

NOTE: Setting A is used to obtain information regarding impedance prior to stimulation and assessment of tDCS tolerability prior to starting VR. Additionally, the application of a brief electrical current has previously been used to provide some degree of somatic sensation to assist in study blinding[24-25,31]. Setting B allows entering in the specific study code for randomization (active or sham) for each participant. Settings C and D are not used in this protocol.

4. Psychophysiology Set-up

4.1. Use hard- and software capable of recording and analyzing electrodermal activity (EDA)/galvanic skin response (GSR) on a dedicated psychophysiological recording computer that is different from the computer that runs the VR software.

4.2. Create a data acquisition template according to software specific procedures with the following data collection settings: 5 µV; 10 HZ; DC. Heart rate: 1000 gain, Norm, DZ, 0.05 Hz.

NOTE: Creating a data acquisition template ensures consistency of data acquisition settings across sessions and participants.

5. tDCS Study Visit: Set-up and Administration

NOTE: For the steps below the addition of TM1 and TM2 refers to research "team member 1" and "team member 2" so that the various steps can be completed simultaneously.

5.1. When the participant arrives, gently clean, without vigorous rubbing, the participant's skin at the approximate areas where the sponges/electrodes will be placed with an alcohol swab and let dry.

5.2. Measure and record the circumference of the participant's head. Calculate 5% and 10% of the circumference to be used later for electrode placement.

5.3. Put the head strap on the participant, covering areas where sponges and electrodes will be placed, in such a way that it is still possible to fit one finger under the head strap.

5.4. Ensure that the rubber band connector is on the side of the head so that it is out of the way of the electrodes and does not interfere with the VR head-mounted display.

5.5. Fill each electrode sponge with 4 mL of saline using a syringe. Insert the electrodes into sponge pockets.

5.6. While positioned behind the participant, establish the location for the cathodal electrode using the previously calculated 10% of head circumference and measure this distance out from the inion of the head to the right. Place the cathodal electrode and verify measurements so that the cathode is approximately behind the right ear on the mastoid process.

5.7. Next, reposition to face the participant and establish the location for the anodal electrode by measuring out the previously calculated 10% of head circumference from nasion up, and then measuring out the previously calculated 5% of head circumference to the right. Place the anodal electrode and verify measurements so that the anode is touching 10 – 20 EEG electrode locations AF3/Fp1.

5.8. Turn the tDCS device on and then plug in the electrodes.

5.9. To load Setting A, exit out of study mode by pressing the top right button, then enter the master code of the device by using the top and bottom left buttons. After entering the master code, click **OK** by using the bottom left button. Next, make sure the arrow is pointing at **trigger**. Use the top right button to move through the settings until it reads, **load… setting**. Scroll the arrow to the bottom of the screen using the left arrows, then use the top right arrow to move through all the settings and back to setting A. Finally, click the top left arrow to load setting A.

5.10. Check the impedance by simultaneously pressing the top right and bottom left button to confirm that there is adequate contact between the tDCS electrodes and participant's skull. Record the initial impedance.

5.10.1. Always make sure that the electrodes are not plugged into the device before turning it on. Similarly, make sure to always unplug electrodes before turning off the device.

NOTE II: The tDCS device will shut off automatically if the impedance is above 55Ω. As a guideline, do not start the tDCS device if the impendence is greater than 35Ω in order to limit the chance of an automatic shut-off. If the impedance is too high, add a little saline to the sponges, move the participant's hair out of the way, or tighten the rubber headband if it appears to be too loose. Avoid dripping saline onto the participant – if this occurs, the sponges are too saturated.

5.11. Start stimulation under Setting A. Record the impedance prior, during, and after stimulation under Setting A. After completion of stimulation under Setting A, remove the electrodes from the tDCS device and turn the device off.

5.12. TM1: Place two self-adhesive, disposable EDA electrode patches on the thenar part of the participant's non-dominant hand.

5.13. TM1: Open the EDA/GSR data acquisition software to allow new data capture. Open the previously generated data acquisition template and click **Create/Record** a new experiment. Calibrate EDA signal following specific software instructions by first attaching one electrode to one electrode patch, calibrate, and then connecting the second electrode to the second electrode patch.

5.14. TM1: To ensure adequate GSR signal ask the participant to take a deep breath in and hold it for 10 s before breathing out.

NOTE: An increase in GSR should be noticeable. If no change in GSR is detected, research staff can clap their hands without warning to elicit a GSR response. A baseline skin conductance level value lower than 2 µS might be problematic because it could indicate too low a skin conductance to measure GSR throughout the VR session.

5.15. TM2: Turn the virtual reality system on and open the Patient Application program. Check

that the screen resolution is set to 1280 x 720 and click **play**. Then, open the Clinician Controller program and select the Iraq Rural driving or the Afghanistan Rural driving scenario based on the scene that is most relevant to the participant's deployment(s). Under the patient avatar window, select the position of **Driver**. Set sound volume at 65% of maximum.

5.16. TM2: With assistance of the participant, place the head-mounted display on the participant's head, ensuring that the display does not dislocate the electrodes. Check for comfort. Then, place the headphones on the participant's head and check for comfort.

5.17. TM1: Start EDA data collection and record 2 min of baseline EDA by explaining to the participant that they'll need to sit quietly for 2 min. Press F1 on the keyboard to mark the beginning of baseline period and F3 to mark the end of baseline period.

NOTE I: Using keys F1, F2, and F3 for markings are essential to allow for later data analyses. F5 can be used to mark participant generated interference throughout EDA data collection (*e.g.* coughing, movement, etc.).

5.17.1. After completion of baseline EDA, do not stop EDA data collection but continue to run until all three drives have been completed.

5.18. Turn the tDCS device on and plug the electrodes back in. The device now reflects **study mode** and Setting B. Use the bottom right button to click **OK** to confirm that Setting B is programmed to apply a 2 mA intensity for a total of 25 min, with a 30 s ramp up and ramp down each.

NOTE: During the VR session participants might express some discomfort from the headband or an itchy, prickly sensation. However, participants should be instructed to report any pain or an increasingly heating or burning sensation as this warrants the immediate shut-off of the tDCS device to avoid local skin burns.

5.19. Enter the participant specific randomization code retrieved from the randomization software and click **OK**, then start the stimulation by pressing the top left button to click **Y**.

NOTE: Participants should be informed that some people experience cyber sickness from VR and that this feeling is similar to car sickness. If cyber sickness occurs, it should recede quickly. Before the participant leaves, inquire if they are able to operate a vehicle. If not, supportive care can be provided, and usually additional waiting time is required.

5.20. To start the drive, click the **Off** button under driver control.

NOTE: Each participant will do three drive-throughs per session, each lasting about 8 min in duration, amounting to 24 min total. The 25 min of active or sham stimulation programmed in the tDCS device allows for an additional minute to be used to check in with the participant in between drive throughs.

5.21. For the first session (VR1, day 1) the VR Controller must guide the participant through the occurrence of VR events using a verbal prompt during the first drive-through as follows: "Up ahead there will be a road ambush. In 3…2…1… go" (VR Controller selects the 'road ambush' in the VR menu).

NOTE: This will only be done for the first VR drive-through on the first session. For all other VR drive-throughs or sessions, the participant must go through the drive without verbal prompting. However, the VR Controller can remind participants that they will see the same scenes as the previous drive-through, but no verbal warning of upcoming VR events will be provided.

5.22. VR Controller: Ensure that each drive-through starts with at least 30s of driving only in the VR environment. Then, administer each VR event (with a minimum of 10s of driving between each event) by clicking the event as labelled in the clinician controller software environment. VR events will occur in the following order: gunshots, Blackhawk helicopter flying overhead, insurgent ambush and another insurgent ambush, followed by IEDs, a bridge ambush and an explosion of the vehicle in front of the participant's vehicle. See Appendix 1 for timing of various VR events in both the Afghanistan and Iraq driving scenarios.

NOTE: This sequence of VR events is repeated in the same order and VR events are repeated at the same time during each of the three VR drive-throughs during each VR session.

5.23. While the VR Controller administers the VR events, have the staff member monitoring the skin conductance data acquisition press F2 on the keyboard every time a VR event is administered.

5.24. When the car returns to the beginning of the drive, stop the car from driving by clicking the **Throttle** button under driver control.

5.25. After each drive-through, the VR Controller must check in with the participant to ensure the safety and comfort of the participant before continuing with the next drive-through. If the participant mentions potentially more serious tDCS side-effects, such as a burning or increasing heating sensation, please follow tDCS device manual guidelines for stopping tDCS.

5.26. Complete drives 2 and 3 using the same order of VR events as during drive 1.

5.27. After completion of all three VR drive-throughs for one session, check and record tDCS impedance by going out of **study mode** by first pressing the top right button and entering the master code of the device by using the top and bottom left buttons.

5.28. Unplug the electrodes from the tDCS device and turn off the device.

5.29. Query the participant for any potential side effects by administering a tDCS side-effects questionnaire[32].

5.30. Finally, clean the VR headset, headphones and rubber headband after use with alcohol swabs and disinfectant wipes. Take a screenshot of the fully collected EDA trace over time for quality control processing.

NOTE: Implementation of additional cleaning and preventative measures might be necessary as precautions to reduce the spread of COVID-19. For example, participants might need to wear surgical facemasks. The wearing of facemasks increases the likelihood of fogging of the VR lenses. Surgical tape can be used to tape the masks over the participant's nose to reduce fogging. Similarly, the availability of multiple headbands - for both tDCS and the VR headset - and headphones will ensure spaced out usage between participants for cleaning and disinfection.

6. Analyses

6.1. GSR preprocessing

6.1.1. Using GSR processing software, open the participant's stored GSR file and save a new copy of the file for preprocessing so that the original, raw data file remains conserved.

6.1.2. Visually inspect the data for artifacts and general drift, then remove or correct them. Follow previously published guidelines on artifact removal and corrections for general drift which can be found at https://www.birmingham.ac.uk/Documents/college-les/psych/saal/guide-electrodermal-activity.pdf

6.2. Skin conductance level baseline

6.2.1. Record the average, minimum, and maximum values (in µS) across the 2 min baseline period by selecting the 2 min baseline period with the cursor. This information provides some index of the tonic skin conductance level and the level of EDA responsiveness.

NOTE: Although a 2 min baseline period is used here, a longer time period of up to four or 5 min can be used.

6.3. Event-related skin conductance response (SCR) to VR stimuli

6.3.1. Determine and create epochs related to VR events using the stimulus type event markings in the data by selecting the one second before each VR event and up to ten seconds following each VR event. The epoch width is the amount of time included to capture the SCR. Each psychophysiology equipment set will have its own set of instructions for creating epochs. Refer to the manual of your psychophysiology-collecting device for this information.

NOTE I: Although SCRs typically have an onset, or latency, of 1-3 s after event presentation, VR events are not always presented immediately when initiated. For example, while an IED explosion and distant gun fire will occur immediately when initiated, the onset of gun fire as part of an

insurgent ambush or the flyover of a Blackhawk is delayed by several seconds. As such, the 10 s window for SCR analyses should be liberal enough to capture SCRs in response to all VR events.

NOTE II: Verify that events, not fixed time intervals, are selected for analysis. Here the events are user defined **type 2- event specific VR start** as entered by a research team member.

6.3.2. Follow data processing procedures as outlined in the psychophysiology software used in order to mark the start and the end of each epoch of interest and extract event-related SCR data. See Appendix 2 for an example using a **Find Cycle** approach. Export preprocessed GSR data for further analyses.

6.4. Further analyses

NOTE: Given the relatively large epochs related to VR events, namely from 1 s prior to 10 s following VR events, the preprocessed output file will contain both event-related SCRs and non-event related, or non-specific SCRs. To determine the event-related SCR, use the first positive deviation that surpasses a 0.02 µS threshold occurring after at least two seconds. A window of two seconds is chosen as the epoch contains the 1 s prior to VR event presentation, and event-related SCRs do not typically have a latency of less than 1 s.

6.4.1. Using statistical analysis software, determine whether distribution of SCR data is normal. If not, apply a square-root or Log transformation to correct for skew/kurtosis following steps appropriate for the statistical analysis package used.

6.5. Use linear mixed models to test for the effect of active tDCS or sham on SCRs during VR, where group (active tDCS or sham) is a between-subjects variable, statistically controlling for baseline skin conductance level (SCL) and other demographic or clinical factors (*e.g.* PTSD severity). In order to test the effect of tDCS on between-session habituation, use VR session (1 – 6) as a within-subjects variable. To assess the effect of tDCS on within-session habituation, use individual drive-throughs (1 – 3) within each VR session as a within-subject variable.

REPRESENTATIVE RESULTS:

Representative results presented here reflect individual psychophysiological data tracings from four participants who completed the above outlined protocol. Enrolled participants are veterans with a diagnosis of PTSD and – in line with trial inclusion criteria – are between the ages of 18 and 70 years old. Given that this a currently ongoing double-blind, randomized sham-controlled trial (NCT03372460), it is not possible to present data pertaining to effectiveness of active tDCS versus sham. Therefore, individual raw, non-processed, skin conductance data tracings collected as part of this ongoing clinical trial are presented. This will provide preliminary insight into what could be expected, including obstacles when collecting psychophysiological data and skin conductance recordings in particular. Data on twelve veterans with warzone-related PTSD using the above protocol as part of a separate pilot study have previously been published[23].

Based on visual inspection of the skin conductance traces, participant A (**Figure 1**) appears to

show signs of between-session habituation from the first VR session to midpoint of protocol, during the third VR session, to the last, sixth VR session.

[Place figure 1 here]

Visual inspection of participant B raw skin conductance tracing (**Figure 2**) appears to indicate within-session habituation when comparing the first drive-through (red square) to the third drive-through (green square). Prior studies suggest that although within-session habituation is important, between-session habituation may be a better predictor of prolonged exposure-based treatment success for PTSD[33-34].

[Place figure 2 here]

Visual inspection of participant C raw skin conductance data (**Figure 3**) appears to show a less stark habituation profile compared to participant A (**Figure 1**), this participant nonetheless demonstrates both between- and within-session habituation. Furthermore, and similar to participant A, the skin conductance level is numerically higher during the first VR session as compared to the remaining five sessions.

[Place figure 3 here]

Raw skin conductance data from participant D (**Figure 4**) demonstrate a skin conductance level that can be considered too low for proper analyses with an absence of visually detectable skin conductance responses. As such, these data represent data collection failure. Although the raw data also reveal the presence of artifacts and electrode signal loss, the persistently low skin conductance levels and absence of visually detectable skin conductance responses across all six VR sessions is apparent for this individual.

[Place figure 4 here]

FIGURE AND TABLE LEGENDS:

Figure 1: Example of raw skin conductance data tracing from participant A. Figure 1 shows screenshots of raw skin conductance data obtained during VR session 1 (top), VR session 3 (middle), and VR session 6 (bottom). Reductions in skin conductance reactivity indicate between-session habituation. VR sessions 2, 4, and 5 are not pictured to allow for better visual comparison of skin conductance tracings.

Figure 2: Example of raw skin conductance data tracing from participant B. Figure 2 shows screenshots of raw skin conductance data obtained during the first drive (red square) and third drive (green square) of one VR session. Data represented in this figure may indicate within-session habituation from the first drive-through to the third drive-through.

Figure 3: Example of raw skin conductance data tracing from participant C. Figure 3 shows raw skin conductance data screenshots from participant C for VR sessions 1 through 6 ordered from

top to bottom. Participant C appears to demonstrate both between- and within-session habituation.

Figure 4: Example of raw skin conductance data tracing from participant D. Figure 4 shows raw skin conductance data screenshots from participant D during VR sessions 1 through 6, ordered from top to bottom, demonstrating unmeasurable skin conductance levels and responses, as well as artifacts (blue ovals) and EDA electrode signal loss (green square).

DISCUSSION:

The protocol detailed above describes the concurrent application of tDCS and VR, as opposed to the serial application of either technique. With respect to existing methods, the simultaneous application of tDCS with VR is important. While the VR provides a contextually rich and immersive environment for fear-related processing, the subthreshold stimulation provided by tDCS allows for the modulates of intrinsic neural activation associated with this fear-related processing. There are multiple critical steps in this protocol that can be divided into those that relate to tDCS+VR implementation and those related to psychophysiological data capture for analyses. With respect to tDCS+VR, it is of critical importance to ensure correct randomization and simultaneous application of tDCS throughout the entire VR session. Another blinded staff member can perform further confirmation of randomization.

As for ensuring simultaneous tDCS+VR two aspects are important; 1) the impedance achieved during tDCS set-up and 2) starting the tDCS device in close proximity to starting VR. The latter issue is relatively straightforward and should ensure that tDCS is continuously applied throughout the VR presentation while remaining well within the safety limits of tDCS when a 2 mA intensity is applied over a 25-minute duration[20]. With respect to impedance, low impedance is desirable. Knowing whether adequate impedance, or contact quality, is achieved depends on the tDCS device that is used. Some devices will display impedance in Ohms, where lower is better, whereas other devices use a 10- or 20-point display scale representing contact quality, where higher is better. Regardless of the specific device, the use of normal saline, 0.9% NaCl solution, as opposed to regular tap water to moisten the electrode sponges improves impedance[35]. The use of regular tap water should further be avoided because it associated with the occurrence of small skin lesions[35-36], one of the more serious possible side-effects of tDCS. Skin lesions can also occur if the skin under the electrodes is vigorously abraded prior to tDCS[37] or if a conductive gel is used, which can dry out[35,38], and should therefore also be avoided. Finally, a high impedance prior to starting tDCS can result in reaching or surpassing the prescribed safety parameters of the device, which will trigger the device to shut down mid VR administration. Although it is important to sufficiently moisten the electrodes sponges to ensure adequate impedance, this should be balanced by not excessively soaking the electrodes, as this may result in leaking, or dripping, of saline when the VR headset is placed. Leaking of saline may allow the electrical current to 'spread' over a larger area resulting in a lower, but unknown current density[39], which depends on tDCS intensity (in mA) and size of electrodes (in cm^2). Likewise, it is important that the VR head mounted display does not physically touch the sponges/electrodes in order to avoid disruption of current flow and shifting of electrodes as participants move their head.

