BioZen Users Manual

Table of Contents

1. Introduction

BioZen is an Android application that aids in meditation by providing real-time biofeedback information to a user via data collected from various wireless biosensors. Biofeedback "sessions" may be saved for later reference and trend analysis. See Appendix A for compatible biosensor devices.

2. Home Screen

The Home Screen includes a scrolling button bar on the bottom of the screen. Buttons on this scroll bar allow access to all of the functionality of BioZen.

2.1 Learn Button

The "Learn" button brings up an instruction screen, which gives basic information on how to meditate.

2.2 View Button

The "View" button brings up a special screen, which allows you to view the output of all connected sensors (See section 5, View Sensor Output - View Button).

2.3 New Session Button

The "New Session" button brings up a screen, which will start a new meditation session (See section 3, Meditation Sessions - New Session Button).

2.4 Review Button

The "Review" button brings up a screen, which allows you to review previously recorded sessions (See section 4, Review Sessions - Review Button).
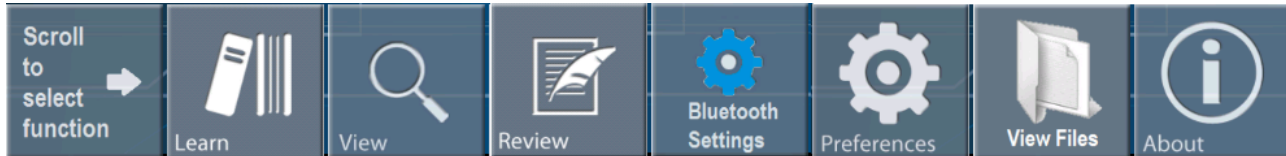
Figure 1 Main Screen Button Scroll Bar Expanded

2.5 Bluetooth Settings

The "Bluetooth Settings" button presents a screen which allows you to manage the biosensors which BioZen will try to use to gather data (See section 6 - Bluetooth Settings).

2.6 Preferences

The "Preferences" button presents a screen which allows you to manage BioZen preferences. These preferences are saved permanently (See section 7 - Preferences).

2.7 View Files

The "View Files: button presents a screen which lists files present on the memory card. This can be useful for determining log files that the system has written (See section 8 - View Files).

2.8 About

The "About" button presents a screen displaying information about the application.

3. Meditation Sessions - New Session Button

Meditation sessions are started from the main screen by pressing the "New Session" button.

A "session" consists of a timed period where biosensors attached to the mobile device you are using will collect and record data which you can then use to assess the effectiveness of your meditation session afterward.

During this period the biosensors will control a set of images (See section 9 Preference Selections) on the screen designed to give feedback on your meditation session. The general goal is to make the images on the screen as bright as possible.

The default set of images is titled "Sunset", which consists of the following three images:

3.1 The Session Image

The background image is static (even through biosensors may change, the background image always stays the same).
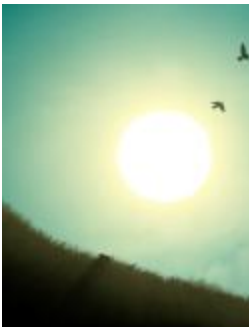
3.2 The Background Image

The background image is overlaid on top of the session image. Its intensity is controlled directly by one of the biosensors (by default it is controlled by the EEG parameter e-Meditation but can be changed via preferences). The stronger the signal of the selected parameter, in this case e-Meditation, the brighter the image gets.

The sum effect of the session image and the background image is that the stronger its selected parameter gets, the more the composite image looks like daytime – conversely the weaker its selected parameter gets, the more the composite image looks like nighttime.

3.3 The Foreground Image (Optional)

The optional foreground image (See section 9 Preference Selections) is also overlaid op top of the session image.

Its intensity is also controlled by one of the biosensors (by default it is controlled by the skin temperature but can be changed via preferences) but in a different fashion than the background image is controlled. The intensity of the foreground image gets stronger when its selected parameter tends to stay the same and it gets weaker (or more transparent) as its selected parameter tends to make frequent changes.

