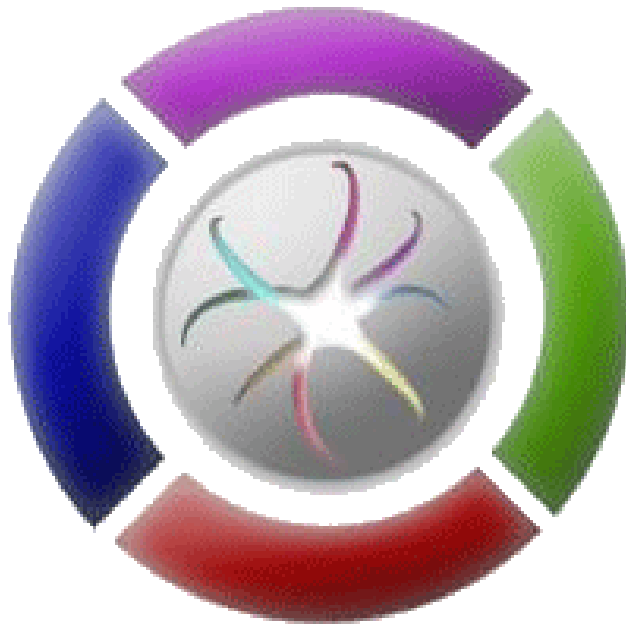
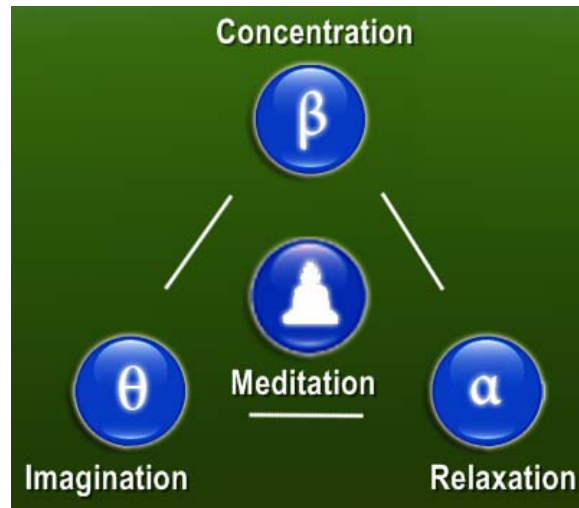


Help and Documentation for the Neuro Feedback Training Software from The Mind Connection



Introduction.

This is the documentation file for The Mind Connection Neuro Feedback Training Software. Neuro Feedback Training is a mental training product that is made for a broad range of users. It allows you to train certain brainwaves that are being produced by your brains. The main training goal is the **Meditation** protocol that allows you to train for a certain ratio of Beta, Alfa and Theta brainwaves. The meditation protocol is sometimes also referred to as the Awakened Mind state. In this state thinking, acting, sensing and being integrate in harmonious ways. Peak experience and peak performance states occur naturally and effortlessly.



The protocols for **Concentration**, **Relaxation** and **Imagination** train for the specific elements of a Meditation. The Concentration protocol is made to train Beta brainwaves. The Relaxation protocol is made to train Alfa brainwaves. The Imagination protocol is made to train Theta brainwaves.

On the following pages all adjustable functions of the user interface will be explained with the corresponding windows of **The Mind Connection Neuro Feedback Training interface**.

You will learn how to connect the headset (NeuroSky MindWave) with the neurofeedback training software. After making some preferences and selecting a specific training protocol, you can start a neurofeedback session by opening the audiovisual feedback window. In this real time 3D window you will see and hear the decors, objects, colors, cameras and sounds animating to the fluctuations in your actual brainwave patterns.

