

AcqKnowledge RSA Scoring Manual

Updated 2014/01/25

1. Setup for scoring

1.1. On your computer, find the 1-minute long AcqKnowledge datafiles you created while scoring impedance (e.g., "1-ZCG-SAL001.acq", "2-ZCG-SAL001.acq")

1.2. Open AcqKnowledge

1.2.1. Windows 7 prompt

1.2.1.1. Windows 7 may ask you if you want to allow AcqKnowledge to make "changes to the computer"

1.2.1.2. Say "Yes"

1.2.2. AcqKnowledge Hardware Prompt

1.2.2.1. If a dialogue box appears that says, "Choose MP150"

1.2.2.1.1. Ensure that "No hardware" is selected in the pull-down menu next to "Work with:"

1.2.2.1.2. Click "OK"

1.2.2.1.3. You may want to check the checkbox next to "Do not ask me again"

1.3. Set the time units used by AcqKnowledge (Note: you only have to do this once per computer on which you use AcqKnowledge)

1.3.1. Go to "Display" -> "Preferences"

1.3.2. Under "Measurements," find the pull-down menu for time units

1.3.3. Select "milliseconds" from the "Time Units" pull-down menu

2. Create your RSA Data Spreadsheet

2.1. Open a new spreadsheet in any spreadsheet program (e.g., Excel)

2.1.1. Name the file the same name as your overall RSA file

2.1.2. In the first row, create headings for three columns:

2.1.2.1. "Minute"

2.1.2.2. "RSA"

3. Run the Respiratory Sinus Arrhythmia (RSA) analysis for EACH of the 1-minute data files you created while scoring impedance

3.1. Prepare for the RSA Analysis

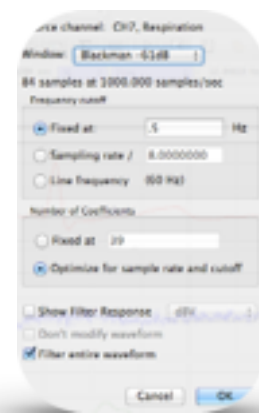
3.1.1. Create a respiration channel from Z0

3.1.1.1. Make sure you can see the Z0 channel, because you may have hidden it while completing the ECG or ZCG analyses

3.1.1.2. Select the Z0 channel

3.1.1.3. Go to "Edit" -> "Duplicate Waveform" to duplicate the channel

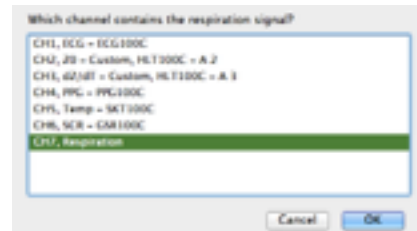
3.1.1.4. Rename the new channel "RESP" (i.e., the abbreviation for respiration)



- 3.1.1.4.1. Double-click on the channel name on the left-hand side of the channel
- 3.1.1.4.2. Enter "RESP" in the text box that appears and click "OK"
- 3.1.1.5. While the RESP channel is selected, go to "Transform" -> "Digital Filters" -> "FIR" -> "Low Pass"
 - 3.1.1.5.1. Ensure the settings look similar to this figure ———->
 - 3.1.1.5.2. Select the option to use a "fixed" frequency cutoff
 - 3.1.1.5.3. Make the fixed cutoff 0.5 Hz
 - 3.1.1.5.3.1. Sometimes you can go as high as 1 Hz, depending on respiration rate
 - 3.1.1.5.4. Ensure that "Filter entire waveform" is checked
 - 3.1.1.5.5. Ensure the "Source" channel is your newly created respiration channel
- 3.1.1.6. Click "OK"

3.2. Run an initial RSA analysis, mainly to auto-score as much respiration as possible

- 3.2.1. Go to "Analysis" -> "Hemodynamics" -> "Respiratory Sinus Arrhythmia"
- 3.2.2. You will be prompted to select the channel with the ECG signal
 - 3.2.2.1. Select the ECG channel
 - 3.2.2.2. Click "OK"
- 3.2.3. You will be prompted to select the channel with the respiration signal
 - 3.2.3.1. Select the respiration channel
 - 3.2.3.2. Click "OK"