In this protocol, skin conductance is considered a primary outcome measure. Skin conductance is a psychophysiological measure of sympathetic nervous system activity[40]. Typical factors associated with skin conductance acquisition, such as effects of environmental temperature and humidity, aging, smoking status, caffeine use, and use of medications with anticholinergic effects[41], will need to be considered, but cannot always be eliminated. For example, it is possible to ask participants to abstain from using caffeine-containing products prior to VR sessions, but it is not ethical to ask them to discontinue antidepressant medications. Moreover, for reasons that are not always clear, a portion of individuals demonstrate very low or unmeasurable skin conductance levels and/or skin conductance responses, which is highlighted in Figure 4. It is therefore important to enroll a sufficient sample size to tolerate the loss, or absence, of data. Specific to the implementation of this protocol, it should also be mentioned that event markers are currently entered manually during the psychophysiological data capture. Although this is a limitation, it is not uncommon in hospital systems that a non-hospital managed computer, in this case the computer that runs the VR environment, cannot be connected to the encrypted hospital information technology network. This means that it is not possible to have the computer that runs the VR environment send signals (*e.g.* through a TTL pulse) to the psychophysiological data capture computer that is on the hospital network. Although less elegant, one solution is to have two research team members be present during each VR session; one that controls the VR administration and one that manually enters event markers to the psychophysiological tracing, as can be seen at the top of each figure (see Figures 1 – 4). However, this does not address the presence of a slight time difference, less than half a second, from when VR events are initiated by the VR controller and entering the event marker by the second person. Future studies might want to mitigate this so that event markers can automatically be registered. Yet, the presence of a second research team member – different from the person who operates the VR environment – who can observe the participant throughout sessions is highly recommended. It should be expected that some participants might have strong emotional reactions during the study or experience cyber sickness-related side effects. The ability of the research team to quickly respond to these situations ensures the best possible care.

In summary, this protocol uses simultaneous tDCS during VR to augment habitation to trauma-related scenarios. The principal advantage of this approach is the use of an immersive trauma-related context and the application of a non-invasive brain stimulation technique during a clinically relevant cognitive process, as opposed to doing either consecutively. While the protocol described here uses in-office application in a veteran sample with PTSD, this approach of simultaneous non-invasive brain stimulation and virtual reality can translate to other fear-based and anxiety disorders as well as at-home applications of exposure-based approaches.

ACKNOWLEDGMENTS:

We would like to thank Sydney Brigido, Hannah Hallett, Emily Aiken, Victoria Larson, Margy Bowker, Christiana Faucher, and Alexis Harle for their dedicated effort on this project. This work was supported by a Merit Award (I01 RX002450) from the United States (U.S.) Department of Veterans Affairs, Rehabilitation Research and Development Service and the Center *for* Neurorestoration and Neurotechnology (N2864-C) at the Providence VA (VA Rehabilitation Research and Development Service). The views expressed in this article are those of the authors

and do not represent the views of the U.S. Department of Veterans Affairs or the United States Government. We thank all the participants.

DISCLOSURES:

The authors have nothing to disclose.

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Figure 1.

Click here to access/download;Figure;Fig 1_TAVRE_hab s1.3.6.pdf

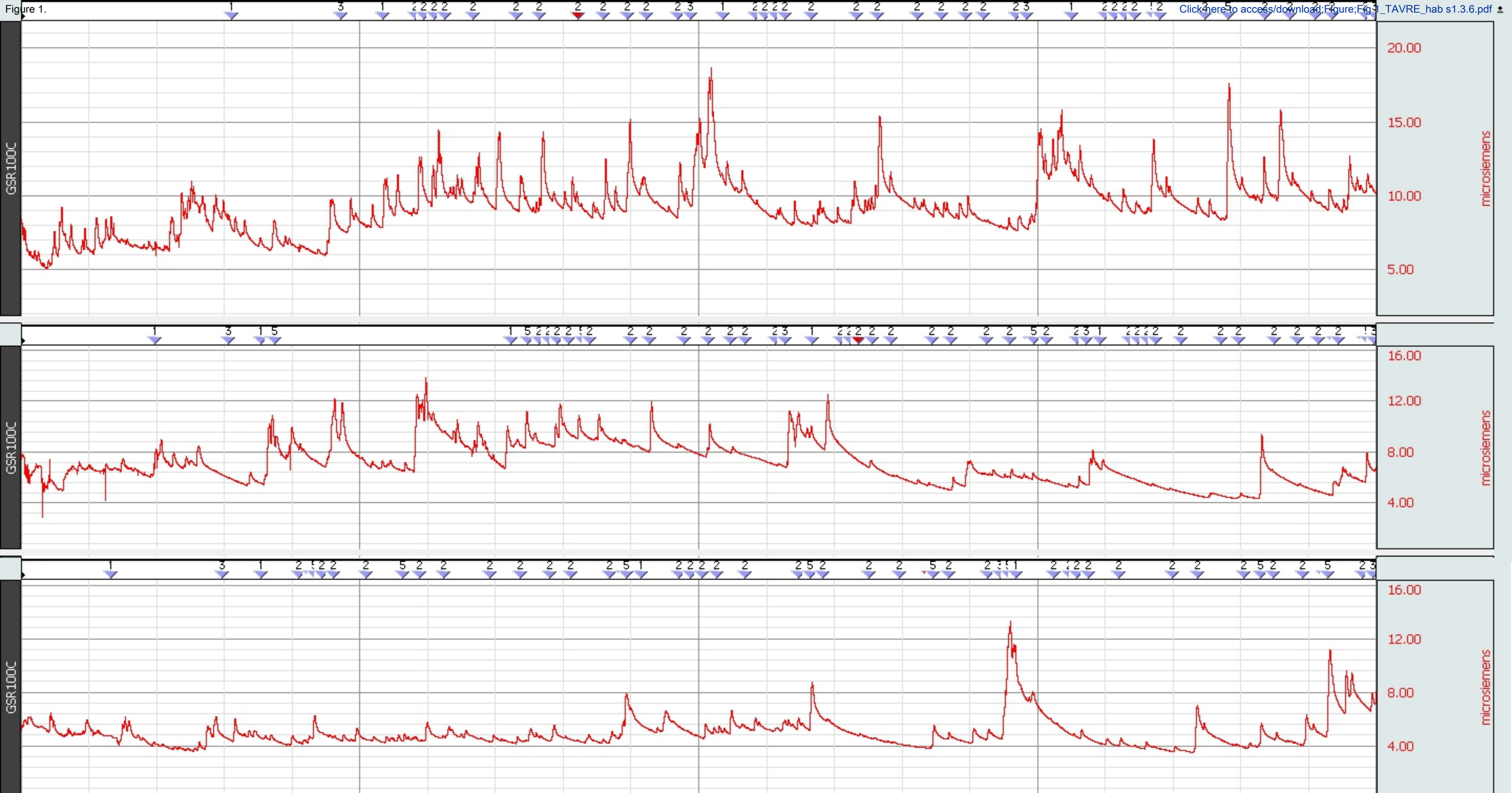


Figure 2.

Click here to access/download;Figure;Fig 2_TAVRE_within session.pdf

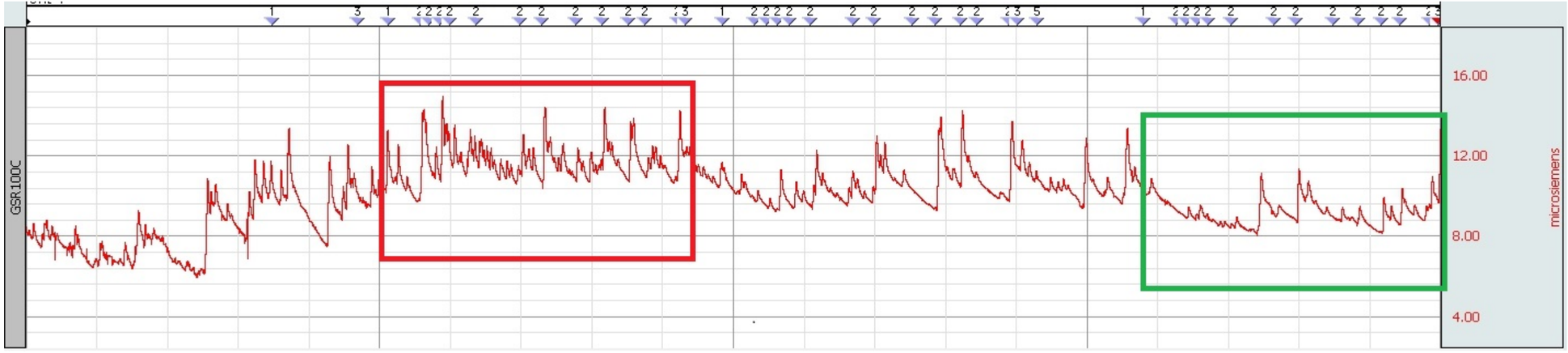


Figure 3.

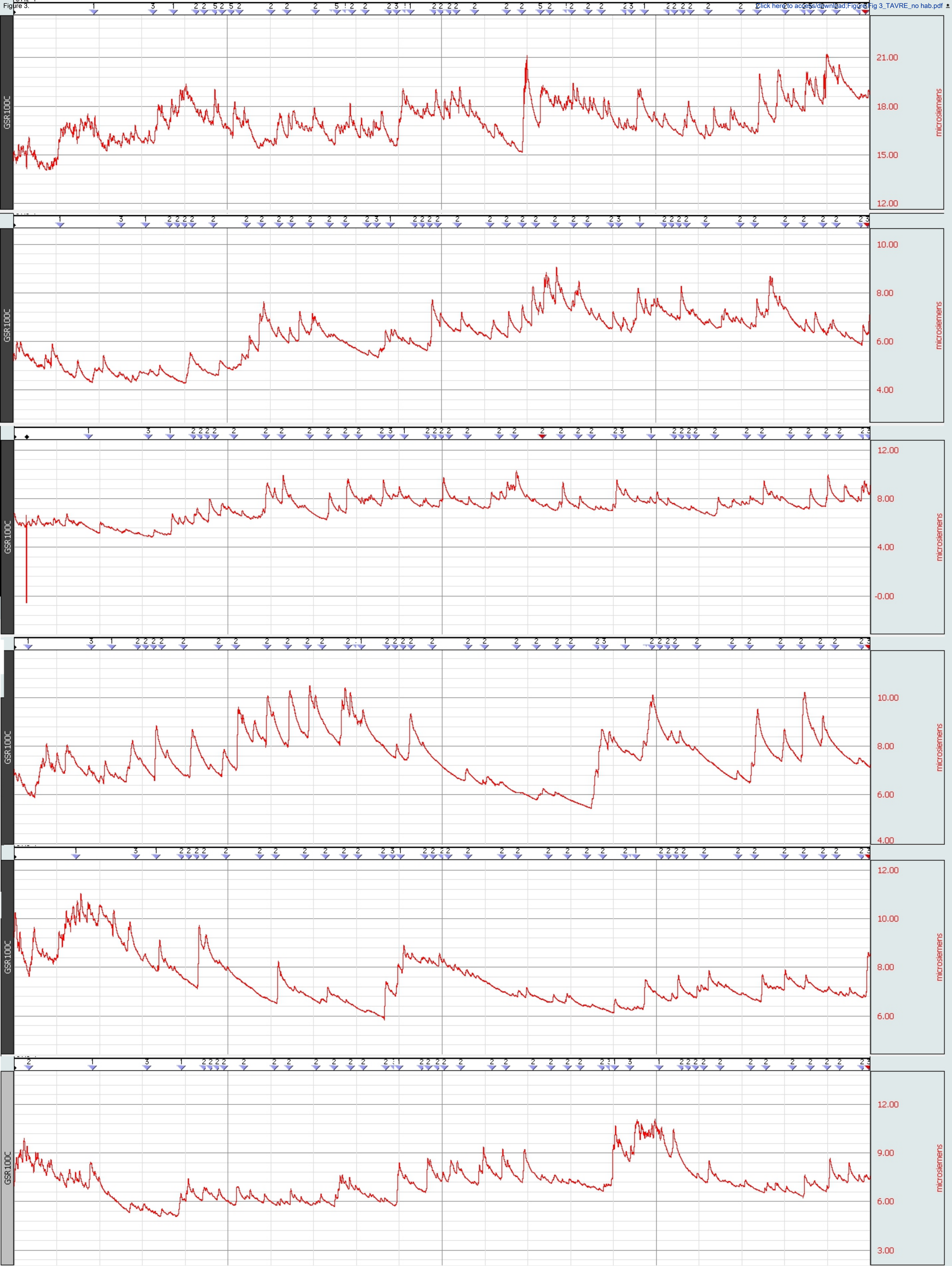


Figure 4.

Click here to access/download;Figure;Fig 4_nonresp artifacts.pdf

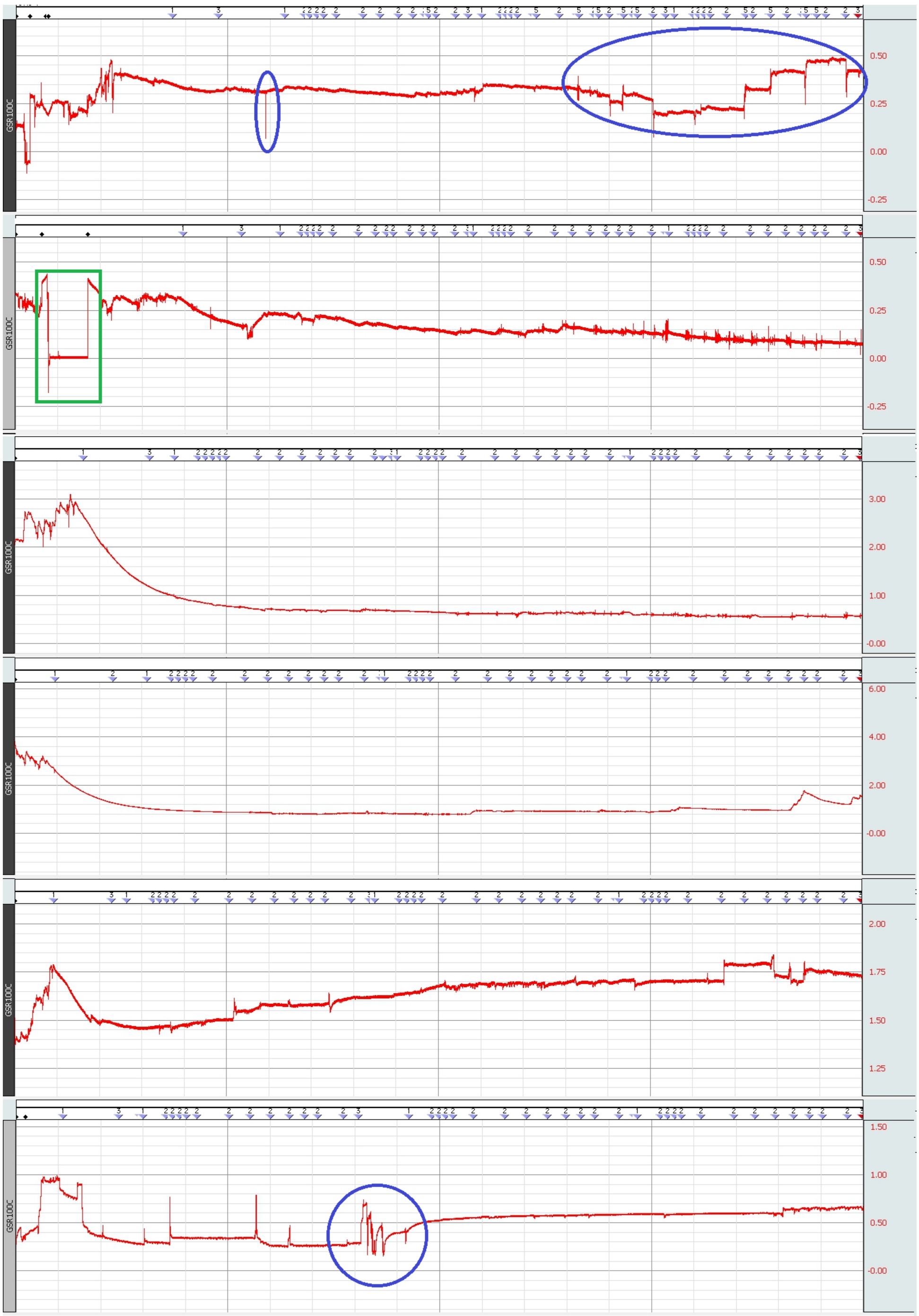


Table of Materials

Name of Material/ Equipment	Company	Catalog Number
ECG data acquisition module	Biopac	Part #: ECG100C
ECG electrode patches	Biopac	Part #: EL503, EL503-10
ECG leads	Biopac	2 x Part #: LEAD110
EDA/GSR acquisition module	Biopac	Part #: EDA100C
EDA/GSR electrode patches	Biopac	Part #: EL507, EL507-10
EDA/GSR leads	Biopac	2 x Part #: LEAD110, LEAD110A, LE
HD/tDCS-Explore Neurotargeting Software	Soterix Medical	Contact Soterix Medical
Psychophysiology (ECG & EDA/GSR) analysis software	Biopac	Part #: ACK100W, ACK100M
EDA/GSR	Biopac	Part #: MP160WSW, MP160WS
Randomization and data capture software	Redcap	https://www.project-redcap.org/
Saline - 0.9% NaCi	e.g Vitality Medical	e.g. #37-6280
tDCS electrodes and sponges	Jali Medical (USA)	Contact Jali Medical
Transcranial direct current stimulator (tDCS)	Jali Medical (USA)	Contact Jali Medical
Virtual reality system	Virtually Better	Contact Virtually better

Comments/Description

ECG100C Electrocardiogram Amplifier records electrical activity generated by the heart to record ECG.
These pre-gelled disposable electrodes have a circular contact and are most suitable for short-term recordings, including surface EMG, ECG, E
These electrode leads are used with the EL500 series disposable snap electrodes.
The EDA100C Electrodermal Activity Amplifier measures both the skin conductance level (SCL) and skin conductance response (SCR) as they v
These disposable snap electrodes are designed for electrodermal activity studies and are pre-gelled with isotonic gel. The latex-free electrode
These electrode leads are used with the EL500 series disposable snap electrodes.
Software to assist in electrical field modeling and optimization of electrode montages for brain targeting. Free available options include ROAS
Biopac AcqKnowledge software data acquisition and analysis software allows for waveform analysis and instantly view, measure, analyze, and
MP160 data acquisition system; needs connected EDA/GSR and ECG modules ordered separately, see next two entries.

