HRV Team Manual

October 14, 2019

Ibernetics, LLC

Table of Contents

Terms

Heart Rate Monitor: A small piece of electronic equipment that is attached to the body and that transmits the time between heartbeats, called the interbeat interval, to the mobile device running the app. These are generally chest strap monitors, ear-clip, or wristband monitors. Wristband monitors are highly inaccurate and are not recommended.

HRV Team: The iOS app purchased and used with a heart rate monitor to explore heart rate variability.

Heart Rate Trace (HRT): The recording the app makes of the user's beat-to-beat heart rate.

Heart Rate Variability (HRV): This refers to the change in heart rate beat-to-beat. As a healthy heart beats, some beats are slightly faster or slower than others. This variation in beat-to-beat heart rate is called heart rate variability. Heart rate variability can be measured in a wide variety of ways and some types of variability are healthy and some are not. The HRV Team app can be used to increase some healthy types of variability.

Getting Started

iOS Devices that connect to HRV Team

HRV Team is compatible with the iPad.

HRV Team requires iOS 11.0 or later.

HRV Team is currently only available in English.

iOS Device Settings

If you are recording audio or video and the screen turns off automatically because of your device settings, then the recording will end. That is behavior caused by the iOS device and the HRV Team app cannot change that. If you do not want the app to stop recording because the display turns off, then we suggest you change the auto-lock time in Settings --> Display & Brightness.

We recommend setting this to 15 minutes or Never. If you set this to a shorter time then you will have to touch the screen frequently while recording to keep the display from turning off.

Remember that if you set the Auto-Lock time to Never, then the display will be accessible by anyone if you leave the device unattended.
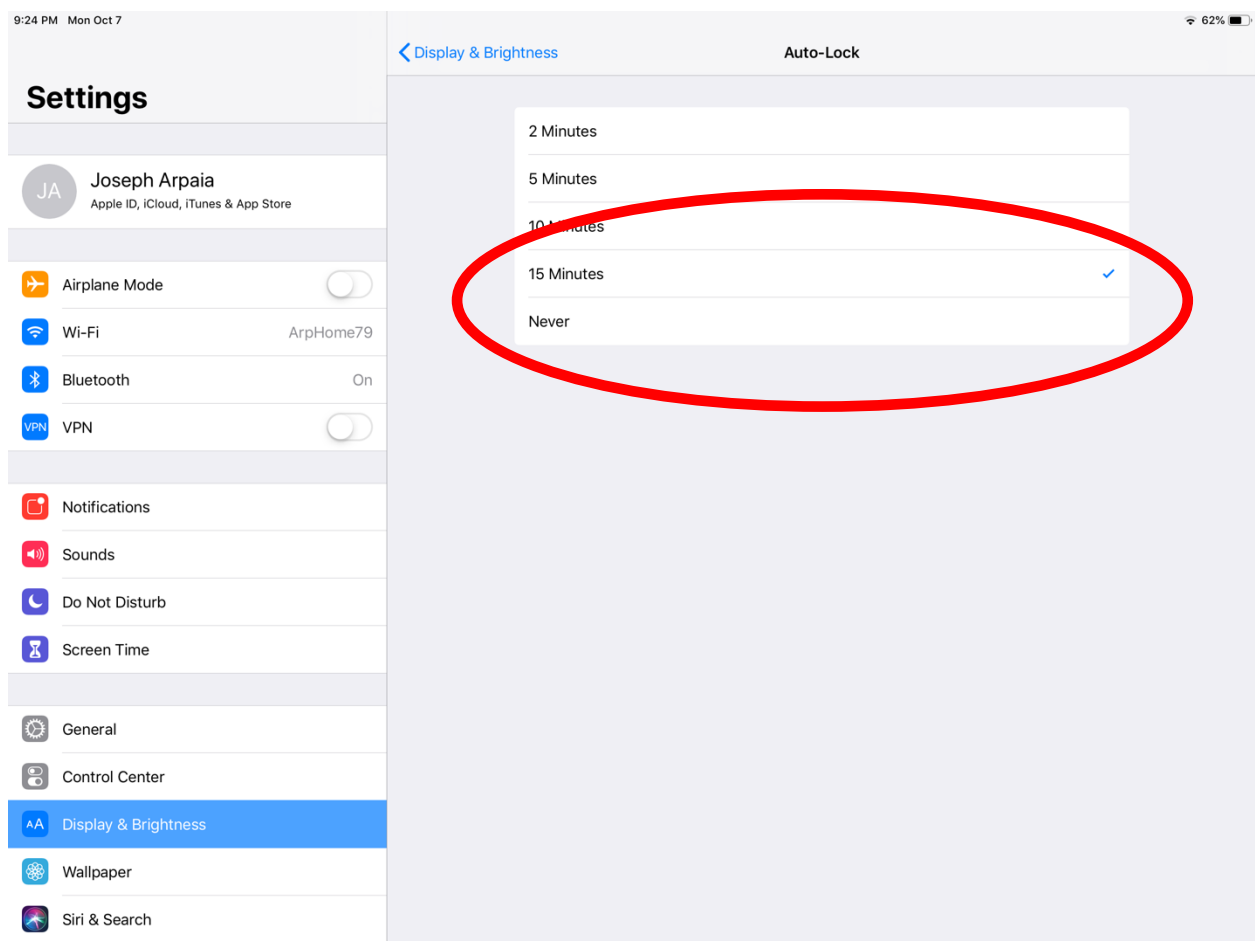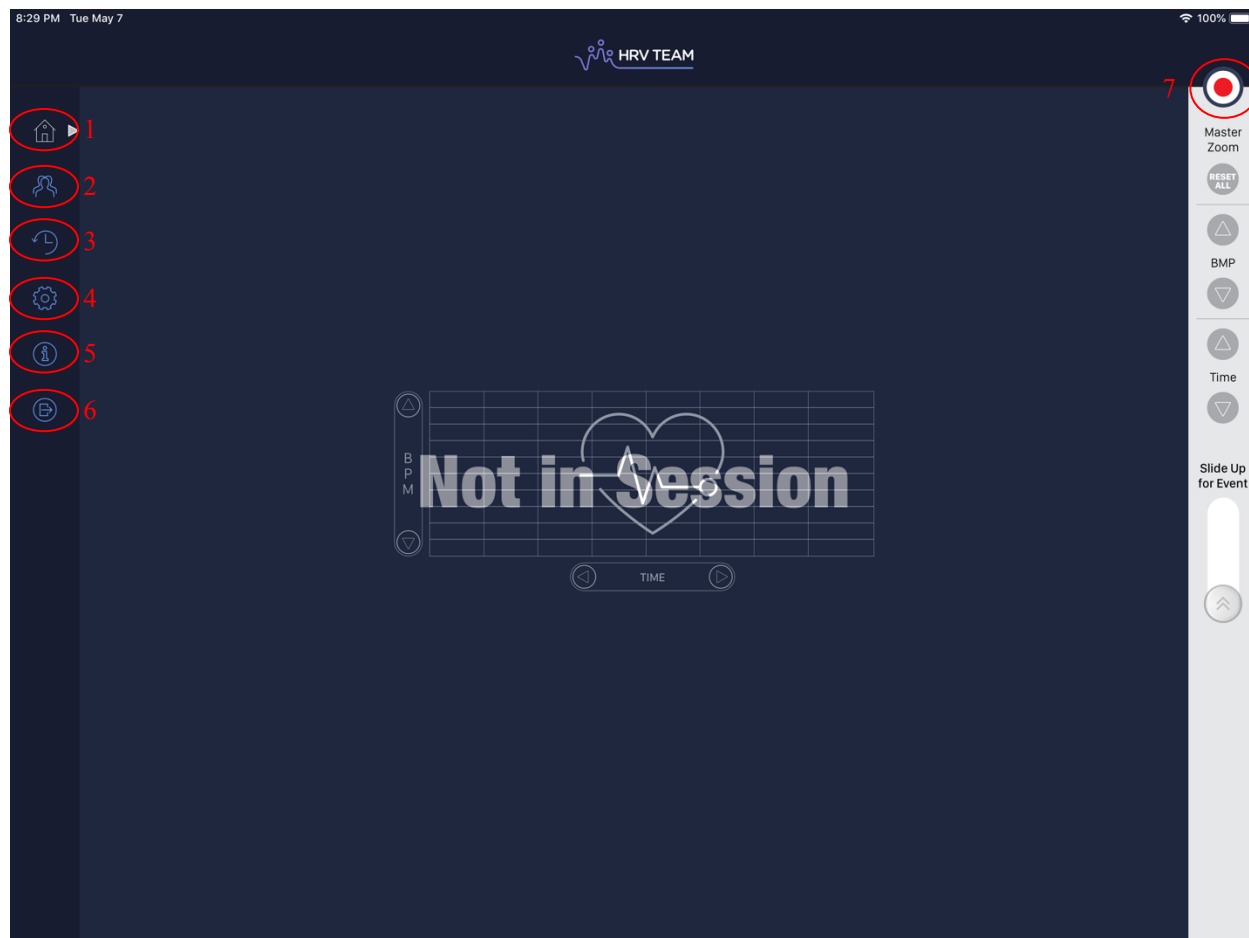
Agree to Terms of Use

The first time you start HRV Team, you must tap "Agree" to the Terms of Use in order to use the app.

HRV Team will record all events that show up on your screen. If text messages or other notifications appear automatically on your screen you may want to turn those off while recording with HRV Team.
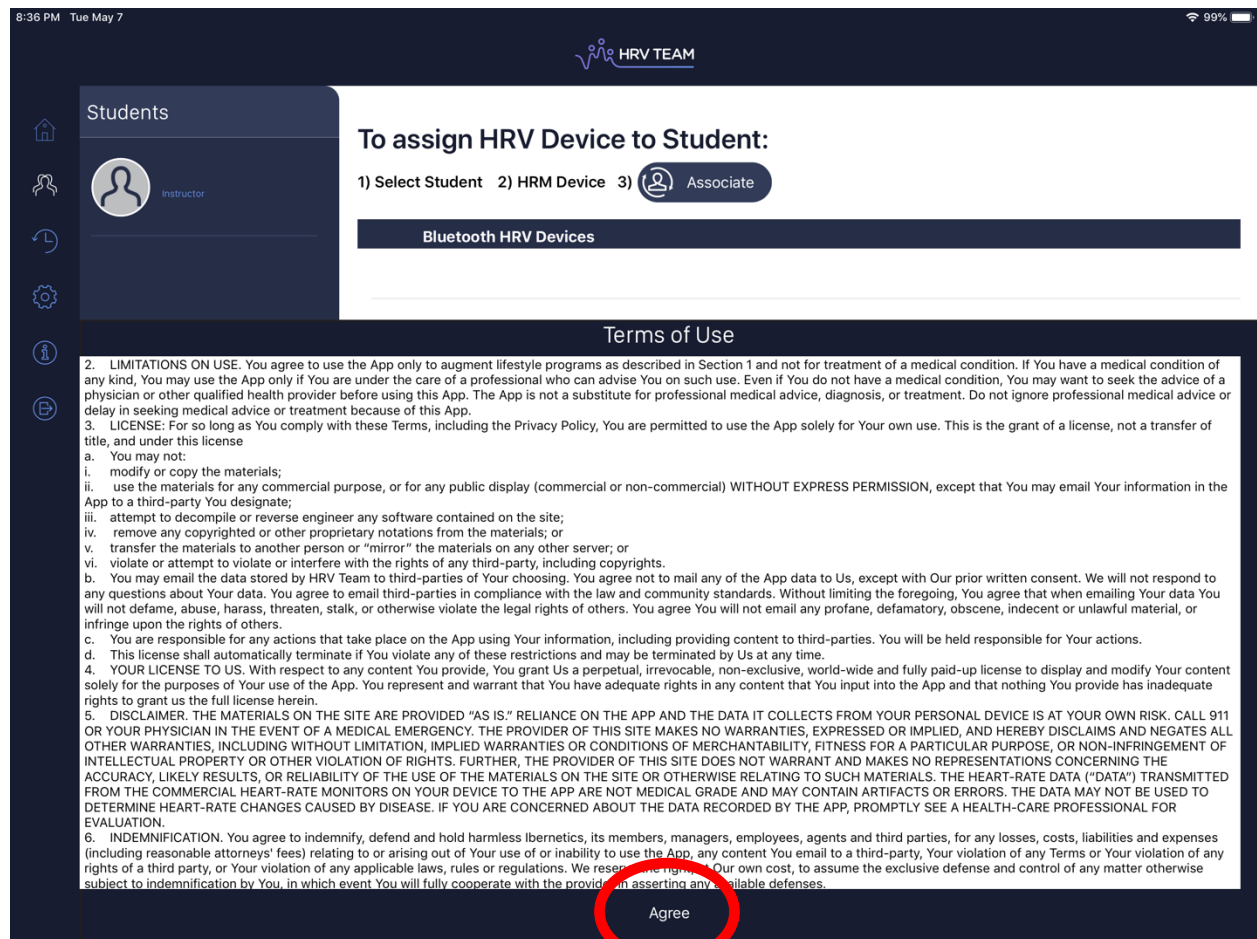
Main Menu

1) Home
   - Returns the app to the Chart View.
2) Instructors and Students
   - Add instructors and students with their names and photos to HRV Team.
3) History
   - Review previous sessions and add titles and notes.
4) Settings
   - Turn the camera and microphone on or off as needed.
5) Information
   - Version number of the installed HRV Team app
6) Export Data Sets
   - Email data sets as a csv file and export video files to your iOS device.
7) Record Button

Connecting the Heart Rate Monitors

Specific instructions for assigning a heart rate monitor to a student and linking that heart rate monitor to the app will follow. This page contains general instructions for using a heart rate monitor.

HRV Team uses Bluetooth LE, also called Bluetooth 4.0, to connect to the heart rate monitors. The Bluetooth connection is low energy and the connection becomes less reliable as the person wearing the monitor moves farther from the iPad. Generally, the connection works well within 7-10 m, but objects that block radio waves such as structural walls will break the connection even at a close distance.

Cell phones and some portable electronic equipment can create radio frequency noise that interferes with the connection. At one training, a portable power supply for small construction hand tools was causing interference with the Bluetooth connection.

Students should make sure that they follow the manufacture's guidelines for wearing the heart rate monitor. Most of the difficulties with poor data transmission have come from poor connections between the chest strap and the student or low battery levels in the heart rate monitor. If a heart rate monitor can be actively linked to the app but many data points are out of range for an expected heart rate value, then the most common problems are chest strap position or a low battery.

We recommend that no more than 10 heart rate monitors be actively linked to the app at the same time.

Heart Rate Monitors that connect to HRV Team

HRV Team will work with any monitor that transmits RR interval or interbeat interval data using standard Bluetooth Low Energy, BLE, protocols. The app records data using the accuracy of the heart rate monitor. It has been tested successfully with the following monitors:

- Zephyr HxM Smart
  - ° 4 msec accuracy for RR interval data
  - ° This is the only monitor that transmits activity data to the app.
  - ° Requires the HxM Smart monitor, NOT the HxM BT monitor which will NOT work with the app.
- Polar H7 and H10
  - ° 1 msec accuracy for the RR interval data
- FirstBeat
  - ° 1 msec accuracy for RR interval data

Other monitors may use a proprietary protocol and if so they will not work with HRV Team. Monitors that state they use Bluetooth 4.0 or Bluetooth LE protocols are likely to work as those protocols are not proprietary. Garmin, Fitbit, and Sony monitors all use proprietary protocols and will not work with HRV Team.

Several monitors advertise heart rate monitoring but often they monitor only the average heart rate and not the beat-to-beat heart rate. Those monitors will not be useful as the average heart rate does not show heart rate variability.

Adding Instructors and Students

Adding Instructors

HRV Team uses instructors as one way to organize the heart rate data that is saved in a session. Each session must have an instructor assigned to it. In a training organization there may be many instructors. Each instructor who is going to use the app should have their name entered and should use their name when running a training session. If HRV Team is being used by a group to track stress in the group and there is no real "instructor" then the group can create a symbolic name for the app to use as the instructor.
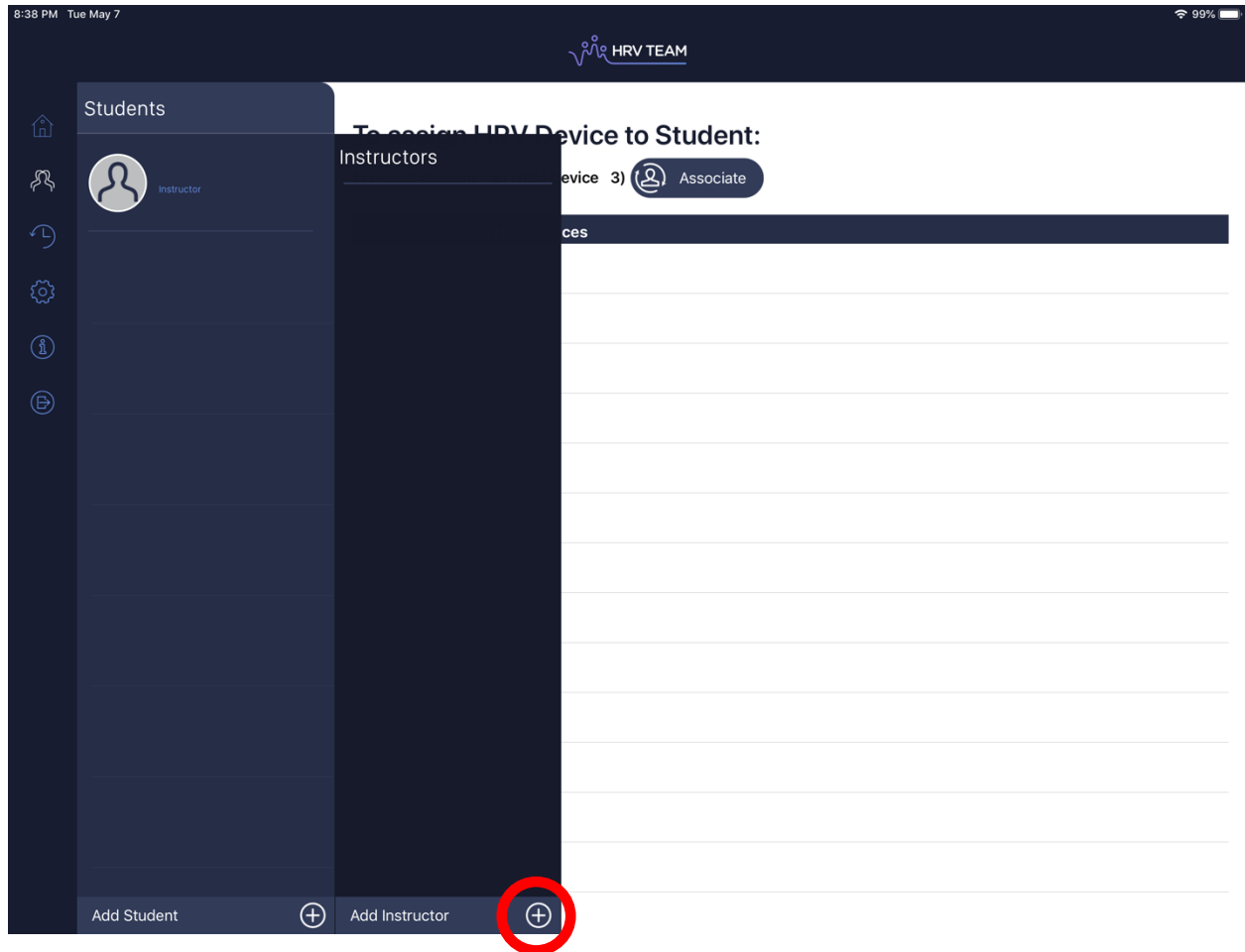
First tap the Instructors and Students button to open the Instructors and Students page.
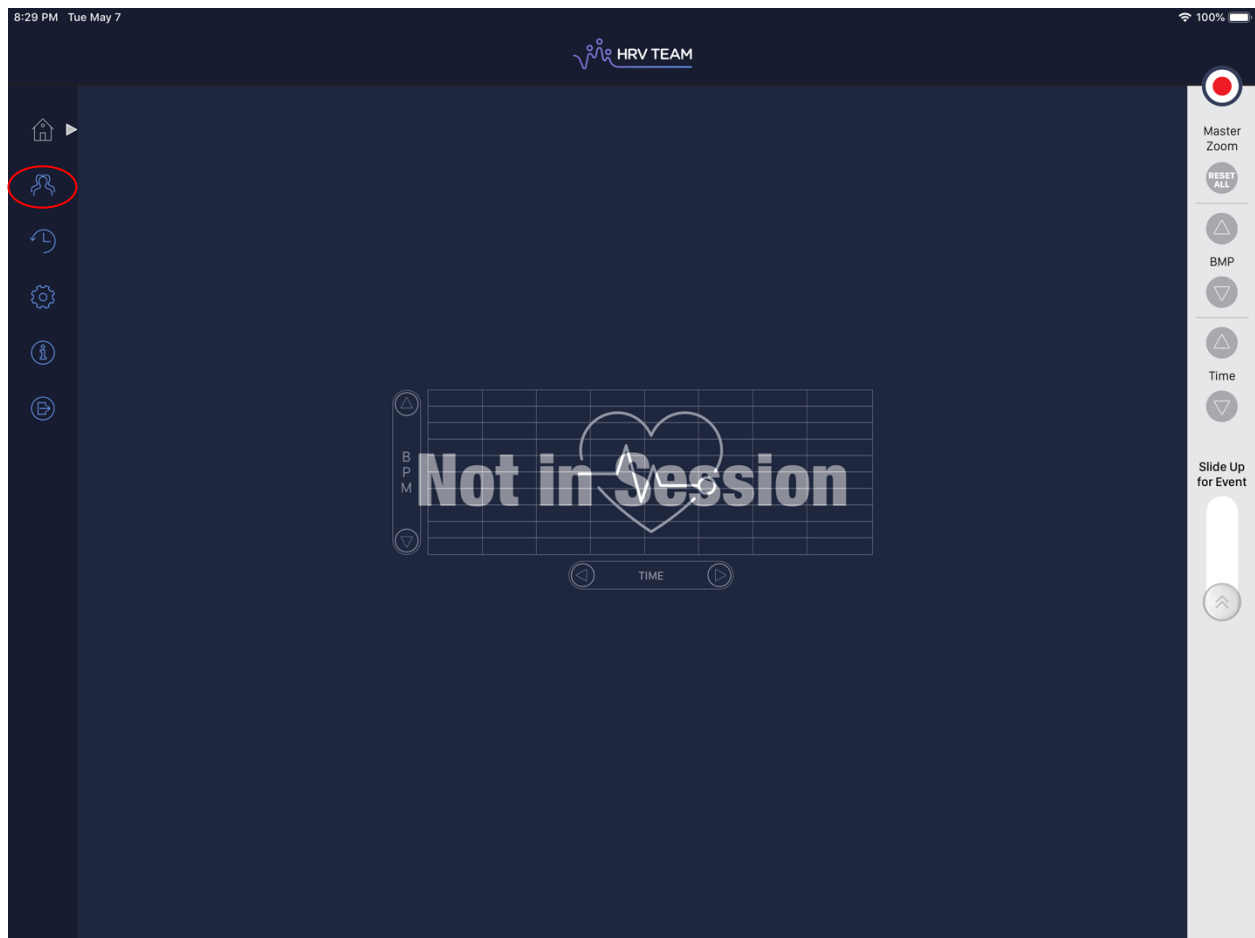
Tap here to add an instructor. Once you have added at least one instructor you can add students.
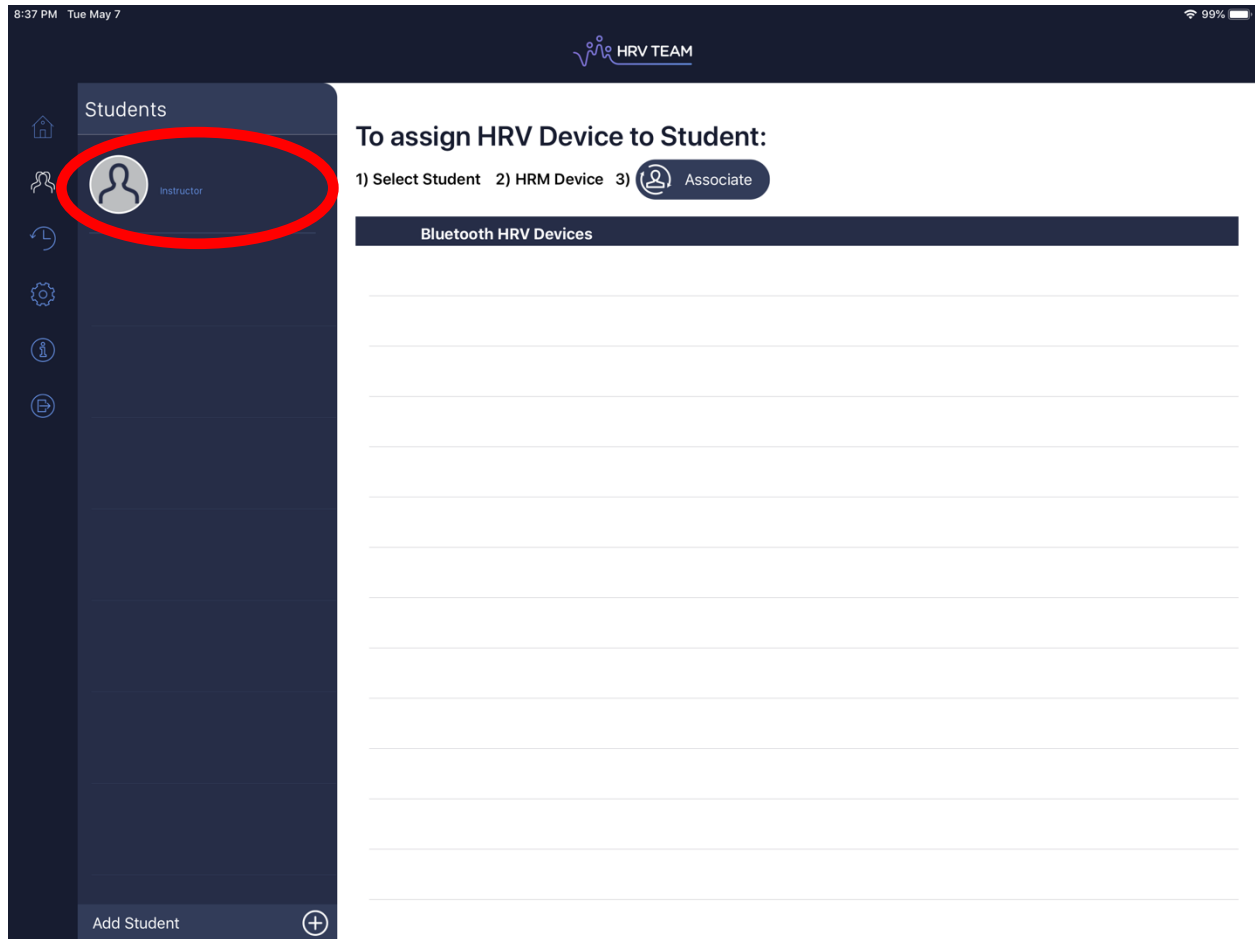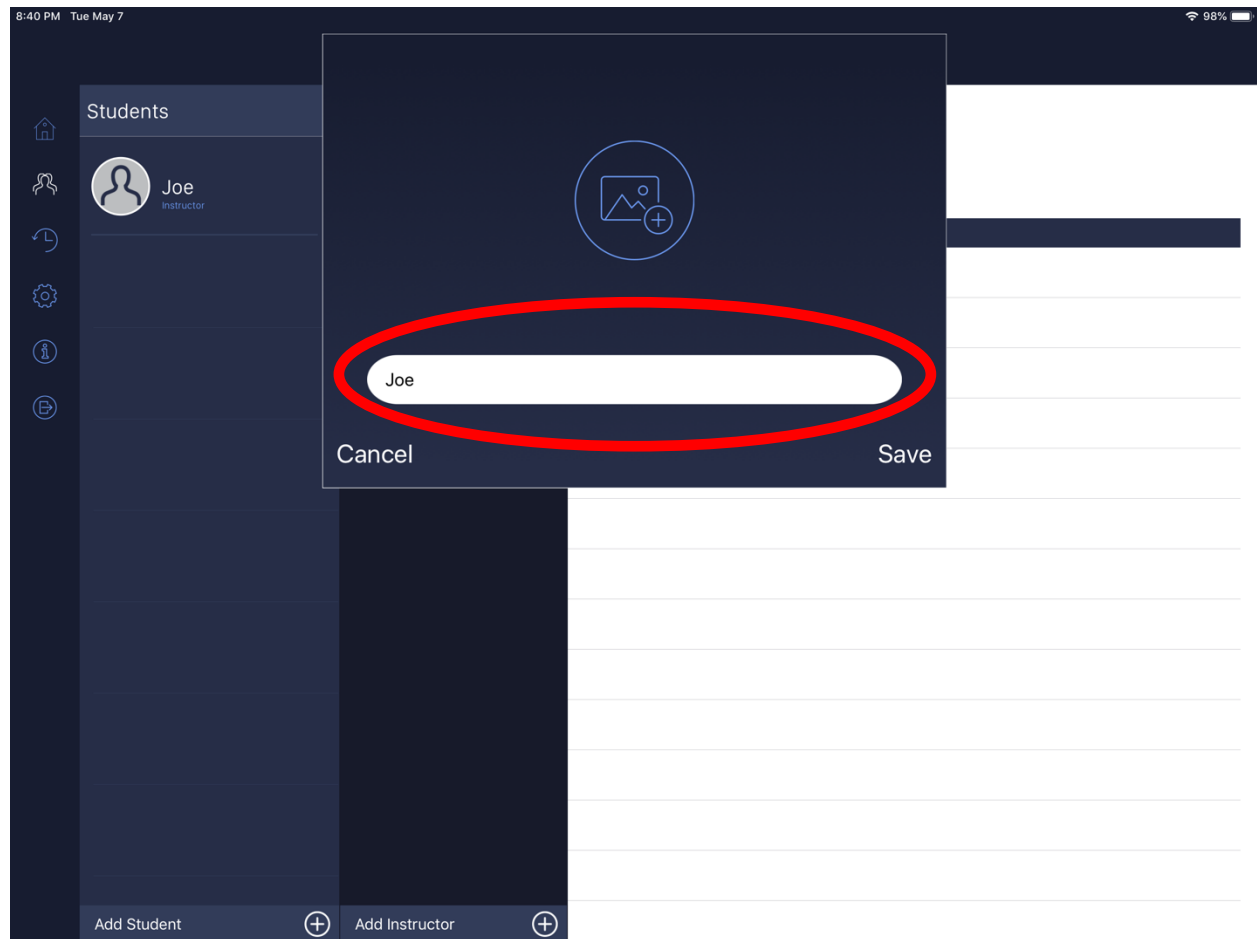
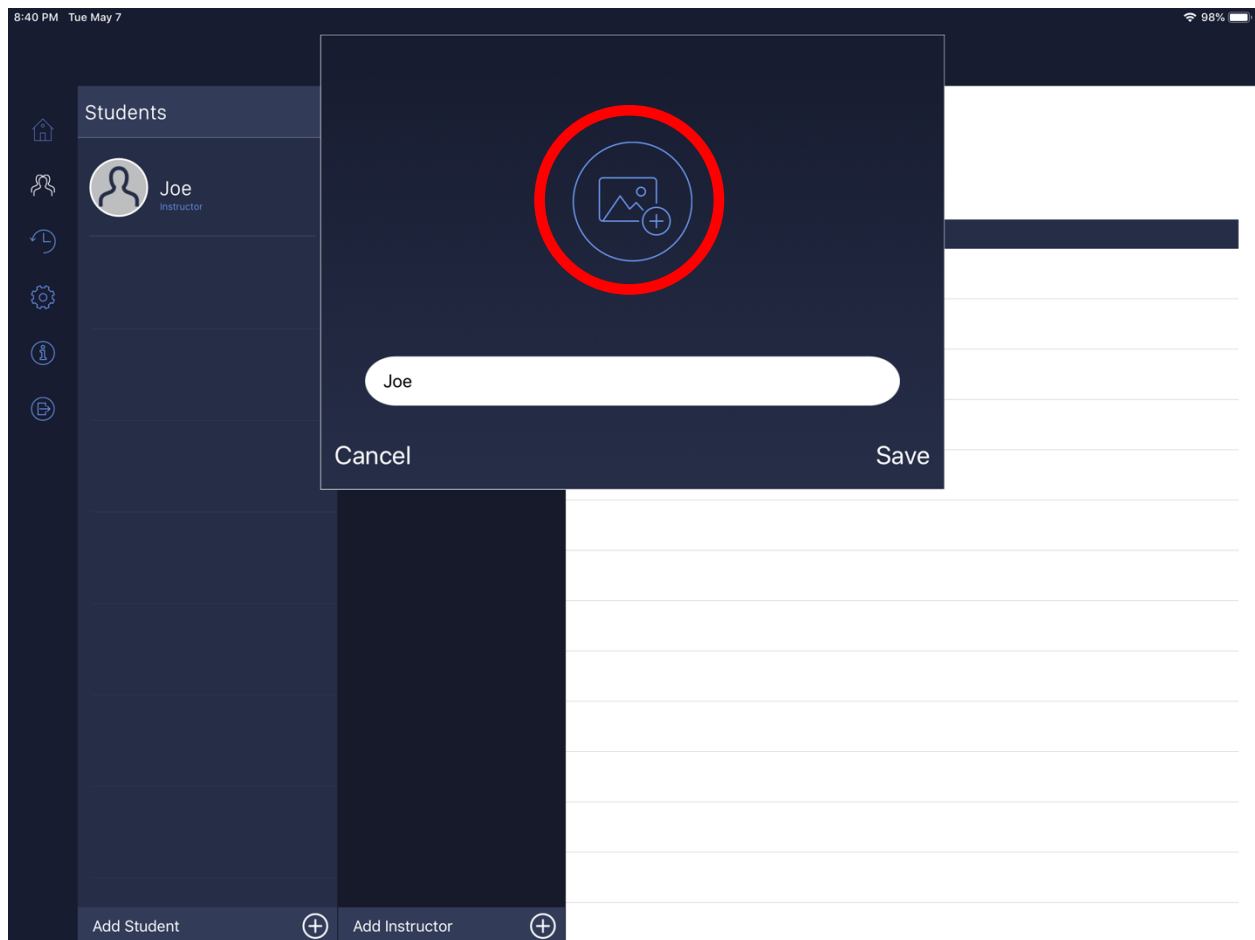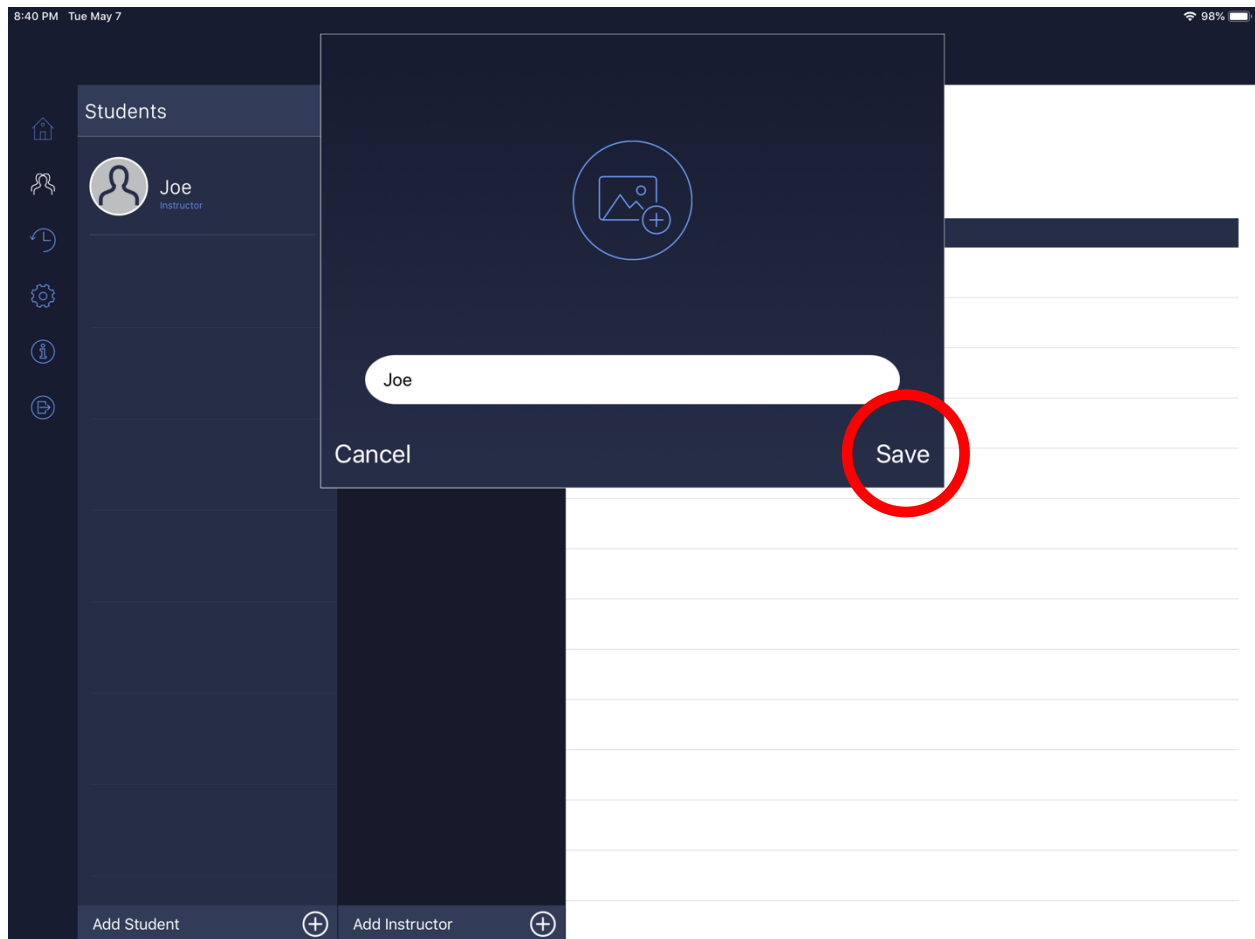Tap the Plus button to add an instructor.