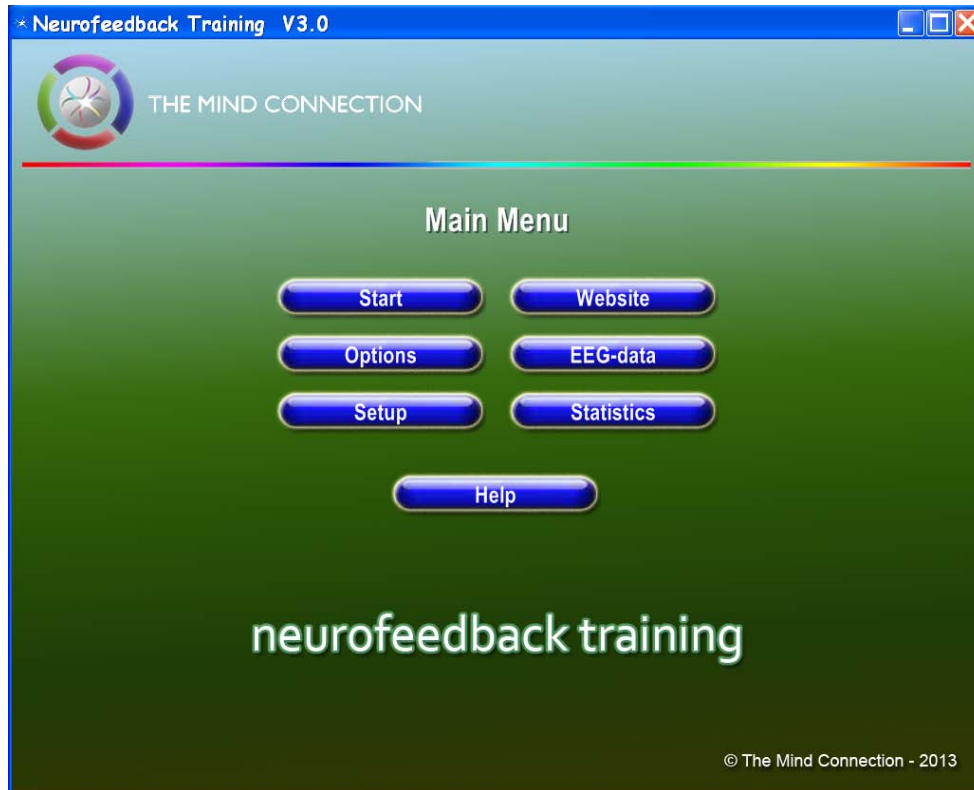
You can record neurofeedback sessions and analyze them after the session with a number of graphical and statistical representations.

The references page lists some external links.

The last pages are devoted to the story behind the brainwaves.

Introduction.....	2
1. Main Menu.....	4
2. Start Training Preferences.	5
2.1 Relaxation Protocol.....	6
2.2 Concentration Protocol.....	6
2.3 Imagination Protocol.....	6
2.4 Meditation Protocol.....	6
3. Warning Sounds and Headset Errors.	7
4. Help.....	7
5. Links.	7
6. Options Menu.	8
7. Setup Menu.....	9
8. Symbols in the Session.....	10
9. Graphic representations of brainwave files.....	11
10. Statistics Window.....	13
11. References.	15
12. The story behind the brainwaves.	16

1. Main Menu.



The **Start** button will guide you to the Startup Preferences. There you can select the desired training protocol and the neurofeedback training session can be started.

The **Options** button will guide you to the options menu. There you can adjust certain options (see the Options Menu explanation).

The **Setup** button will guide to the setup menu. There you can adjust and test the headset or select a different language.

The **Website** button will guide you to The Mind Connection website.

The **EEG-data** button will guide you to a graphical representation of a previously recorded session.

The **Statistics** button will guide you to a statistical representation of a previously recorded session.

The **Help** button will display this Help and Documentation file. It is also accessible thru the other screens of the interface.

2. Start Training Preferences.



This obligatory menu before the actual session starts allows you to **choose the training protocol, adjust the duration time and start the session**. The protocols for **Concentration, Relaxation and Imagination** have only one training option. The **Meditation** protocol has two training options.

Option 1 has one scene, like the other protocols. Option 2 has nine scenes. The design of these scenes update periodically. The duration of a scene depends on the total duration setting of the whole session.