REDCap software and consortium support are available at no charge to non-profit organizations that join the REDCap consortium. Joining req
Regular saline can be purchased from different vendors.
tDCS electrodes and sponges sold separately - contact vendor to order correct size (e.g. 5x5 cm)
The neuroConn DC-STIMULATOR PLUS* is a single-channel programmable direct and alternating Current Stimulator.
PTSD Suite from Virtually better "Bravemind" is an application for clinicians specializing in treating Posttraumatic Stress Disorder (PTSD).

:OG, etc

ary with sweat gland (eccrine) activity due to stress, arousal or emotional excitement.
es conform and adhere well to fingers/hands. Use with LEAD110A or SS57L unshielded electrode lead.

ST and SIMNibs that run in Matlab.
d transform data.

uires submission of a standard, online license agreement.

September 14, 2020

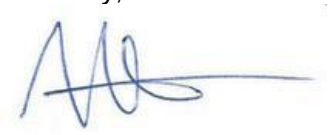
Dear Drs. Bajaj and Troyer,

Thank you for the review of our manuscript entitled “Simultaneous application of transcranial direct current stimulation during virtual reality exposure” (authors: M. van ’t Wout-Frank & N.S. Philip). We appreciated the editorial guidance, the thoughtful comments from the reviewers who pointed out missing aspects, and the additional time provided to revise our manuscript.

As requested, we responded to all comments and concerns from the editor and reviewers, which are highlighted using track changes in the attached manuscript file. In addition, a “clean” version of the manuscript is also included for readibility. Direct responses to the comments and concerns are listed below. We believe our manuscript is stronger and more informative following these revisions, and look forward to hearing from you

We appreciate the opportunity to revise this manuscript for consideration for publication in *JoVE*.

Sincerely,



Mascha van ’t Wout-Frank

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Providence VA Medical Center

Response to Editor and Reviewers

Below we address the comments put forward by the editor and reviewers.

Editorial comments:

1. Please take this opportunity to thoroughly proofread the manuscript to ensure that there are no spelling or grammar issues. The JoVE editor will not copy-edit your manuscript and any errors in the submitted revision may be present in the published version.

This has been done.

2. Please format the manuscript as: paragraph Indentation: 0 for both left and right and special: none, Line spacings: single. Please include a single line space between each step, substep and note in the protocol section. Please use Calibri 12 points.

We have updated the formatting, but please let us know if additional changes need to be made.

3. Please define all abbreviations during the first-time use.

This has been corrected.

4. JoVE cannot publish manuscripts containing commercial language. Please remove all commercial language from your manuscript and use generic terms instead. All commercial products should be sufficiently referenced in the Table of Materials and Reagents.
For example: NeuroConn device, etc.

We have removed all commercial language.

5. Please ensure that all text in the protocol section is written in the imperative tense as if telling someone how to do the technique (e.g., “Do this,” “Ensure that,” etc.). The actions should be described in the imperative tense in complete sentences wherever possible. Avoid usage of phrases such as “could be,” “should be,” and “would be” throughout the Protocol. Any text that cannot be written in the imperative tense may be added as a “Note.”

This has been done.

6. The Protocol should contain only action items that direct the reader to do something.

We have updated the Protocol accordingly.

7. The Protocol should be made up almost entirely of discrete steps without large paragraphs of text between sections. Please simplify the Protocol so that individual steps contain only 2-3 actions per step.

The Protocol has been simplified.

8. Please ensure you answer the “how” question, i.e., how is the step performed? For this please include button clicks in the software, knob turns, mechanical actions, command lines, etc.

We have included the button clicks etc as best as we could. In an effort to stay within the 10 pages of the protocol length, we now include Appendix 1 and 2 to detail the order and timing of VR events for both driving scenarios and GSR data analyses processing steps.

9. 1: Is there any age or sex-specific bias for the participants, please include more details on participant recruitment?

We have included additional recruitment details. These are listed as in- and exclusion criteria.

10. 1.2: Citation to show MRI guidelines?

We have updated this language and included a link to the MRIsafety website where pre-screening forms can be downloaded.

11. 7: For the analysis step please include all the button clicks in the software to show how this is done.

We realize that it is important for readers to be able to follow precise steps for data pre-processing and analyses. However skin conductance is a widely used physiological measure and manuals on pre-processing are widely available. As such we now refer to one such manual that forms the basis to our analyses given that we use the same software package and which can be found here: https://www.birmingham.ac.uk/Documents/college-les/psych/saal/guide-electrodermal-activity.pdf under 6.1.2. In addition, we included Appendix 2 to detail steps implemented in our protocol.

12. There is a 10-page limit for the Protocol, but there is a 2.75-page limit for filmable content. Please ensure the highlight is no more than 3 pages or less of the Protocol (including headings and spacing) that identifies the essential steps of the protocol for the video, i.e., the steps that should be visualized to tell the most cohesive story of the Protocol.

We have selected 3 pages for filmable content. However, due to the location of the text, the highlighted section covers manuscript pages 5-8.

13. Each Figure Legend should include a title and a short description of the data presented in the Figure and relevant symbols.

We have updated the Figure Legends.

14. Please obtain explicit copyright permission to reuse any figures from a previous publication. Explicit permission can be expressed in the form of a letter from the editor or a link to the editorial policy that allows re-prints. Please upload this information as a .doc or .docx file to your Editorial Manager account. The Figure must be cited appropriately in the Figure Legend, i.e. “This figure has been modified from [citation].”

We are not reusing figures from previous publications. As such no explicit copyright permissions are required.

15. As we are a methods journal, please ensure that the Discussion explicitly cover the following in detail in 3-6 paragraphs with citations:
a) Critical steps within the protocol
b) Any modifications and troubleshooting of the technique
c) Any limitations of the technique
d) The significance with respect to existing methods
e) Any future applications of the technique

Changes were made to the Discussion accordingly.

16. Please sort the materials table in alphabetical order.

The materials table is now sorted in alphabetical order.

Reviewer #1:
No major concerns, except for the recruitment/selection of subjects. This is not detailed in the manuscript and would be a critical aspect of the study. How do the authors propose to recruit so that the VR

scenarios are equally meaningful to all? Are there studies with the Virtually Better platform that can be cited with regard to recruitment?

> We have included additional information on in- and exclusion criteria for recruitment and enrollment. Perhaps to more directly address the point of the reviewer, it can be expected that, due to the variability in traumatic experiences, the VR will not be exactly equally meaningful to all. However, the included VR events and broader VR scenarios include common experienced incidents during deployment to Iraq and/or Afghanistan and therefore provide a contextually meaningful experience to those individuals with warzone-related trauma due to deployment in Iraq and/or Afghanistan.

Participants undergo six session of tDCS+VR over the course of 2-3 weeks, and psychophysiology recorded throughout each session. What is the "endpoint" of the study? psychophysiology measures have decreased? A statement on the hypothesis would be useful.

> We now include an explicit hypothesis. This is now stated at the end of the introduction. In sum, we hypothesize to see a reduction over time (i.e. across the six VR sessions) in psychophysiological responding, i.e. habituation. We specifically focus on between-session skin conductance reactivity to predict a reduction in symptoms and an improvement in social and occupational functioning.

No mention of artifact reduction. Startle responses would alter GSR readings and need to be accounted so.

> We realize the need for removing startle responses in various paradigms such as fear conditioning and extinction. However, we are simulating deployment experiences, where startling events were a defining feature, using a continuous driving scenario in a virtual Iraq/Afghanistan context. Hence, startling events were included and consisted out of the presentation of an IED explosion and the “flip” of the MRAP in front of the VR driver. Yet these events that triggered a startle response were presented towards the end of each 8-minute drive only, and each drive-through started with 45 seconds of driving only to allow for any startle response in response to being in the VR to return to normal prior to presenting VR events. Aside from wanting to simulate an as realistic scenario relevant for a variety of veterans with warzone-related PTSD, the inclusion of startling VR events is theoretically motivated. One of our main hypotheses focusses on the effect of tDCS on habituation rate over time, and previous reports suggest that PTSD is associated with slower habituation to startling stimuli (Jovanovic, T., Norrholm, S. D., Sakoman, A. J., Esterajher, S., & Kozarić-Kovačić, D. (2009). Altered resting psychophysiology and startle response in Croatian combat veterans with PTSD. International Journal of Psychophysiology, 71(3), 264-268; Shalev, A. Y., Peri, T., Brandes, D., Freedman, S., Orr, S. P., & Pitman, R. K. (2000). Auditory startle response in trauma survivors with posttraumatic stress disorder: a prospective study. American Journal of Psychiatry, 157(2), 255-261).

Reviewer #2:

My question is about the position of the active electrode over the scalp. In the current article, the authors mention FP1, while in their previous studies the selected scalp position was AF3. Please clarify the sense of this difference.

> The reviewer is correct that in a previous report detailing our pilot findings with this protocol we reported that the anodal electrode was placed over AF3. In that pilot study we used 5x5 cm^2 electrode sizes. After conversation and additional modeling with Dr. Parra, consultant on our grant, we decided to use 3x3 cm^2 electrodes for the full trial. The use of smaller electrodes is helpful for two reasons: 1) increases the current density and, 2) allows for electrodes to be fully covered by the rubber head band used to keep the electrodes in place, resulting in less movement of electrodes while participants explore the VR environment and less interference with the VR head mounted display. We target the placement of the electrodes based on head measurements as detailed in the protocol, page 5 under 5.6 and 5.7. Therefore, the location of

the anodal electrode covers the Fp1 and AF3 region with the corners of the electrodes touching both 10-20 EEG coordinates. We have updated the introduction to better reflect the location of the anode.

I also recommend mentioning in the introduction the recent article by Vicario et al. (2020), to provide more evidence of feasibility of the stimulation set-up (that study was intended to replicate the former one by van 't Wout, M. et al. 2026, brain stim) from other labs/research groups. Moreover, this study provides evidence from computational modelling that the stimulation of VMPFC is a key area to modulate a remote brain region implied in the fear extinction learning (i.e., Amygdala).

We now mention Vicario et al. (2020) in the introduction to demonstrate that other research groups have used a similar electrode montages to target the brain region of interest to modulate extinction processes after fear conditioning.

AFGHANISTAN

TIME/EVENT	VISUAL/AUDIO CUE	DIRECTIONS
0:00 GO	Select "OFF" to start driving	Turn on scent → Select "Fan High" + "Scent 1&2"
0:50 Gun Battle Distant		Select from *Sound Section*
1:05 A-10 Flyover		Select from *Event Section*
1:20 .50 Caliber Burst-2		Select from *Sound Section*
1:35 Black Hawk Flyover		Select from *Event Section*
2:17 Road Ambush	Lead vehicle @ SECOND pair of rocks following the city; look for tree	Select from *Event Section*; reset (un-highlight) when sound stops
~2:37 Radio 1	When ambush audio stops	Select from *Sound Section*
3:27 Road Ambush	Lead vehicle @ pair of rocks right before FARM	Select from *Event Section*; reset (un-highlight) when sound stops
~3:37 Radio 1	When ambush audio stops	Select from *Sound Section*
4:18 IED *(right)* 40m	Immediately after last big farm building passes windshield wiper	Distance: 40 m Direction: Top right corner
~4:23 .50 caliber burst	When IED audio stops	Select from *Sound Section*
~4:31 Radio 1	When .50 caliber burst audio stops	Select from *Sound Section*
4:57 Road Ambush	Lead vehicle @ next pair of rocks	Select from *Event Section*; reset (un-highlight) when audio stops
~5:19 Radio 1	When ambush audio stops	Select from *Sound Section*
5:39 IED *(right)* 40m	Lead vehicle should be just past rock and black car	Distance: 40 m Direction: Top right corner
~5:44 .50 Caliber Burst-1	When IED audio stops	Select from *Sound Section*
~5:52 Radio 1	When .50 caliber burst audio stops	Select from *Sound Section*
6:12 IED *(left)* 30m	Lead vehicle just past multi-colored debris on the right	Distance: 30 m Direction: Top left corner
~6:17 .50 Caliber Burst-1	When IED audio stops	Select from *Sound Section*
	DO NOT RESET RADIO	
6:49 Bridge Ambush	Lead vehicle @ vehicles parked on the right side, close enough to see soldiers	Select from *Event Section*; reset (un-highlight) when audio stops
~7:01 Radio 1	When bridge ambush audio stops	Select from *Sound Section*
7:35 Vehicle Flip	Lead vehicle @ last set of debris (red barrel and black car) after check point	Select, do not reset. Let the MRAP drive through the smoke.
STOP	When program jumps back to "start",o not let the car start driving to the next round	Select "THROTTLE" and Reset Vehicle Flip.

Wait ~5 seconds before starting next drive and check in with the participant.

Example: "How are you doing? Are you good to continue? Is your head still feeling okay?"

* * For the 1st drive on Day 1, cue the participant for when events will happen: i.e. "there will be a road ambush in 3…2…1…" After Day 1, do not give cues to the participant. The VR Controller can *quietly* cue the EDA administrator for event marking.

IRAQ

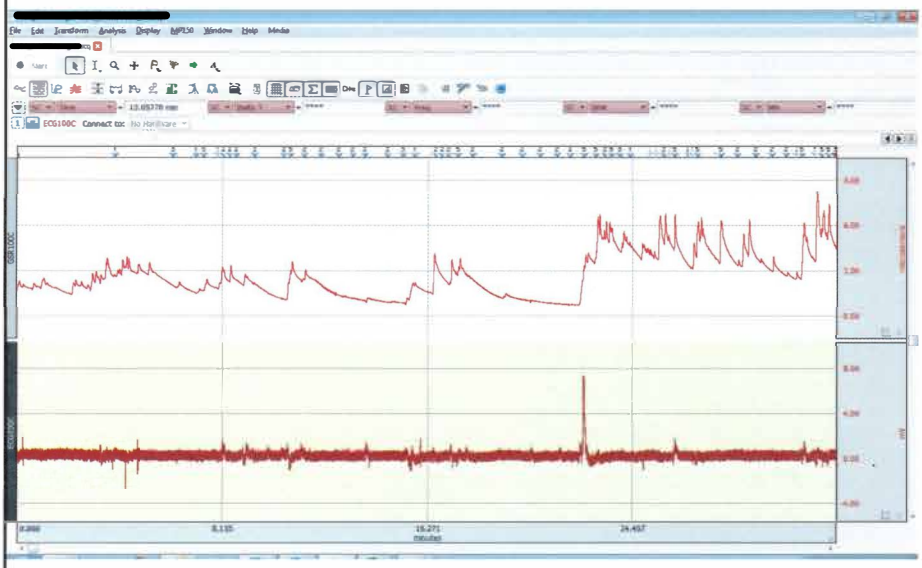
TIME/EVENT	VISUAL/AUDIO CUE	DIRECTIONS
0:00 GO	Select "OFF" to start driving	Turn on scent → Select "Fan High" + "Scent 1&2"
0:50 **Gun Battle Distant**	Just after first pair of rocks	Select from *Sound Section*
1:05 **A-10 Flyover**	Red barrels on the right	Select from *Event Section*
1:20 **.50 Caliber Burst-2**	2nd set of rocks	Select from *Sound Section*
1:35 **Black Hawk Flyover**	Black rectangle on the ground on right	Select from *Event Section*
2:15 **Road Ambush**	Three lines on road, lead vehicle should be @ first pair of rocks following city	Select from *Event Section*; reset (un-highlight) when sound stops
~2:37 Radio 1	When ambush audio stops	Select from *Sound Section*
3:24 **Road Ambush**	Lead vehicle should be @ pair of rocks following the palm trees	Select from *Event Section*; reset (un-highlight) when sound stops
~3:46 Radio 1	When ambush audio stops	Select from *Sound Section*
3:59 **IED *(right)* 40m**	Wait for camel to pass the left side of the MRAP front window	Distance: 40 m Direction: Top right corner
~4:04 .50 caliber burst	When IED audio stops	Select from *Sound Section*
~4:12 Radio 1	When .50 caliber burst audio stops	Select from *Sound Section*
4:27 **A-10 Flyover**	Wait for black car to pass right side of the MRAP front window	Select A-10. Do not mark for skin conductance.
4:57 **Road Ambush**	Three lines on road, lead vehicle should be @ rock and red debris	Select from *Event Section*; reset (un-highlight) when audio stops
~5:20 Radio 1	When ambush audio stops	Select from *Sound Section*
5:39 **IED *(right)* 40m**	Lead vehicle should be just past pair of rocks	Distance: 40 m Direction: Top right corner
~5:44 .50 Caliber Burst-1	When IED audio stops	Select from *Sound Section*
~5:52 Radio 1	When .50 caliber burst audio stops	Select from *Sound Section*
6:15 **IED *(left)* 30m**	Lead vehicle just past grey rectangular shaped debris on the right	Distance: 30 m Direction: Top left corner
~6:20 .50 Caliber Burst-1	When IED audio stops	Select from *Sound Section*
	DO NOT RESET RADIO	
6:45 **Bridge Ambush**	Lead vehicle @ vehicles parked on the right side, close enough to see soldiers	Select from *Event Section*; reset (un-highlight) when audio stops
~7:07 Radio 1	When bridge ambush audio stops	Select from *Sound Section*
7:35 **Vehicle Flip**	Lead vehicle @ last set of rocks after check point	Select, do not reset. Let the MRAP drive through the smoke.
STOP	When program jumps back to "start", do not let the car start driving to the next round	Select "THROTTLE" and Reset Vehicle Flip.