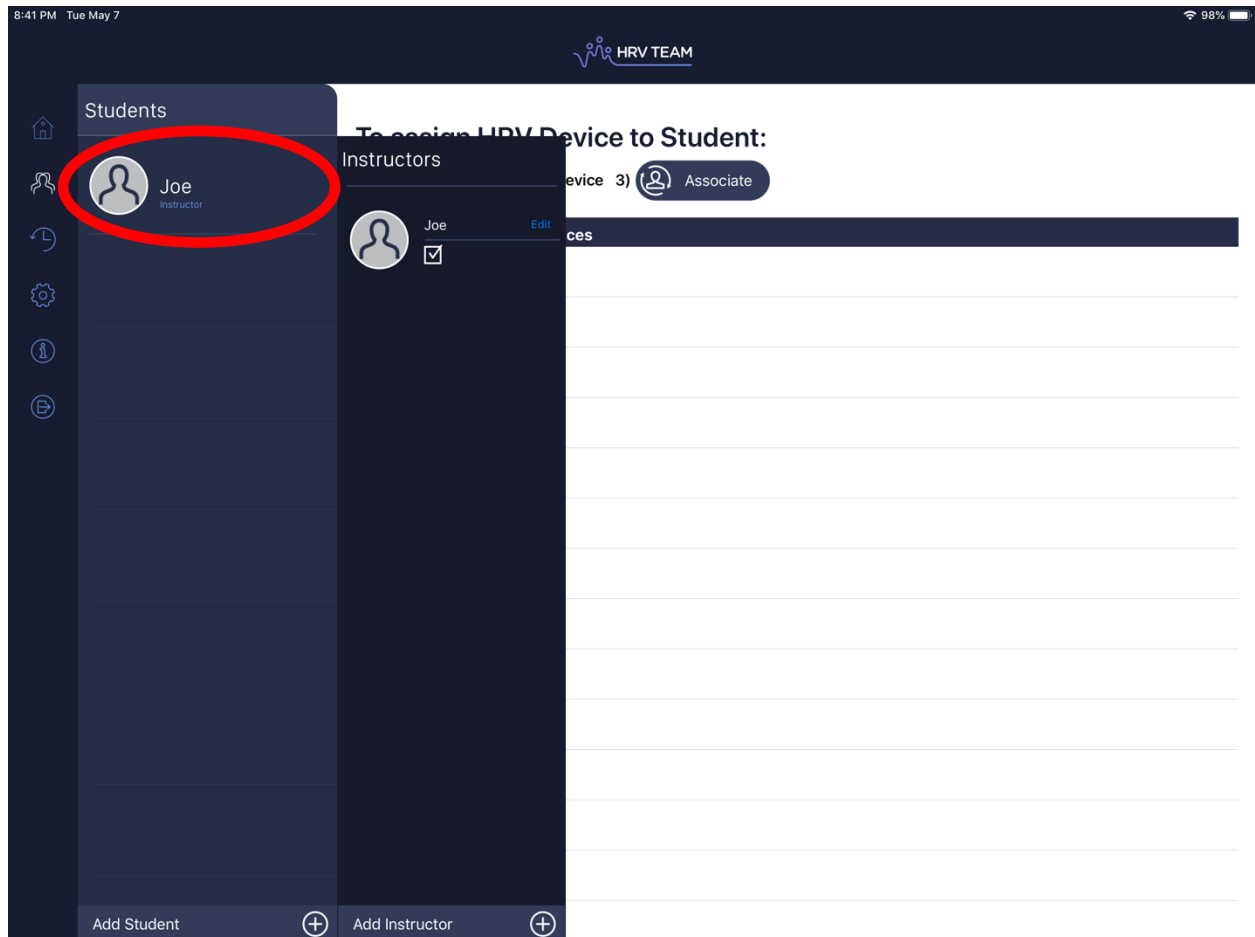Type the instructor's name into the white bar.

You can add a photo for the instructor if you want. Tap the image icon to add a photo, though adding a photo is not necessary.

Then press Save.

Your instructor is now saved under the list of instructors. Tap the instructor button again to make the instructor slide out menu go away.

Adding Students

Once you have added an instructor you can add students. Students are NOT grouped under instructors. In a training organization, different instructors may teach the same students. Or one instructor may substitute for an instructor who is absent. The assignment of students to an instructor comes when setting up a session, which is discussed later.

Tap the Plus button to add a student.
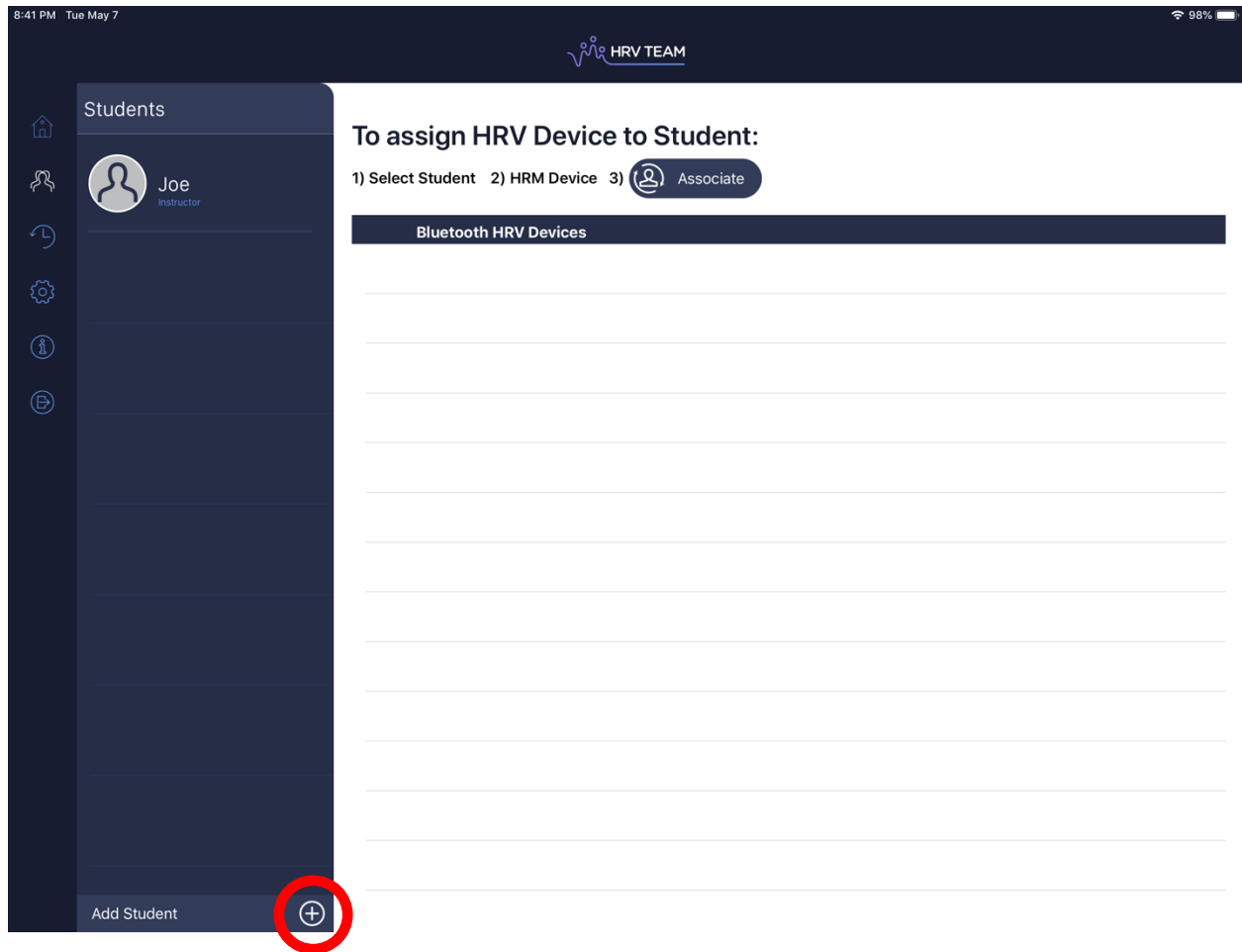
Type the student's name into the white bar and tap Save. Tap the image button to add a photo for the student if you wish to. Tap the Plus button again to add another student.
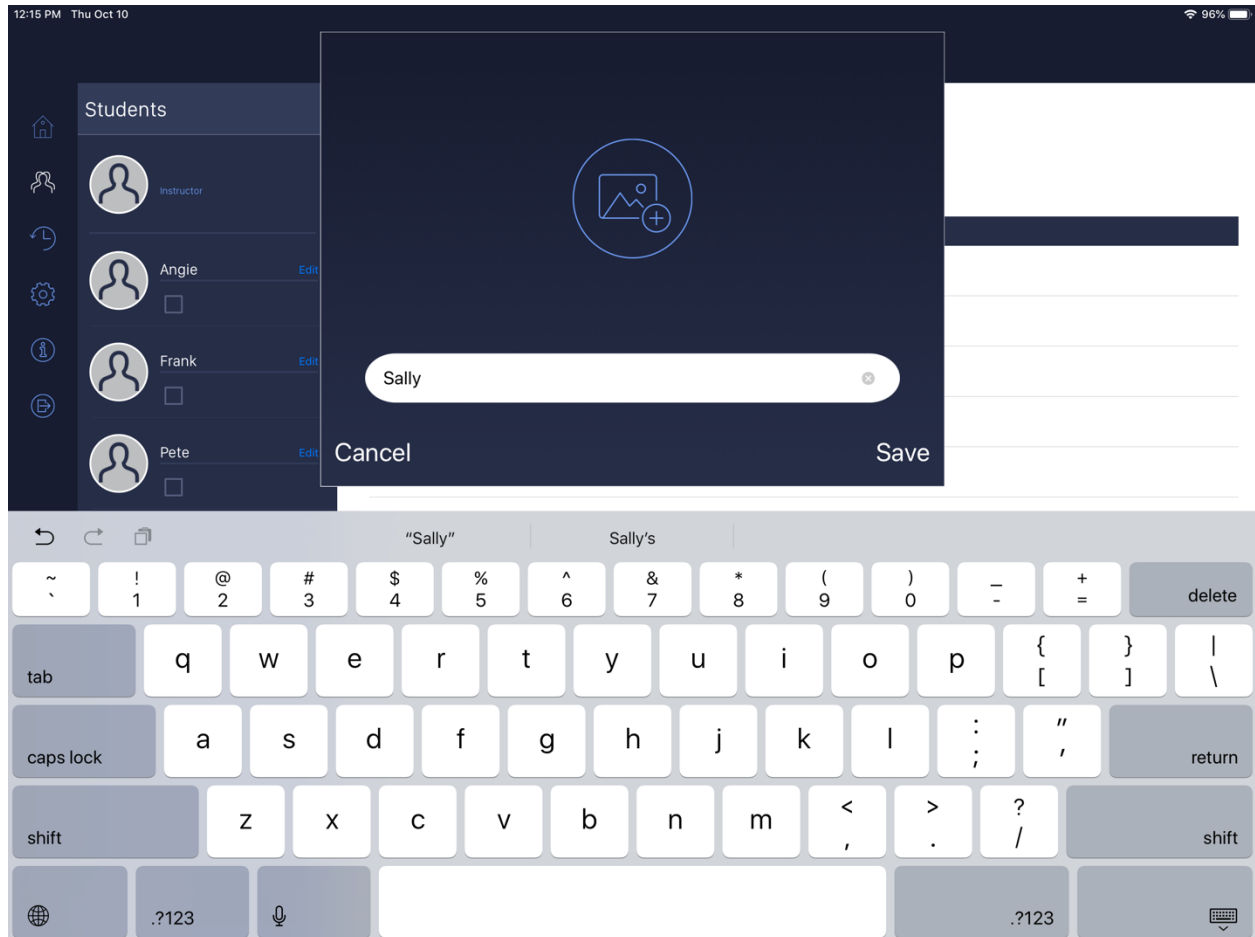
Once you have added all of your students then you are ready to set up a session. Look at the checkboxes next to each student's name. These checkboxes indicate whether the student's data will appear in the chart display for the session. If the box is unchecked, then the student's data will not appear. Tap the box to toggle the checkbox on and off. Make sure the checkbox is on for every student you want to record for that session.
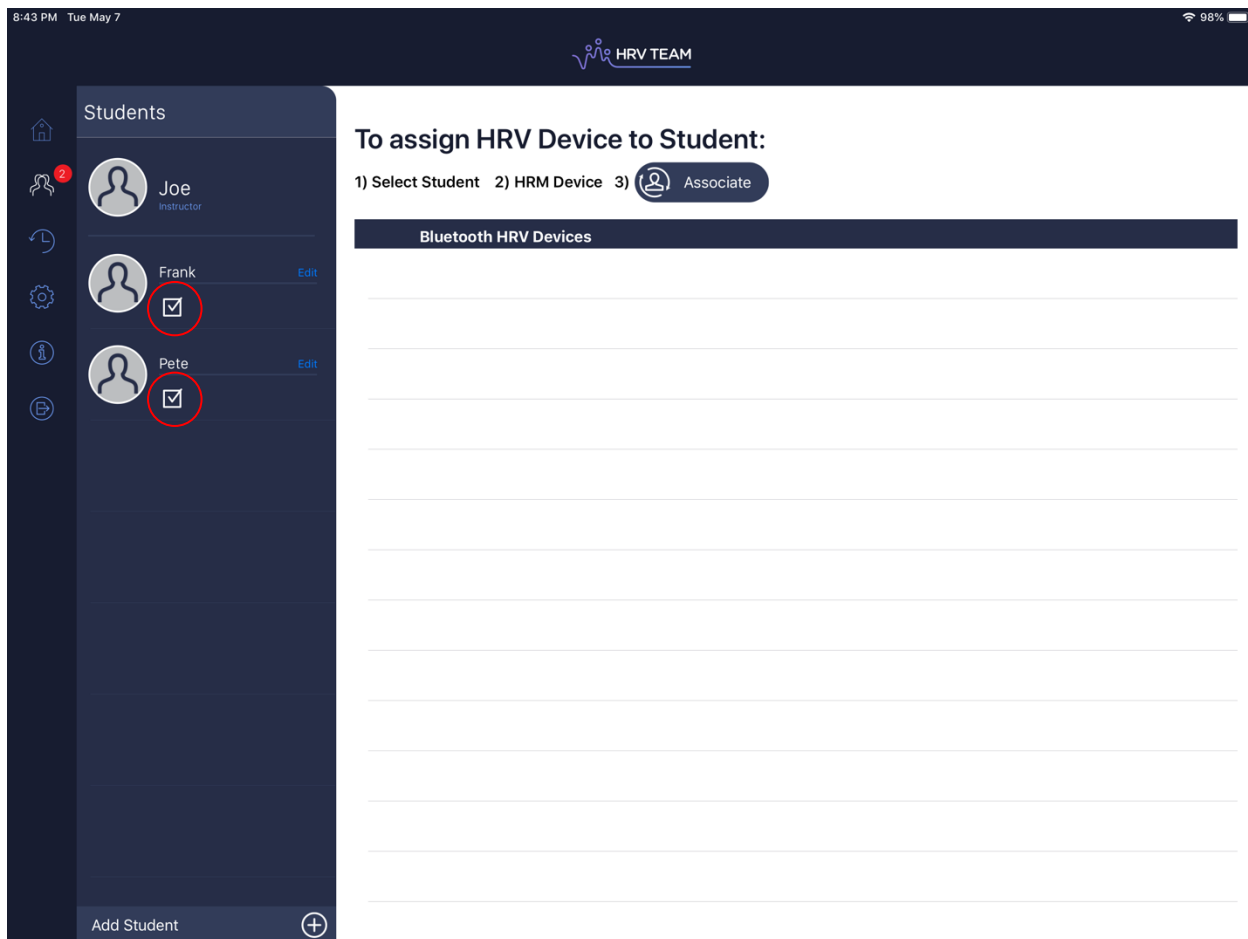
Assigning a Heart Rate Monitor to Each Student

1) Tap the student's name.
2) Tap the heart rate monitor device's name that that student will be using.
3) Next tap the Associate button. This assigns that heart rate monitor to that student.
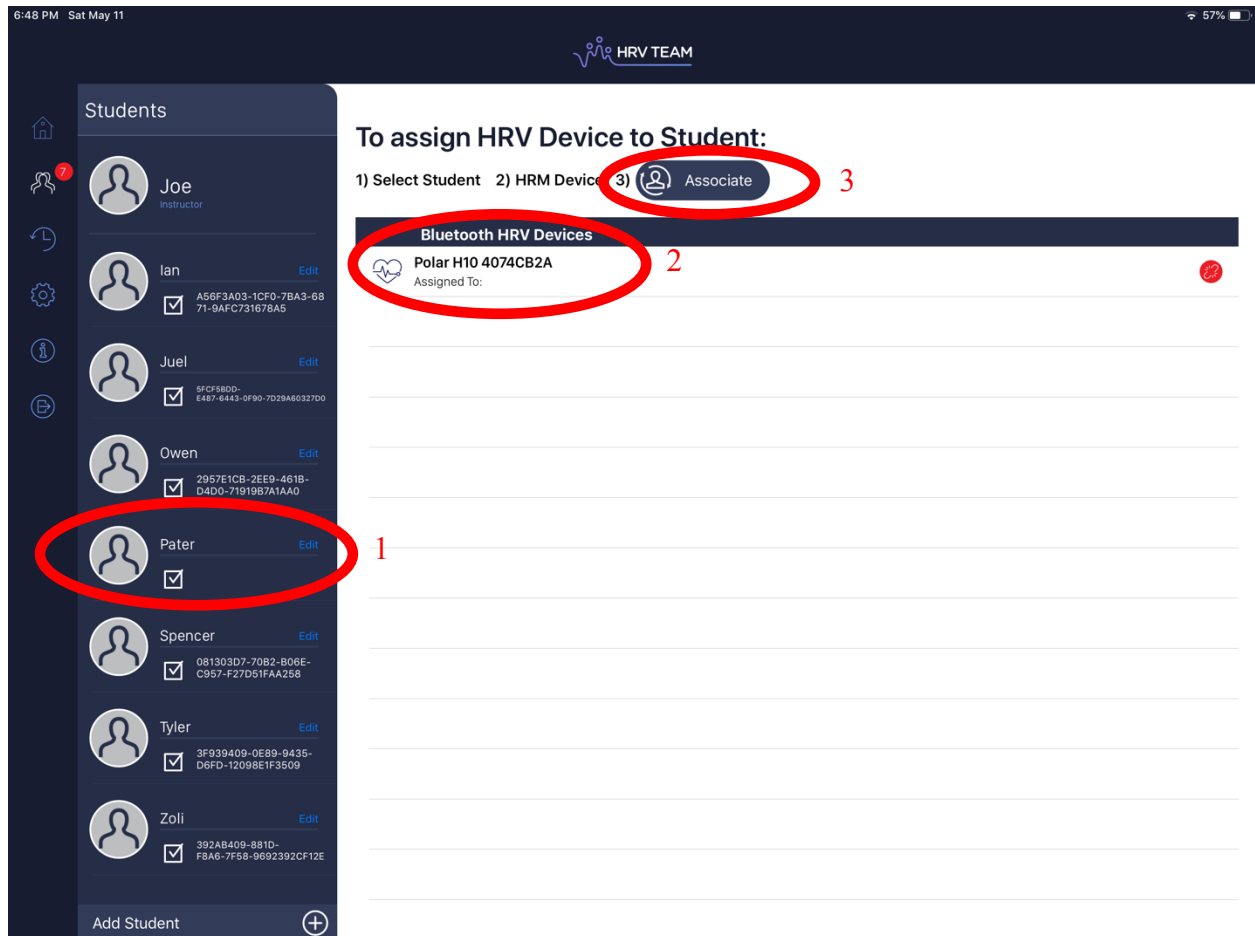
The device is now assigned to Peter. Repeat this process for each student whose data you wish to record. It can be helpful to have each student have a card with the device ID of their heart rate monitor for reference. Or you can have students put on and attach the heart rate monitors one at a time, assigning each device to the appropriate student in turn.