Above you see the **headset signal feedback**. The 'Signal' bar shows the strength of the headset signal. If the bar is filled with color, then the signal is strong. If the system cannot detect the headset, an error message will appear below the signal bar. Verify that the headset is switched on and press the refresh button. If the software is in the Playing file mode it will respond to the selected file (see the Options window). The 'Artifact Filtering' bar to the right of the screen can be used to adjust the **filtering of artifacts** (background noise).

The 'Poor Signal' light indicates when the **signal of the hardware** is 'low'. If the light is bright red, then there is poor signal. If it is dark, then the signal is good. The 'Artifacts' light indicates if there is too much **signal noise** coming from the headset. 'Eye Blink' lights up whenever the **eye is blinked** by the user. These events generate **warning sounds**. They can be set on or off with the switches above them.

2.1 Relaxation Protocol.

For example you can select the **Relaxation** protocol. The color in the signal bar corresponds with the protocol color. In this case it is green. It consists of one scene designed to train relaxation. The relaxation protocol is a combination of Theta brainwaves (25%), Alfa brainwaves (100%) and Beta brainwaves (25%).

2.2 Concentration Protocol.

You can select the **Concentration** protocol. The color of this protocol is red. It consists of one scene designed to train concentration. The concentration protocol is a combination of Theta brainwaves (25%), Alfa brainwaves (50%) and Beta brainwaves (100%).

2.3 Imagination Protocol.

You can select the **Imagination** protocol. The color of this protocol is blue. It consists of one scene designed to train your imagination. The imagination protocol is a combination of Theta brainwaves (100%), Alfa brainwaves (50%) and Beta brainwaves (25%).

2.4 Meditation Protocol.

You can select the **Meditation** protocol. This is the main training protocol. The color of this protocol is yellow. It consists of two applications designed to train meditation. The meditation protocol is a combination of Theta brainwaves (55%), Alfa brainwaves (100%) and Beta brainwaves (35%).

The first application consists of one scene. The second application consists of nine scenes. These scenes will be updated to a number of individual designs. The total duration of the application is set by the Duration slider.

You can choose the options of 'Meditation Training 1' that consists of one scene and 'Meditation Training 2' that consists of nine scenes.

3. Warning Sounds and Headset Errors.



The **sound buttons** in the Start Training Preferences window can be used to turn 'on' or turn 'off' the sounds of the poor signal, artifacts and eye blink signals. If the software cannot detect the headset you will get the **Please switch headset on** message. Switch it on and then use the refresh button above.