Wait ~5 seconds before starting next drive and check in with the participant.

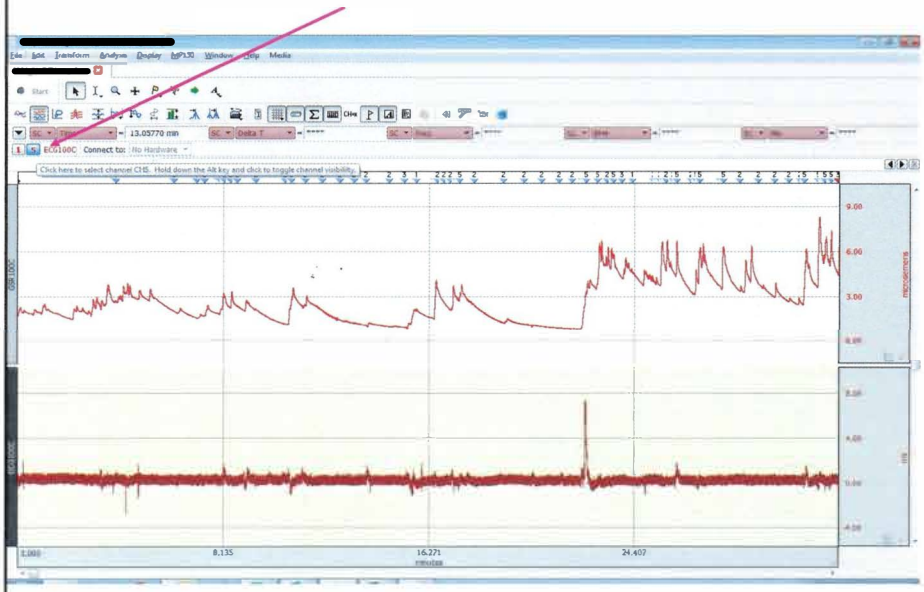
Example: "How are you doing? Are you good to continue? Is your head still feeling okay?"

* * For the 1st drive on Day 1, cue the participant for when events will happen: i.e. "there will be a road ambush in 3…2…1…" After Day 1, do not give cues to the participant. The VR Controller can *quietly* cue the EDA administrator for event marking.

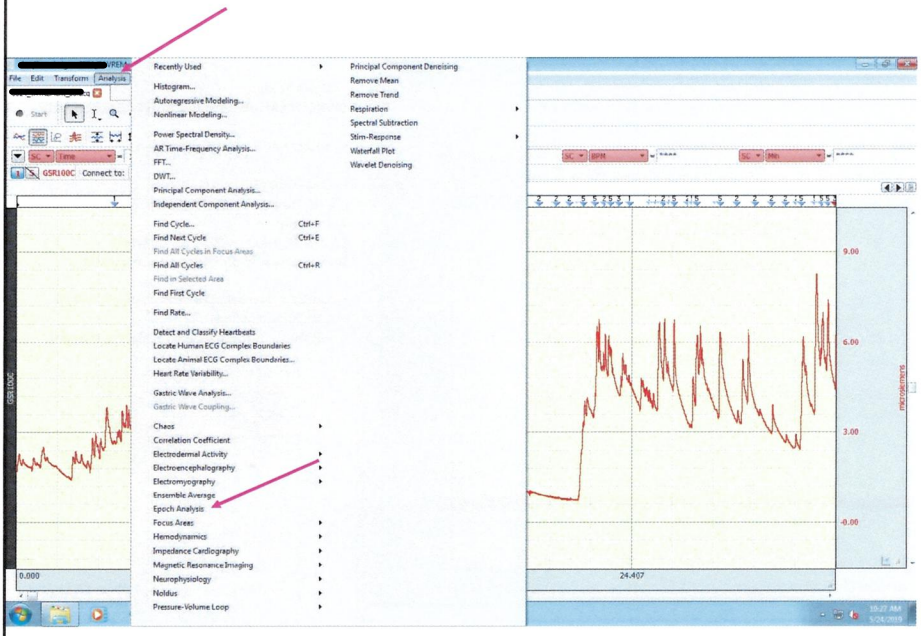
Epoch Analysis



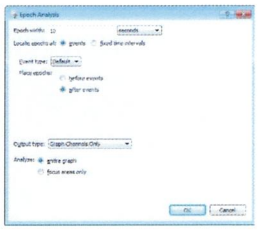
- Select participant/file to open
- Save new file
- Select a channel. Selected channels will be highlighted yellow.
- Hit these buttons to auto scale the channel.

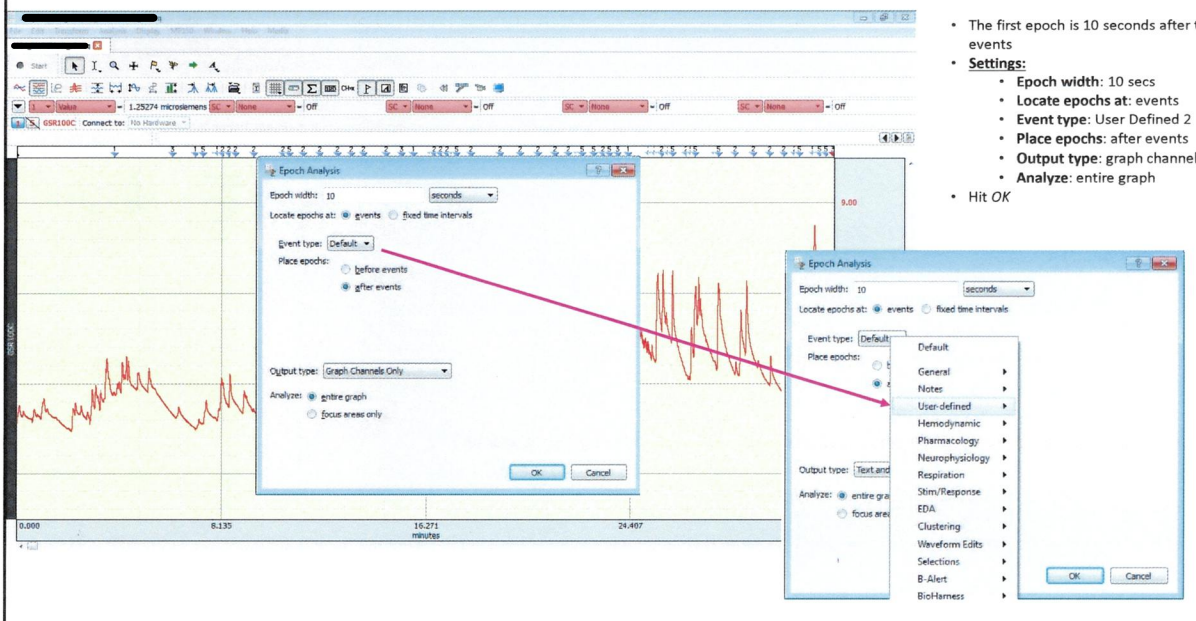


- Hide the Heart Rate channel
  - Hold down the ALT key while clicking on the channel number in the tool bar.
  - The heart rate channel is Channel 5
- Auto scale horizontally and vertically for all channels
  - Press these buttons

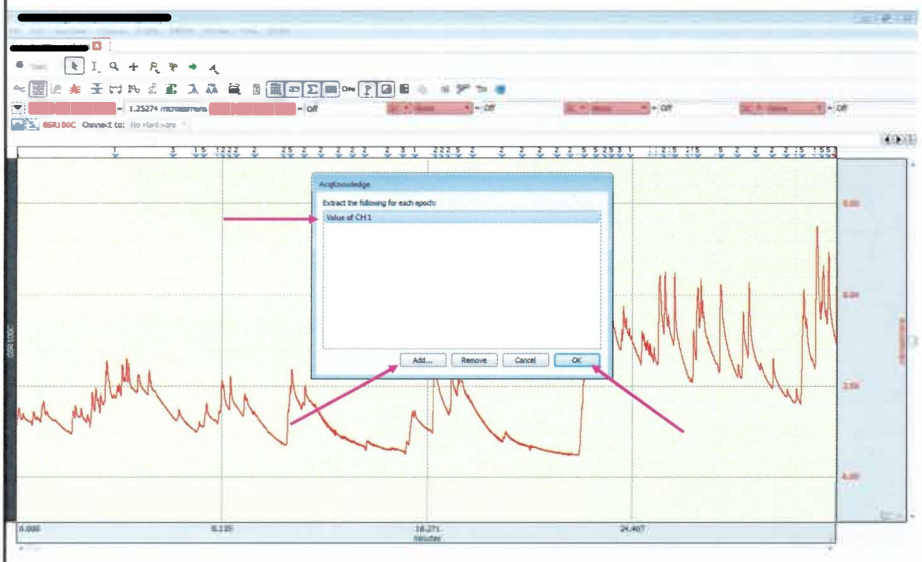


- Select GSR100C Channel (Channel 1) so the channel is highlighted yellow
- Then go to analysis → epoch analysis
- This screen will pop up



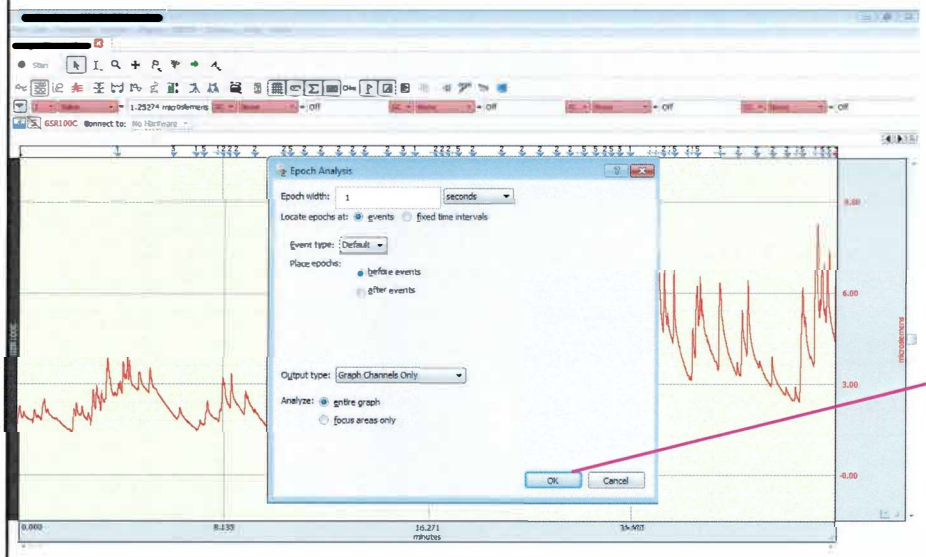


- The first epoch is 10 seconds after the events
- **Settings:**
  - **Epoch width**: 10 secs
  - **Locate epochs at**: events
  - **Event type**: User Defined 2
  - **Place epochs**: after events
  - **Output type**: graph channels only
  - **Analyze**: entire graph
- Hit *OK*



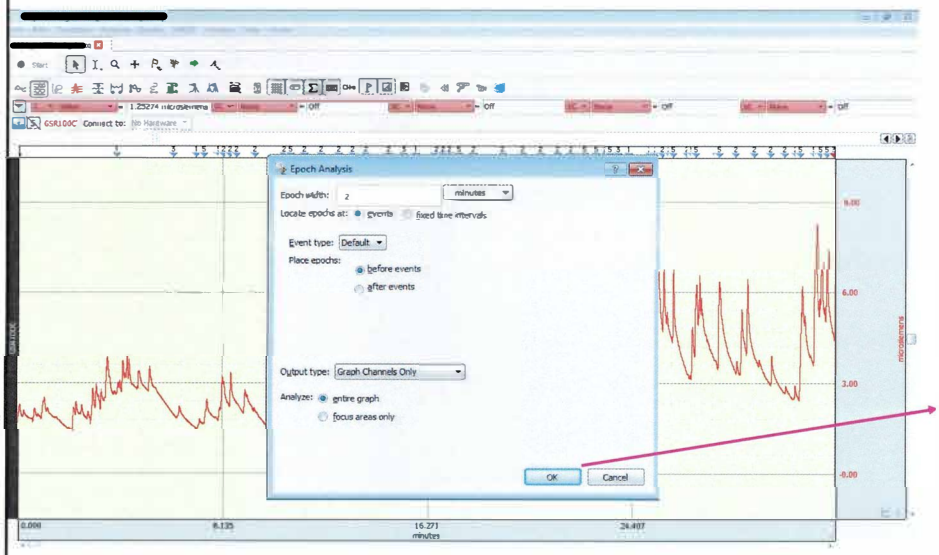
- After hitting *OK*, this screen pops up
- Add the value of CH1 and then hit *OK*
  - If *Value of CH1* is not there press *Add...* and then value. Make sure only one is in queue to be extracted otherwise you will get multiple channels.

- A new channel will now appear that has the 10 sec epochs
- You will then repeat the previous steps two more times for a total of 3 epoch channels.



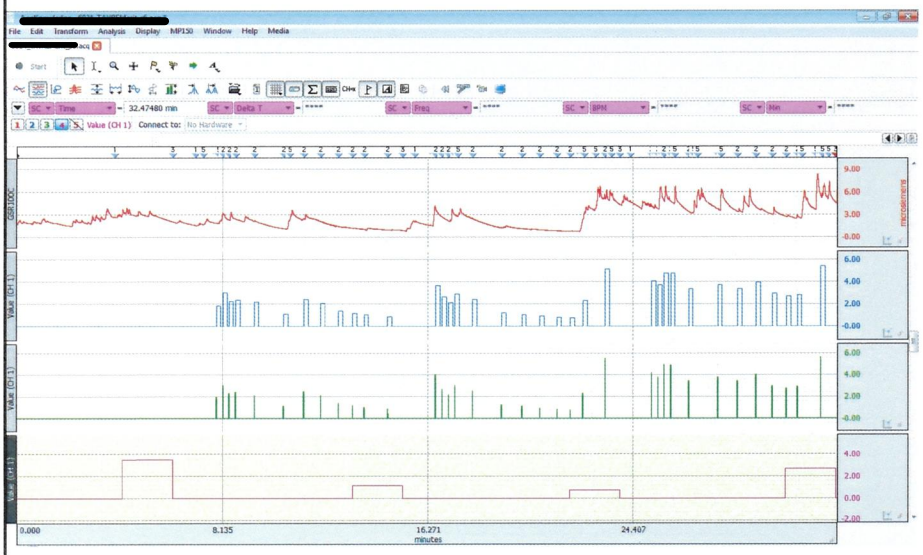
1 sec epochs before events

- **Settings:**
  - **Epoch width**: 1 secs
  - **Locate epochs at**: events
  - **Event type**: User Defined 2
  - **Place epochs**: before events
  - **Output type**: graph channels
  - only **Analyze**: entire graph
- Hit *OK*
- The hit *OK* for *Value of CH1*

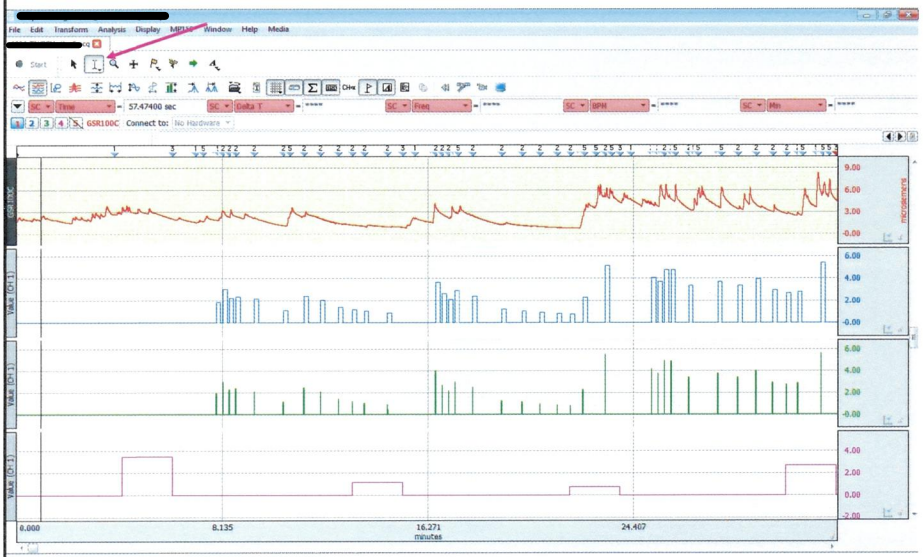


2 min epochs before events (this is for the baseline 2 minutes). Use event 3 for the stop of the baseline recording. Don't start from event 1 in case baseline was recorded for longer than 2 minutes. You want the last 2 minutes of the baseline.