Tap the small red icon button to link the device to the app. The icon will turn green when the device connects to the app, but it may take a few seconds after being tapped.
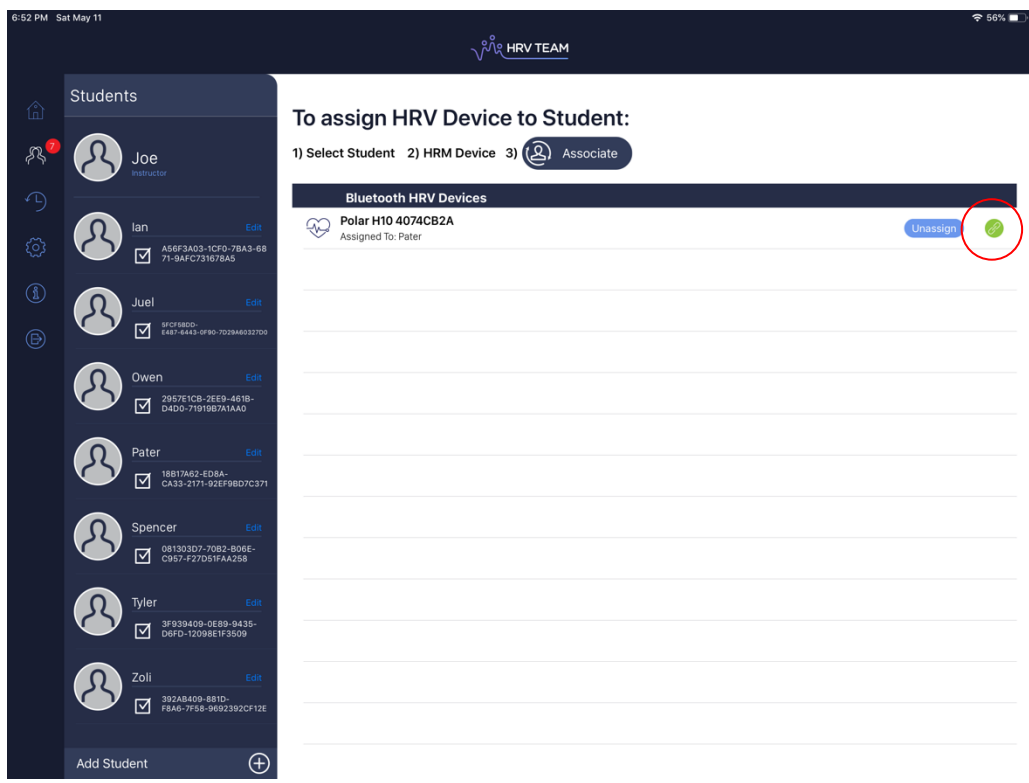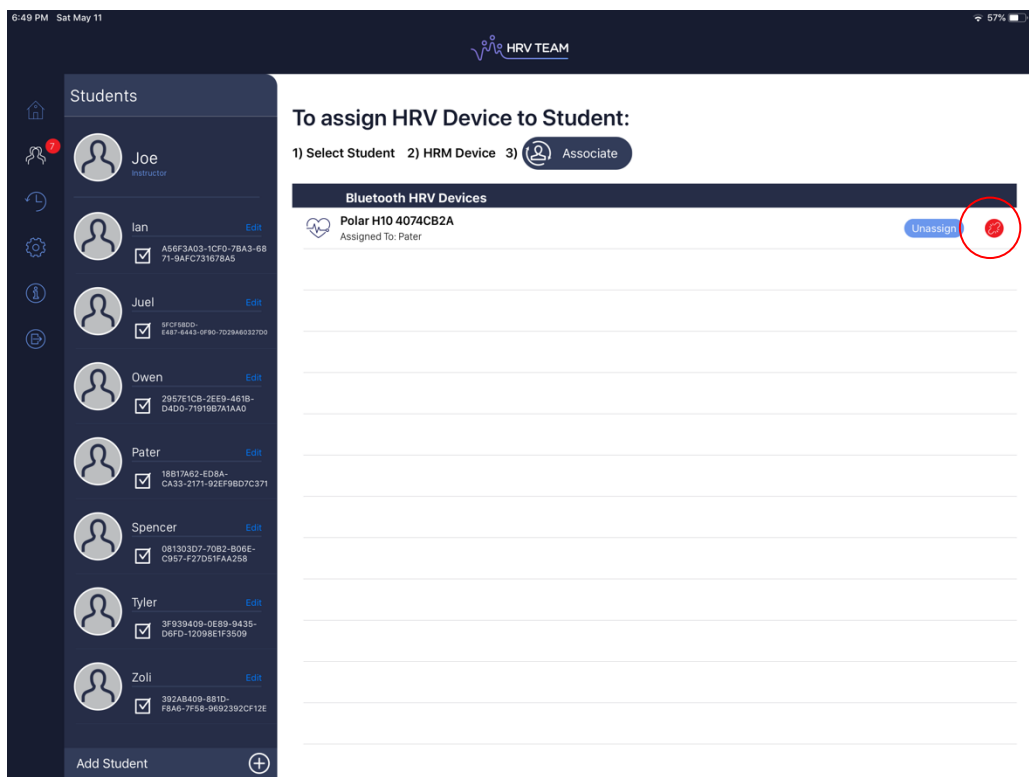
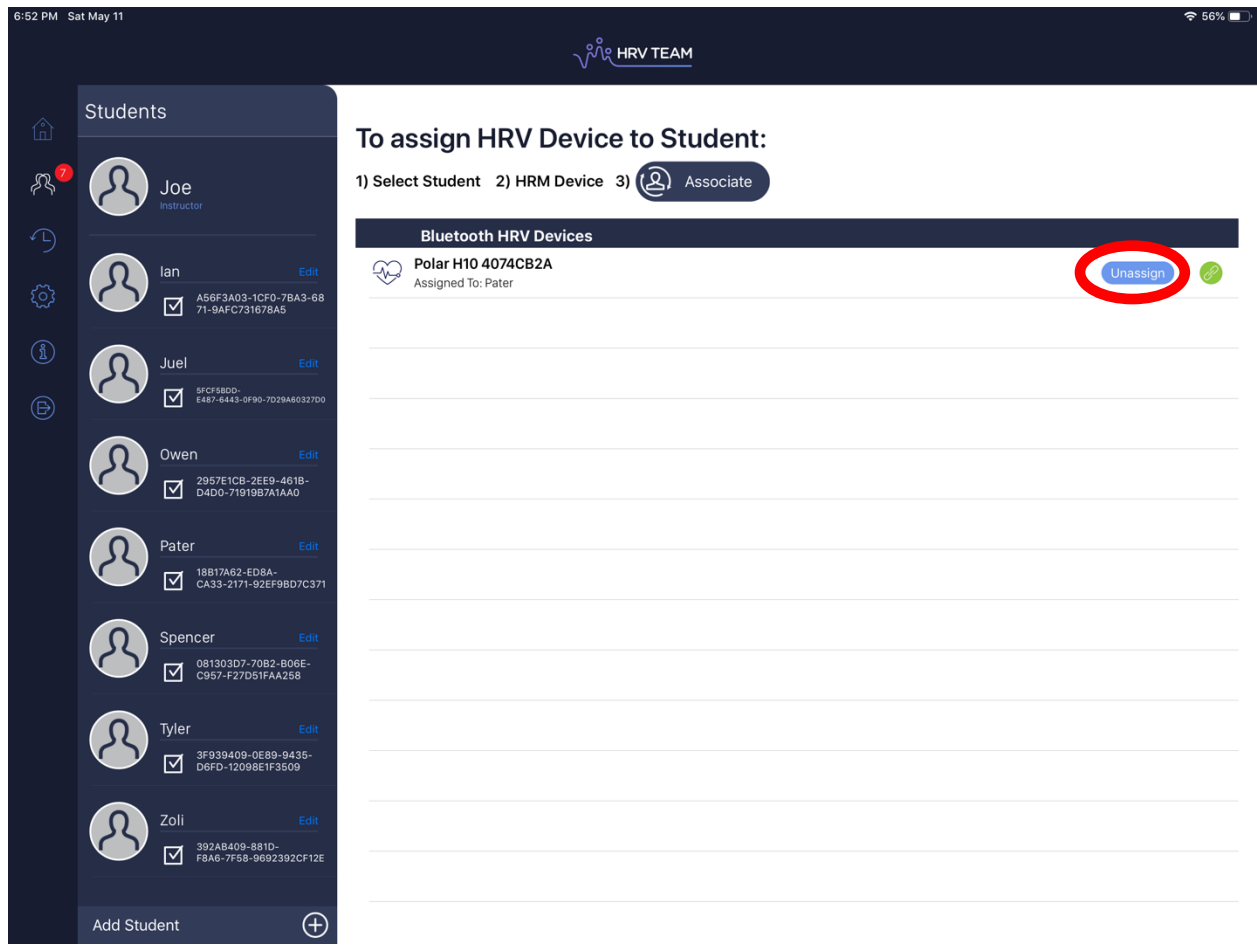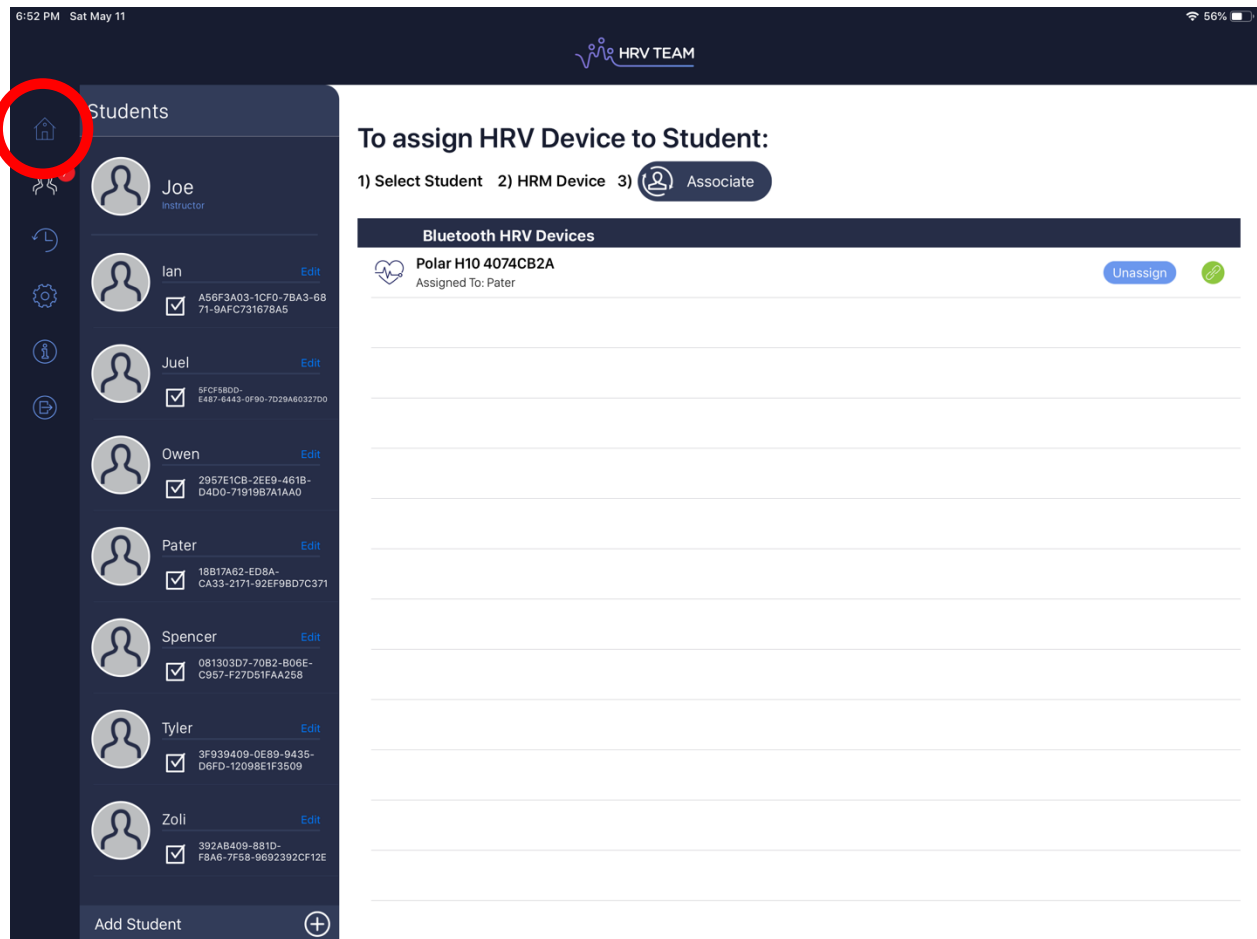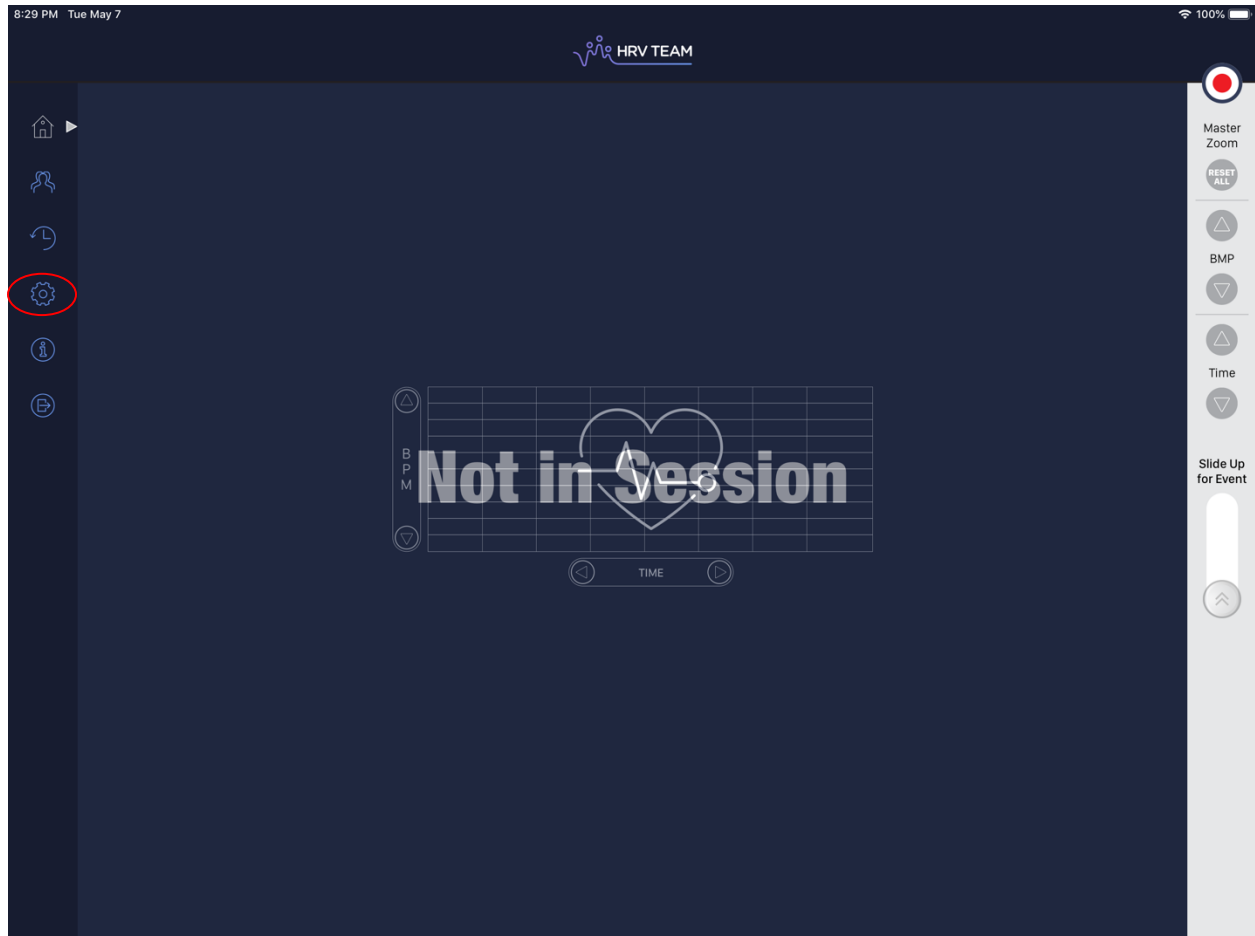To unassign the device from Peter, tap the Unassign button.

Tap the Home icon to return to the Chart View where the data is being displayed.

Settings

Press the Settings icon to change the recording settings.

HRV Team offers you the options of recording video only, audio only, or both. You can also use the front camera or the back camera of your iOS device to record. In this image, the app is set to record audio and video from the back camera.

If you allow recording of the camera and microphone, HRV Team will record all events that show up on your screen and all audio picked up by the microphone. If text messages or other notifications automatically appear on your screen, you may want to turn those off while recording with HRV Team. Be aware that visual and audio information from the background can contain information that is confidential. It is your responsibility as the user to avoid recording personal information without permission.
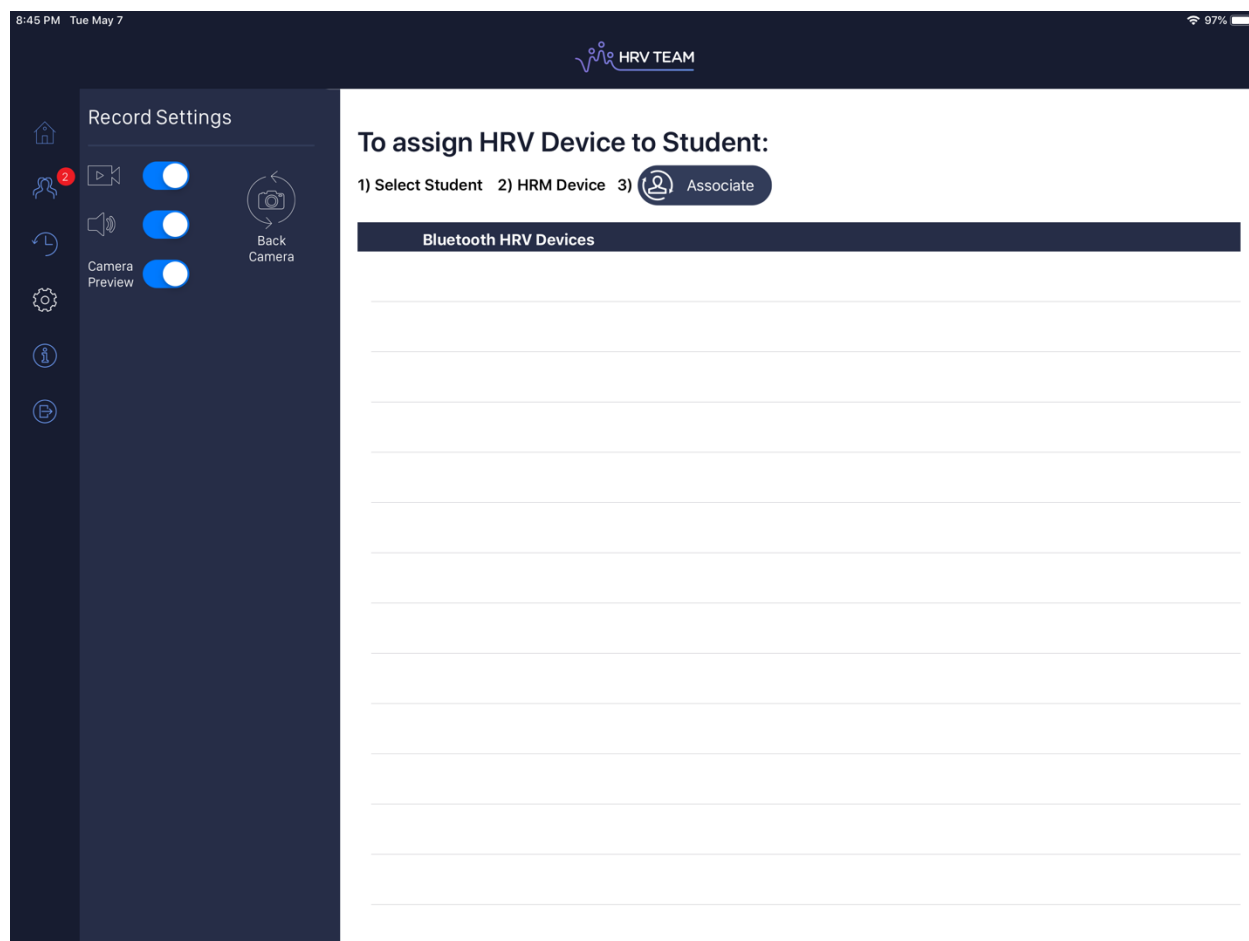
Tap the button next to the camera icon to enable or disable video recording. In this image video recording is enabled. If video recording is disabled HRV Team will record audio only.
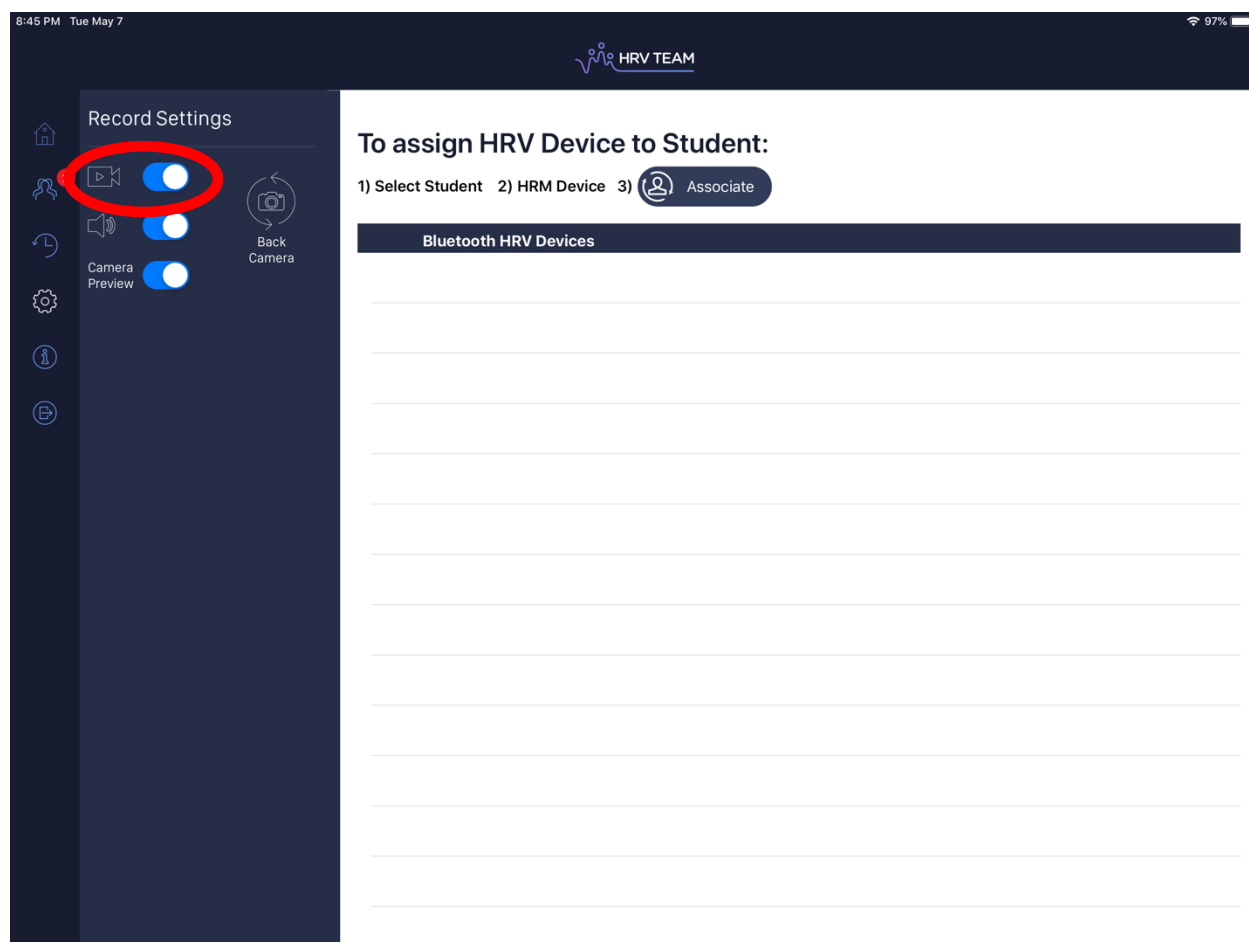
Tap the button next to the speaker icon to enable or disable audio recording. In this image audio recording is enabled. If audio recording is disabled HRV Team will record video only. If you turn off both audio and video recording, then you will only record the heart rate data.
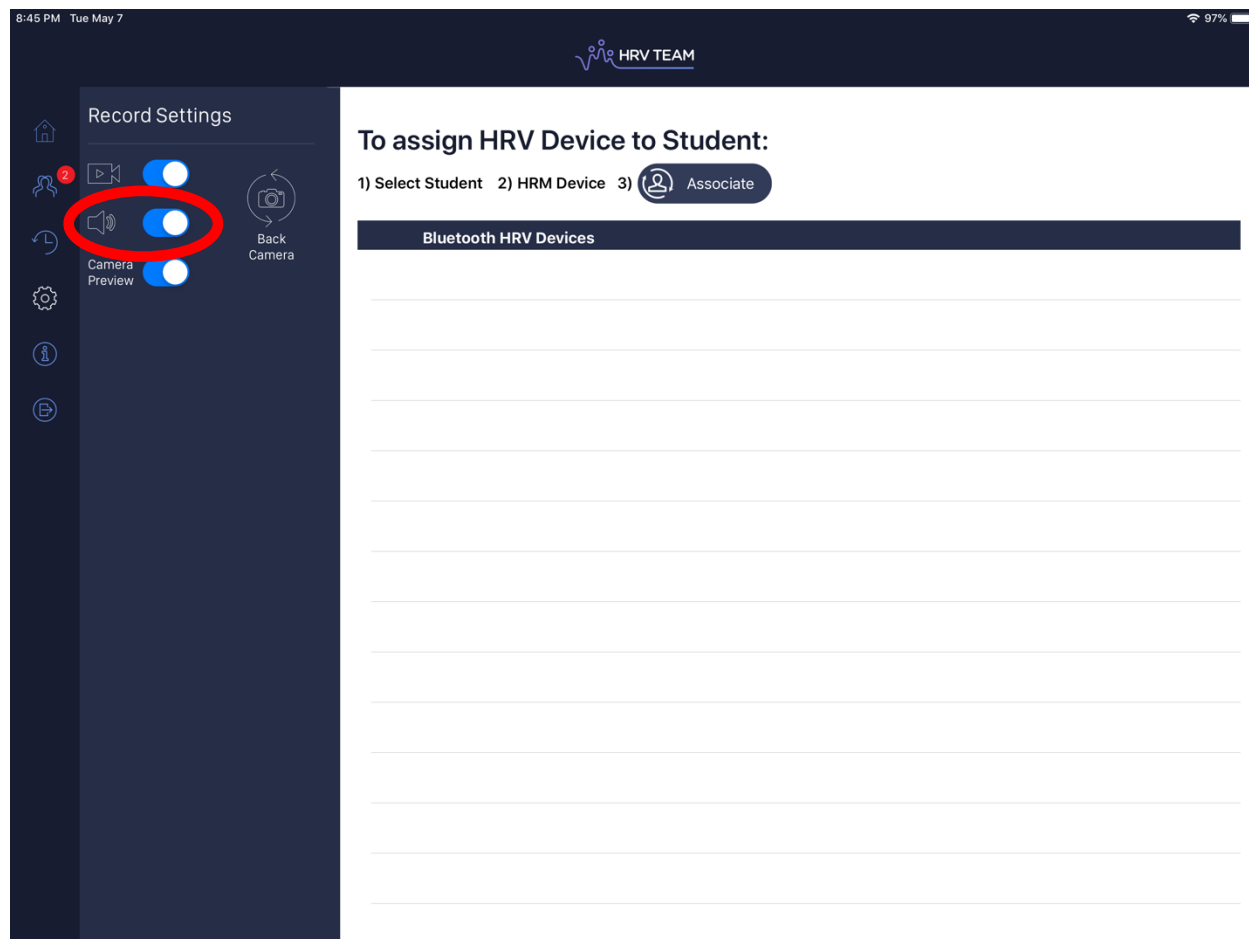
Camera preview allows you to see the camera view behind the heart rate trace data on the Chart View while the video is being recorded. Currently camera preview is set to on. Tap the button next to Camera Preview to turn it off. With camera preview off the chart data will not be superimposed over the camera view. The microphone and camera will still be recording audio and video even if camera preview is off. The chart data recording and the video will be stored separately.
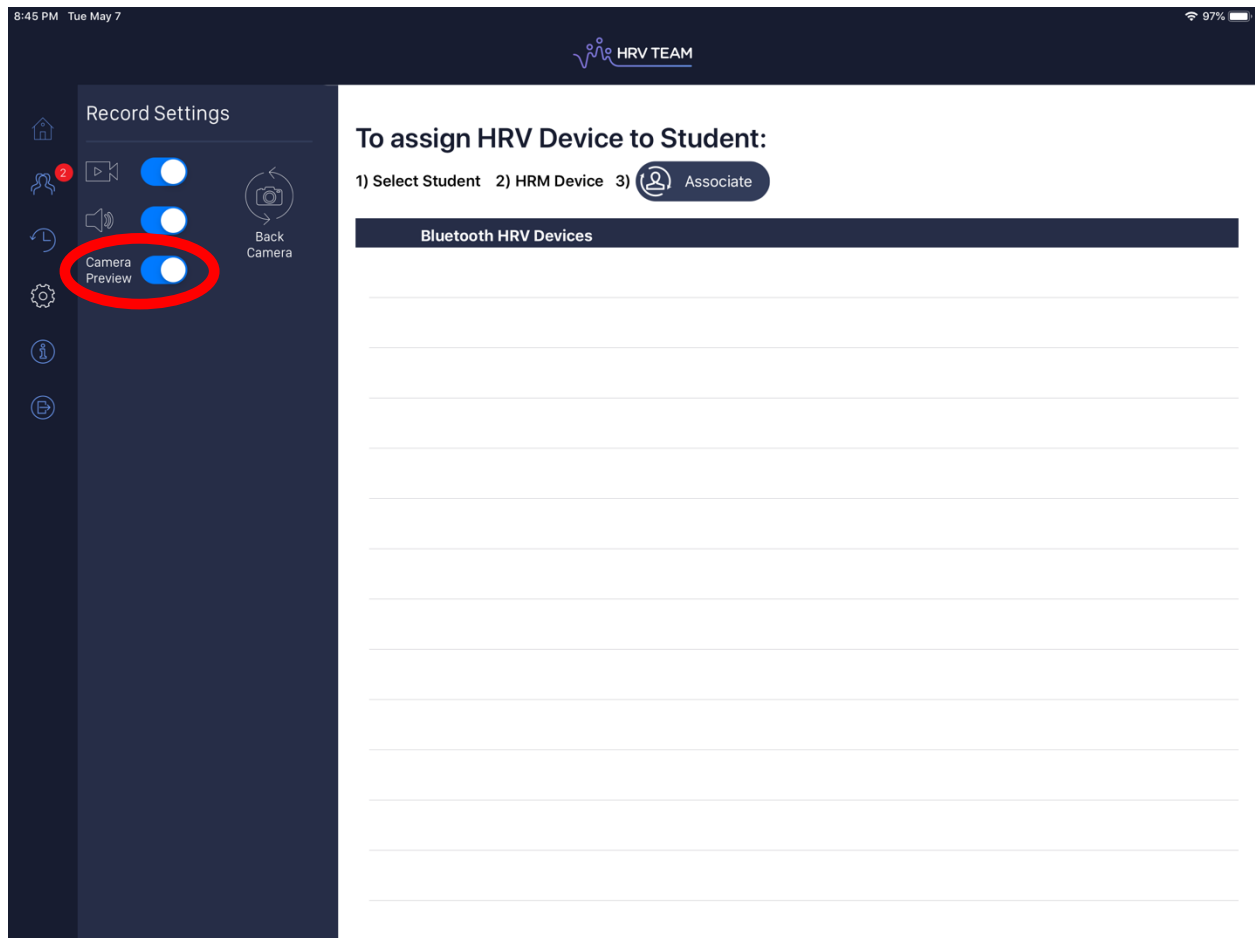
HRV Team is set to record video with the back camera. The back camera points in the opposite direction from the iOS display. Tap the button to set HRV Team to record video with the front camera. The front camera is the camera pointing in the same direction as the display.
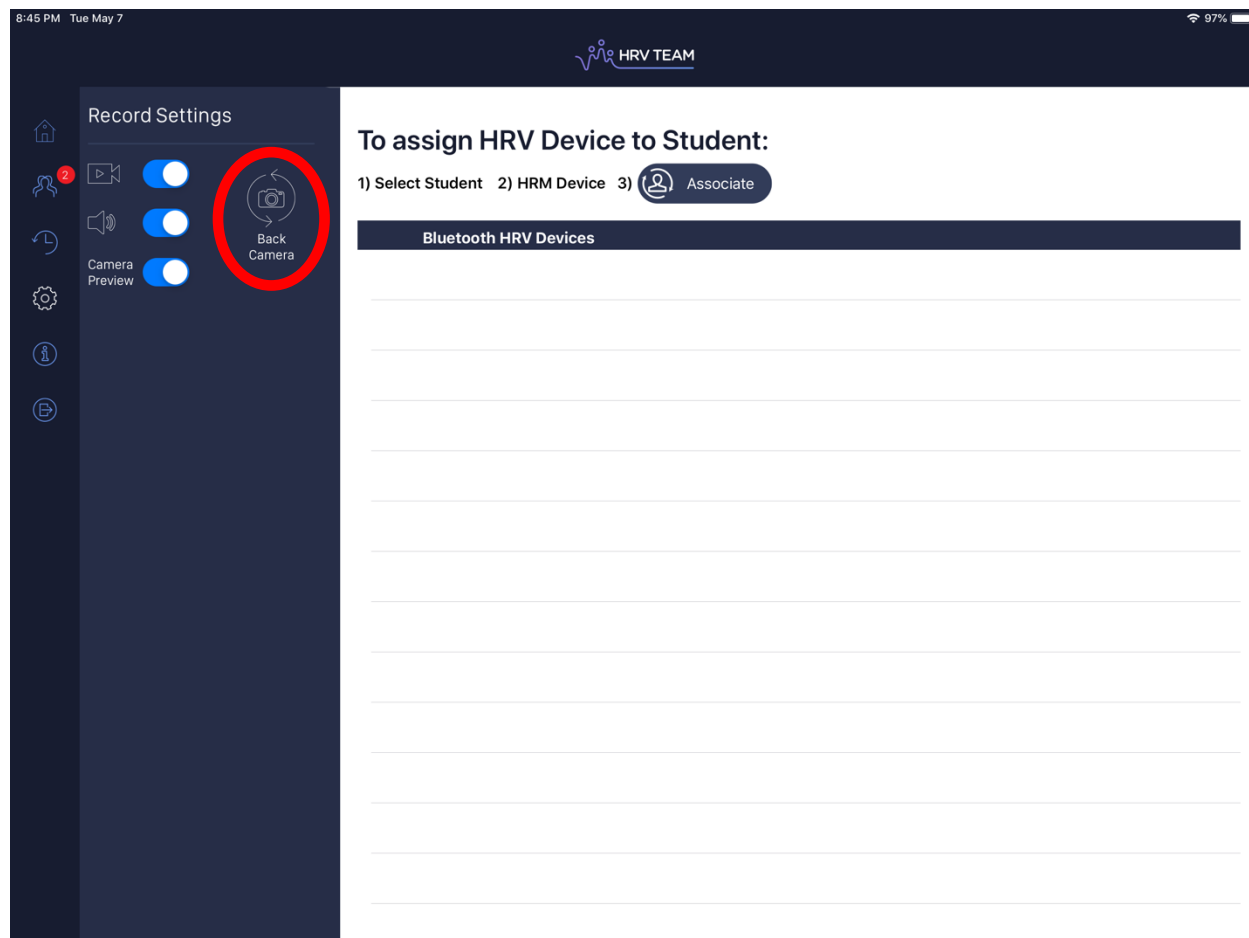
Recording Sessions