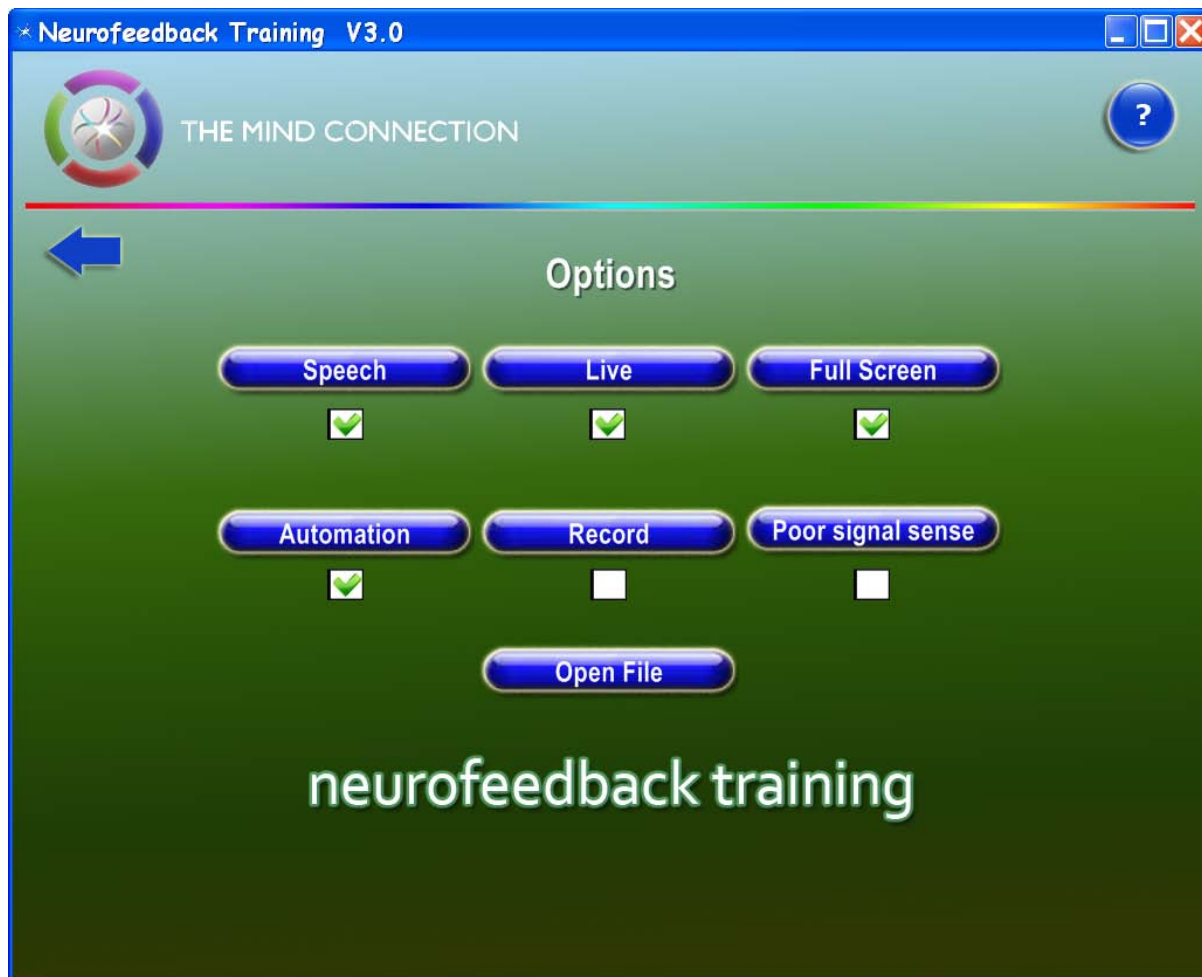
4. Help.

The help button can be used in every window of the interface. It will guide you to the **Help and Documentation** document you are now reading. Read the References page for external help.

5. Links.

You can use the internet to find more information about the headset from **NeuroSky** that is used with our Neuro Feedback Training Software. There are many sites that have information on biofeedback, brainwaves and EEG registration. Some of them are discussed in chapter 11 on the story behind the brainwaves. Here is the website of **The Mind Connection**.