- 3.3. Wait while AcqKnowledge conducts the RSA analysis
 - 3.3.1. When it is done, an excel file will open

3.4. Review the "Heart Period" Graph to fine-tune your ECG Scoring

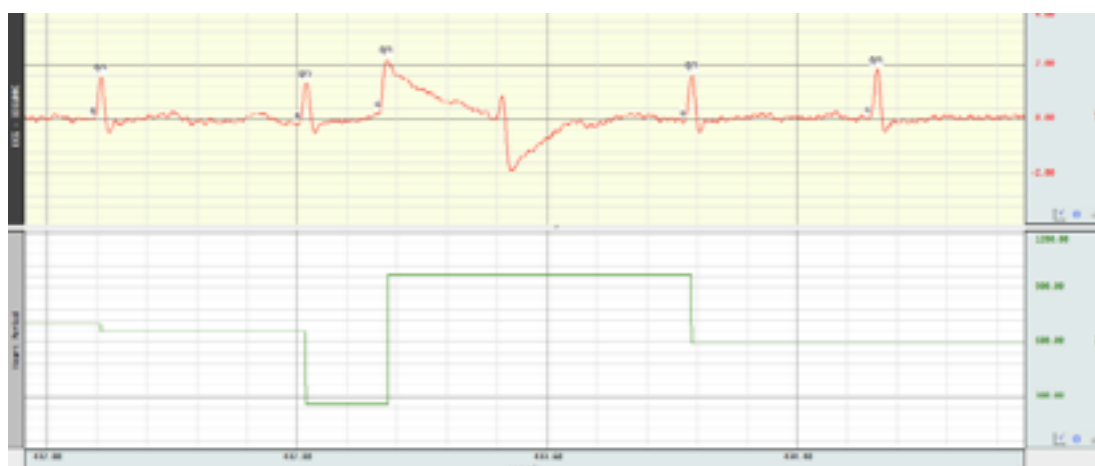
- 3.4.1. Note: This graph plots the number of milliseconds (*ms*) between each successive heart beat, where *ms* between heart beats are plotted on the y-axis and time of the study is on the x-axis.
- 3.4.2. Review the Heart Period graph for any sudden changes in heart period, which will look like a spike up or down
- 3.4.3. Good Heart Period data looks like this:



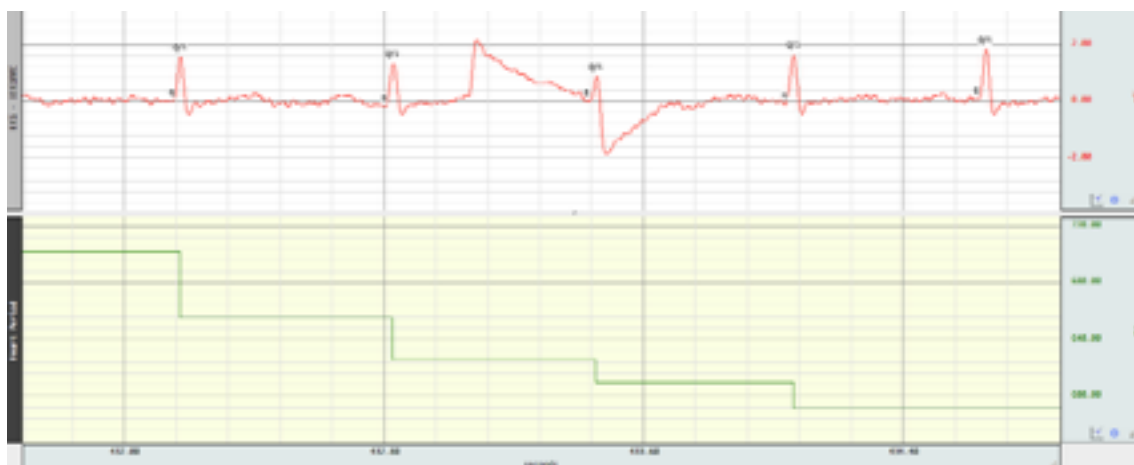
- 3.4.4. Bad Heart Period data looks like the following image