IMPORTANT SECURITY INFORMATION

When you, the user, record audio or video, it is your responsibility and yours alone, to make sure you have permission to make that recording, that you record only what you have permission to, and that you share the recorded material only with whom you have permission to. It is very easy to record confidential information from the background without realizing it. It is your responsibility to make sure this does not happen and if it does to delete the confidential material. This is especially important if you export the recording to Photos or other devices. Ibernetics, LLC and its affiliates cannot take any responsibility for breaches of confidentiality caused because the user recorded material or shared recorded material without appropriate permissions. Please refer to the Terms of Use if you have questions about this.

How to Record

Tap the Home icon to return to the Chart View where the data is being displayed.
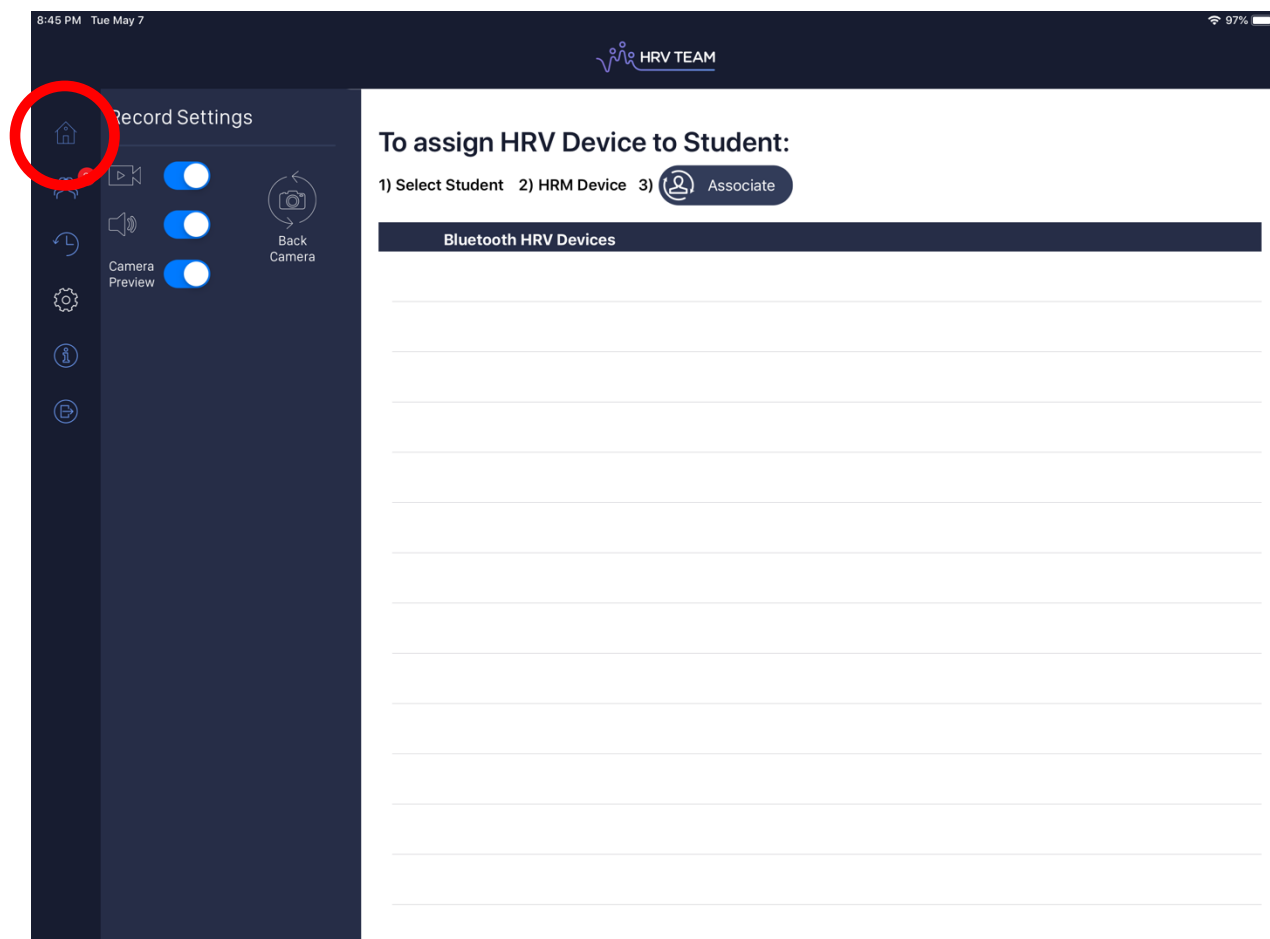
Heart rate trace data will scroll across the screen from right to left for any student wearing a linked heart rate monitor. Tap the record button in the upper right corner to begin recording this data. **Data will not be recorded unless the Record button is on.**

If you are not recording, the chart display will show a "Not in Session" message.
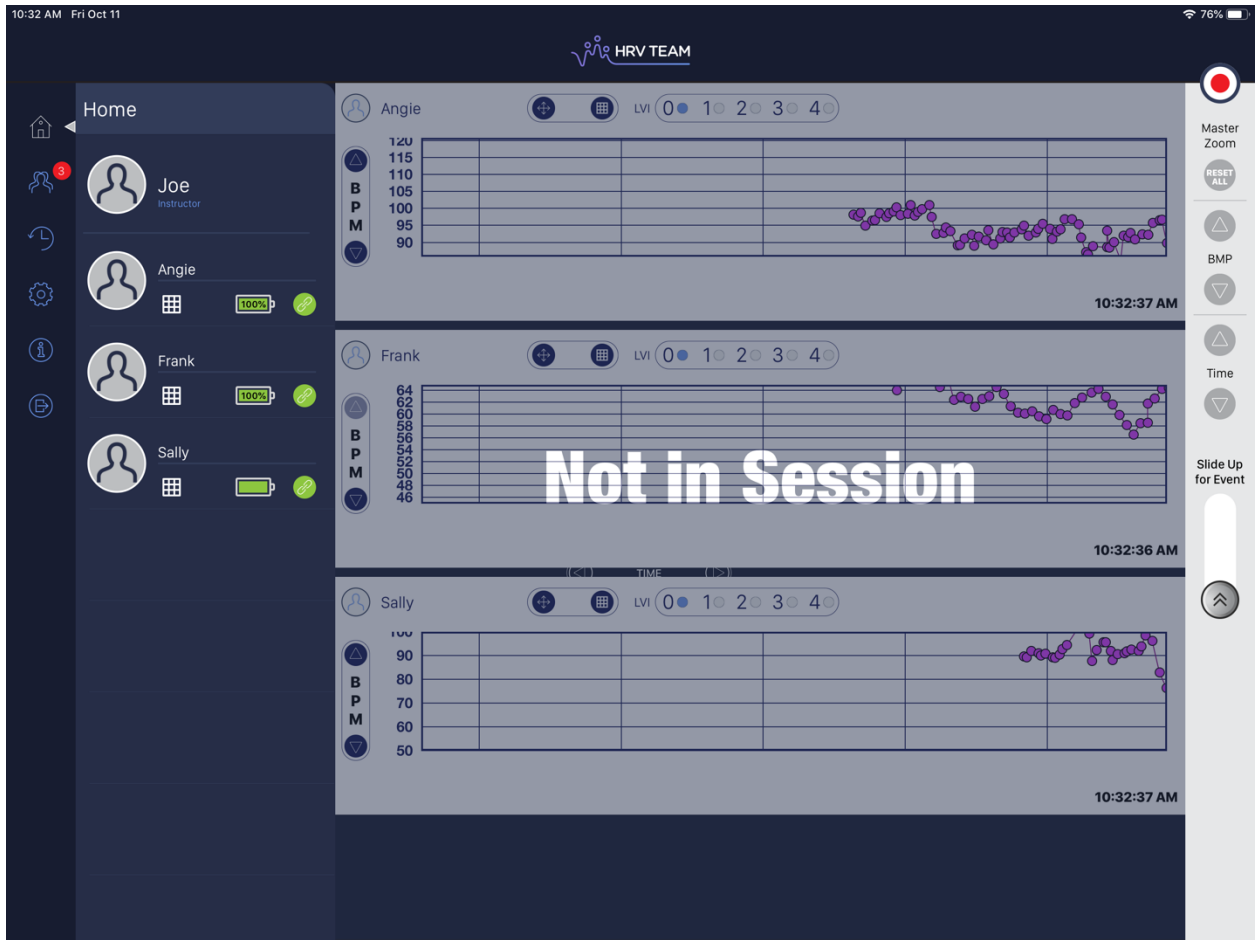
The first time you start recording you will see an additional message from your device to make sure you want to record. This is a security requirement from Apple.

Tap OK to allow video recording.
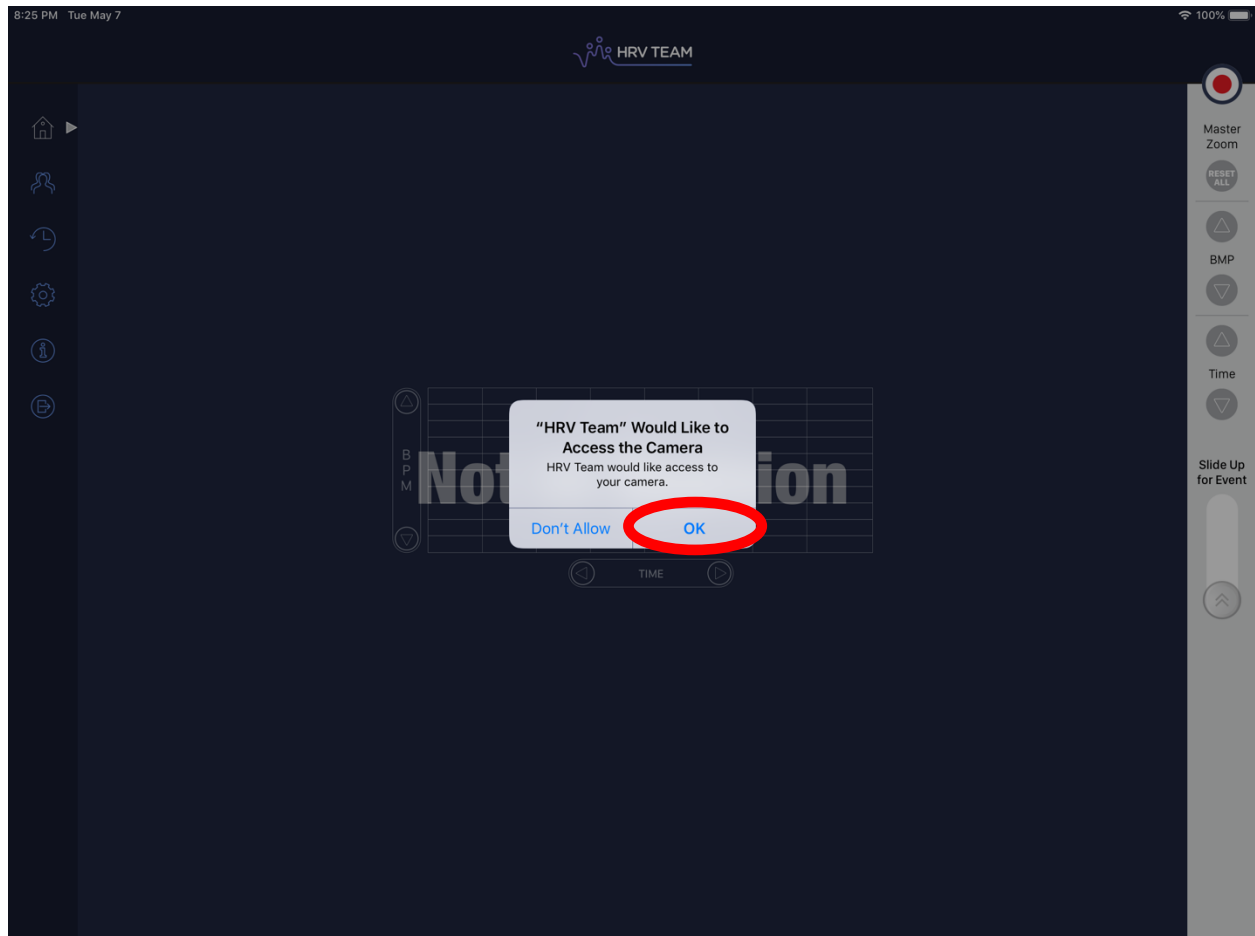
Tap OK to allow audio recording.
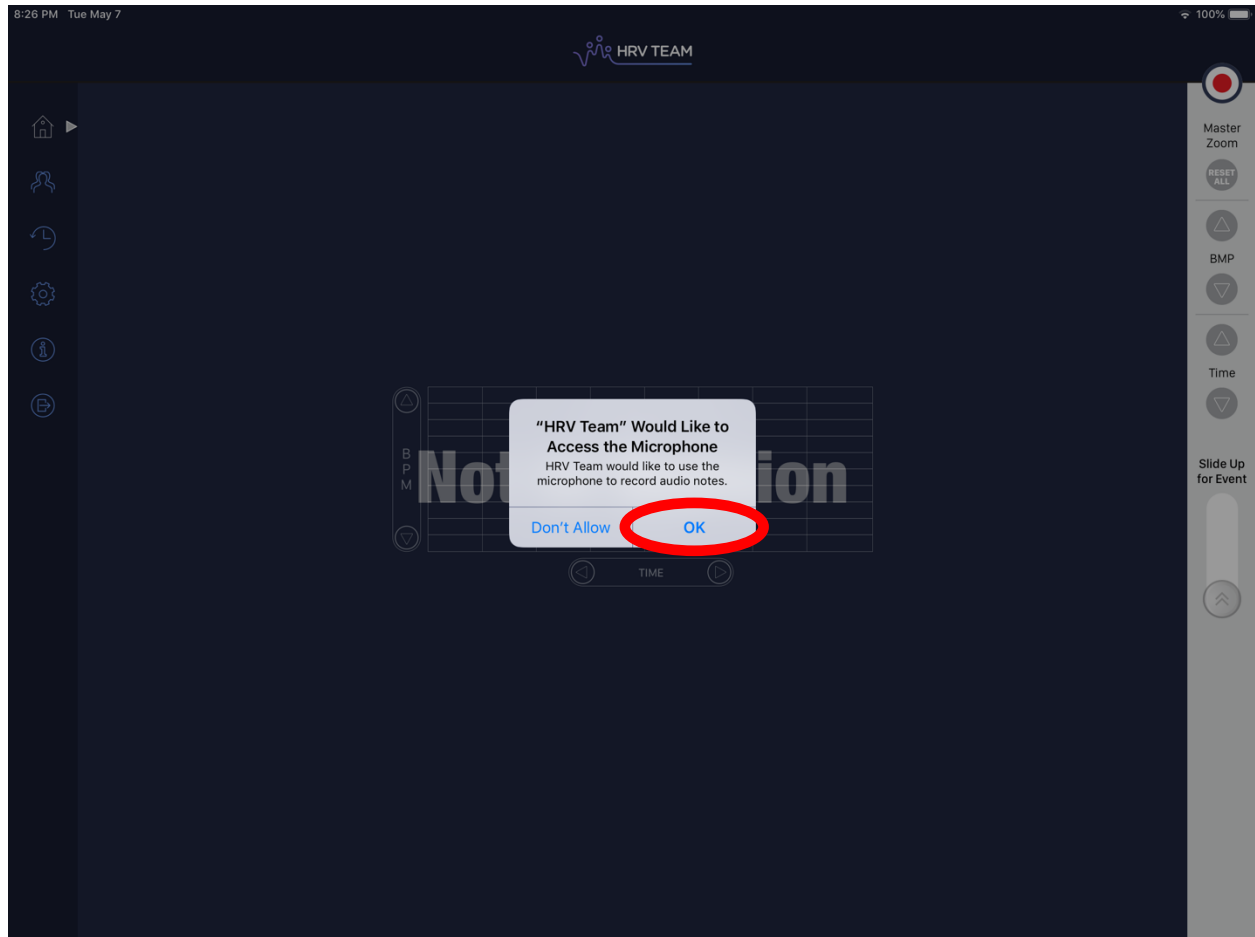
Your iOS device will also ask if you want to allow HRV Team to do screen recording. If you tap "Record Screen Only" then only the heart rate trace data will be recorded. Tap "Record Screen & Camera" to record the heart rate trace data with the camera view.

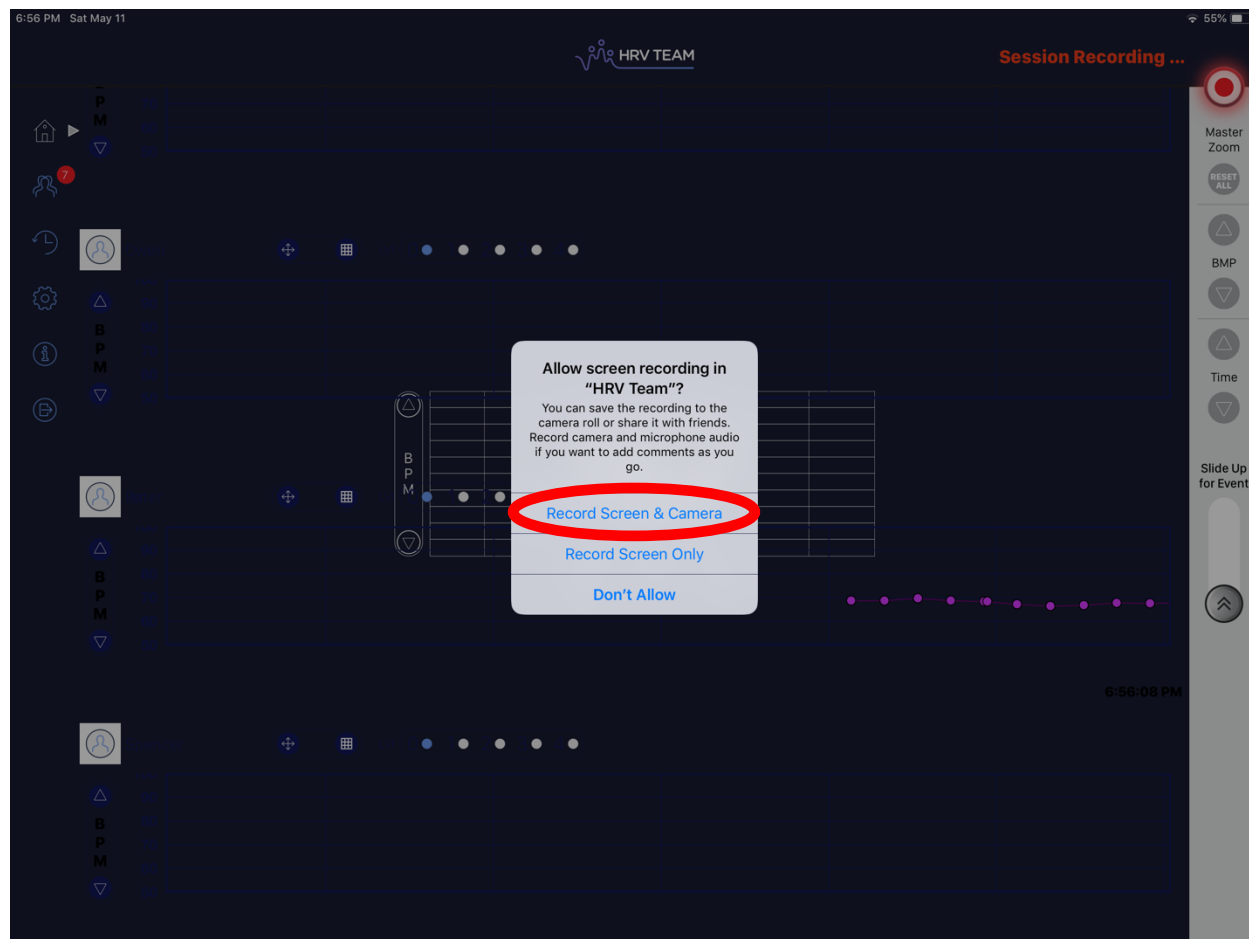Make sure the Recording button is on and the "Not in Session" message has disappeared. The "Session Recording . . ." message now appears in the upper right corner to let you know you are recording.