- **Settings:**
  - **Epoch width**: 2 minutes
  - **Locate epochs at**: events
  - **Event type**: User Defined 3
  - **Place epochs**: before events
  - **Output type**: graph channels only
  - **Analyze**: entire graph
- Hit *OK*
- The hit *OK* for *Value of CH1*

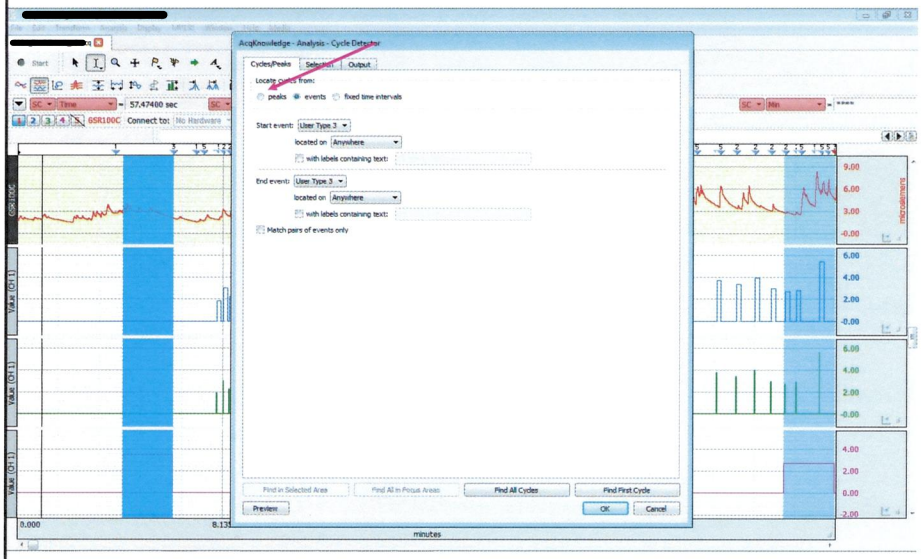


This is what it should look like when you have completed all of the epochs.

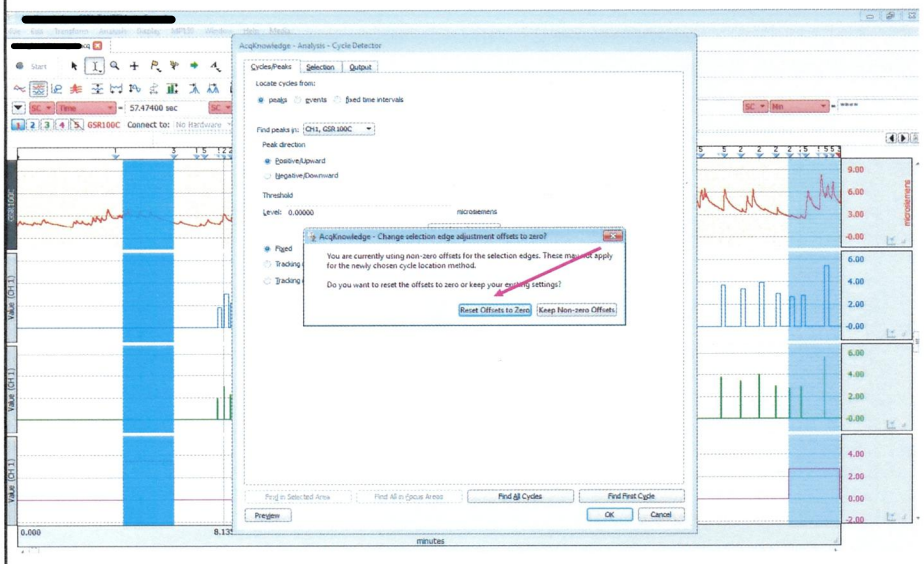


- Select 'I-beam' tool and place line at the beginning of the file
- Make sure the 'I-beam' is placed before the first F1 mark.
- Also make sure that the first channel (the GSR channel) is highlighted yellow.

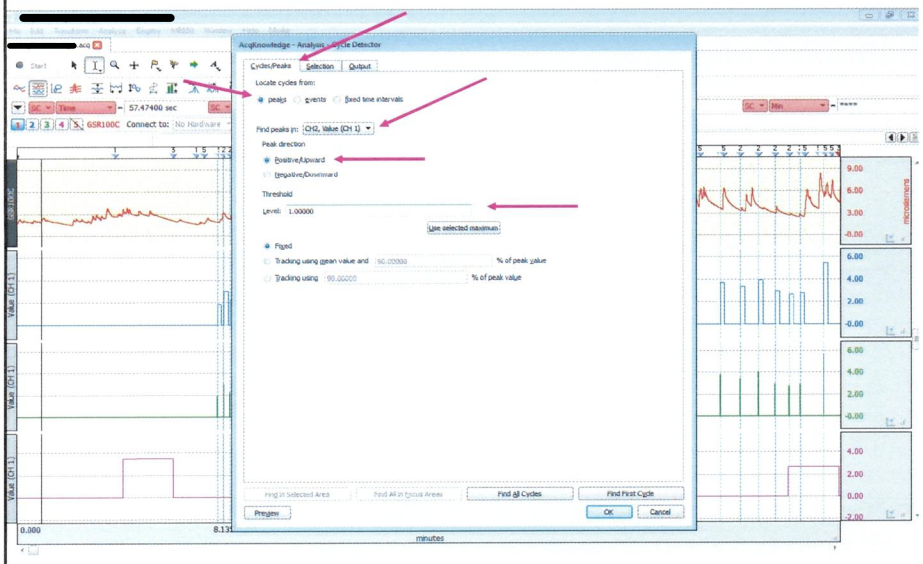
- Go to Analysis → Find Cycle
- Make sure that I-Beam is at beginning of file and GSR channel is selected.



- This screen will pop-up.
- Click "*Locate cycles from: peaks*"



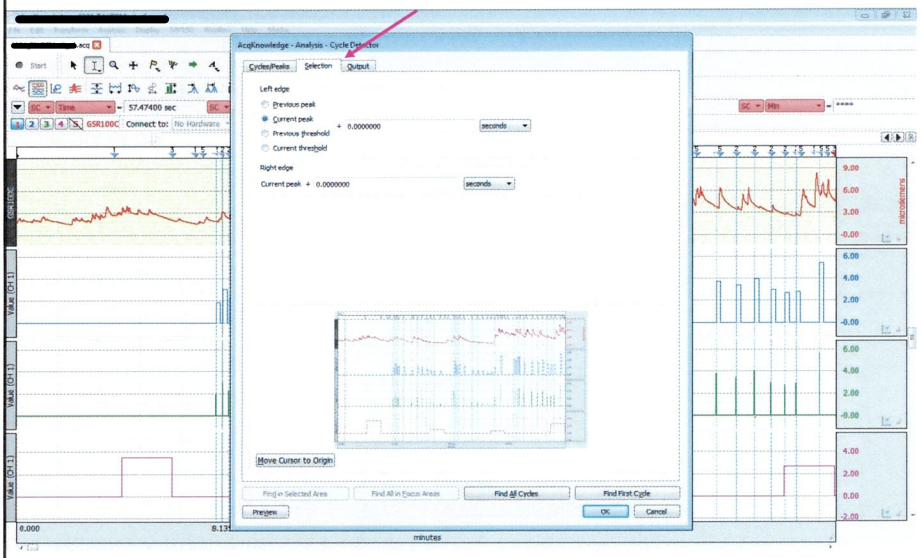
- This screen will pop up
- Click *Reset Offsets to Zero*



Cycle/Peaks Tab

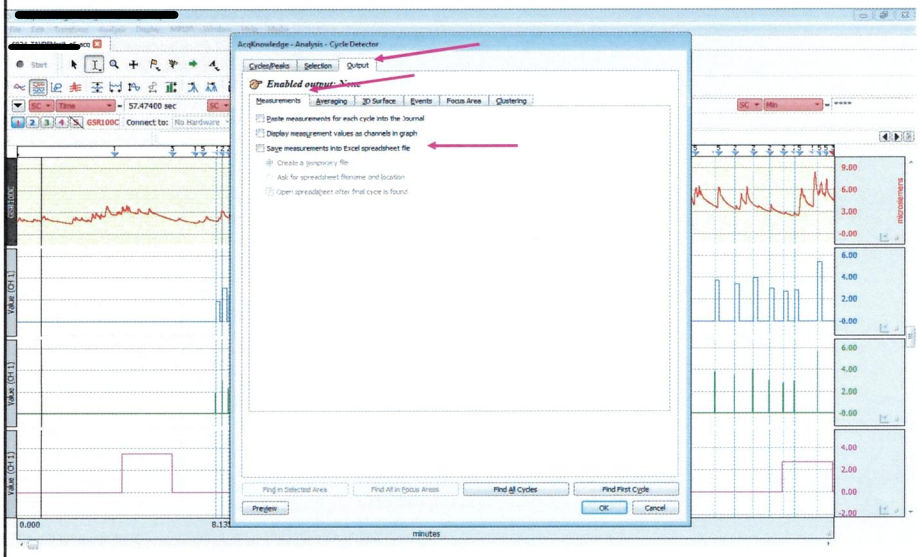
- **Locate cycles from**: peaks
- **Find peaks in**: CH2 (this is the 10 sec epochs)
- **Peak direction**: Positive/Upward
- **Threshold**: 1.00
- **Fixed**

**You might need to change the threshold level. The most ideal is to have it about 5, but that isn't always the case. If someone has a low GSR you will need to lower the level. Sometimes to 0.5 or lower.



Selection Tab

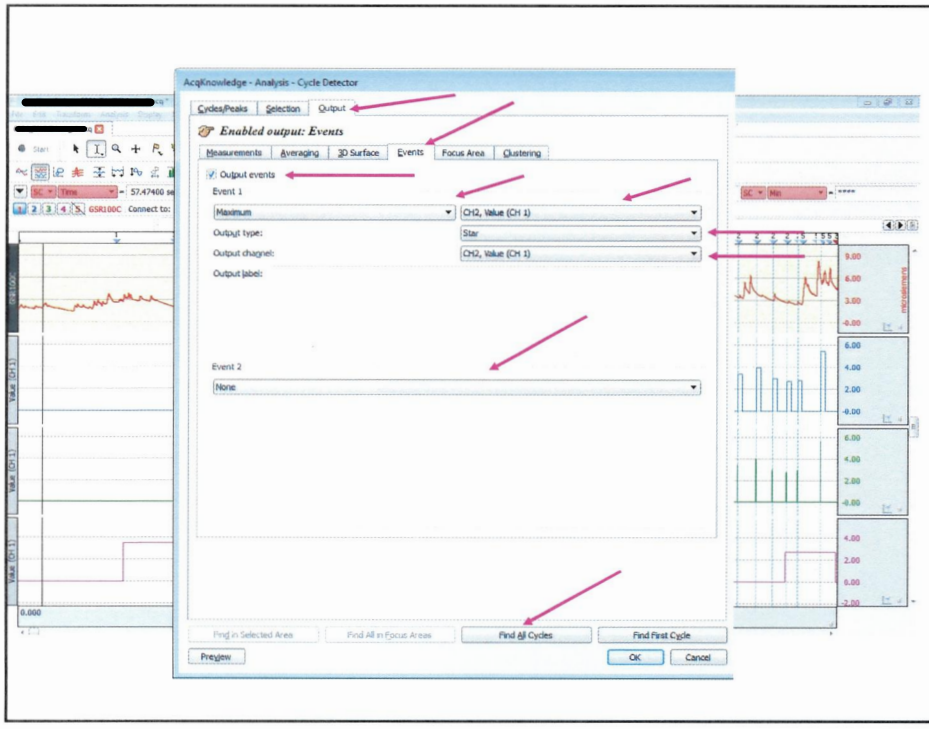
- You should not need to change anything on this tab. It should look like this.



Output Tab

- **Measurements**
  - Nothing should be checked

You do not need to change anything on the Averaging or 3D Surface tab

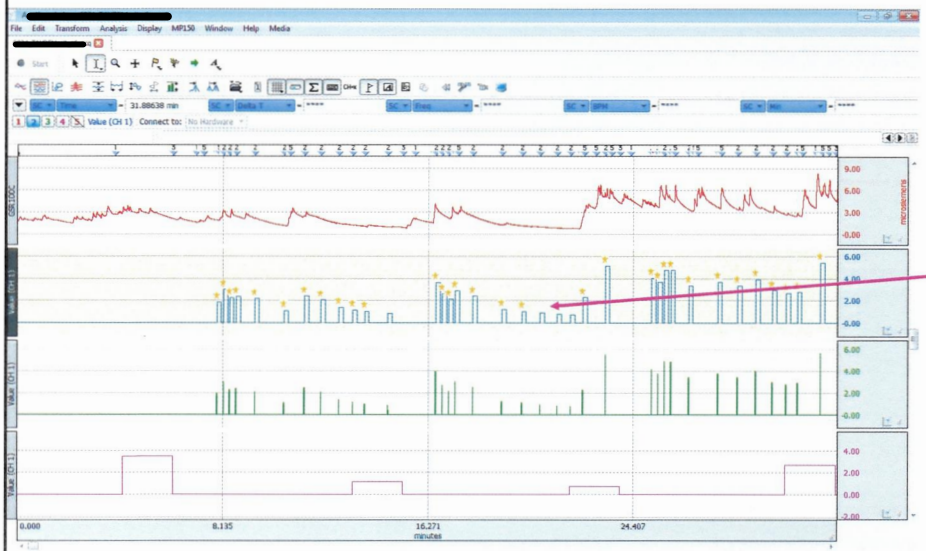


Output tab

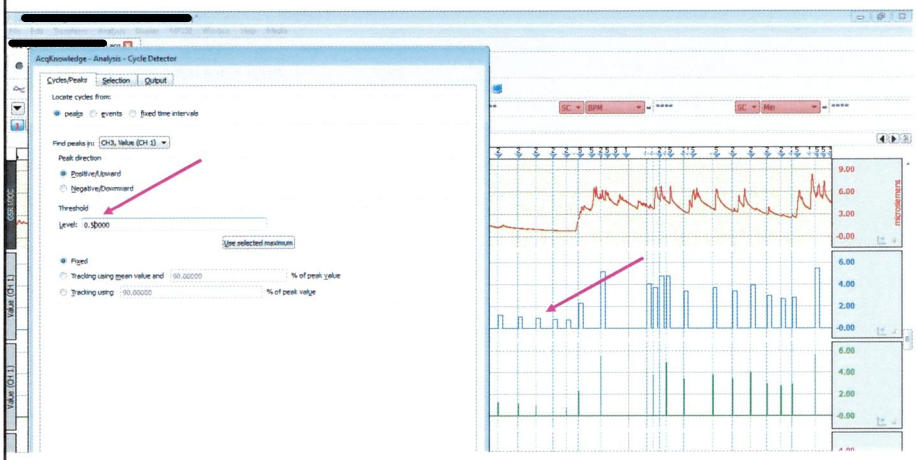
Events

- Check Output events
- **Event 1**
  - Maximum, Ch2
  - **Output type**: Star
  - **Output channel**: CH2
- **Event 2**
  - None

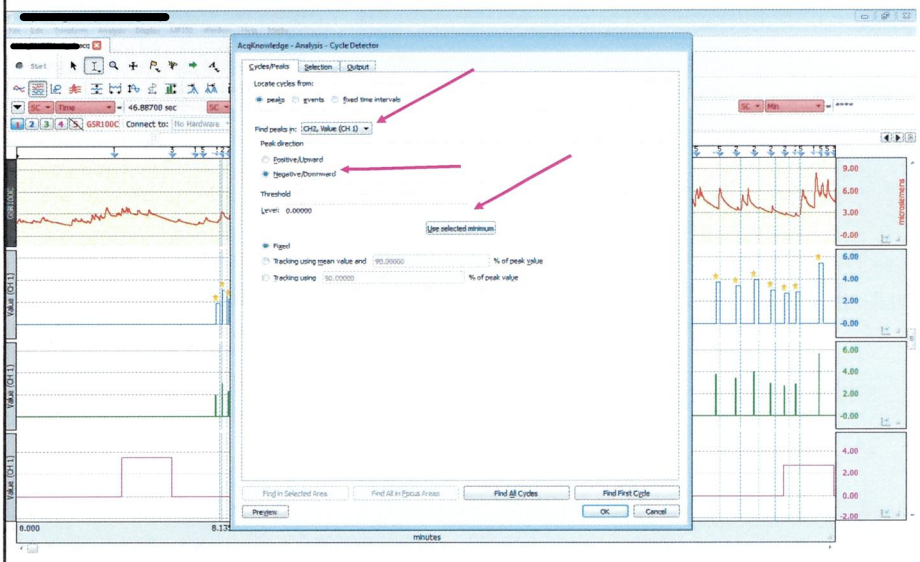
- Focus Area and Clustering tabs should not need to be adjusted
- Then click *Find All Cycles*



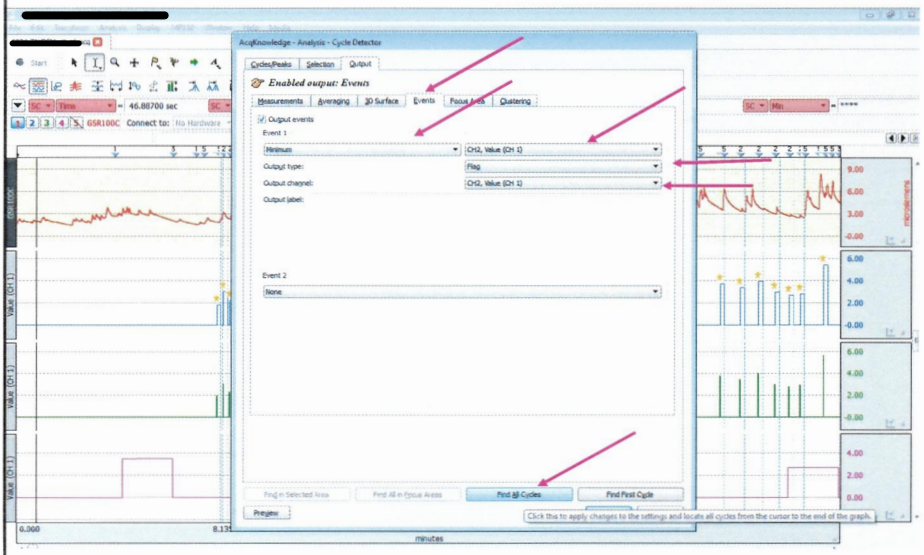
- Little gold stars will appear on the top left corner of each of the epochs.
- A couple epochs did not get stars
  - This happens when the threshold is set too high.
  - Start over with a lower threshold