3.4 The session

3.4.1 Starting the session

When you first a session a session startup screen will appear:
- **EEG signal strength**
- **Screen images**. Initially, all of the images that were configured for this session appear at full intensity – that way you get a good idea of all of the elements that might appear on the screen.
- **Start button**. Press this button when everything is set up and you are ready to go.
- **Prompt message**. If you have selected any EEG parameters you will be asked to adjust the EEG headset until the signal strength indicator at the top of the screen turns green and indicates a good signal connection (3 – 5 bars). If you have difficulty getting the indicator to turn from red to green or to get enough bars try adjusting the headset and its electrodes. Make sure that the electrodes have a good connection to your skin on your ear and on your forehead. Wiping the electrodes with a little plain saline solution often helps ensure a good connection.

After you have established a good connection and pressed the start button all of the images except the main session image will fade out to transparent at which point they begin to be controlled by the selected parameters of the biosensors. At this point you should attempt to maximize the intensity of the background and (if configured) foreground images.

Note that during the session, the signal strength indicators (red/greed bars at the top right of the screen) will only be visible if they indicate a bad connection, otherwise they will be invisible.

At any time during the session you may touch anywhere on the screen to toggle on screen controls. When toggled you will see:
- **Quit button**. Allows you to quit the session before the timer countdown reaches zero.
- **Timer countdown**. Timer which indicates the amount of time remaining in the session.

To hide these controls when visible touch the screen anywhere again.

3.4.2 Ending the Session

When the countdown timer reaches zero BioZen will playback a series of bells to notify you of the end of the session (alternatively you can end the session by pressing the "quit" button).
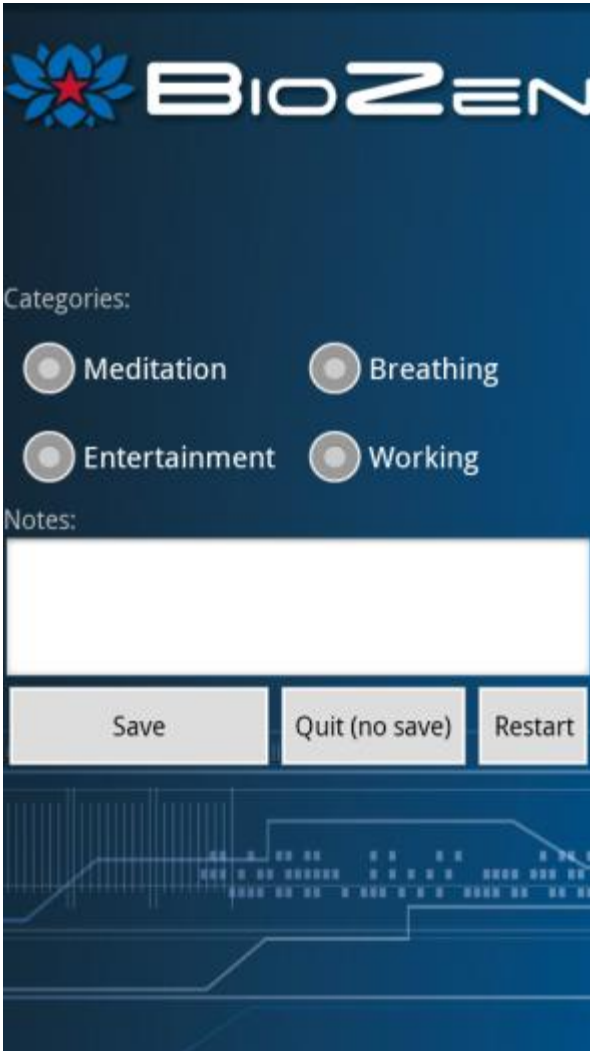
You will then be presented with the "End Session" screen. Here you are given the option to select a category for the session (Meditation, Breathing, Entertainment, and Working), and enter notes to be saved with the session.

Pressing "Save" will save the session so that you can review it later on. You may also press "Quit" to exit back to the home screen without saving, or press "Restart" to go return to the session (in case you pressed "Quit" before the end of the session).