In this image you can also see the master display settings on the right, the student's individual charts with their HRT data in the center, and the instructor and student slide out menu on the left. The next several pages will explain each of these features.
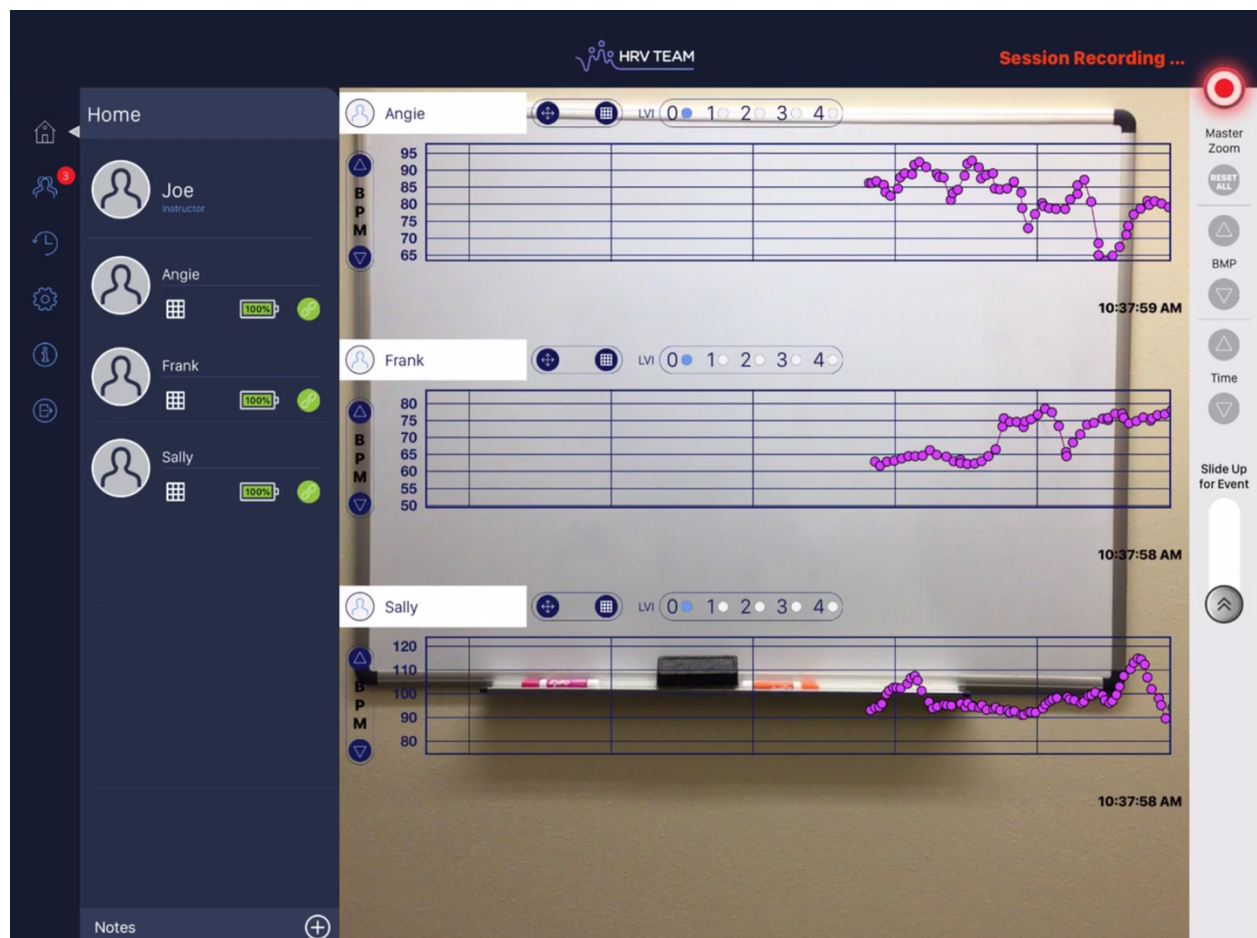
Display Settings

The icons on the right under the Record button will change the display scales for all of the charts.
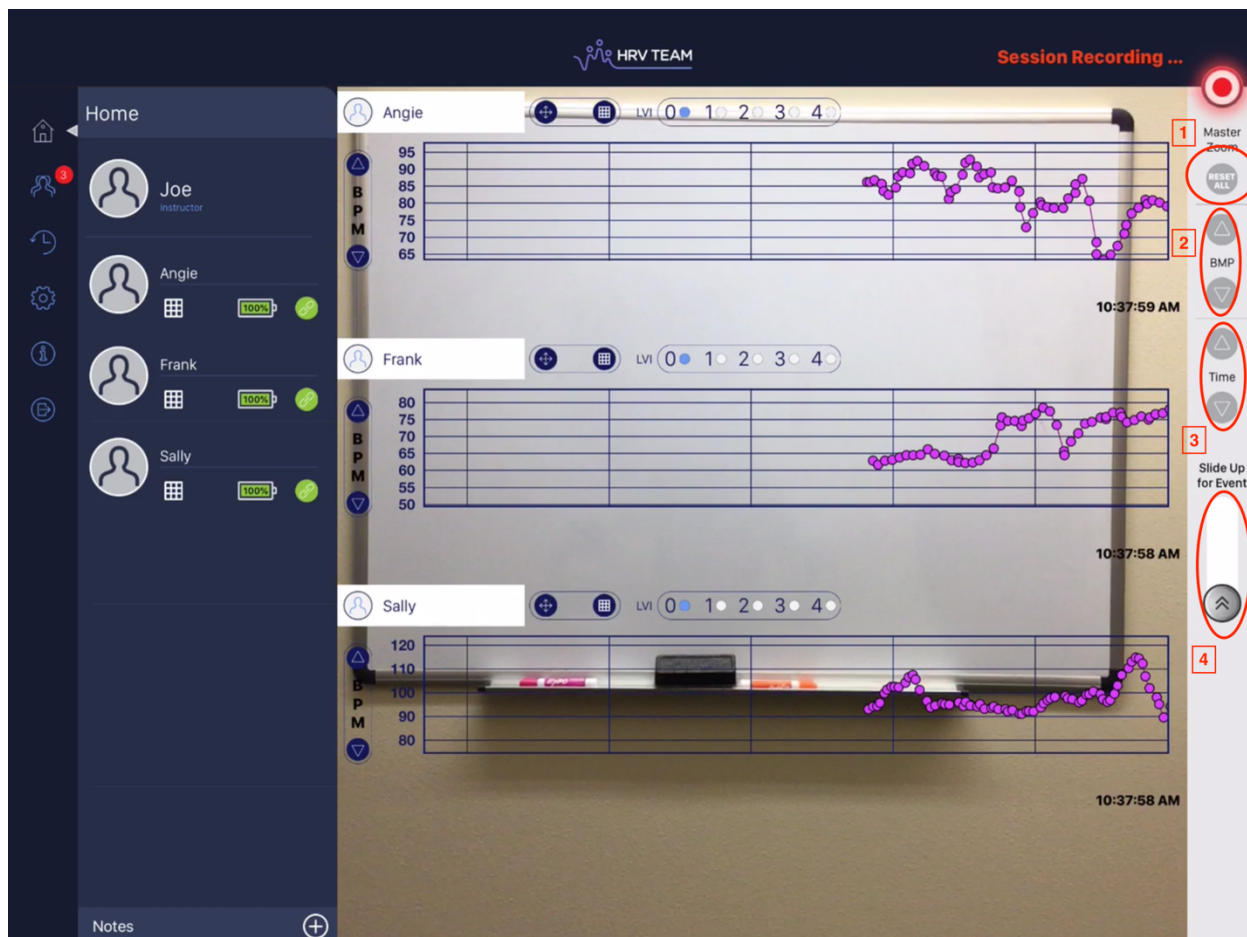
1) Tap the Reset All button to reset all chart displays back to default settings.
2) Use the arrow buttons for BPM to set the range of heart rates displayed. It is important to set the range sufficiently large so that the heart rate will not go off the screen as it increases or decreases significantly.
3) Use the arrow buttons for Time to set the amount of heart rate data that appears. We recommend setting the amount of time on the screen to between 30 seconds to 1 minute in portrait view and between 1 to 2 minutes in landscape view.
   - **The heart rate data will lag the video by 1-2 seconds because it takes the heart rate monitor that long to calculate the heart rate for each beat. Therefore, the heart rate of the person in the video at this moment will appear in 1-2 seconds.**
4) You can use an event marker to timestamp relevant events that occur while recording. To do this, slide the Event button up, and a vertical line will appear in the data, marking that timestamp.

The center of the screen shows the student's charts with their individual HRT. You can also change the display settings for individual student's charts
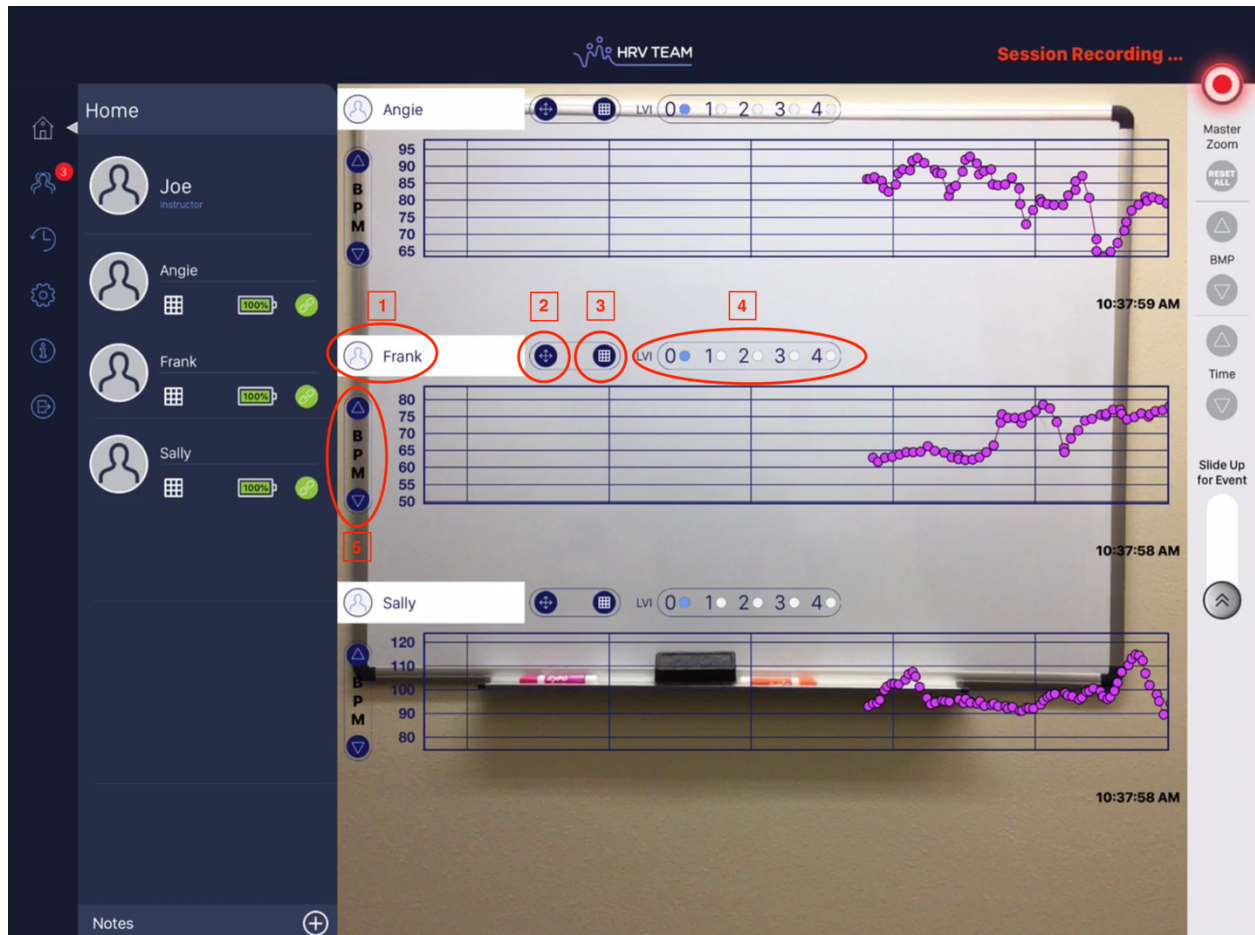
1) Student's Name
2) Tap to expand the student's chart to full screen.
3) Close an individual student's chart by tapping the Chart button. Data will still be collected even if their chart is off.
4) The Low Variability Index (LVI) will change how the data points are colored in the chart display and in the history display. That index is used for non-linear analyses of heart rate variability. Leave the LVI set to 0 for each student.
5) The BPM arrows change the heart rate display for that student.

Scroll through the charts to see student charts that are currently off screen by touching the space above or below a chart and moving your finger up and down the charts.
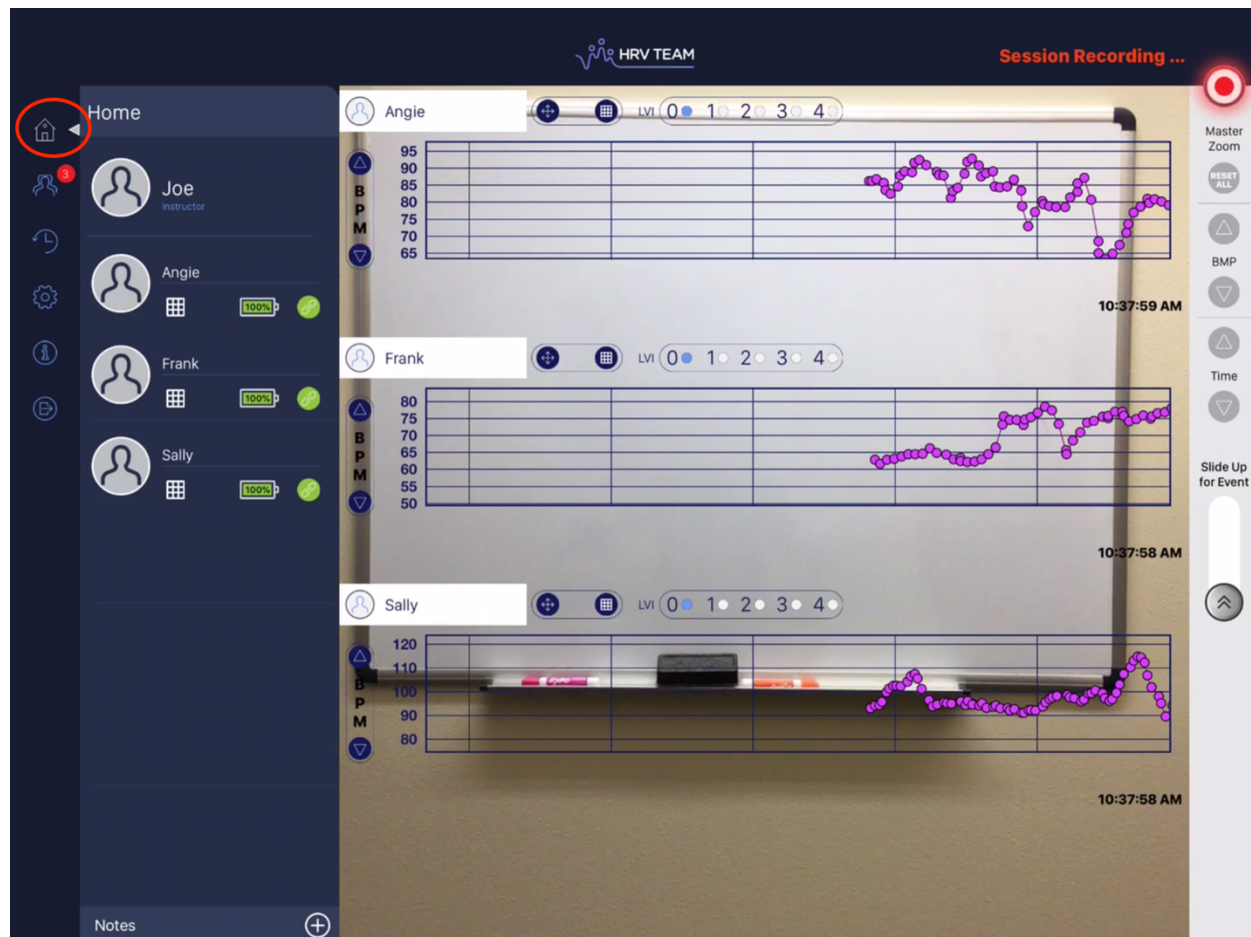
If you touch the space above or below a chart and hold without moving your finger, the chart will break free and you can rearrange it above or below the other charts.
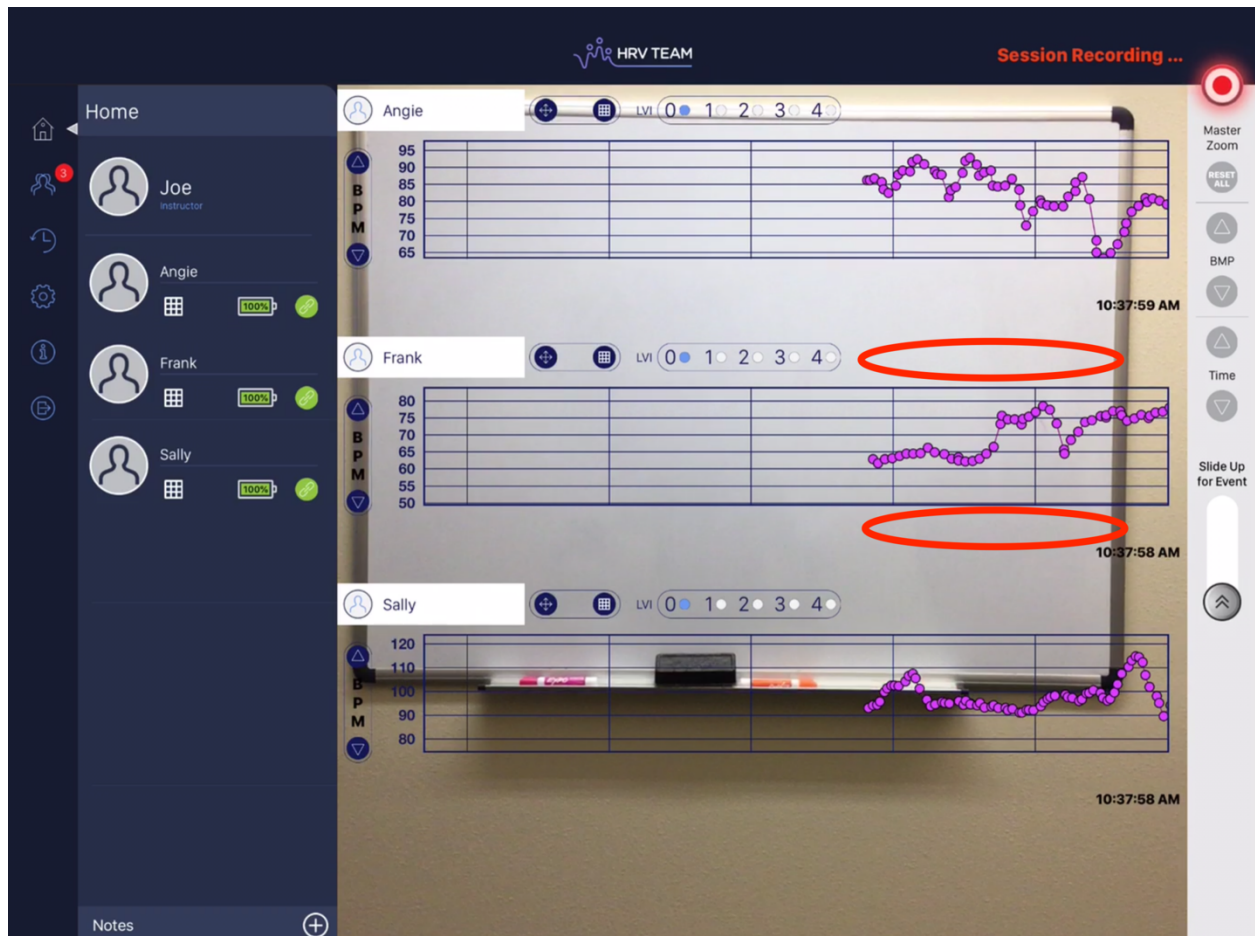
Instructor and Student Slide Out Menu

You can view the Chart Display with or without the instructor and student slide out menu. Tap the Home icon to see the slide out menu.

The green icon indicates that the student's heart rate monitor is connected to the app. The app will only record data for students whose HRM is connected. To stop collecting data for an individual student, tap the link icon so it turns red.
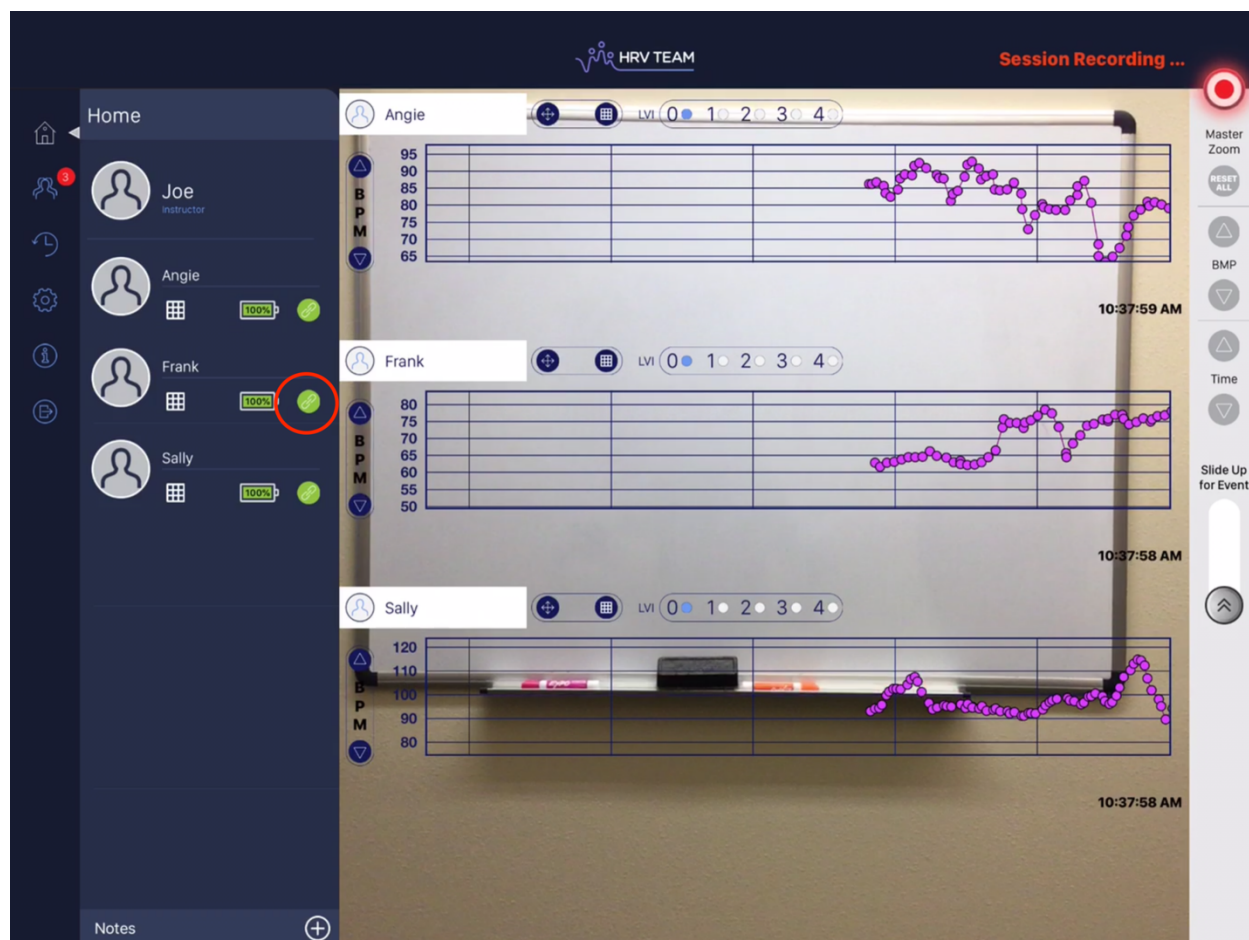
From this slide out menu you can toggle each student's chart on and off by tapping the Chart button under their name. Data will still be collected even if their chart is off so long as the link icon next to the student's name is green.