- Try again with a lower threshold
- When you put in a new threshold you will notice blue lines appear on the graph
- Keep lowering the threshold until you see lines on each of the epochs



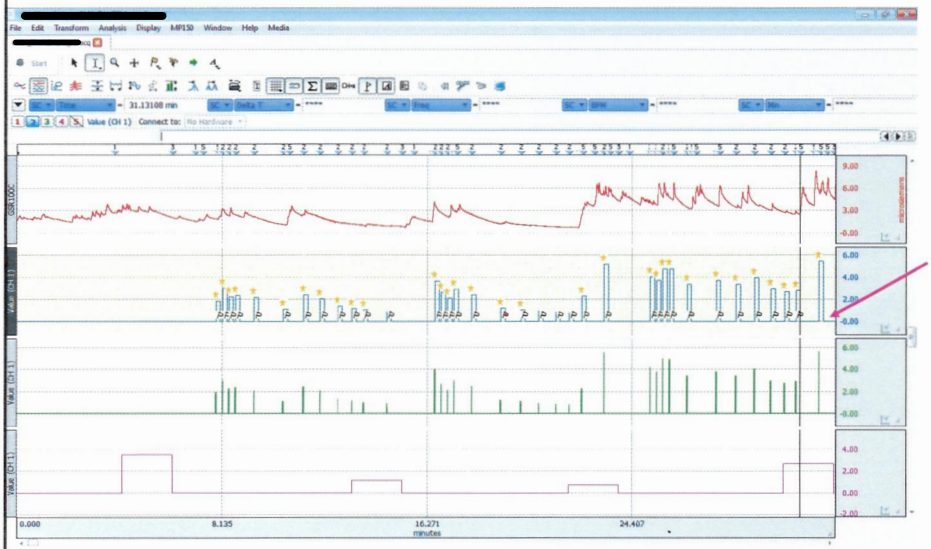
- After you have placed the stars for the Positive/Upward direction of each of the epochs, repeat the steps for the Negative/Downward direction
- Cycles/Peaks
  - **Locate cycles from**: peaks
  - **Find peaks in**: CH2
  - **Peak direction**: negative/downward
  - **Threshold level**: 0.00
  - **Fixed**



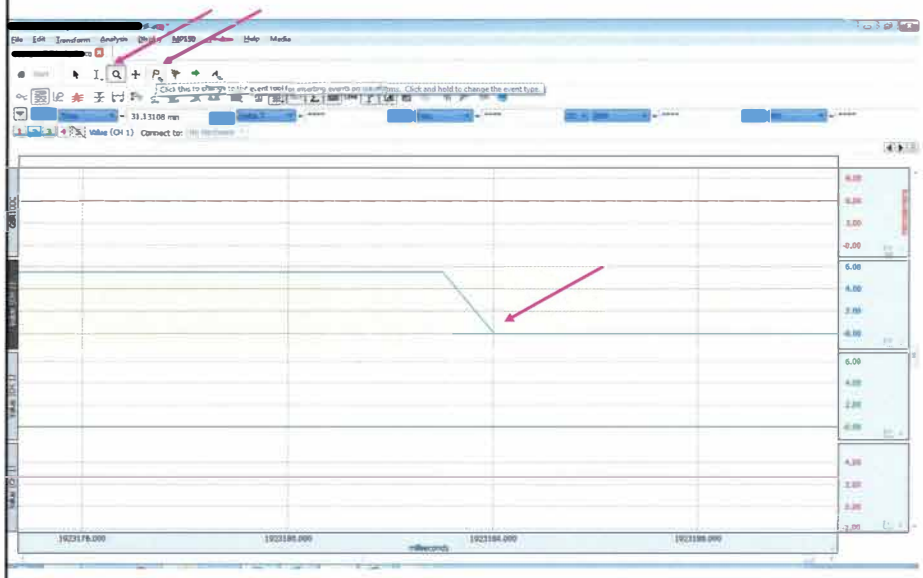
Output tab
Events

- Check Output events
- **Event 1**
  - Minimum, Ch2
  - **Output type**: Flag
  - **Output channel**: CH2
- **Event 2**
  - None

- Averaging, 3d Surface, Focus Area and Clustering tabs should not need to be adjusted
- Measurements – make sure nothing is checked
- Then click *Find All Cycles*



- Flags will be placed on the bottom right corner of the epochs
- The last epoch will not have a flag

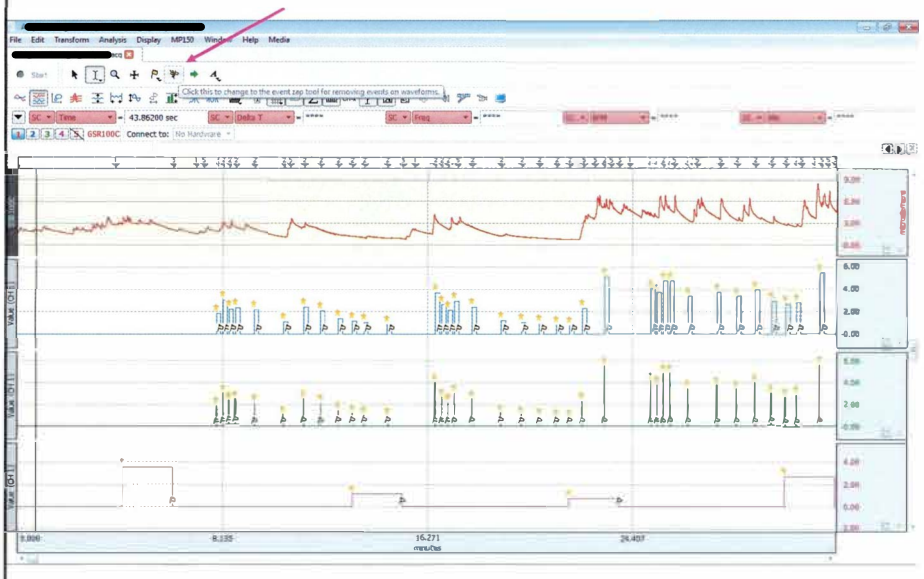


- To place the last flag...
  - Zoom in with the magnifying glass.

  - Use the autoscaling tool to make the graph fit the screen

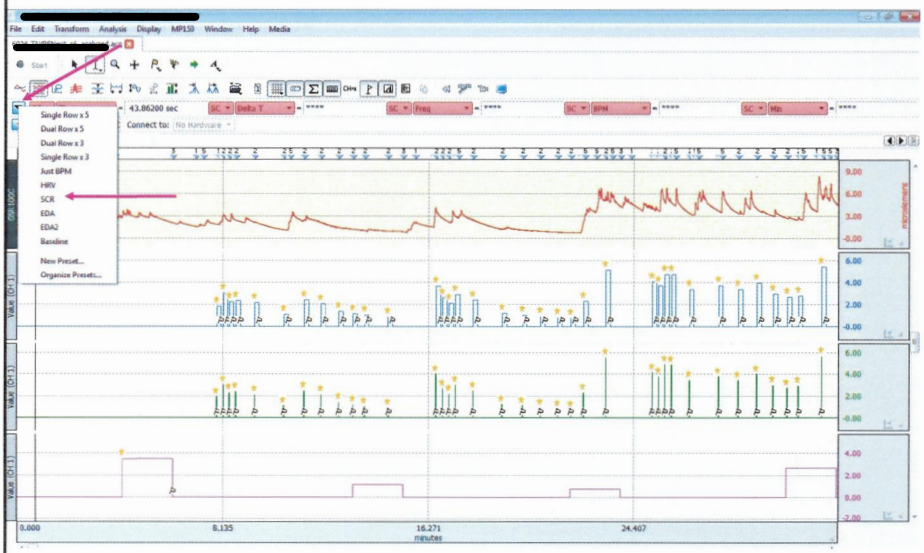
  - Click the flag tool

  - Click and hold the bottom right corner to change the type of flag (it should automatically be a flag so you probably don't need to change it)
  - Then click at the corner to place the flag. Make sure it is directly on the corner and not off to the side.



- Repeat the steps for the other two channels.
- Make sure that when you place the stars and flags they are going on the correct channel

- On the last channel, you do not need all the stars/flags. Only the ones for the first 2 minutes.
- Use the Flag Zap tool. You can either zap individually or drag and zap.

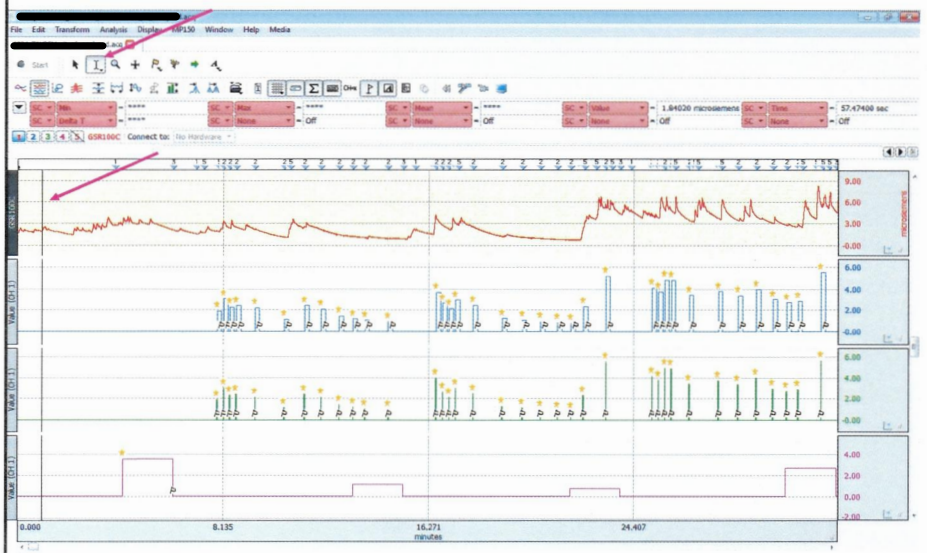


- Select the variable bar preset SCR 
  - This preset is on the computer in the VR room, if you use a different computer you might not have the preset
- There should be the following 10 settings

Min	Max	Mean	Value	Time
Delta T	P-P	Calculate	Correlate	Lin_reg

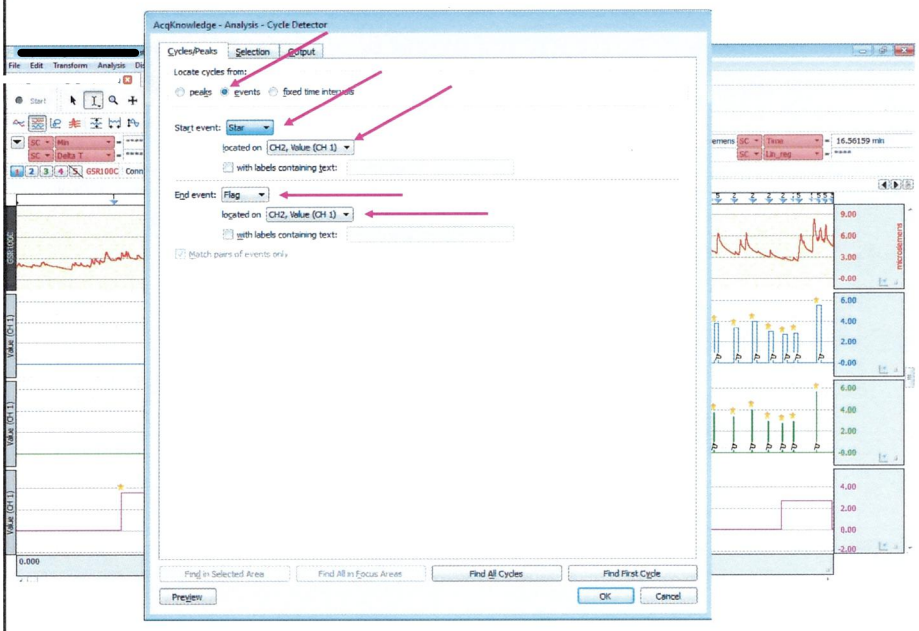
P-P = Max-Min
Calculate = Max-Mean

If you need to reset the variable bar. You will have to create a new calculate variable.



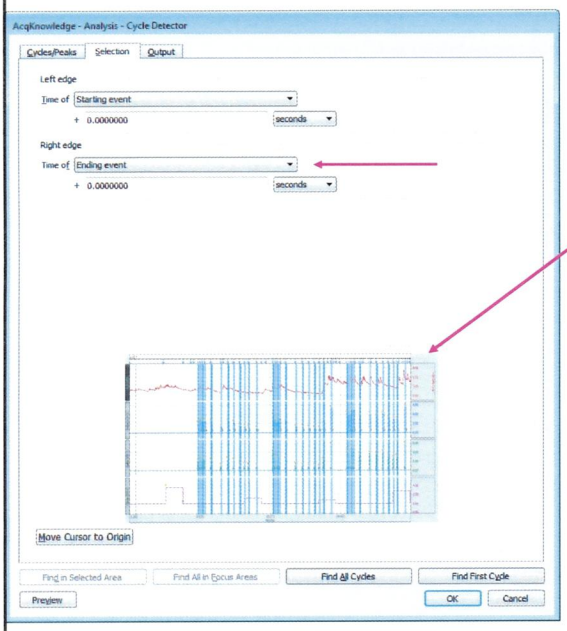
- Select 'I-beam' tool and place line at the beginning of the file
- Make sure the 'I-beam' is placed before the first F1 mark.
- Make sure that the GSR channel is highlighted

- Go to Analysis → Find Cycle
- Make sure that I-Beam is at beginning of file and GSR channel is selected.



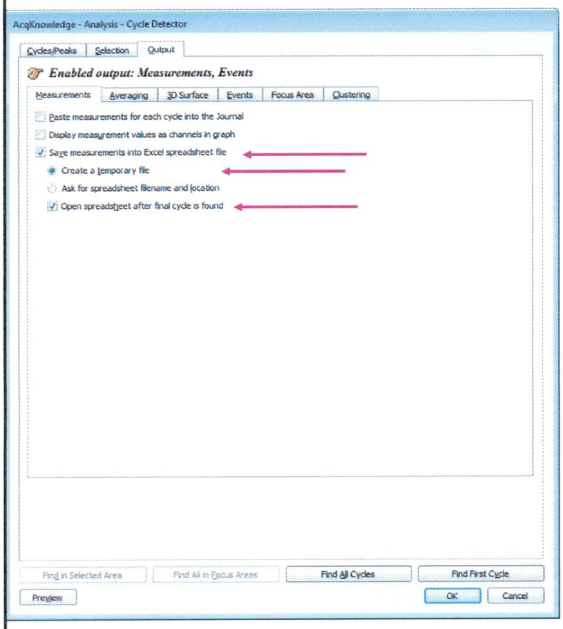
- Now instead of peaks, choose events

Cycles/Peaks
- **Start event**: Star
- **Located on**: CH2
- **End Event**: Flag
- **Located on**: CH2



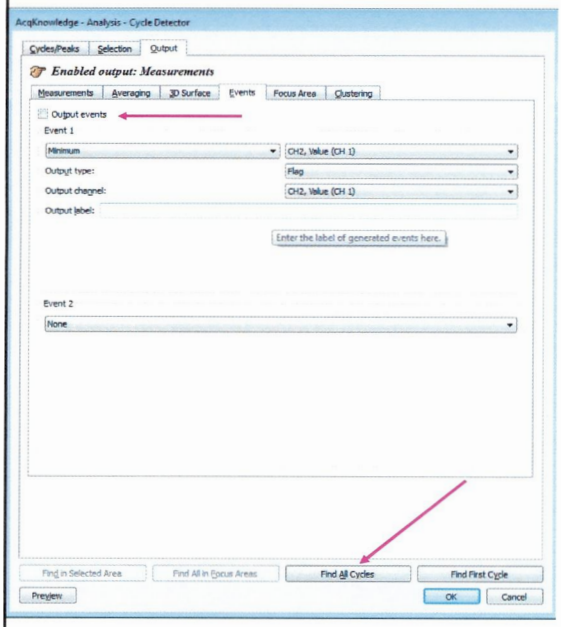
Selection
- Left edge – starting event
- Right edge – ending event

You should see the blue bars expand and be 10 secs long

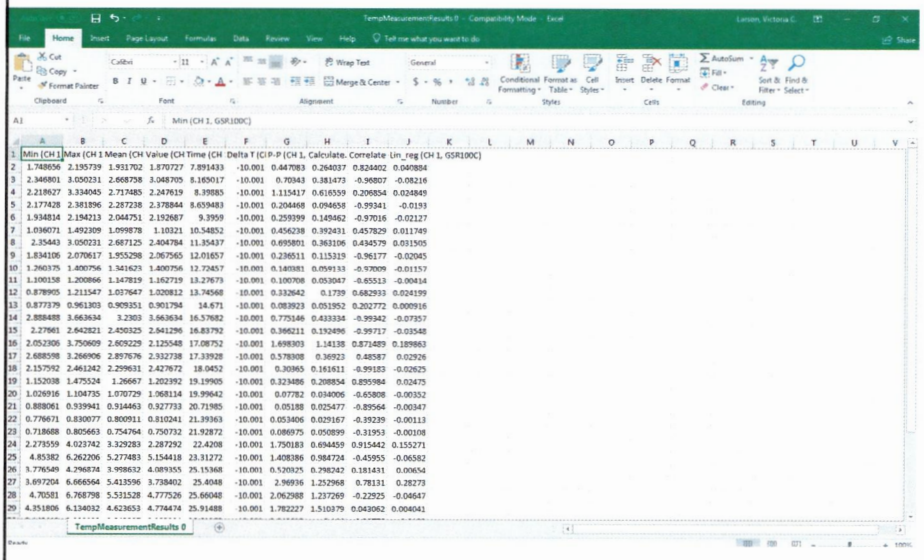


Output

Measurements
Select *Save measurements into Excel spreadsheet file*
Select *Create a temporary file*
Select *Open spreadsheet after final cycle is found*