4. Review Sessions - Review Button

The "Review Sessions" screen allows you to review previously saved sessions and consists of three main parts:

Session Filters

Graphical Session History

Timeline Selector

Tabular Session History
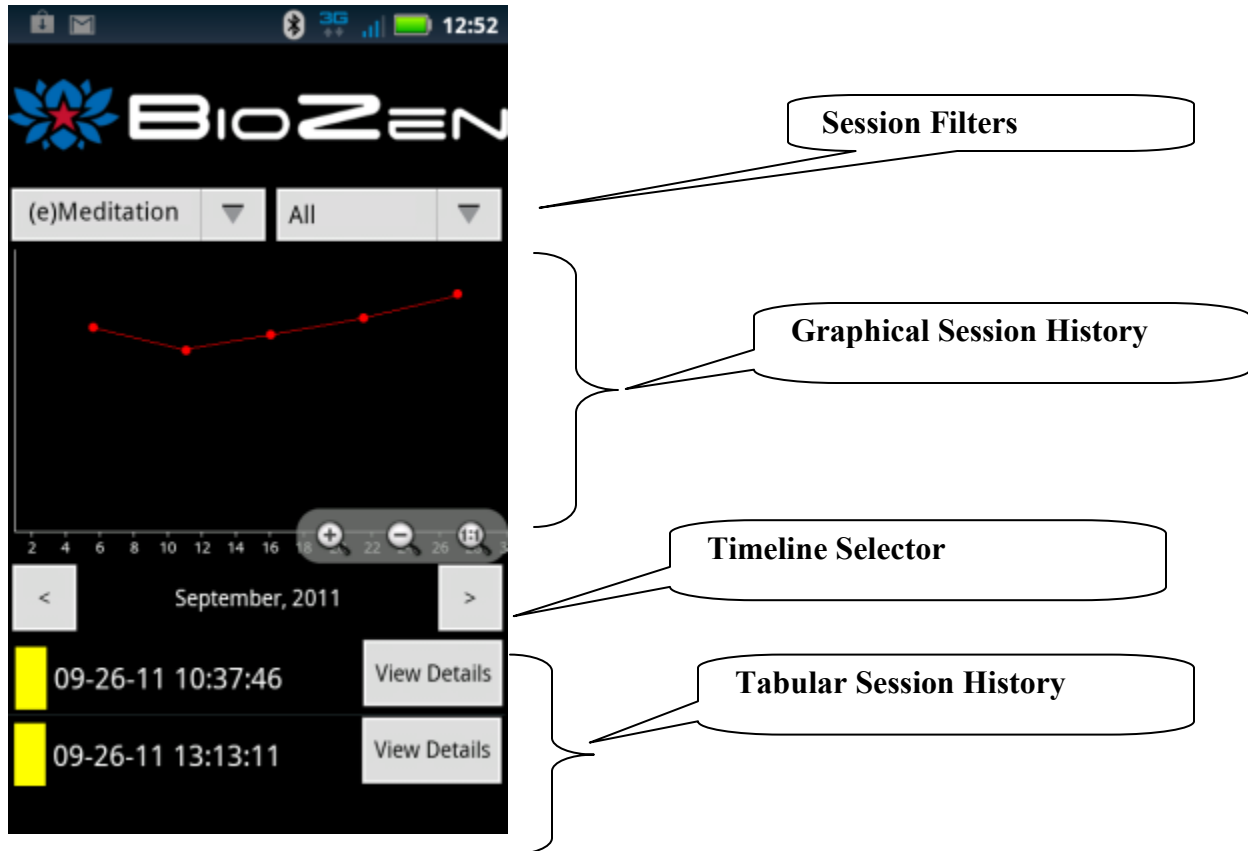
4.1 Session Filters

The *Parameter Filter* (Left dropdown box) applies only to the Graphical Session History. It selects which parameter will be graphed for each session. The *Category Filter* applies to both the Graphical Session History and the Tabular Session History. It selects what types categories of sessions should be displayed.

4.2 Graphical Session History

This section shows the results of saved sessions as a graph. One dot is placed for each recorded session The X axis corresponds to the time/date of the session and the Y axis corresponds to the average value of the parameter selected by the *Parameter Filter* (see above).

4.3 Timeline Selector

The timeline selector allows you to scroll through specific months (or days) of history. The Graphical Session History and the Tabular Session History sections will only show sessions that are indicated by the timeline.

