**Trouble Shooting**

Here you find answers to some of the problems you might encounter or that previous users have asked. Please contact us if you can’t find an answer to your question here!

1. **Can I use EasieRR on my MacBook?**

To date EasieRR is only compatible with Microsoft Windows.

1. **Can I run EasieRR if I have no Matlab license?**

EasieRR is a standalone application, thus no Matlab installation is required.

1. **Which systems are supported?**

EasieRR requires 64-bit Windows operating systems (Microsoft Windows 7 or higher), a min. 2 GHz processor, min. 4 GB RAM and display resolution of 1280 x 1024

1. **Are the MATLAB source files provided?**

Source files are not provided.

1. **What is the peak detection algorithm used?**

The peak detection method being used is peak prominence. The height of the peak to be detected must be at least a certain value times the width of the peak at half the max. height. This value can be set in the “Peak prominence” window when loading a new file.

1. **What is a “good data range”?**

We consider a good data range a range with clearly visible heart beats on the ECG trace, an adequate signal-noise ratio and only few irregularities. These should be possible to be corrected manually using the “move mark”, “insert mark” and “mark outlier” options while staying below a threshold of 10% of deleted outliers (=outlier percentage; Mohr et al. 2002; Langbein et al. 2004). Note: Only the “mark outlier” action which is deleting the marked peaks altogether contributes to this outlier percentage!!

1. **Why did you analyse ranges of 20 seconds in your publication?**

There was too much noise in the data to analyse the whole 3-5 min recordings of data. Instead we decided to analyse the average of several 20-second-ranges as a proxy. We chose 20 seconds because this was the max length were we could analyse at least one range from most test subjects. Previous studies in animals have used even shorter ranges of 10-seconds (Briefer et al. 2015, Désiré et al. 2006, Reefmann et al. 2009). Reefmann et al. (2009) even compared 4 min and 10 s ranges of HRV data and recommend short ranges (i.e. 10 s) should be chosen If acute reactions of the heart to a stressor are to be analysed. For long-term changes due to chronic stress 5-min or even 24-h recordings are suggested (Task force 1996).

1. **Is there a way to see if all already analysed and corrected ranges have been saved?**

Yes you can check the ranges you analysed before you click on «save to file» by using the «check data» button or after you saved to file by opening the according text file that was generated after clicking on “save to file”.

1. **Regarding the values, what do you consider a plausible metric (RMSSD, SD1, SD2 etc. ?) and value?**

The program allows a species-specific analysis and calculation of recommended standard HRV parameters in both, the time- and the non-linear domain (RMSSD, SDNN, SD1, and SD2). HR is a good indicator for overall arousal or activity, it does not allow to draw direct inferences on the separate activity of the two autonomic nervous branches, the PNS and the SNS. In contrast, RMSSD has been found to reflect PNS-mediated HRV and can quantify the instantaneous variance between heart beats. SDNN reflects the long-term variability of beat-to-beat intervals and is usually interpreted as an indicator of the sympatho-vagal balance. SD1 is describing the instantaneous variability of the RR-interval time series (see RMSSD) and reflecting parasympathetic efferent activity at the sinus node. SD2 is describing the long-term variability of the RR-interval time series.

As RMSSD and SD1 are correlated HRV metrics, it is redundant to report both.

The values you can expect very much depend on the species you are looking at.

In goats these ranged from:

Min/max HR: 87-210

Min/max RMSSD: 4-189

Min/max SD2: 9-177

Min/max SD1: 3-136

Min/max SD: 7-136

**References:**

Briefer, E. F., Tettamanti, F., McElligott, A. G. (2015). Emotions in goats: mapping physiological

behavioural vocal profiles. Animal Behaviour 99, 131-143

Langbein, J., Nürnberg, G., and Manteuffel, G. (2004). Visual discrimination learning in dwarf goats and associated changes in heart rate and heart rate variability. Physiology & Behaviour, 82(4), 601-609.

Mohr, E., Langbein, J. and Nürnberg, G. (2002). Heart rate variability: A noninvasive approach to measure stress in calves and cows. Physiology & Behavior, 75, 251–259.

Reefmann, N., Wechsler, B. and Gygax, L. (2009). Behavioural and physiological assessment of positive and negative emotion in sheep. Animal Behaviour, 78, 651-659

Task Force of the European Society of Cardiology and the North American Society of Pacing and Electrophysiology (1996). Heart rate variability: Standards of measurement, physiological interpretation, and clinical use. Circulation, 93, 1043–1065.

Désiré, L., Veissier, I., Despres, G., Delval, E., Toporenko, G., & Boissy, A. (2006). Appraisal process in sheep (Ovis aries): Interactive effect of suddenness and unfamiliarity on cardiac and behavioral responses. Journal of Comparative Psychology, 120(3), 280-287.