6. Options Menu.

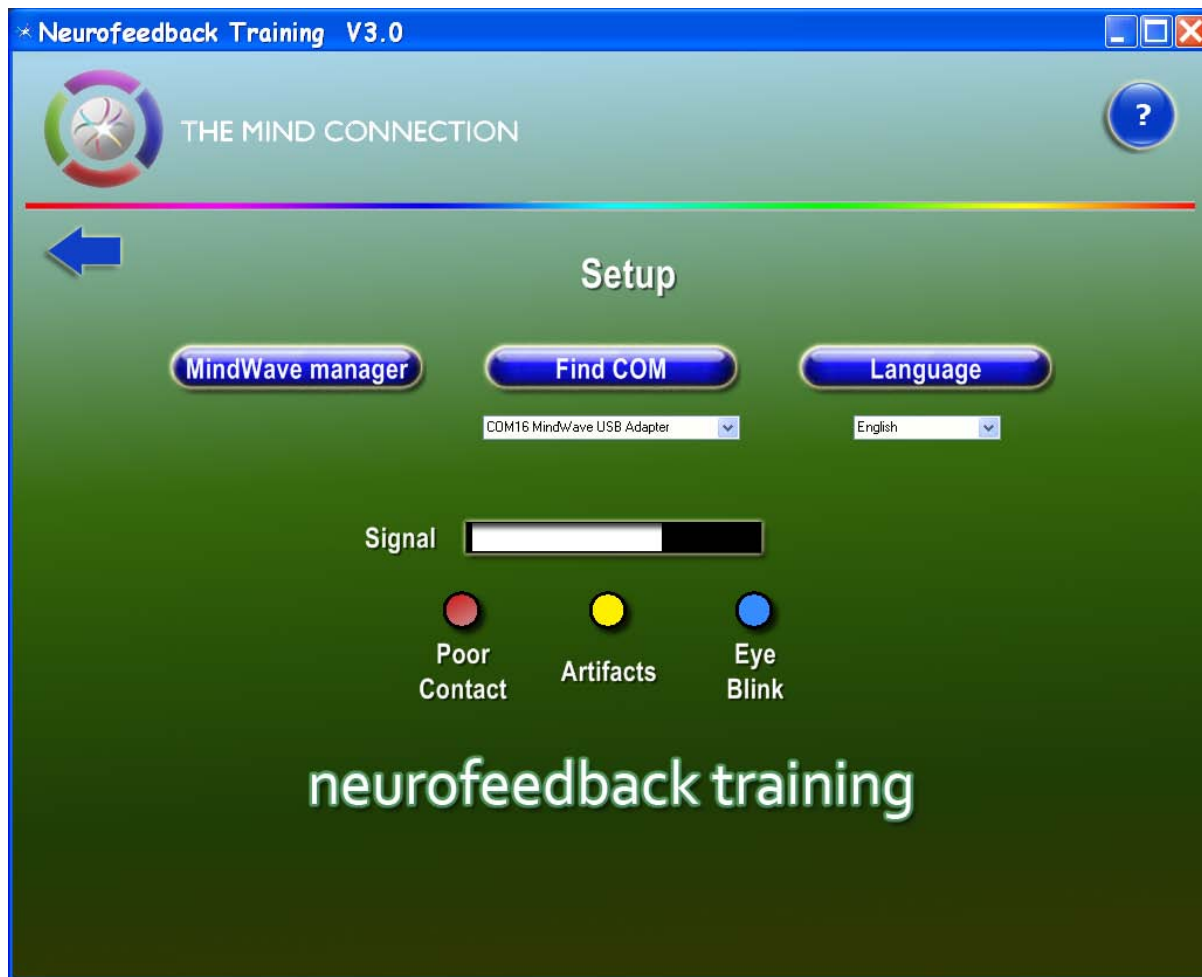


In the 'Options' menu you can select or deselect the **Speech** button what will enable or disable the speech during the session. With the **Live** button you can activate or deactivate the signal of the headset. If the 'Live' option is not used, the standard EEG-data file will be loaded and used during the session. You can set the 3D feedback window to **Full Screen** instead of in a window.

The **Automation** button allows you to control the automation level of the graphics and sound feedback in relation to the signal input. The **Record** button allows you to record the EEG-data during the session. If you have problems with the headset contact you can select the **Poor contact sense** button. The software will then accept worse sensor contact.

The **Open File** button allows you to load an EEG-data file. This file will be used during the session if the 'Live' option is not switched on. The graph of the loaded EEG-data file can be viewed in the 'Main Menu' by pressing the 'EEG-data' button.