Note: you can change the resolution of the timeline by pressing the text of the timeline indicator. By default the timeline selector shows "Day of Month", and the left/right arrows change the current month. By pressing the text of the timeline indicator you may toggle between "Day of Month" and "Hour of Day". When the timeline indicator is set to "Hour or Day", the left/right arrows change the current day.

4.4 Tabular Session History

This section shows the results of saved sessions as a list. Each saved session is represented by a line item in this scrollable section. Each line consists of three components:

- **Session Time and Date**
- **Session Category**. If a category exists for a session it will be indicated in parentheses after the session time and data (M = Meditation, B = Breathing, E = Entertainment, W = working).
- **Details button**. Pressing this button will bring up a dialog showing all of the saved data corresponding to the selected session.

5. View Sensor Output - View Button

This screen shows a graphical representation of all of the biosensors. This is a handy tool for you to use to make sure that the biosensors are indeed presenting their data properly to BioZen.

Biosensor data is shown on the graph in the middle portion of the screen. New data is presented on the right hand side of the screen and scrolls to the left as each new set of data is received.

Note that currently the graph updates approximately once per second.
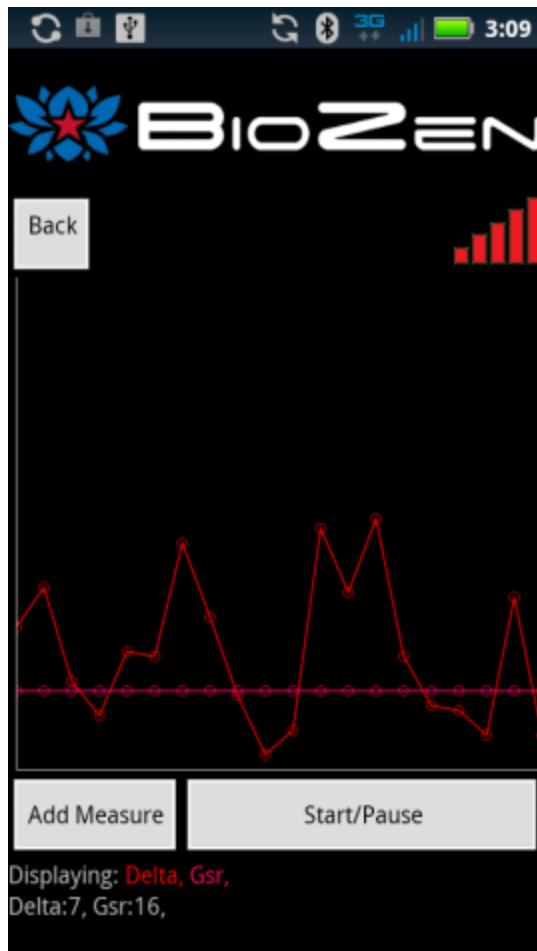
5.1 Add Measure Button

Pressing this button will bring up a dialog where you can select any or all of the sensor measures (parameters) you wish to display.

5.2 Start/Pause Button
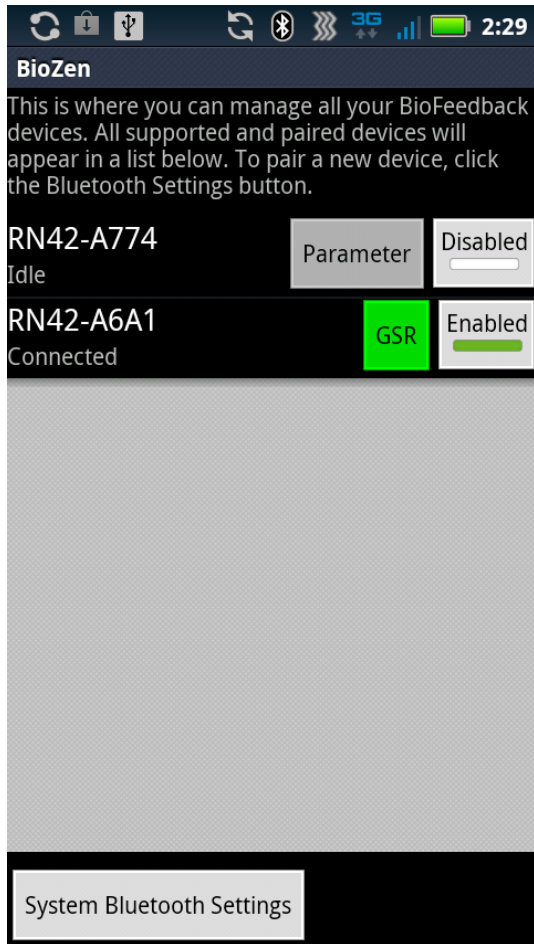
Starts/pauses updating the screen

5.3 Measure (Parameter) list

This line at the bottom of the screen shows all of the measures you have selected and which colored line in the graph represents this measure.