Tap the Home icon again to close the slide out menu.
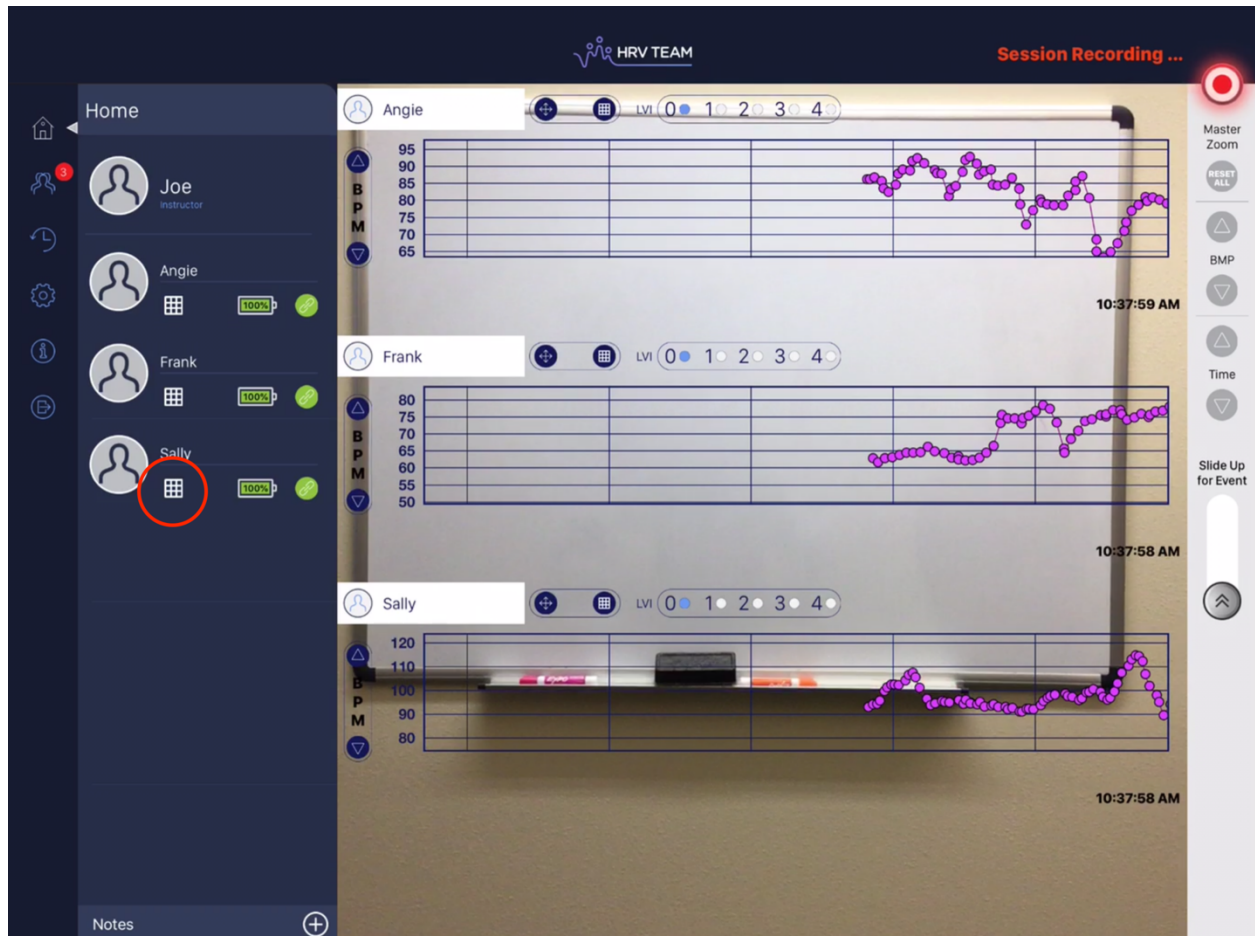
To stop all recording, tap the Record button again.
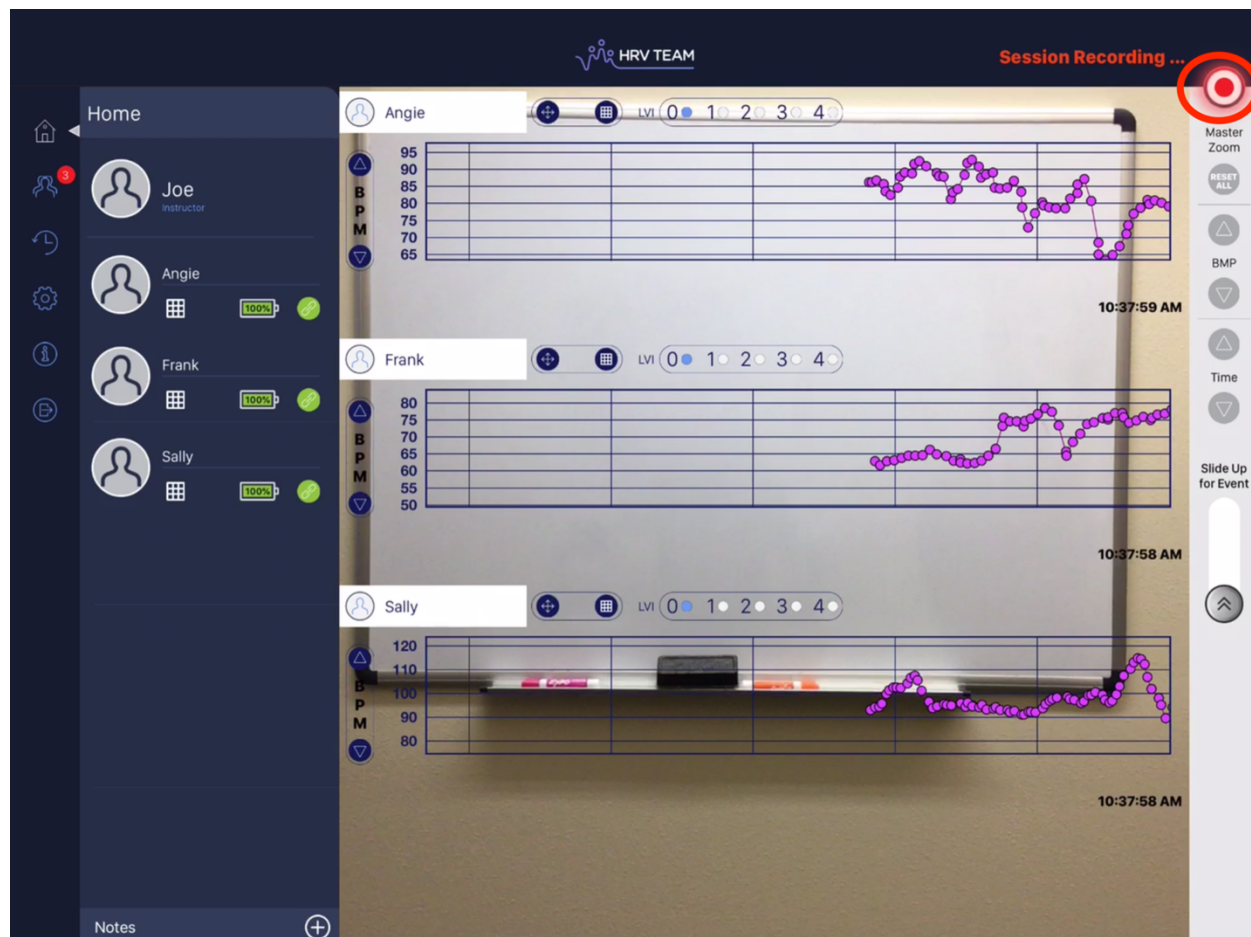
Reviewing Previous Sessions

To review previous sessions, tap the History button in the main menu.
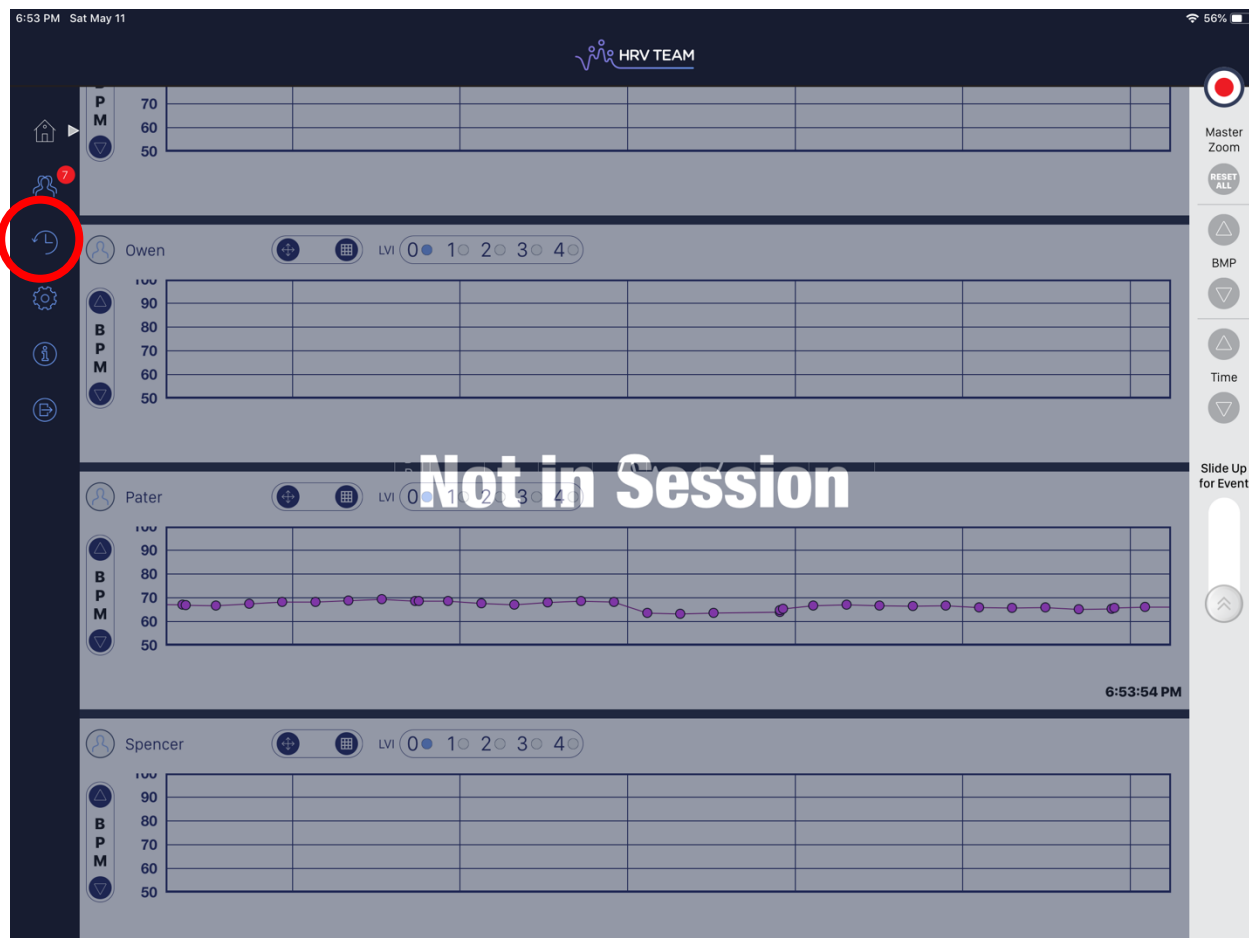
Tap the session you want to review from the History slide out menu. The selected session will become outlined. If the video option is selected in the upper right corner, then the recordings from that session will appear. If the chart option is selected, then the chart data from that session will appear.
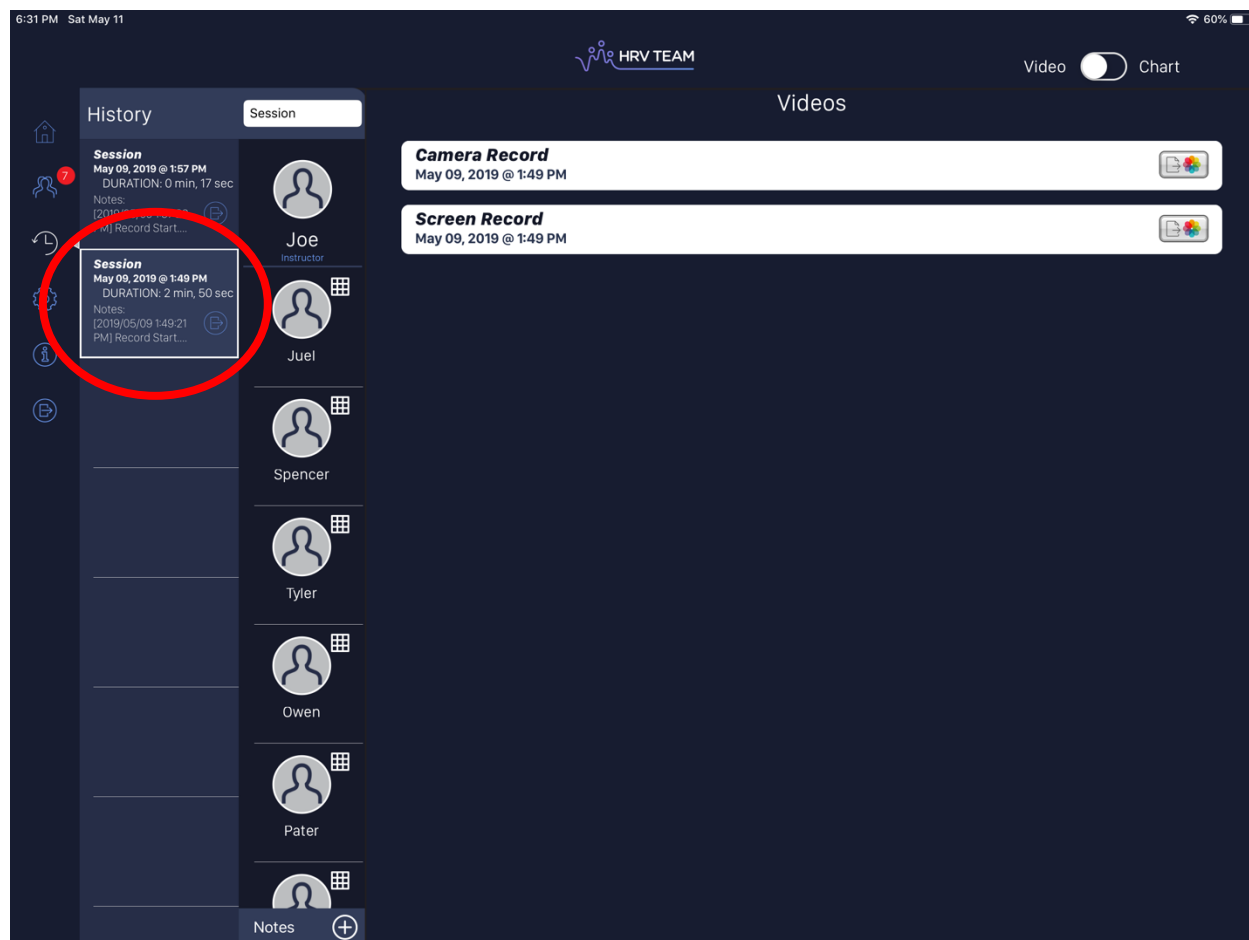
The Camera Record will show just the video recording without the heart rate trace data.
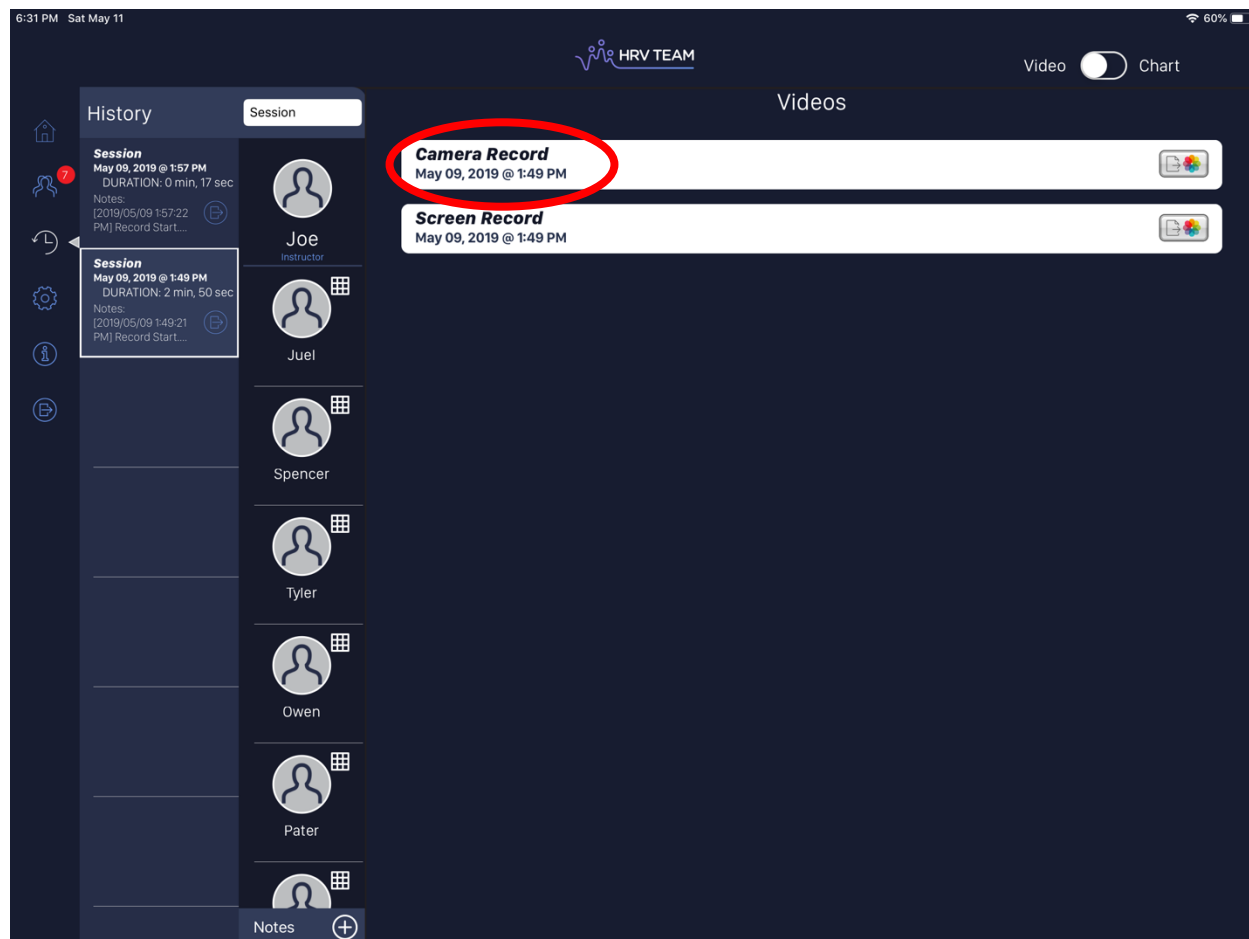
The Screen Record will show the video recording with the heart rate trace data. Tap the Screen Record to view your video and data.
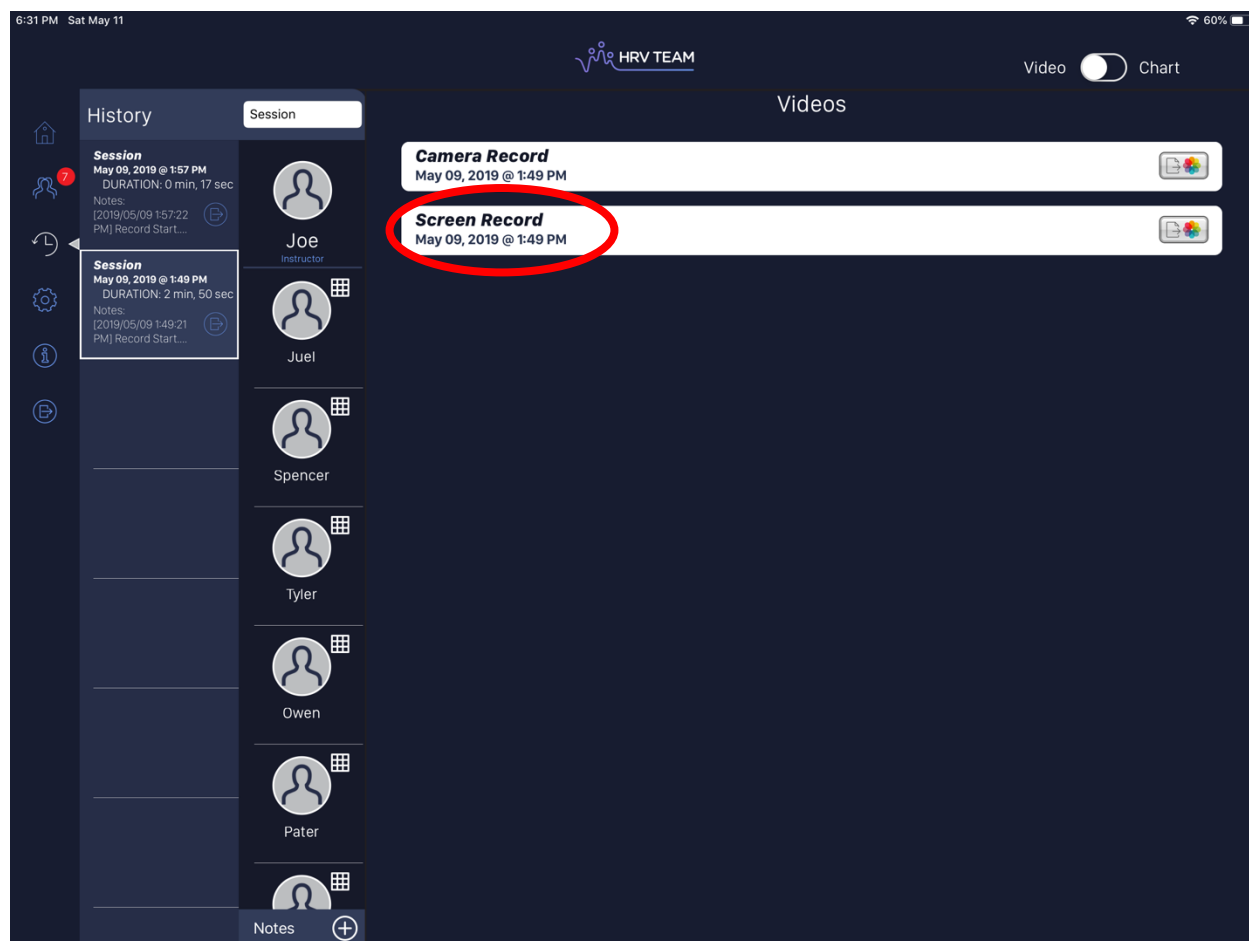
Display Settings in History Mode

If you have selected the chart option in the upper right then the display will look very similar to the Chart View display, with individual student's charts showing their heart rate data.

You can change the display settings while reviewing a session similar to those while recording a session. The main difference is you can now change the time displayed on each individual student's chart.

The icons on the right under the Record button will change the display scales for all of the charts.

1) Tap the Reset All button to reset all chart displays back to default settings.
2) Use the arrow buttons for BPM to set the range of heart rates displayed.
3) Use the arrow buttons for Time to set the amount of heart rate data that appears. We recommend setting the amount of time on the screen to between 30 seconds to 1 minute in portrait view and between 1 to 2 minutes in landscape view.
4) When the Sync Time box is checked, all the charts display the same time period, give or take a couple seconds. Tap the checkbox to turn on Sync Time.

You can also change the display settings for an individual student's charts.

1) Student's Name
2) Tap to expand the student's chart to full screen.
3) Close an individual student's chart by tapping the Chart button.
4) The BPM arrows change the heart rate display for that student.
5) The Time arrows change the time display for that student.

You will also see a slide out menu of the instructor and all students next to the Chart Display. From this slide out menu you can toggle each student's chart on and off by tapping the Chart button under their name.

Scroll through the charts to see student charts that are currently off screen by touching the space above or below a chart and moving your finger up and down the charts.

If you touch the space above or below a chart and hold without moving your finger, the chart will break free and you can rearrange it above or below the other charts.

Event markers placed while recording will appear in the data as vertical lines.
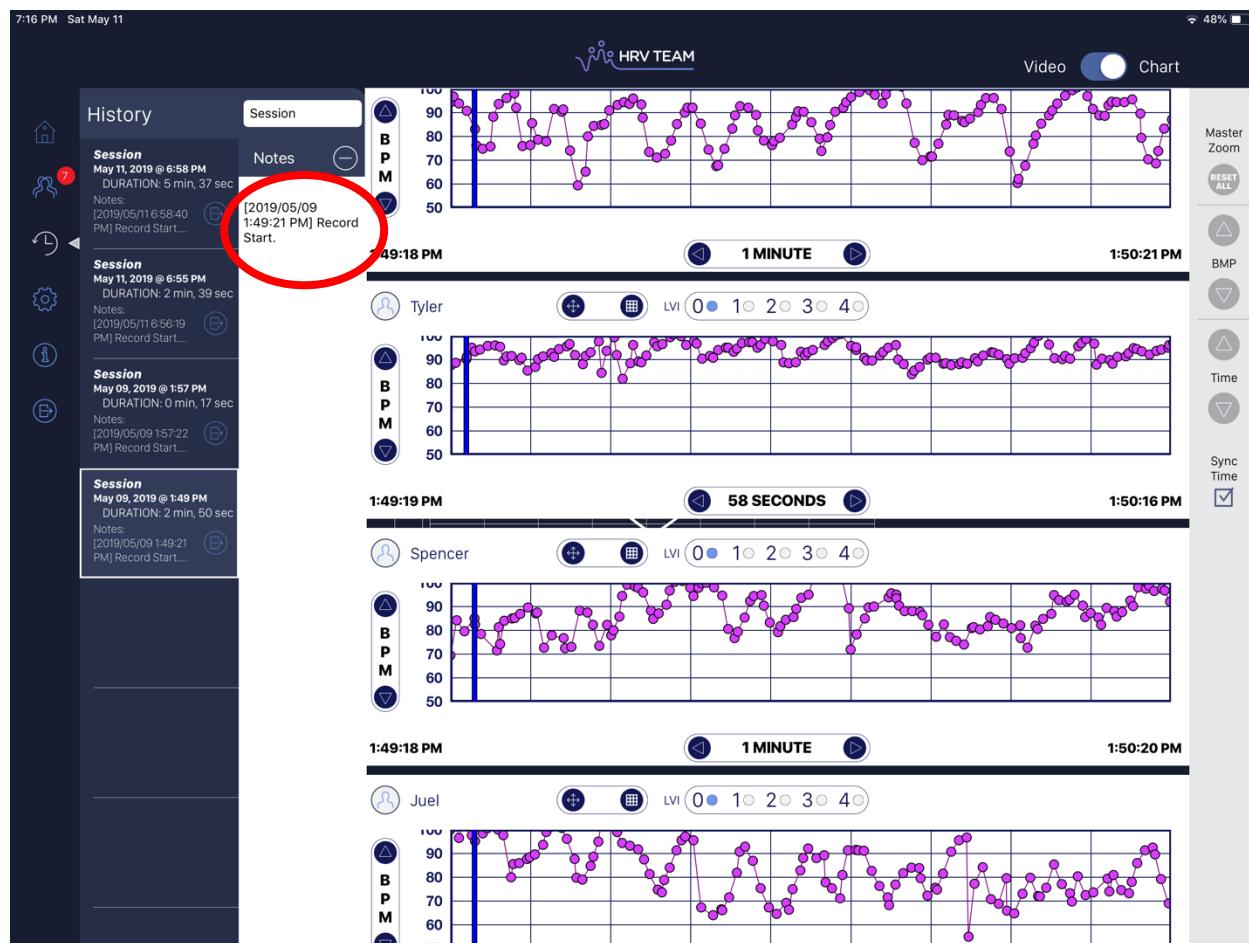
Add a Title and Notes

Tap the white box above the instructor's name in the slide out menu to give the session a title.
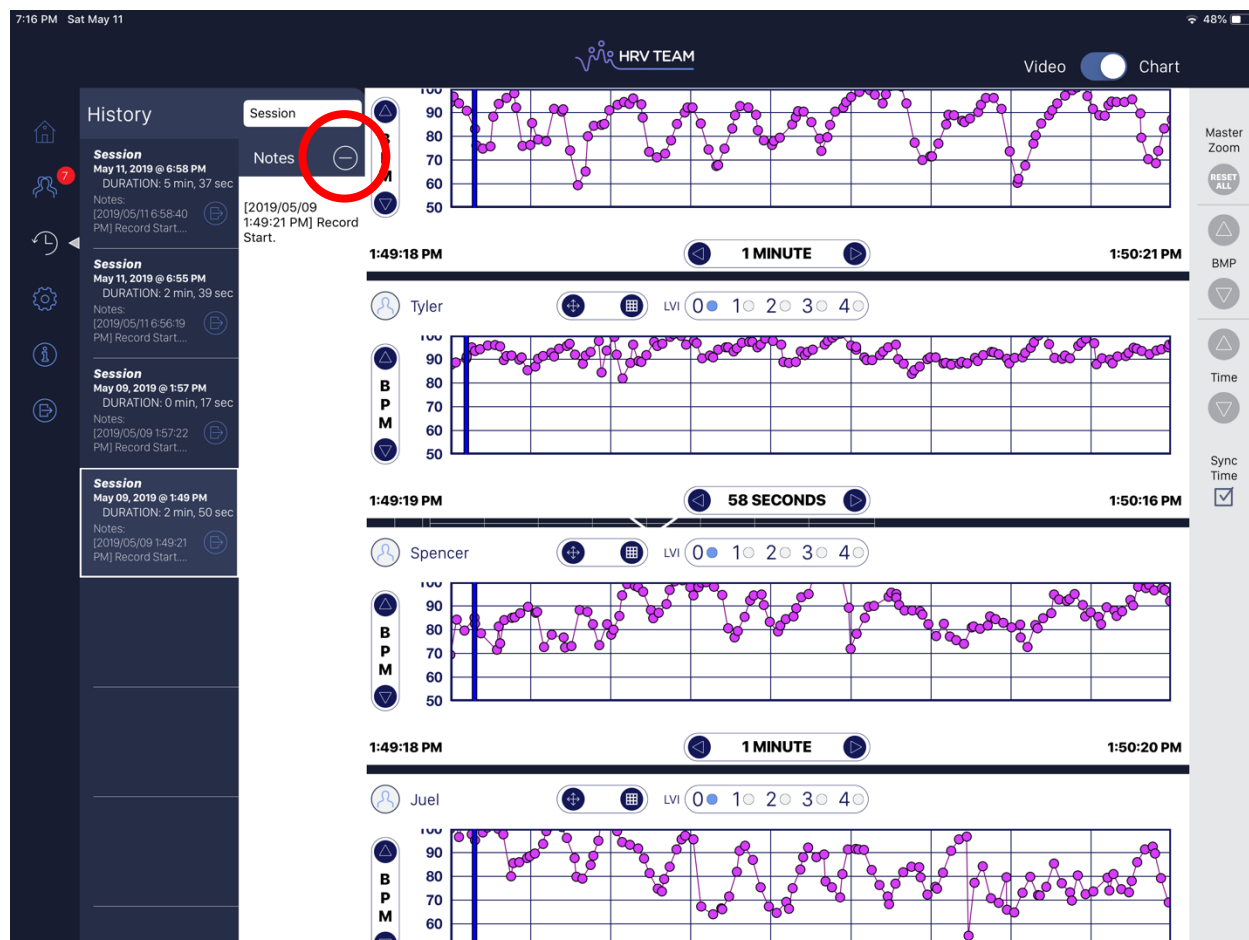Then type in the session title and tap Save.

