

Webinar Q&A Report:

Mountain Lab: Studying the effects of stress and extreme conditions on human physiology

1. Did you or anyone investigate effects on EEG parallel to ECG/respiration?

My team did not collect EEG data, but some colleagues from University of British Columbia and the University of Victoria did collect EEG data during ascent using portable Muse systems. They are looking at the data now, so unfortunately, I can't tell you anything about what they found.

2. Dr. Day... your ascent-descent profile in Nepal showed that acetazolamide was present/taken during your ascent. Did all participants take a regular dose, and did that affect your measurements, results, or statistical analysis in any way?

Yes, I wanted to err on the side of safety for my self-funding participants. We all took 250mg Diamox daily (125 mg twice per day) during ascent. Diamox acts on the kidneys to induce a metabolic acidosis, which aids in acclimatization by acting as a ventilatory stimulant, possibly improving oxygen saturation. This may have affected our data in many ways. This is a caveat we have to reconcile in various resulting manuscripts. I plan on returning in May 2018, this time without Diamox, so we can make some comparisons on data sets that are similar between the two trips. The Wilderness Medical Society does not recommend prophylactic Diamox for low risk ascents, so participants should be fine as long as we follow a reasonable ascent profile, build in rest days, trek slowly, and ensure adequate hydration and nutrition.

3. I work with EEG signals; how do you think EEG as a channel from Fz Cz Pz be integrated along with ECG and Respiratory parameters to get some insight into neurocognition?

I am sorry but I don't have any expertise in EEG measurements. Feel free to contact Dr. Olav Krigolson at the University of Victoria, as he was making measurements using a portable Muse system.

I think cognitive function at altitude is an important topic, and we'll be assessing this in combination with brain blood flow when we go back in May 2018.

This from my ADI representative: From an equipment point of view, integrating an EEG recording with our other measurements would have been quite simple as the PowerLab system can record EEG using the same bio-amplifiers we were already using for ECG. LabChart software is also capable of the type of spectral analysis that would be needed to analyse this data. It would be interesting to see if there were any measurable altitude related effects on an EEG.

4. Dr. Day, you made reference to acute mountain sickness. How did you watch for that and did any of your group experience this in Nepal?

We used the standard Lake Louise AMS scoring system (15 point scale), and participants self-reported their scores daily. At the highest altitude (~5200m), we had a participant with a 9, a 7 and two 6s on the scale. It's important to watch for safety, especially above 5000m, and have supplementary oxygen available. The challenge in our field is that it's difficult to predict who will get sick ahead of time. The participant that had a 9 was fine until that last night at 5200m. We put him on supplementary oxygen for a few hours, then descended after breakfast. He was fine after descending to 4300m.

5. Can you tell us a little more about how you process your input signals in PowerLab?

One of the strengths of the power lab system is that you can collect data from external devices. These inputs can then be processed as you wish for calculations in real time. For example, we routinely calculate heart rate from the ECG channel, mean arterial pressure from the finometer channel, and mean cerebral blood velocity from the ultrasound channel. We also calculate breath-by-breath ventilation from You can also assess heart rate variability from the ECG channel using the HVR module in Lab Chart Pro, where you can get indices of short term and long term variability. Contact your ADI representative if you need guidance, or contact me personally.

6. What was the biggest challenge or hiccup that occurred on the EBC trek and how did you adjust on the spot? Also, what type of security and back-up measures did you put in place for data storage?

The biggest hiccup was probably when most of our bags and pelican cases didn't arrive in Kathmandu with us. They were stuck in Toronto on a tight layover. Because flights through that airline only arrive every other day, we were stuck without our clothes and gear for a few days. Luckily, they arrived in time for baseline measures, and we flew to Lukla on our intended flight to start the trek.

On previous expeditions, we had a number of reliability issues with the hard disks we were using for data storage due to the change in atmospheric pressure. Bringing a couple of spare computers and making sure data was backed up on at least three other disks was an important part of our archiving practice.

7. What features did you mostly use in LabChart to analyze your data? Any helpful "how to's" you'd like to share?

LabChart's Cyclic Measurements feature is very useful for pulling out information about all the periodic signals we were looking at (ECG, blood pressure, ultrasound blood velocity, respiratory gases). I use rate, mean, maximum and minimum for these measurements all the time, which can be calculated in real time in LabChart. We discuss processing these kinds of data in detail here:

[MacKay CM., Skow RJ, Tymko MM, Boulet LM, Ainslie PN, Davenport MH, Steinback CD, Lemeiux CE, and Day TA \(2016\). Central Respiratory Chemosensitivity and Cerebrovascular CO₂ Reactivity: A Rebreathing Demonstration Illustrating Integrative Human Physiology. Adv Physiol Edu. 40: 79–92.](#)

Contact me personally if you have any specific questions I might be able to help with.

8. Would you recommend any tips on an efficient way to keep tubes clean of moisture during gas analysis/sampling at altitude?

We had trouble with moisture in the spirometer flow heads and tubing. We took them a part a lot, and used gas from our oxygen tanks to blow them out frequently. I would recommend heating the flow head if you ever do this yourself, as I will be this May when I go back. We changed the filters and nafion tubing regularly.

9. When working out of the lab in a field situation, how did you find dealing with any increase movement artefacts. Or did you find this at all with the equipment you used?

We always made our measurements when participants were seated, so there were no issues related to this.

10. I am currently having to use multiple software systems to record and analyze my research data. How many do you use and how have you found this has changed since using ADInstruments equipment?

I now use ADI LabChart for all my data collection, signal processing and analysis now. I then output the data into excel and/or Sigmaplot or statistical analysis.

11. I'm currently using Hemocue to measure capillary Hb but finding it is not sustainable for cold climates or high altitudes and is failing. Do you have any suggestions on other field equipment that could be used for this? Also, any suggestions for measuring SaO2 (record each second) under water in rising pressure (i.e. following an apnea divers descent below surface).

We also used the hemocue device for [Hb]. However, all of our measurements were made in heated lodges during ascent, so we had no trouble with devices due to temperature. I think the Abbott iSTAT device is well-suited for blood gas and electrolyte measurements in the field, if you want to step it up. As for oxygen saturation during diving, I bet you could use a portable finger pulse oximeter and water proof it on the finger? Perhaps you can find a telemetry system?

Thank you all for attending the webinar, and for your questions. Please don't hesitate to contact me personally if you have any further inquiries.

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If you have additional questions for [ADInstruments](#) or Dr. Trevor Day regarding content from this webinar or wish to receive additional information about the products and solutions presented in this webinar, please contact them by email:

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