5.4 Measure (parameter) values

This line at the bottom of the screen displays the current value for each of the measures you have selected.

6. Bluetooth Settings

The **"Bluetooth Settings"** menu item presents a screen which allows you to manage the biosensors which BioZen will try to use to gather data.

This screen lists all of the Bluetooth devices which are paired to the device you are using. Each line contains four components:

Name (text, top left): This is the Bluetooth name of the device just as it appears in the devices main Bluetooth settings screen).

Connection status (text, bottom left): Current connection status of the Bluetooth sensor (idle, connecting, connected.

Parameter selection (button, near right): Pressing this button will bring up a list of potential parameters which this sensor may source (e.g. GSR). It is important to make this association so that other activities in BioZen know which sensor sources which parameter. This button will show up as grey if no association is made, and green once an association is made.

Enable/Disable (button, far right). This is a toggle button that tells BioZen whether or not to try to use this sensor. BioZen will only try to establish a connection with a device if it is both paired and enabled.

The "System Bluetooth Settings" button in this screen will bring you to the devices system Bluetooth Settings page.

Note: If a biosensor is first paired while in "System Bluetooth Settings" as screen reached from BioZen, it may be necessary to exit BioZen and restart for the biosensor to complete its initialization process and actually connect to BioZen.

7. Preferences

The **"Preferences"** menu item presents a screen, which allows you to enter preference selections for BioZen so you can customize it for your own use (See section 9 Preference Selections).

8. View Files

The **"View Files"** presents a list of files located in external storage (memory cars). Long pressing on a file brings up a context menu which allows you to attach the file to an email for sending.

9. Preference Selections

Preference data may is saved to the device so that the user can customize sessions and provide a personalized experience. The following parameters are customizable:

Parameter Name	Default	Description
Session Length	20 minutes	Length of meditation sessions.
Show Foreground Image	False	If enabled, a foreground image is displayed on the meditation screen. Its intensity is controlled by a selectable parameter (by default it's skin temperature).
Audio Track	None	Selects between several pre-recorded audio tracks to play during the meditation session.
Background Images	Sunset	Selects the image set which is displayed to the user during meditation sessions.
Show Connection Messages	True	If enabled, BioZen will show toast messages each time any sensor connects or disconnects.
Background Image Control	Delta	This option brings up a list of biosensor parameters which allows you to select which parameter controls the background image.
Foreground Image Control	Skin Temperature	This option brings up a list of biosensor parameters which allows you to select which parameter controls the foreground image.

User Mode	Single User Mode	This option allows you to select between Single User Mode and Provider Mode (see section 10, Single User Mode verses Provider Mode).
Show Instructions on Start	False	If enabled the instructions page will be presented before each time a meditation session is initiated.
Advanced Preferences		The advanced preferences should not be changed by the user in normal circumstances.

10. Single User Mode verses Provider Mode

By default BioZen operates in Single User Mode. Meaning that only one person will be using the device to record meditation sessions. If more than one user will be using the device, Provider Mode may be enabled via the Preferences Selections. Provider mode will allow you to set up user accounts on the device via the BioZen user interface. Once logged in as a specific user you are allowed access only to your own sessions.

Provider Mode changes the user interface at application startup. If "Provider Mode" is enabled, when the application is first started, you will be presented with a user selection screen which allows you to either select an existing user, or to add a new user. Once a user is selected the application will continue on as normal (with the exception of being able to create and see sessions for the selected user only).