Tap the Notes Plus button on the bottom of the slide out menu under the students' names to enter notes.

Tap the white column under the Notes icon to bring up the keyboard and enter your notes.
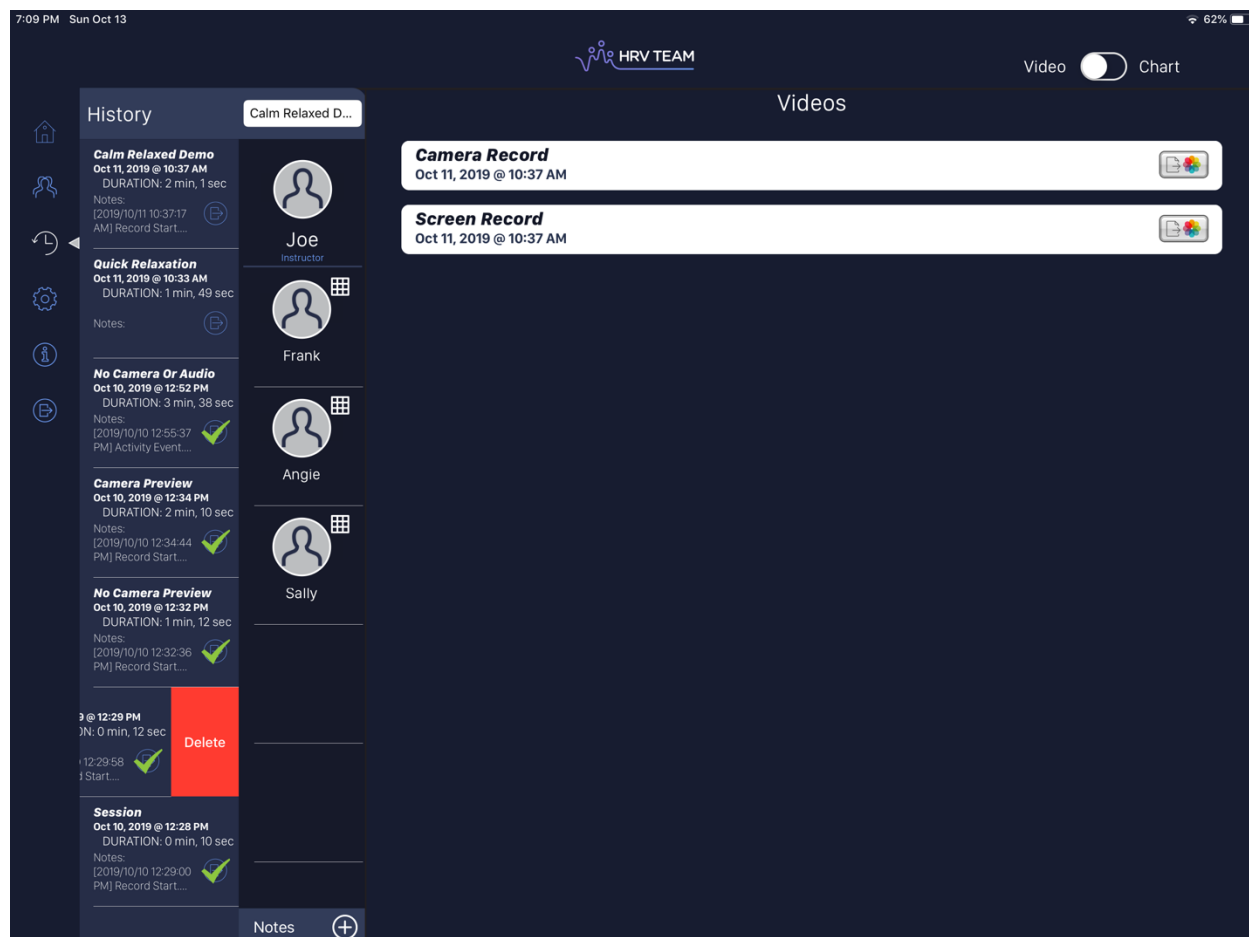
Tap the Minus button to minimize the Notes menu when you are done.

Deleting Sessions

To delete a session simply slide the session icon to the left and a red "Delete" tab will appear.
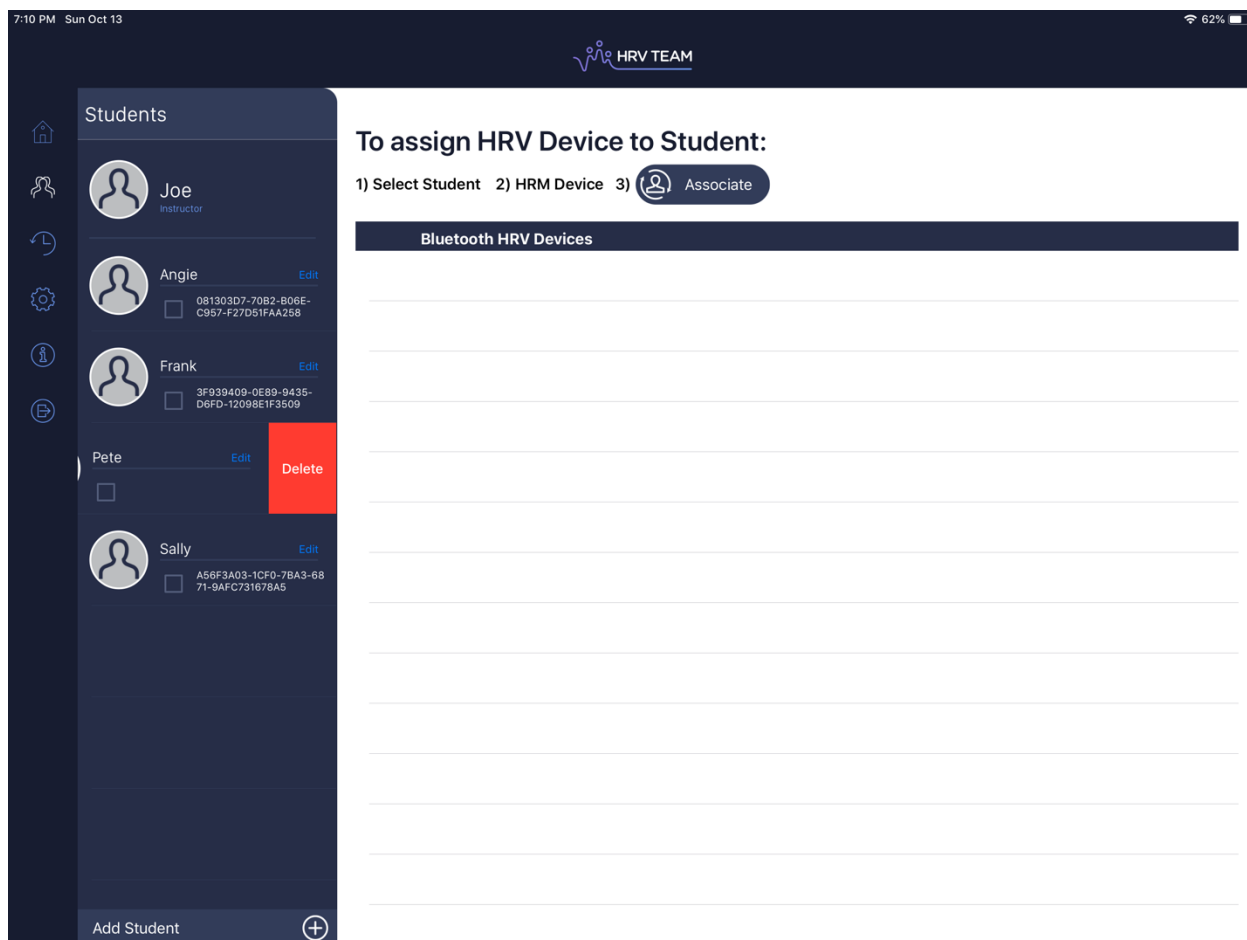Tap on the delete tab to delete the session.

A confirmation box will appear to let you cancel the delete process if you decide you do not want to delete the session. If you choose to delete the session all chart data and recordings from that session will be deleted. Note that this will not affect any data you have emailed or any recordings you have exported from the app to Photos.
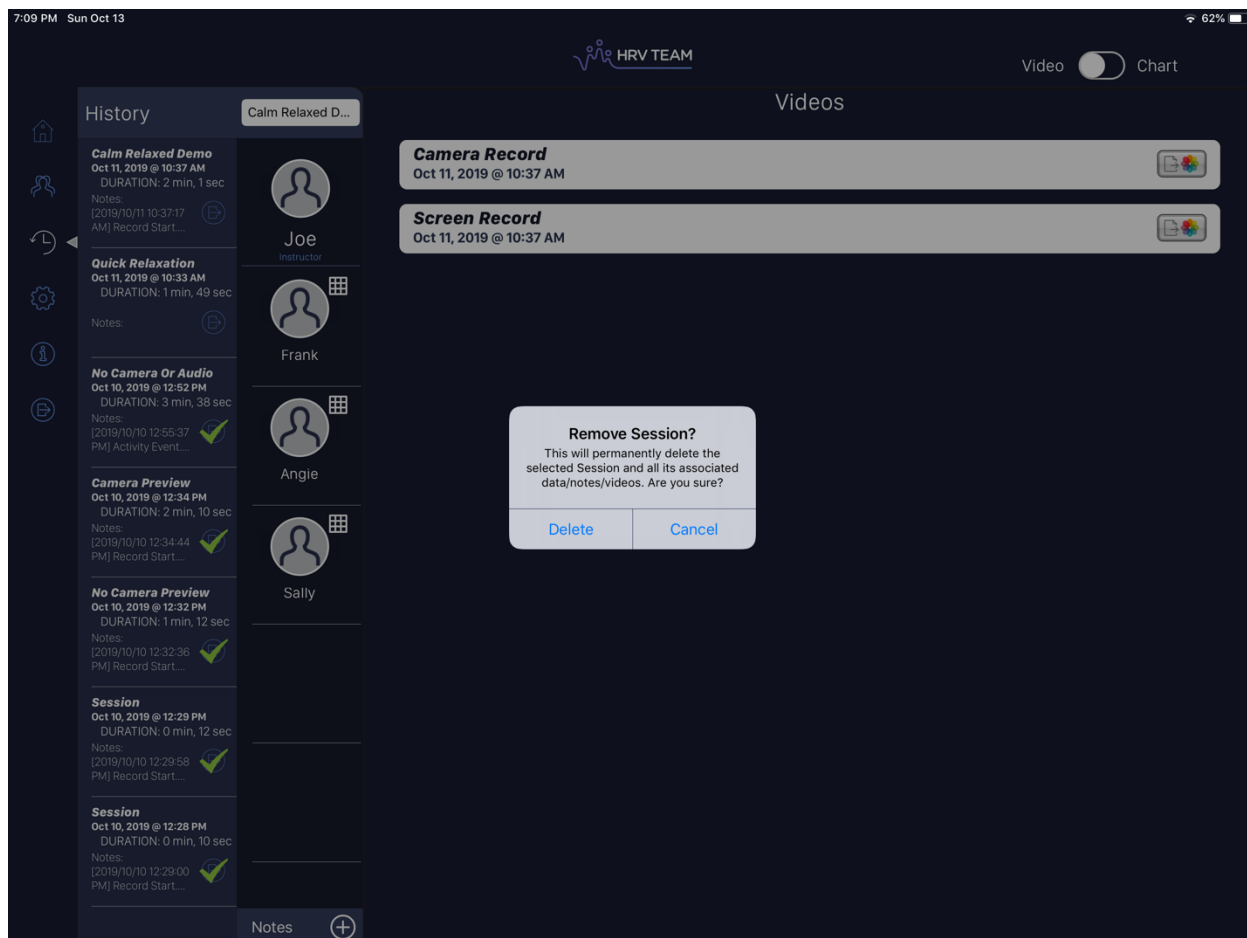
Deleting Students

To delete a student from the list simply slide the student's icon to the left and a red "Delete" tab will appear. Tap on the delete tab to delete the student and all the data related to that student.
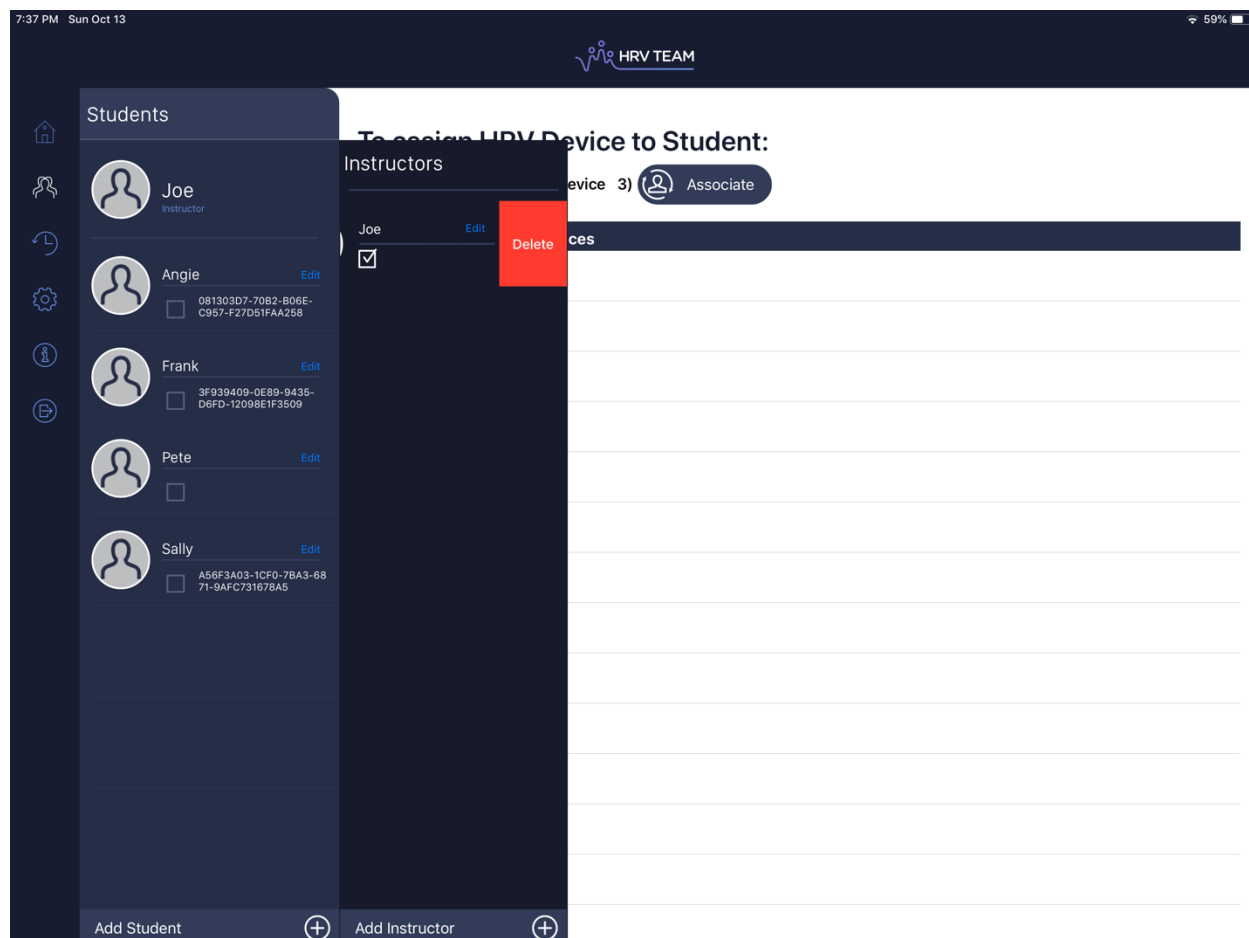
A confirmation box will appear to let you cancel the delete process if you decide you do not want to delete the student. Note that this will not affect any data you have emailed or any recordings you have exported from the app to Photos.
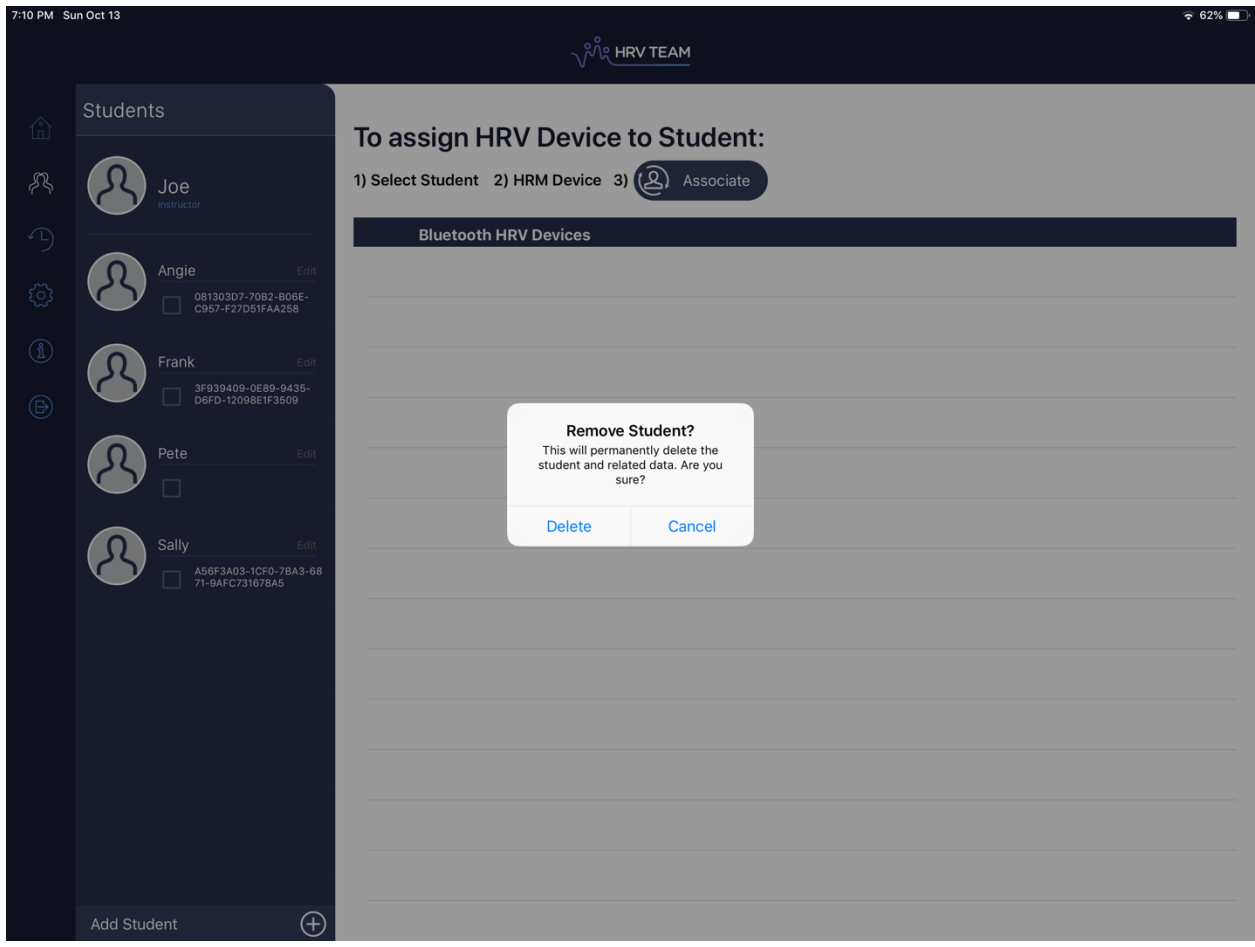
Deleting Instructors

To delete an instructor simply slide the session icon to the left and a red "Delete" tab will appear. Tap on the delete tab to delete the instructor. Note that doing so will delete all data associated with that instructor.

A confirmation box will appear to let you cancel the delete process if you decide you do not want to delete the instructor. Note that this will not affect any data you have emailed or any recordings you have exported from the app to Photos.
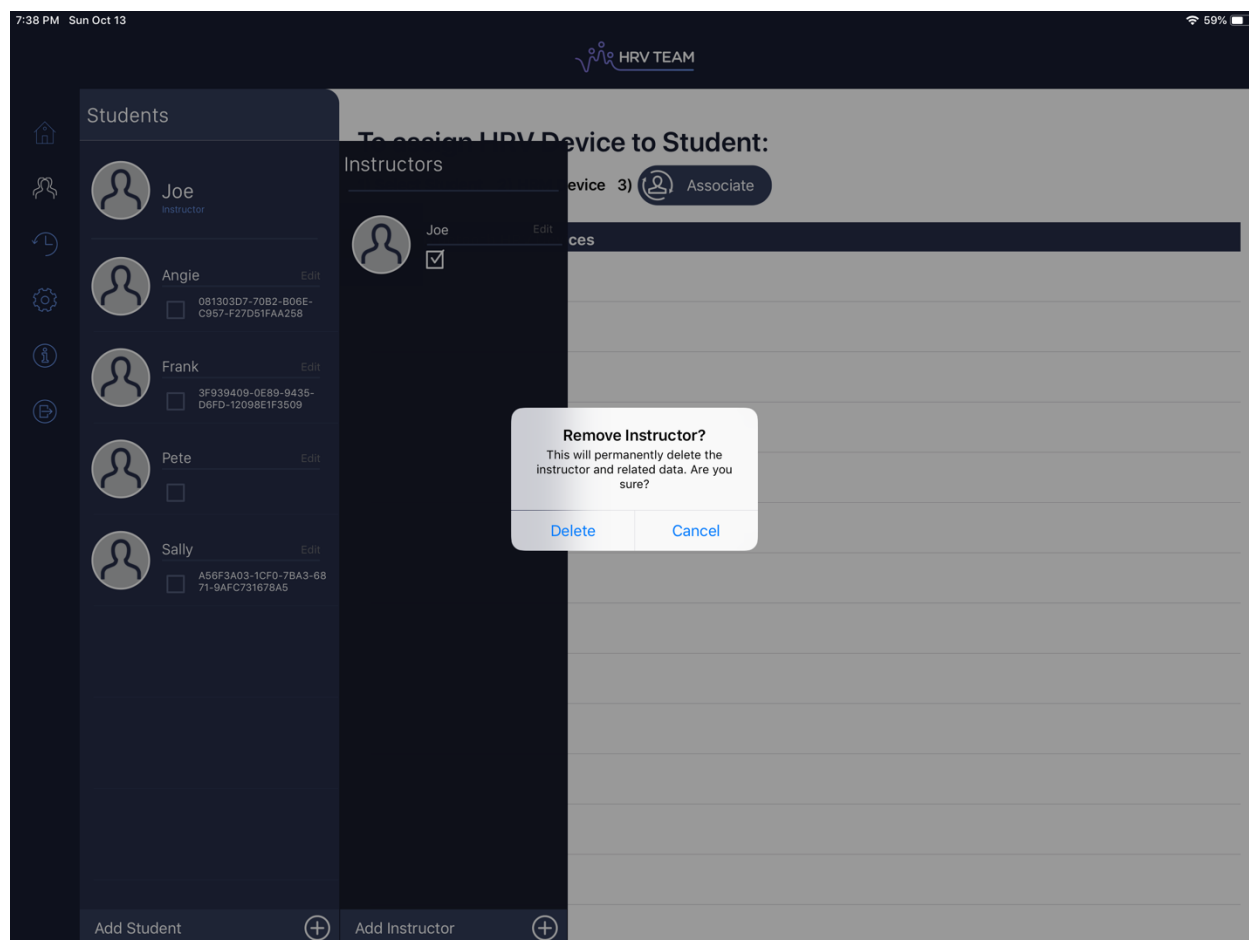
Exporting Data

You can email session data from the History slide out menu or the Export screen. You can also export the video file to your Photos on your iOS device.