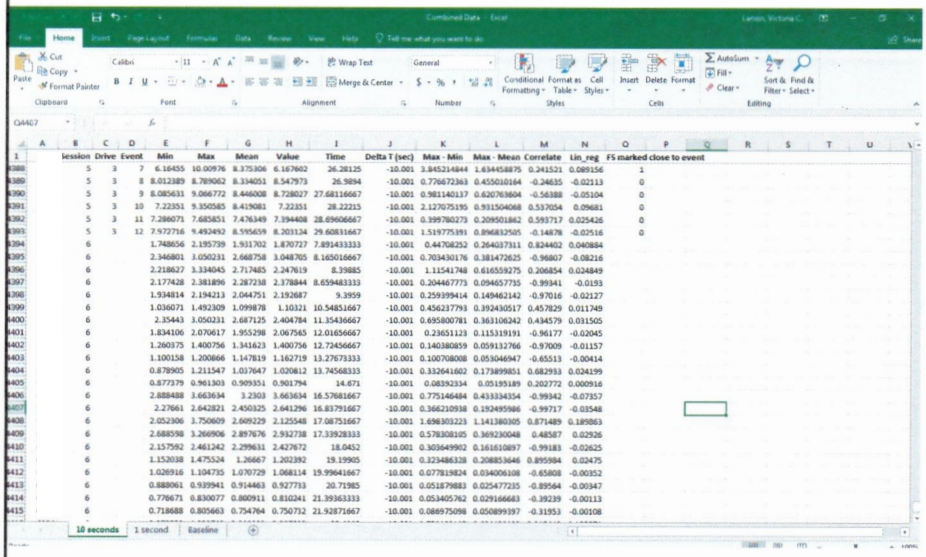


- It is important that *Output events* is unchecked on the **Events** tab.
- If it is checked it will double your flags/stars and you will have to delete them and redo placing the flags/stars
- Then click *Find All Cycles*



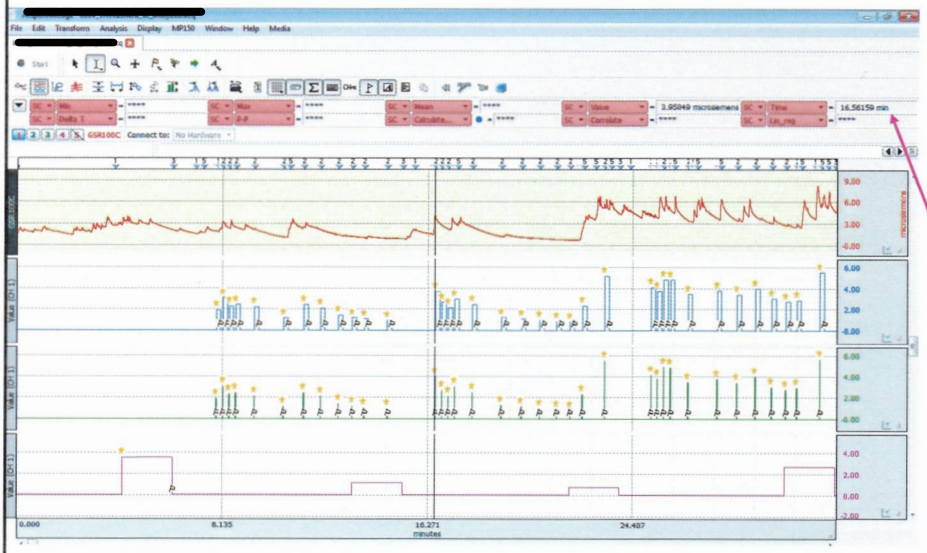
Min (CH 1	Max (CH 1	Mean (CH	Value (CH	Time (CH	Delta T (C	P-P (CH 1,	Calculate.	Correlate	Lin_reg (CH 1, GSR100C)
1.748656	2.195739	1.931702	1.870727	7.891433	-10.001	0.447083	0.264037	0.824402	0.040884
2.346801	3.050231	2.668758	3.048705	8.165017	-10.001	0.70343	0.381473	-0.96807	-0.08216
2.218627	3.334045	2.717485	2.247619	8.39885	-10.001	1.115417	0.616559	0.206854	0.024849
2.177428	2.381896	2.287238	2.378844	8.659483	-10.001	0.204468	0.094658	-0.99341	-0.0193
1.934814	2.194213	2.044751	2.192687	9.3959	-10.001	0.259399	0.149462	-0.97016	-0.02127
1.036071	1.492309	1.099878	1.10321	10.54852	-10.001	0.456238	0.392431	0.457829	0.011749
2.35443	3.050231	2.687125	2.404784	11.35437	-10.001	0.695801	0.363106	0.434579	0.031505
1.834106	2.070617	1.955298	2.067565	12.01657	-10.001	0.236511	0.115219	-0.96177	-0.02045
1.260375	1.400756	1.341623	1.400756	12.72457	-10.001	0.140381	0.059133	-0.97009	-0.01157
1.100158	1.200866	1.147819	1.162719	13.27673	-10.001	0.100708	0.053047	-0.65513	-0.00414
0.878905	1.211547	1.037647	1.020812	13.74568	-10.001	0.332642	0.1739	0.682933	0.024199
0.877379	0.961303	0.909351	0.901794	14.671	-10.001	0.083923	0.051952	0.202772	0.000916
2.888488	3.663634	3.2303	3.663634	16.57682	-10.001	0.775146	0.433334	-0.9934	-0.07357
2.27661	2.642821	2.450325	2.641296	16.83792	-10.001	0.366211	0.192496	-0.99717	-0.03548
2.052306	3.750609	2.609229	2.125548	17.08752	-10.001	1.698303	1.14138	0.871489	0.189863
2.688598	3.266906	2.897676	2.932738	17.33928	-10.001	0.578308	0.36923	0.88587	0.02926
2.157592	2.461242	2.259631	2.427672	18.0452	-10.001	0.30365	0.161611	-0.99183	-0.02625
1.152038	1.475524	1.26667	1.202392	19.19905	-10.001	0.323486	0.208854	0.895984	0.02475
1.026916	1.104735	1.070729	1.068114	19.99642	-10.001	0.07782	0.034006	-0.65808	-0.00352
0.888061	0.939941	0.914463	0.927733	20.71985	-10.001	0.05188	0.025477	-0.89564	-0.00347
0.776671	0.830077	0.800911	0.810241	21.39363	-10.001	0.053406	0.029167	-0.39239	-0.00113
0.718688	0.805663	0.754764	0.750732	21.92872	-10.001	0.086975	0.050899	-0.31953	-0.00108
2.273559	4.023742	3.329283	2.287292	22.4208	-10.001	1.750183	0.694459	0.915442	0.155271
4.85382	6.262206	5.277483	5.154418	23.31272	-10.001	1.408386	0.984724	-0.45955	-0.06582
3.776549	4.296874	3.998632	4.089355	25.15368	-10.001	0.520325	0.298242	0.181431	0.00654
3.697204	6.666564	5.413596	3.738402	25.4048	-10.001	2.96936	1.252968	0.78131	0.28273
4.70581	6.768798	5.531528	4.777526	25.66048	-10.001	2.062988	1.237269	-0.22925	-0.04647
4.351806	6.134032	4.623653	4.774474	25.91488	-10.001	1.782227	1.510379	0.043062	0.004041

- This is the file that will pop up.
- Copy the data and paste into the large combined file.
- Save this file in the participants folder

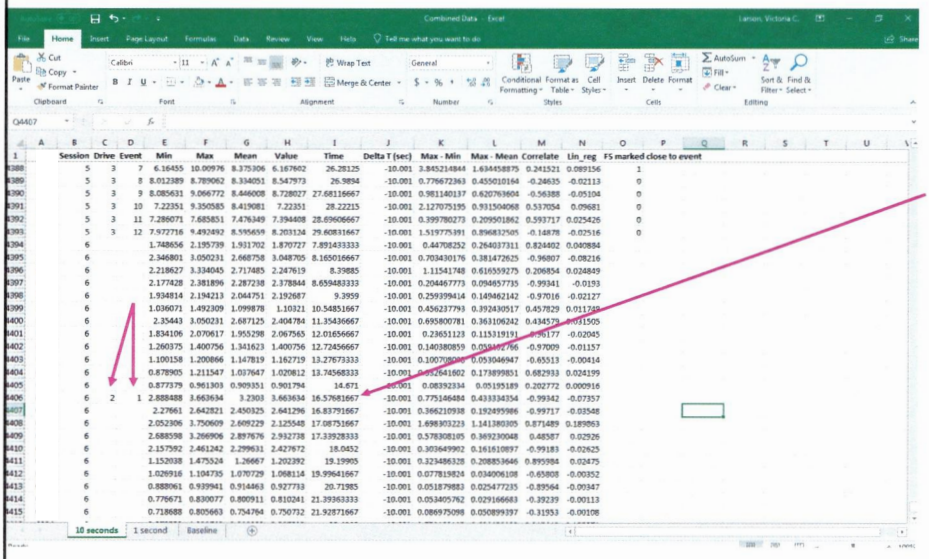


Session	Drive	Event	Min	Max	Mean	Value	Time	Delta T (sec)	Max - Min	Max - Mean	Correlate	Lin_reg	F5 marked close to event
5	3	7	6.16455	10.00976	8.375306	6.167602	26.28125	-10.001	3.845214844	1.634458875	0.241521	0.089156	1
5	3	8	8.012389	8.789062	8.334051	8.547973	26.9894	-10.001	0.776672363	0.455010164	-0.24635	-0.02113	0
5	3	9	8.085633	9.066772	8.446008	8.728027	27.68116667	-10.001	0.981140137	0.620763604	-0.56388	-0.05104	0
5	3	10	7.22351	9.350585	8.419081	7.22351	28.22215	-10.001	2.127075195	0.931504068	0.537054	0.09681	0
5	3	11	7.286071	7.685851	7.476349	7.394408	28.69606667	-10.001	0.399780273	0.209501842	0.593717	0.025426	0
5	3	12	7.972716	9.492492	8.595659	8.203124	29.60831667	-10.001	1.519775391	0.896832505	-0.14878	-0.02516	0
6			1.748656	2.195739	1.931702	1.870727	7.891433333	-10.001	0.44708252	0.264037311	0.824402	0.040884	
6			2.346801	3.050231	2.668758	3.048705	8.165016667	-10.001	0.703430176	0.381472625	-0.96807	-0.08216	
6			2.218627	3.334045	2.717485	2.247619	8.39885	-10.001	1.11541748	0.616559275	0.206854	0.024849	
6			2.177428	2.381896	2.287238	2.378844	8.659483333	-10.001	0.204467773	0.094657735	-0.99341	-0.0193	
6			1.934814	2.194213	2.044751	2.192687	9.3959	-10.001	0.259399414	0.149462142	-0.97016	-0.02127	
6			1.036071	1.492309	1.099878	1.10321	10.54851667	-10.001	0.456237793	0.392430517	0.457829	0.011749	
6			2.35443	3.050231	2.687125	2.404784	11.35436667	-10.001	0.695800781	0.363106242	0.434579	0.031505	
6			1.834106	2.070617	1.955298	2.067565	12.01656667	-10.001	0.23651123	0.115319191	-0.96177	-0.02045	
6			1.260375	1.400756	1.341623	1.400756	12.72456667	-10.001	0.140380859	0.059132766	-0.97009	-0.01157	
6			1.100158	1.200866	1.147819	1.162719	13.27673333	-10.001	0.100708008	0.053046947	-0.65513	-0.00414	
6			0.878905	1.211547	1.037647	1.020812	13.74568333	-10.001	0.332641602	0.173899851	0.682933	0.024199	
6			0.877379	0.961303	0.909351	0.901794	14.671	-10.001	0.08392334	0.05195189	0.202772	0.000916	
6			2.888488	3.663634	3.2303	3.663634	16.57681667	-10.001	0.775146484	0.433334354	-0.99342	-0.07357	
6			2.27661	2.642821	2.450325	2.641296	16.83791667	-10.001	0.366210938	0.192495986	-0.99717	-0.03548	
6			2.052306	3.750609	2.609229	2.125548	17.08751667	-10.001	1.698303223	1.141380305	0.871489	0.185863	
6			2.688598	3.266906	2.897676	2.932738	17.33928333	-10.001	0.578308105	0.369230048	0.48587	0.02926	
6			2.157592	2.461242	2.299631	2.427672	18.0452	-10.001	0.303649902	0.161610897	-0.99183	-0.02625	
6			1.152038	1.475524	1.26667	1.202392	19.19905	-10.001	0.323486328	0.208853646	0.895984	0.02475	
6			1.026916	1.104735	1.070729	1.068114	19.99641667	-10.001	0.077819824	0.034006108	-0.65808	-0.00352	
6			0.888061	0.939941	0.914463	0.927713	20.71985	-10.001	0.051879883	0.025477235	-0.89564	-0.00347	
6			0.776671	0.830077	0.800911	0.810241	21.39363333	-10.001	0.053405762	0.029166683	-0.39239	-0.00113	
6			0.718688	0.805663	0.754764	0.750712	21.92871667	-10.001	0.086975098	0.050899397	-0.31953	-0.00108	

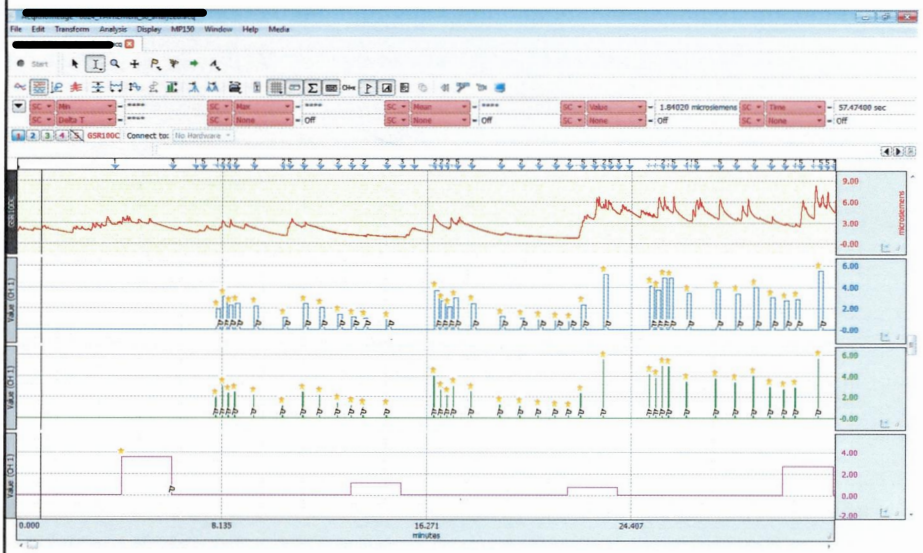
- This is what the big excel looks like



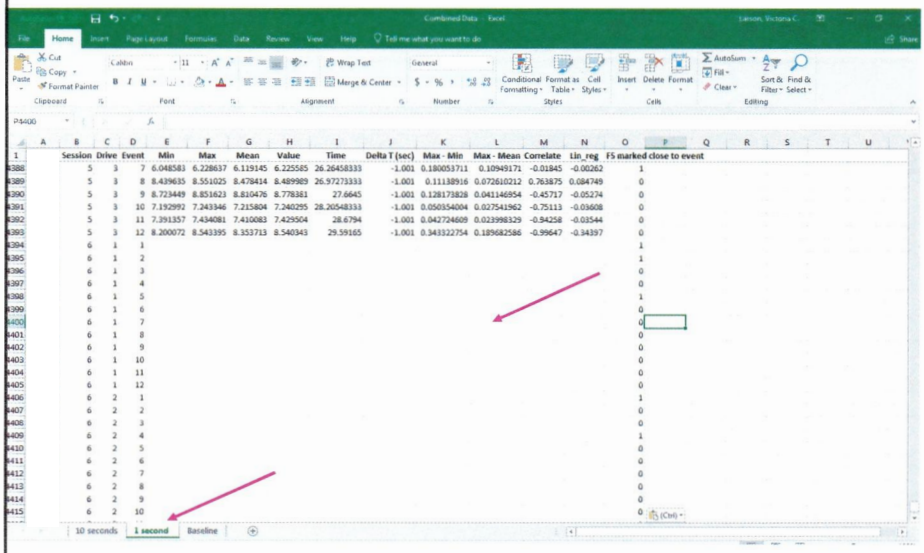
- Labeling the events in the excel sheet
  - To find the start of drive two, place the I-beam tool at the start of the first event. Look at the time. Then go and put Drive 2, Event 1 in the excel sheet.
  - Then repeat for Drive 3, event 1
  - Then fill out the rest 2-12 for each drive
  - If there are more or less than 12 events, there is an extra F2 marked.
  - You can figure out which is wrong by following the pattern of events or looking at the timing.