11. Connecting with Bluetooth Biosensors

Follow the biosensor manufacturer's instructions for pairing the biosensor with the device you are using. For android devices the system Bluetooth Settings page is accessed from the main menu at Settings->Wireless&Networks->Bluetooth settings. When the biosensor is paired successfully it will report "paired but not connected"

Once the biosensor is paired, open BioZen and navigate to the "Bluetooth Settings" page from its main menu. Confirm that the biosensor shows up in this list and the button to the right of the device is toggled to "Enabled". Note that the BioZen will not try to actually connect with the biosensor until either the "View" or the "New Session" screens are activated from the home screen.

12. Troubleshooting

12.1 How can I tell if my biosensor is connected and sending data to BioZen

First of all confirm that the device is paired to the mobile device you are using (see section 13, Connecting with Bluetooth Biosensors). Once a biosensor is paired and enabled go to the "View" screen (from the home screen), press the "Add measure" button and select a parameter associated with the biosensor in question. You should see data from the biosensor on the graph screen and also in the "Values" text line at the bottom of the screen.

12.2 I can't connect to a specific Bluetooth Device

Bluetooth connectivity is one of the most problematic areas you will encounter. **First and foremost, make sure the biosensor in question has a fully charged battery.**

Confirm that the biosensor shows up in the "Bluetooth Settings" page as accessed from the BioZen main menu. If the biosensor is listed but it says "Not enabled", press the button to the right of the name of the biosensor to enable it. If the biosensor is not listed, follow the instructions in section 13, Connecting with Bluetooth Biosensors to make sure the biosensor is paired to the device.

If all else fails try turning off Bluetooth in the mobile device's Bluetooth Settings page, then turning it back on.

Another fallback is to turn the mobile device off and back on

12.3 I keep getting "sensor disconnected", and sensor connected" messages in the meditation screen

These messages are presented when BioZen loses, and regains Bluetooth connectivity with a biosensor. These messages should include the Bluetooth name of the sensor, which is losing and regaining connection. **First and foremost, make sure the biosensor in question has a fully charged battery.** Biosensors with low batteries may tend to lose Bluetooth connectivity.

Some devices may also have very limited transmitting range (battery life may affect this as well). Situating the sensor closer to the biosensor may help alleviate this issue.

12.4 My Bluetooth sensor is paired but it is not showing up in the "Bluetooth Settings" activity.

Once a Bluetooth sensor is paired (via the devices main device settings/Bluetooth settings page) BioZen may take up to 10 seconds to recognize it. You may need to exit the BioZen Bluetooth Settings activity (via the back arrow) and re-enter it (via the main menu button) for it to show up.

12.5 I can't get the signal strength indicator bars to turn green or show enough bars.

This applies to EEG (specifically the NeuroSky Mindset) biosensor only. First, make sure that the mindset headset is paired and connected and you are receiving data from it.

The signal strength bars in the Meditation Screen can be interpreted as follows:

The bars are Red	The bars showing up as Red means that the electrodes on the headset are not making proper skin contact. Try adjusting the headset and confirming that the electrodes on the ear pieces and forehead connecter have good skin contact. Wiping the electrodes with a little plain saline solution often helps ensure a good connection.
The bars are Green but not enough bars show up	Try adjusting the headset and confirming that the electrodes on the ear pieces and forehead connecter have good skin contact. Wiping the electrodes with a little plain saline solution often helps ensure a good connection.
The bars are Green and all of the bars are showing	This means that the headset is connected and working properly.
The bars are not visible	When a meditation session is in progress the bars will be hidden from view if a good signal is being received. They will only show up if there is a problem with the signal connection.

13. Appendix A – Compatible Biosensor Devices

The following biosensor devices have been confirmed compatible with BioZen:

Name	Manufacturer	Available Parameters
BioHarness BT	Zephyr-Technology	Heart rate, Respiration Rate, Skin Temp
BrainAthlete	BrianAthlete	Same as Mindset MS001
MindBand	NeuroSky	Same as Mindset MS001
Mindset MS001	NeuroSky	(EEG) - Delta,Theta,Low Alpha,High Alpha,Low Beta,High Beta,Low Gamma,Mid Gamma,(e)Attention,(e)Meditation
Shimmer2R	Shimmer-Research	ECG, GSR, EMG

The following biosensor devices are currently user development:
  Emotiv Epoc Model 1.0
  MindMedia's Nexus-10