From the History slide out menu, tap the "Export" icon next to the listed notes. Note that this will email the chart data whether the history is showing the videos available or the chart data.
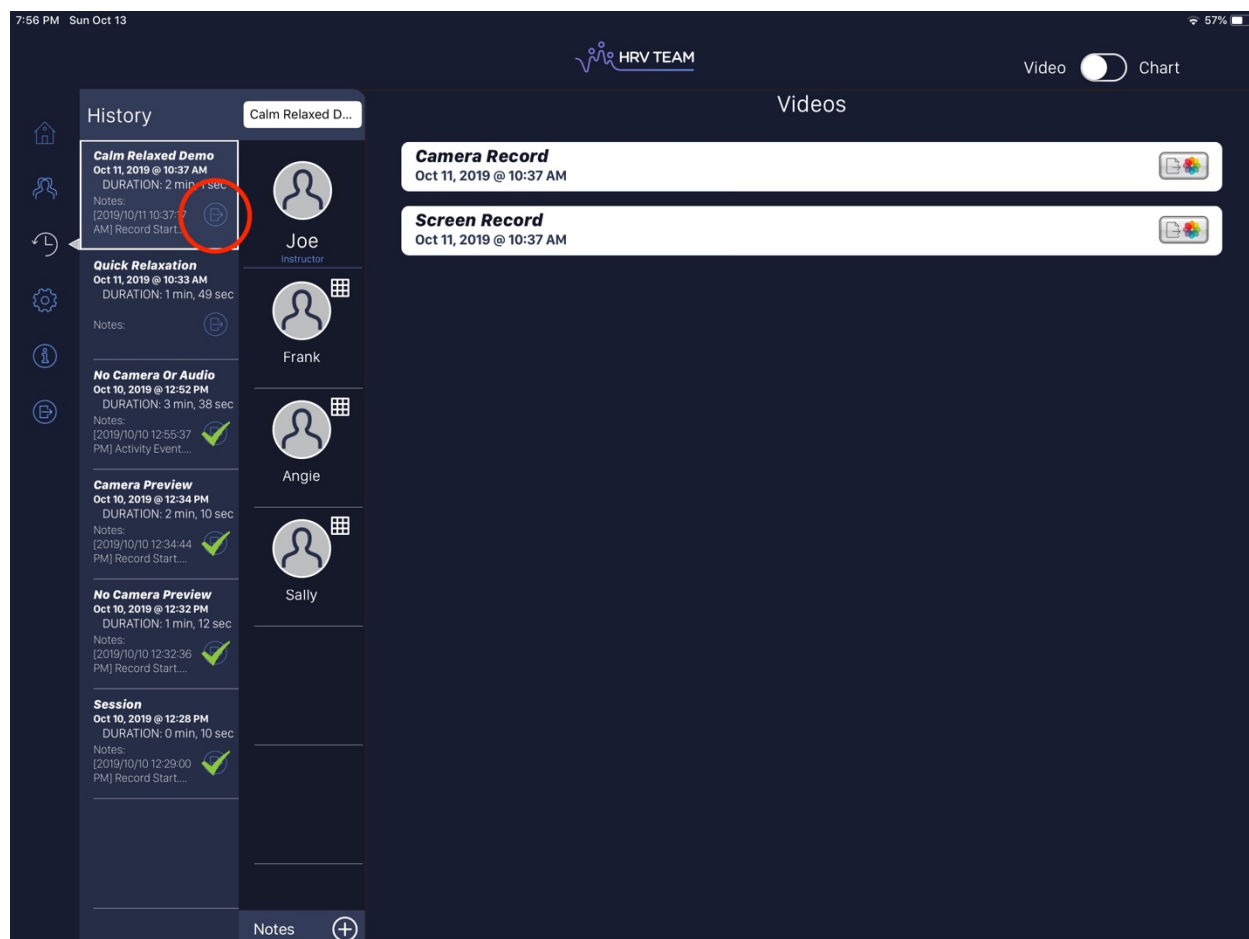
You will be asked to enter a username. The username will be used as the first part of the filename that contains the data and that is emailed to you.
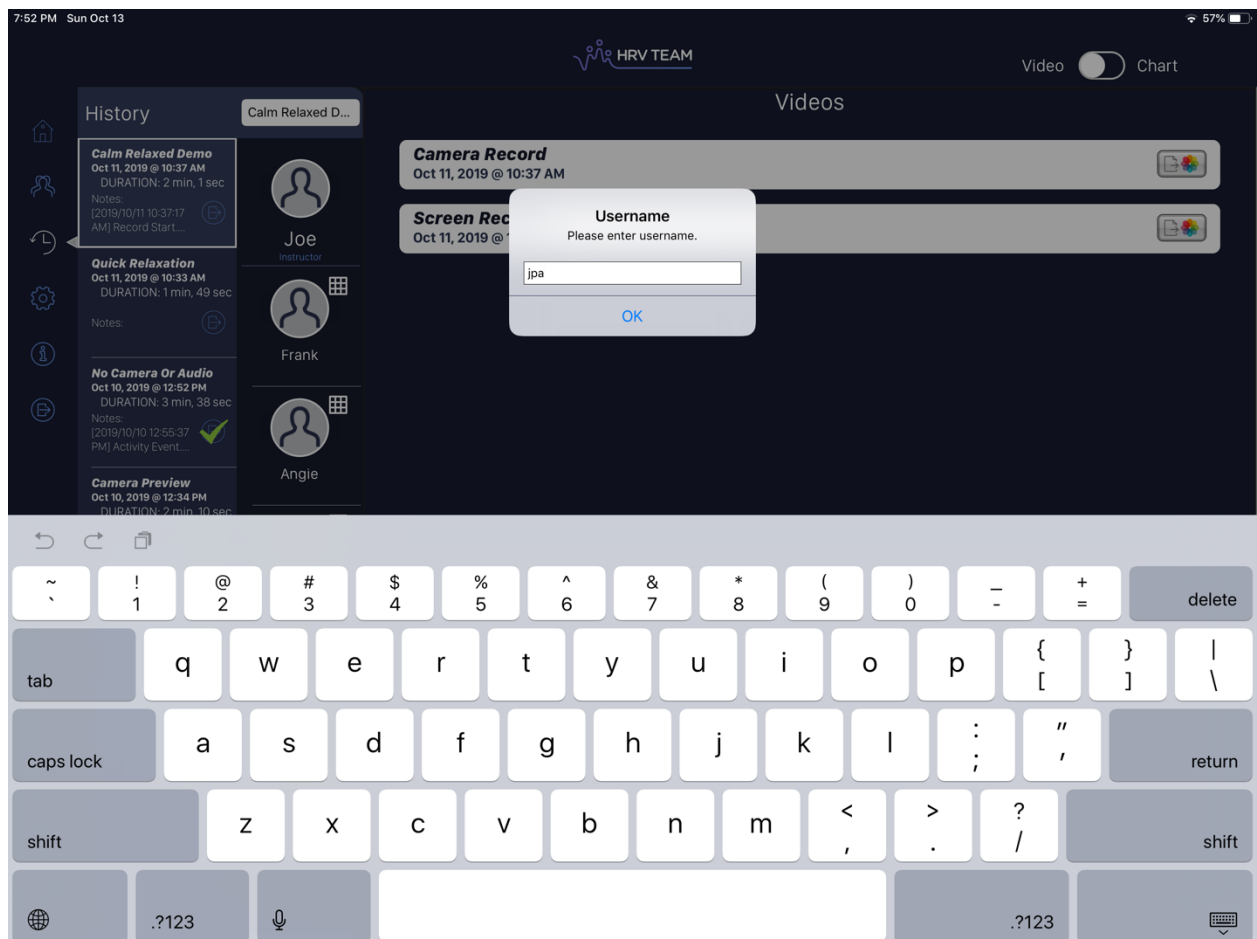
Next you will be asked to enter an email address. Once you have done that tap the Send option. If you decide not to email the data then tap the Cancel option and then tap to delete the draft.
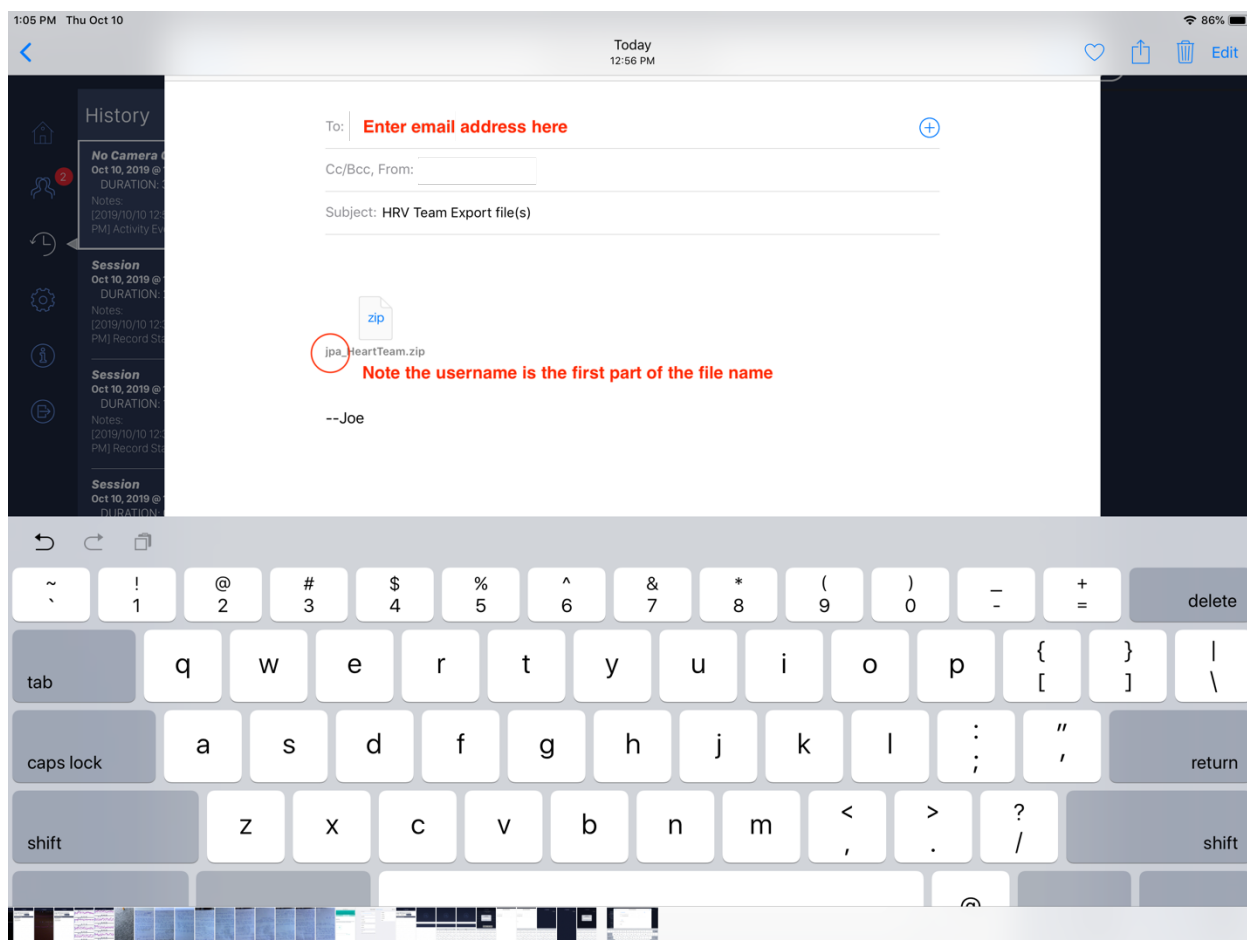
To export the chart data from multiple sessions, tap the Export icon at the bottom of the main menu.
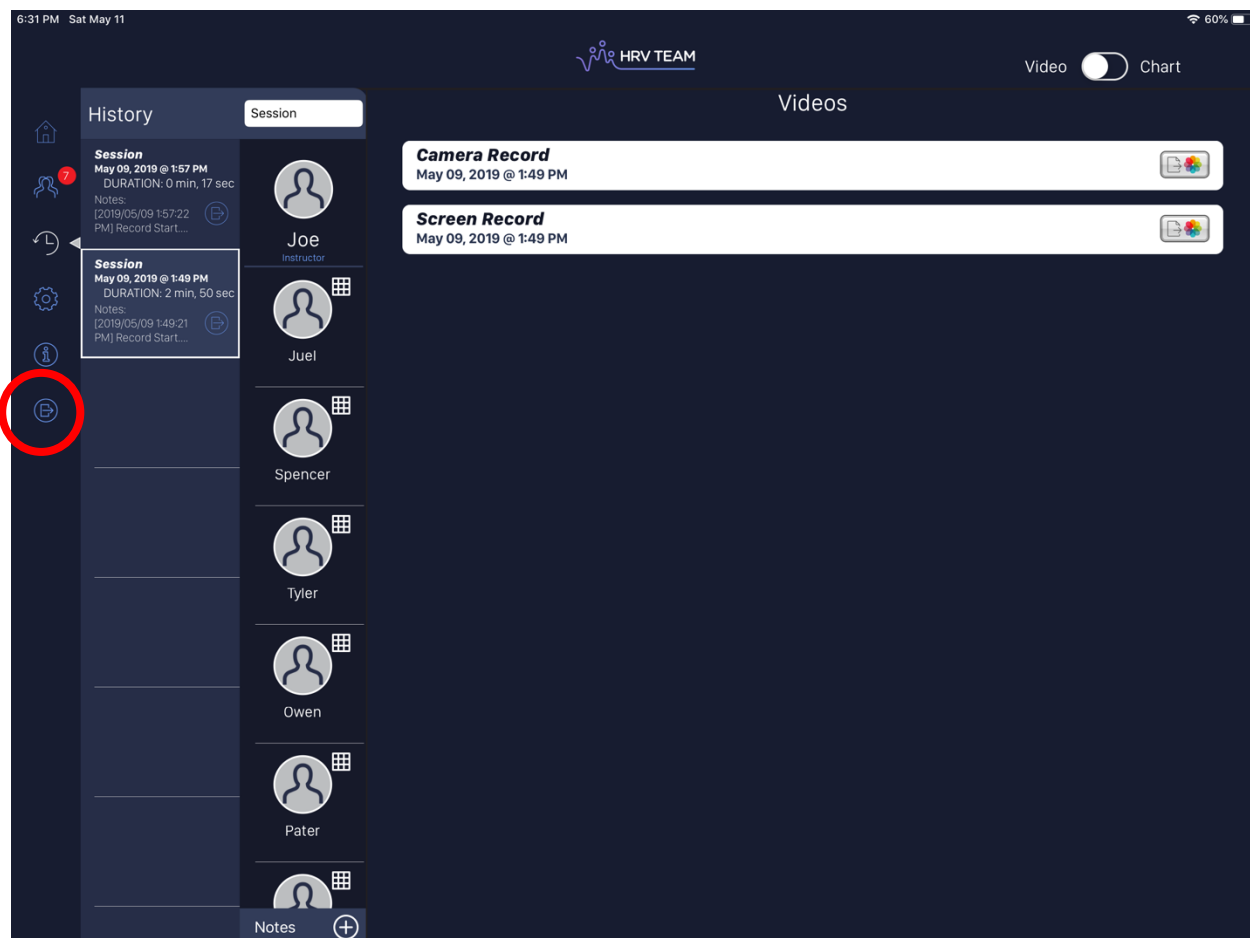
From here you will see the Export Options Screen. You can export multiple sessions based on the dates recorded. The chart data will be emailed as a csv file.
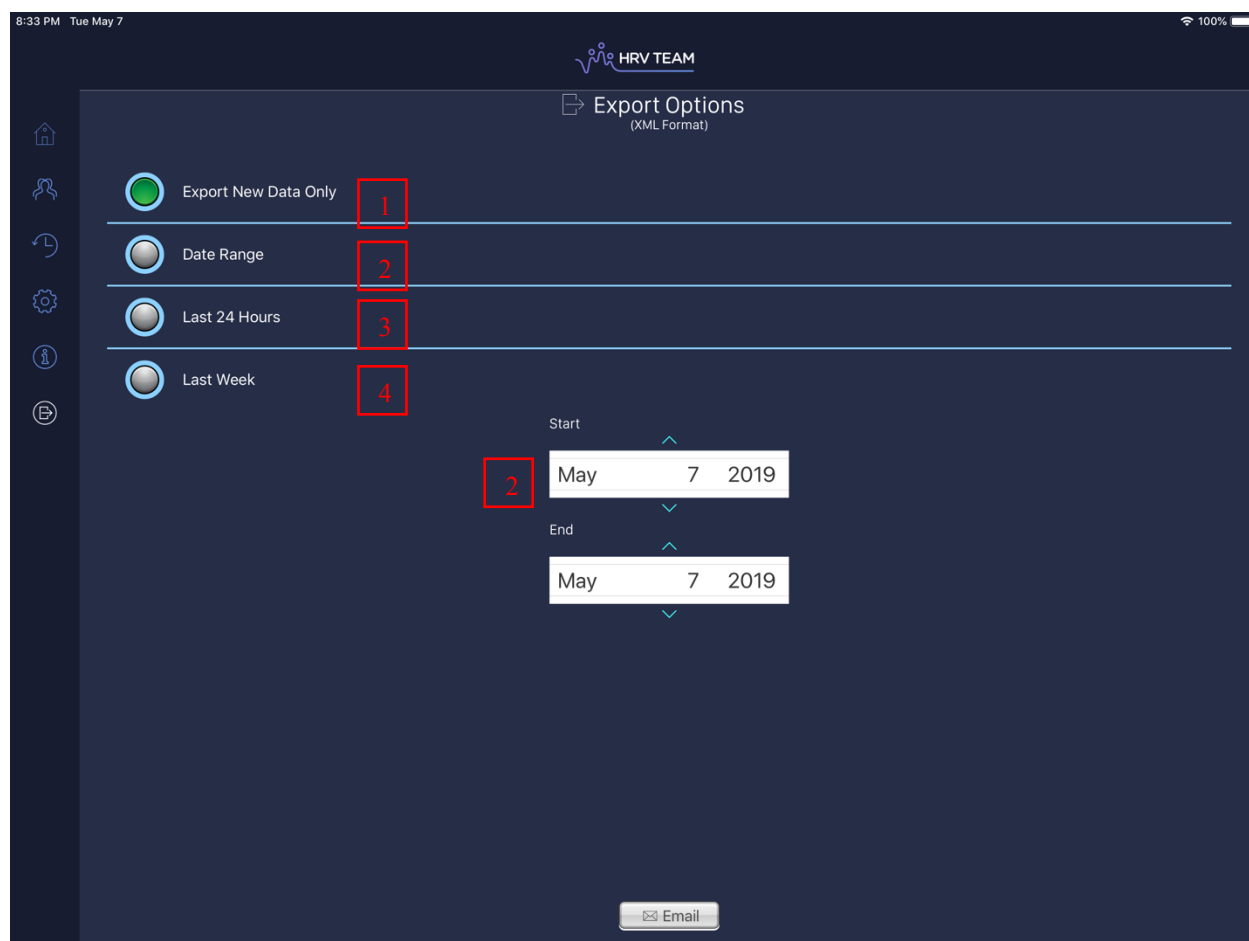
1) Tap Export New Data Only to only export data recorded since the last time data was emailed.
2) Tap Data Range to specify the date range for data you want to email. Then change the Start and End dates in the white boxes below.
3) Tap Last 24 Hours to export data recorded in the last 24 hours.
4) Tap Last Week to export data recorded in the last week.

After you have selected your time option, tap the Email button at the bottom of the screen. The next steps are the same as when you are emailing the data from a single session.
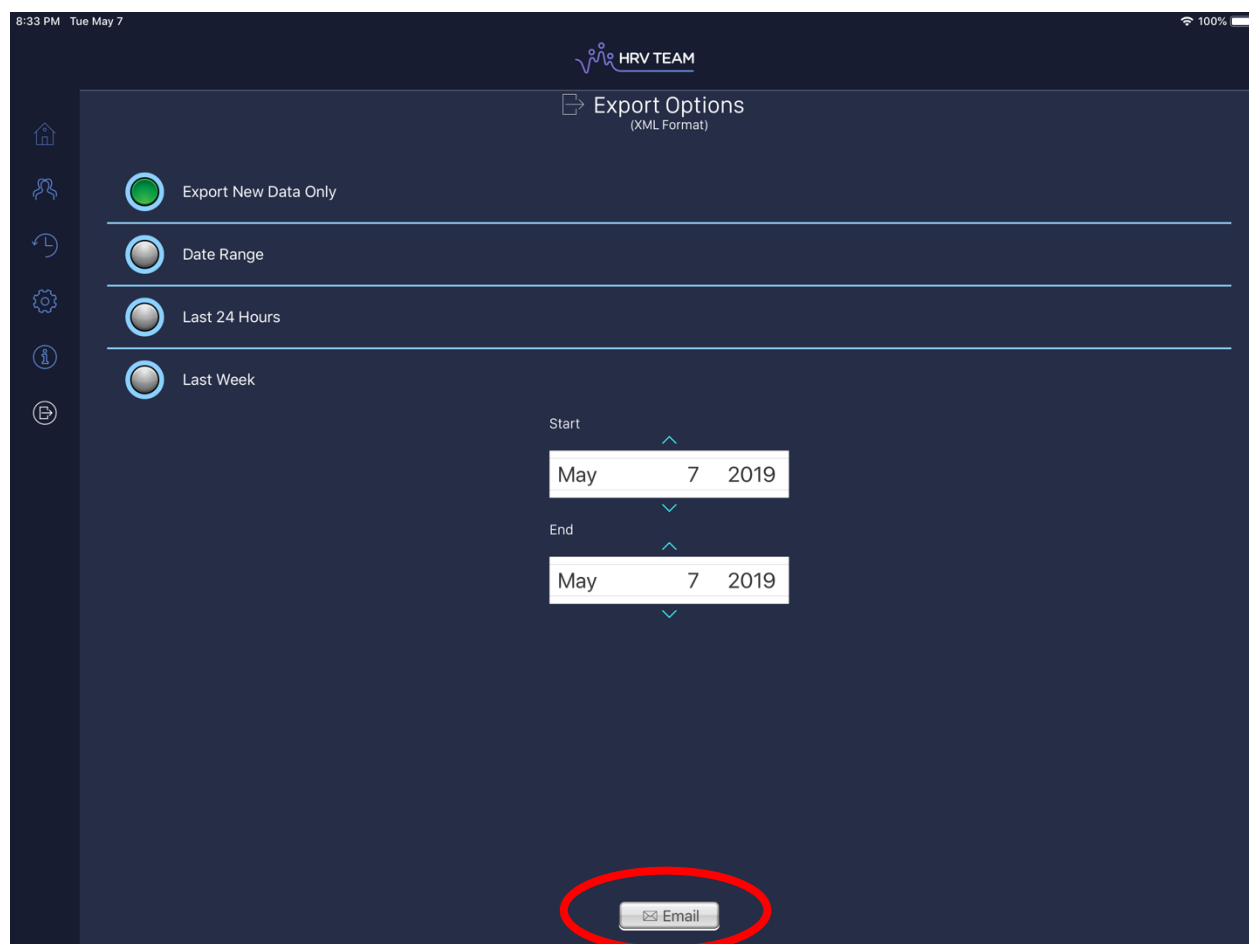
On the History slide out menu, sessions whose chart data has already been emailed will have a green check mark over the email icon. The data from these sessions can be emailed again to the same or a different email address.
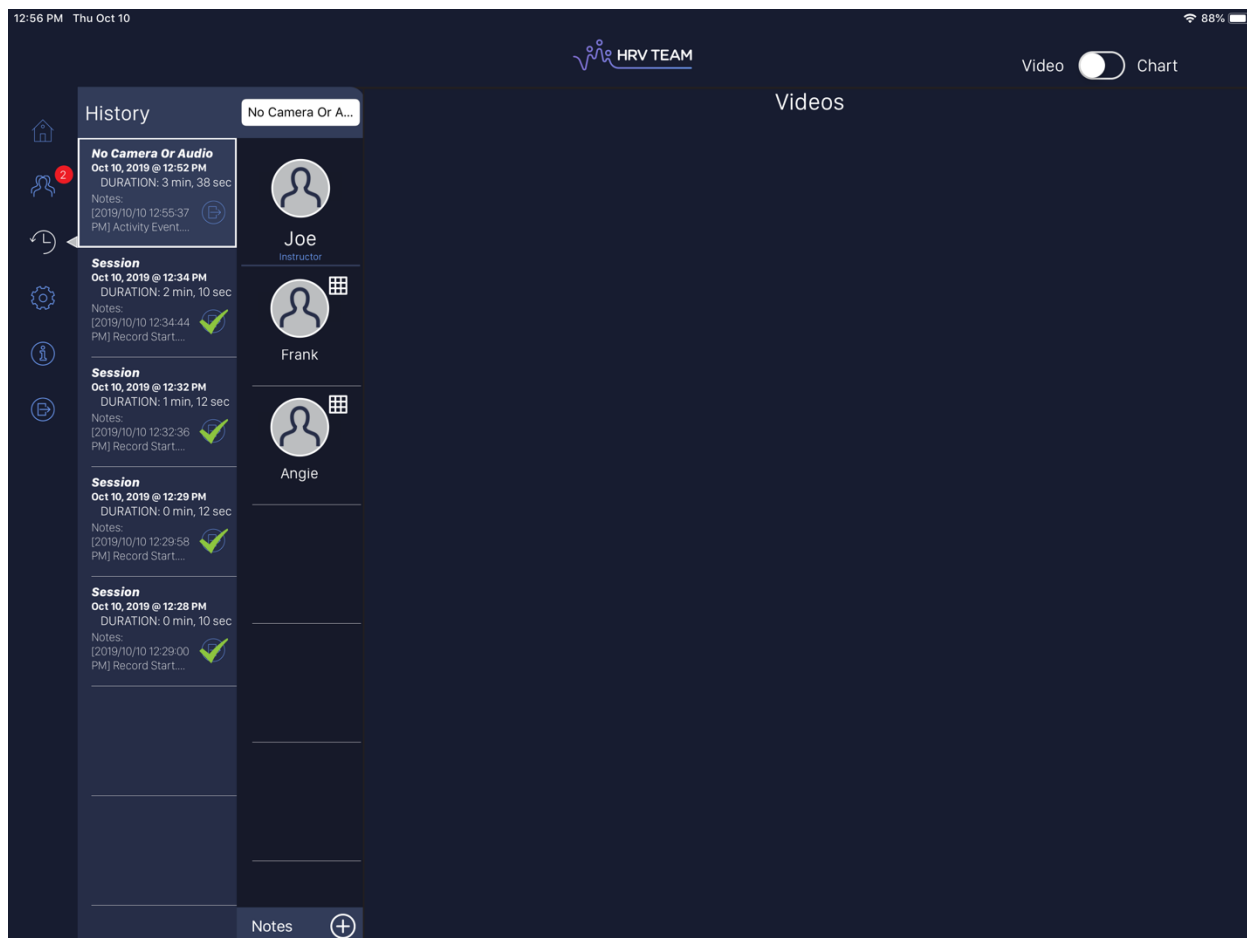
Export the Video Recording to your iOS Device

To export the video recording to your iOS device, return to the list of recordings for a particular session by selecting the Video option in the upper right.

Tap the Export button on the right of each recording to export the video recording to Photos on your iOS device. The Camera Record will export the video without the heart rate trace superimposed on it. The Screen Record will export the video with the heart rate trace superimposed over the camera view.

CAUTION - You are responsible for keeping the material in the video safe. Once you export the video to Photos or to other devices, other apps may be able to examine the data and draw information from it without your knowledge. You are responsible for making sure this does not happen.
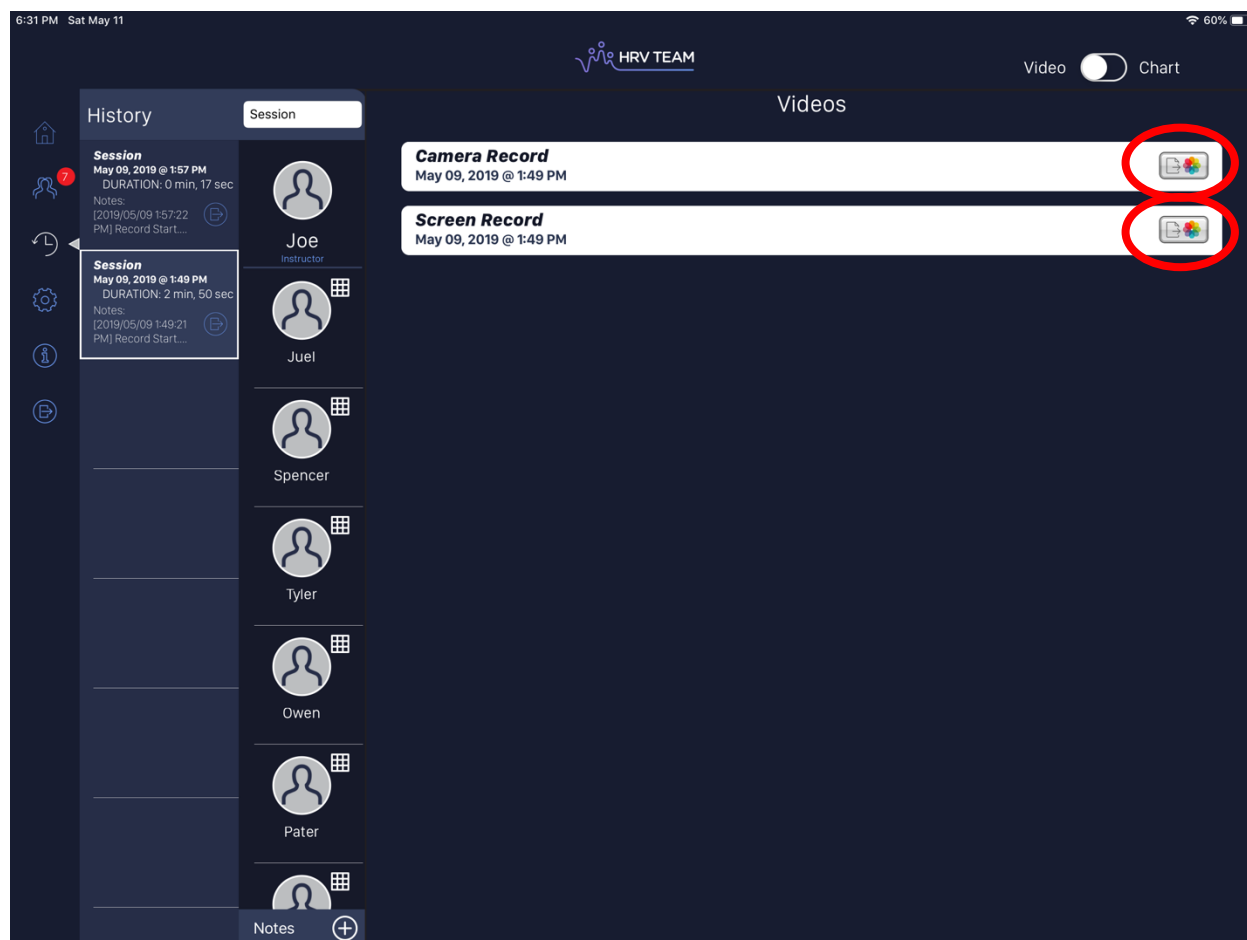
Troubleshooting

Problems with Erratic Heart Rate

The most common cause of an erratic heart rate is a poor connection to the chest strap. We have had some difficulties with the Zephyr chest straps giving more inaccuracies after 20 hours of use.

If you have an erratic heartrate in your HRT try:
- Replacing the batteries in the heart rate monitor
- Repositioning the heart rate monitor
- Making sure your device is still within range of the heart rate monitor

We have not had any difficulties with the app misreading the data sent. Every instance of questionable data has been from the chest strap not working properly, a low battery in the monitor, or too great of a distance for clear BLE communication.

If you are concerned about any student's heart rate, then please ask that student to see a medical professional.

Problems Connecting Heart Rate Monitor to the App

If you are wearing a heart rate monitor and it doesn't appear under Devices, check to make sure the iOS device has Bluetooth on, and that the heart rate monitor hasn't connected to some other Bluetooth device or app. Make sure that other iOS devices that might connect to the heart rate monitor are off or out of range.

If you have used other heart monitors or apps:
• Turn Bluetooth off in the other devices under the device settings.
• Put on the heart rate monitor.
• Turn Bluetooth on.
• Start the app on the iOS device you want to use.

Once the app has paired with a heart rate monitor it will remember that and connect automatically if the heart rate monitor is on and in range.

If the heart rate monitor is not connected to another device or app, but is still not connecting to your iOS device, then replace the battery in the heart rate monitor.