Session	Drive	Event	Min	Max	Mean	Value	Time	Delta T (sec)	Max - Min	Max - Mean	Correlate	Lin_reg	FS marked close to event
5	3	7	6.16455	10.00976	8.375306	6.167602	26.28125	-10.001	3.845214844	1.634458875	0.241521	0.089156	1
5	3	8	8.012389	8.789062	8.334051	8.547973	26.9894	-10.001	0.776672363	0.455010164	-0.24635	-0.02113	0
5	3	9	8.085631	9.066772	8.446008	8.728027	27.68116667	-10.001	0.981140137	0.620763604	-0.56388	-0.05104	0
5	3	10	7.22351	9.350585	8.419081	7.22351	28.22215	-10.001	2.127075195	0.931504068	0.537054	0.09681	0
5	3	11	7.286071	7.685851	7.476349	7.394408	28.69606667	-10.001	0.399780273	0.209501862	0.593717	0.025426	0
5	3	12	7.972716	9.492492	8.595659	8.203124	29.60831667	-10.001	1.519775391	0.896832505	-0.14878	-0.02516	0
6			1.748656	2.195739	1.931702	1.870727	7.891433333	-10.001	0.44708252	0.264037311	0.824402	0.040884	
6			2.346801	3.050231	2.668758	3.048705	8.165016667	-10.001	0.703430176	0.381472625	-0.96807	-0.08216	
6			2.218627	3.334045	2.717485	2.247619	8.39885	-10.001	1.11541748	0.616559275	0.206854	0.024849	
6			2.177428	2.381896	2.287238	2.378844	8.659483333	-10.001	0.204467773	0.094657735	-0.99341	-0.0193	
6			1.934814	2.194213	2.044751	2.192687	9.3959	-10.001	0.259399414	0.149462142	-0.97016	-0.02127	
6			1.036071	1.492309	1.099878	1.10321	10.54851667	-10.001	0.456237793	0.392430517	0.457829	0.011749	
6			2.35443	3.050231	2.687125	2.404784	11.35436667	-10.001	0.695800781	0.363106242	0.434573	0.031505	
6			1.834106	2.070617	1.955298	2.067565	12.01656667	-10.001	0.23651123	0.115319191	-0.96177	-0.02045	
6			1.260375	1.400756	1.341623	1.400756	12.72456667	-10.001	0.140380859	0.059132766	-0.97009	-0.01157	
6			1.100158	1.200866	1.147819	1.162719	13.27673333	-10.001	0.100708008	0.053046947	-0.65513	-0.00414	
6			0.878905	1.211547	1.037647	1.020812	13.74568333	-10.001	0.332641602	0.173899851	0.682933	0.024199	
6			0.877379	0.961303	0.909351	0.901794	14.671	-10.001	0.08392334	0.05195189	0.202772	0.000916	
6	2	1	2.888488	3.663634	3.2303	3.663634	16.57681667	-10.001	0.775146484	0.433334354	-0.99342	-0.07357	
6			2.27661	2.642821	2.450325	2.641296	16.83791667	-10.001	0.366210938	0.192495986	-0.99717	-0.03548	
6			2.052306	3.750609	2.609229	2.125548	17.08751667	-10.001	1.698303223	1.141380305	0.871489	0.189863	
6			2.688598	3.266906	2.897676	2.932738	17.33928333	-10.001	0.578308105	0.369230048	0.48587	0.02926	
6			2.157592	2.461242	2.299631	2.427672	18.0452	-10.001	0.303649902	0.161610897	-0.99183	-0.02625	
6			1.152038	1.475524	1.26667	1.202392	19.19905	-10.001	0.323486328	0.208853646	0.895984	0.02475	
6			1.026916	1.104735	1.070729	1.068114	19.99641667	-10.001	0.077819824	0.034006108	-0.65808	-0.00352	
6			0.888961	0.939941	0.914463	0.927733	20.71985	-10.001	0.051879883	0.025477235	-0.89564	-0.00347	
6			0.776671	0.830077	0.800911	0.810241	21.39363333	-10.001	0.053405762	0.029166683	-0.39239	-0.00113	
6			0.718688	0.805663	0.754764	0.750732	21.92871667	-10.001	0.086975098	0.050899397	-0.31953	-0.00108	

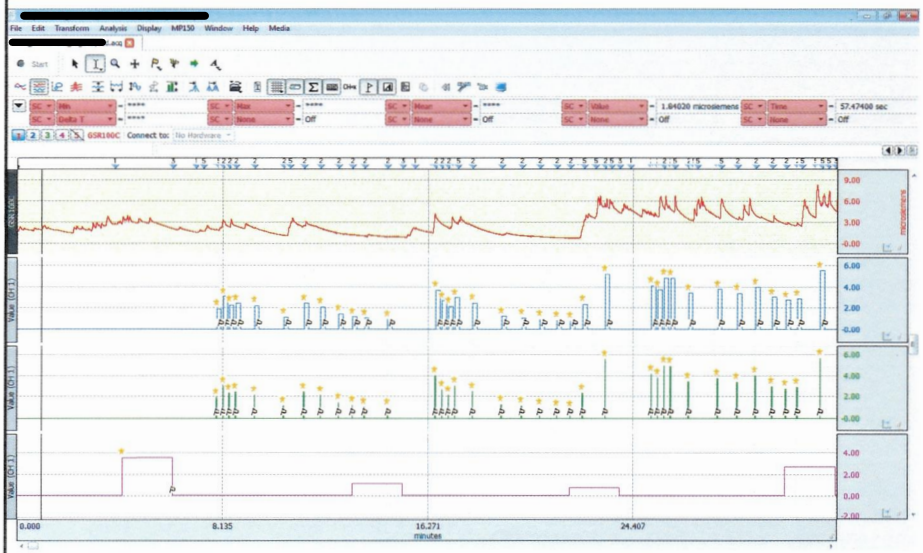


- Repeat the previous steps, but for CH3



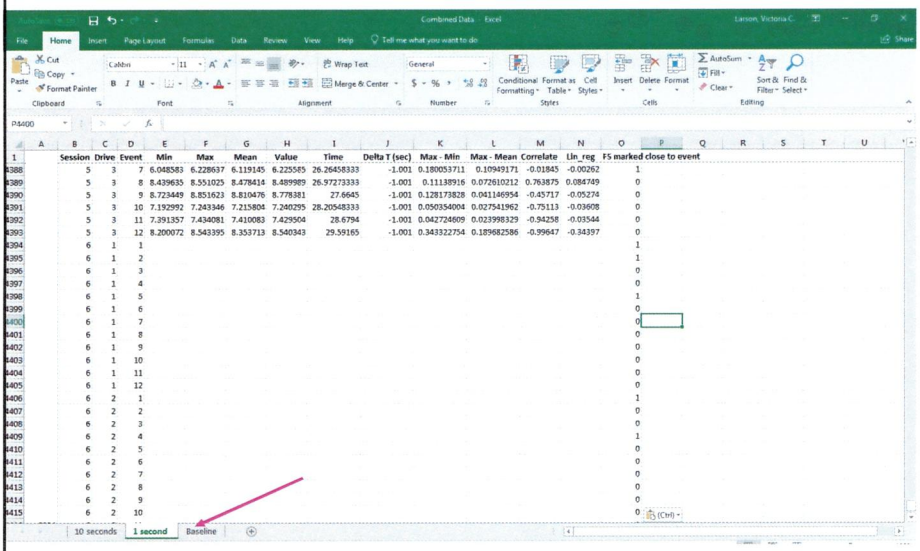
	Session	Drive	Event	Min	Max	Mean	Value	Time	Delta T (sec)	Max - Min	Max - Mean	Correlate	Lin_reg	FS marked close to event
1388	5	3	7	6.048583	6.228637	6.119145	6.225585	26.26458333	-1.001	0.180053711	0.10949171	-0.01845	-0.00262	1
1389	5	3	8	8.439635	8.551025	8.478414	8.489989	26.97273333	-1.001	0.11138916	0.072610212	0.763875	0.084749	0
1390	5	3	9	8.723449	8.851623	8.810476	8.778381	27.6645	-1.001	0.128173828	0.041146954	-0.45717	-0.05274	0
1391	5	3	10	7.192992	7.243346	7.215804	7.240255	28.20548333	-1.001	0.050354004	0.027541962	-0.75113	-0.03608	0
1392	5	3	11	7.391357	7.434081	7.410083	7.429504	28.6794	-1.001	0.042724609	0.023998329	-0.94258	-0.03544	0
1393	5	3	12	8.200072	8.543395	8.353713	8.540343	29.59165	-1.001	0.343322754	0.189682586	-0.99647	-0.34397	0
1394	6	1	1											1
1395	6	1	2											1
1396	6	1	3											0
1397	6	1	4											0
1398	6	1	5											1
1399	6	1	6											0
1400	6	1	7											0
1401	6	1	8											0
1402	6	1	9											0
1403	6	1	10											0
1404	6	1	11											0
1405	6	1	12											0
1406	6	2	1											1
1407	6	2	2											0
1408	6	2	3											0
1409	6	2	4											1
1410	6	2	5											0
1411	6	2	6											0
1412	6	2	7											0
1413	6	2	8											0
1414	6	2	9											0
1415	6	2	10											0

- Paste the results into the 1 second tab and save the temporary file in the participants folder.



- Repeat the previous steps, but for CH4.
- Change the preset to say Baseline instead of SCR.
- Settings should be:

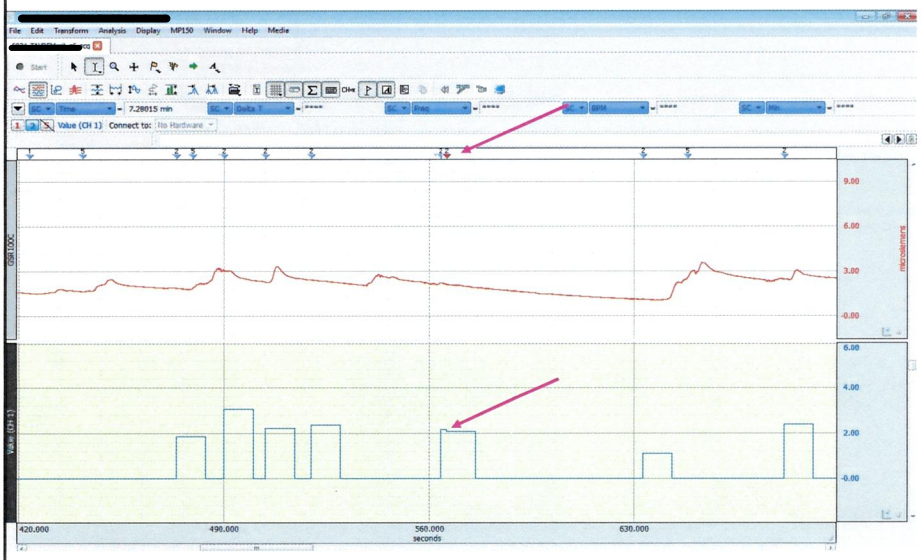
Min	Max	Mean	Value	Time
Delta T	None	None	None	None



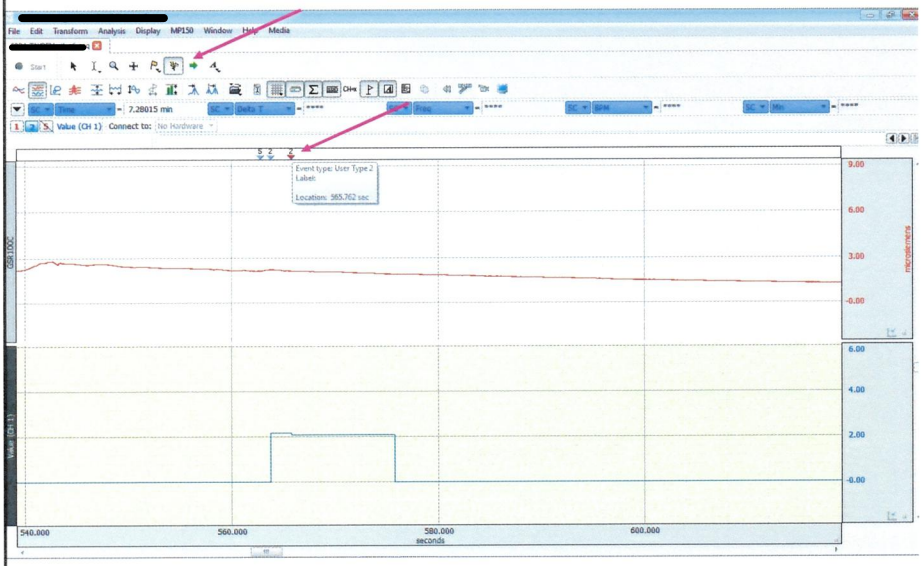
	Session	Drive	Event	Min	Max	Mean	Value	Time	Delta T (sec)	Max - Min	Max - Mean	Correlate	Lin_reg	FS marked close to event
1388	5	3	7	6.048583	6.228637	6.119145	6.225585	26.26458333	-1.001	0.180053711	0.10949171	-0.01845	-0.00262	1
1389	5	3	8	8.439635	8.551025	8.478414	8.489989	26.97273333	-1.001	0.11138916	0.072610212	0.763875	0.084749	0
1390	5	3	9	8.723449	8.851623	8.810476	8.778381	27.6645	-1.001	0.128173828	0.041146954	-0.45717	-0.05274	0
1391	5	3	10	7.192992	7.243346	7.215804	7.240255	28.20548333	-1.001	0.050354004	0.027541962	-0.75113	-0.03608	0
1392	5	3	11	7.391357	7.434081	7.410083	7.429504	28.6794	-1.001	0.042724609	0.023998329	-0.94258	-0.03544	0
1393	5	3	12	8.200072	8.543395	8.353713	8.540343	29.59165	-1.001	0.343322754	0.189682586	-0.99647	-0.34397	0
1394	6	1	1											1
1395	6	1	2											1
1396	6	1	3											0
1397	6	1	4											0
1398	6	1	5											1
1399	6	1	6											0
1400	6	1	7											0
1401	6	1	8											0
1402	6	1	9											0
1403	6	1	10											0
1404	6	1	11											0
1405	6	1	12											0
1406	6	2	1											1
1407	6	2	2											0
1408	6	2	3											0
1409	6	2	4											1
1410	6	2	5											0
1411	6	2	6											0
1412	6	2	7											0
1413	6	2	8											0
1414	6	2	9											0
1415	6	2	10											0

- Paste the results into the baseline tab and save the temporary file in the participants folder.

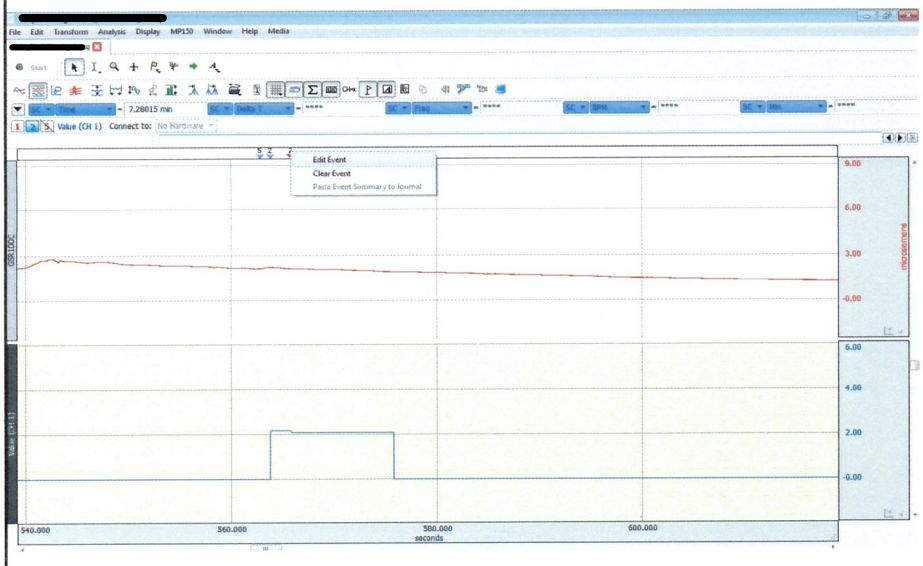
Weird Stuff Happens



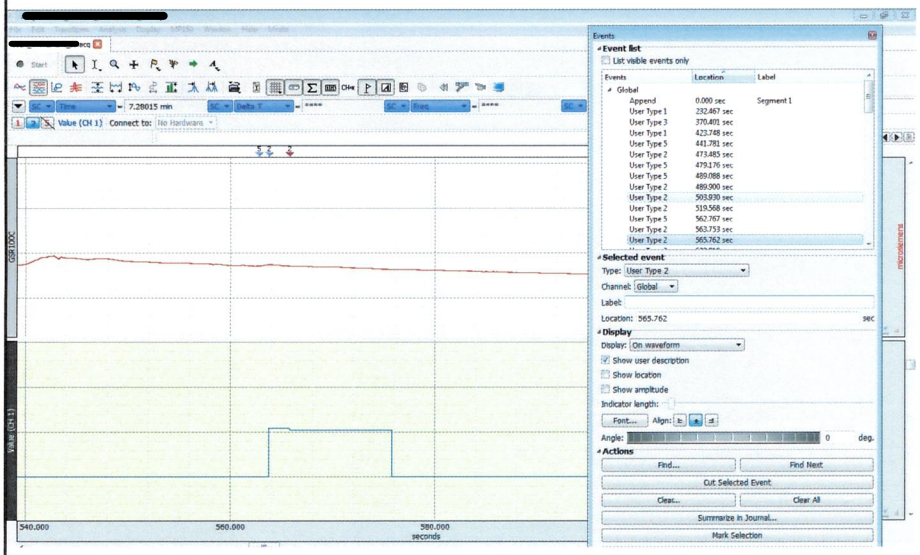
- If you see a little blip in the epoch, that might mean you have 2 F2s next to each other.



- To fix this, delete the F2 that was a mistype. You can either do this with the zap tool or by editing the event.



- If you don't want to zap the event, either edit the event or clear the event
- You can get these options by right clicking on the event



- This is what happens when you click edit events.
- If you ever need to change placement of events, you can also do that here

- After you remove the events you do not want, you will need to redo the epoch.
- It is easiest to just remove the wave form so you don't have multiple waveforms in the file
- Remove by highlighting the waveform you want to delete
- Then go to edit → Remove Waveform