3.4.4.1. When comparing it with the ECG waveform, you can see how the spike in Heart Period corresponds to mistakenly-placed markers in the ECG signal:



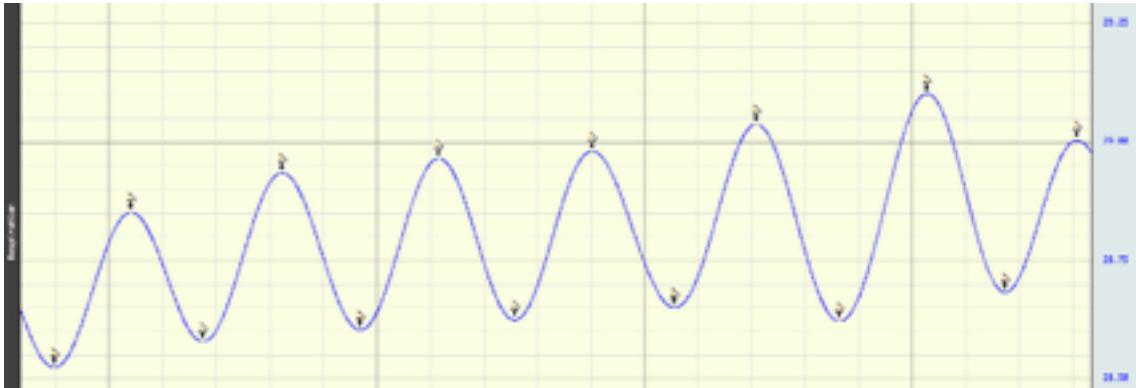
3.4.4.2. To fix the above problem, you would fix the ECG data and rerun the RSA analysis, so the resulting graphs will look like this:



3.4.5. Note: Every time you run the RSA analysis, then AcqKnowledge will add a new Heart Period graph to your AcqKnowledge data file. Be careful, because AcqKnowledge will crash badly if the total number of channels exceeds approximately 20. So, if you need to re-run the RSA analysis a bunch of times, then delete the "Heart Period" graph that is generated each time by selecting the Heart Period channel and going to "Edit" -> "Remove Waveform"

3.5. Review the automatically-placed markers for respiration to fix any badly placed or missing markers

3.5.1. Good Respiration Data will look like this:



3.5.2. Replace all missing inhalations and exhalations

3.5.2.1. Every breath must have an inhalation and an exhalation

3.5.2.2. Every inhalation event must be followed (only) one exhalation event

3.5.2.3. Event types for the event tool:

3.5.2.3.1. **Inhalation:** "Respiration" -> "Inspire Start"

3.5.2.3.2. **Exhalation:** "Respiration" -> "Expire Start"

3.5.2.4. Repeat this process until the entire respiration band is correct marked

3.5.2.5. Note: You may need to remove the extra waveforms if you run the RSA analysis too much, because **AcqKnowledge will crash and lose your data if you allow it to get too many channels (> ~ 16 channels)**

3.6. Export the final RSA Data

3.6.1. Run the final RSA analysis

3.6.1.1. "Analysis" -> "Hemodynamics" -> "Respiratory Sinus Arrhythmia"

3.6.1.2. Select ECG Channel and click "OK"

3.6.1.3. Select Respiration Channel and click "OK"

3.6.1.4. Wait a while for the analysis to run ...

3.6.1.5. When the excel worksheet appears:

3.6.1.5.1. Find the average RSA value for that minute

3.6.1.5.2. Record this average value and the minute number in the RSA Data Spreadsheet that you created in Step 2

3.6.2. Save your work scoring respiration for this segment

3.6.2.1. Use "File" -> "Save As ..." to save the acqknowledge file as "[Minute Number]-RSA-[Original Filename].acq"

3.7. Repeat all of Step 2.2 for each minute of your data file

4. Save the RSA Data Spreadsheet

¡¡Great Job!!