7. Setup Menu.



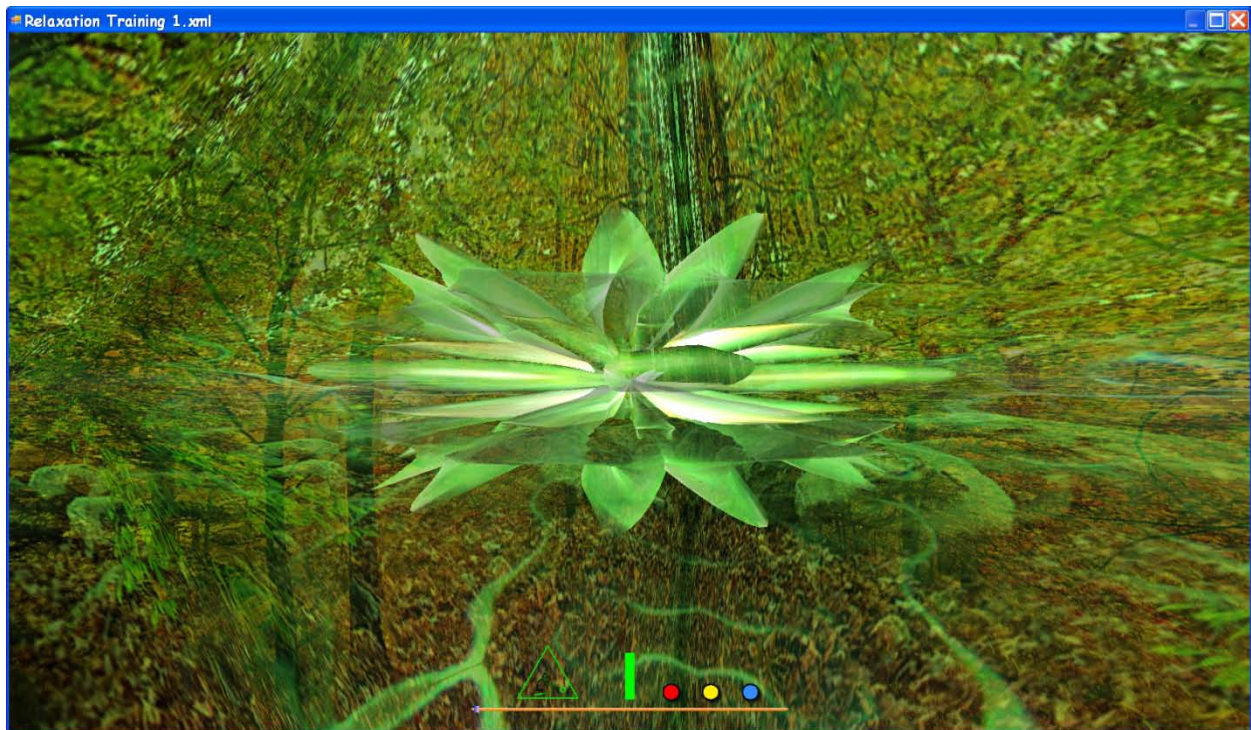
In the **Setup** window you can see the **Find COM** button that is responsible for the connection to the headset. Below it you see a popup window with the text **COM16 MindWave USB Adapter**. The number 16 can be different. It depends on the actual com port number that you are using. If the text is different from the above and there is no similar option available from the popup window, it can be that the USB dongle is not connected or the headset is not properly installed. You can use the **MindWave manager** from NeuroSky to manually select or deselect a specific headset.

You can select a different **Language** for the user interface and the voice instructions.


Below you see the **headset signal feedback**. The Signal bar shows the strength of the headset signal. If the bar is filled with color, then the signal is strong. The **Poor Signal** led indicates when the signal of the headset is low. If the led light is bright red, then there is a poor signal. If it is light red or black, then the signal is good.


The **Artifacts** led indicates that there is too much noise coming from the headset. If it is bright yellow there is a lot of noise. If it is light yellow the noise is moderate. If it is black there is fairly no noise and the signal is good. The blue **Eye Blink** led lights up whenever the eyes are blinked by the user.


8. Symbols in the Session.





During the session you can see symbols at the bottom of the screen.
Press the spacebar to hide and show these symbols.

The animated line in the triangle  mirrors the shifts in your attention. The dot in the triangle indicates the desired state to navigate to with your attention. The top of the triangle represents the beta waves. To the bottom right you see the alpha waves. To the bottom left you see the theta waves. The animated line plots the path that your attention moves on trough time.

The colored bar  shows the signal strength of the chosen protocol.

The red dot  lights up when there is poor signal from the hardware.

The yellow dot  lights up when there is too much background noise.

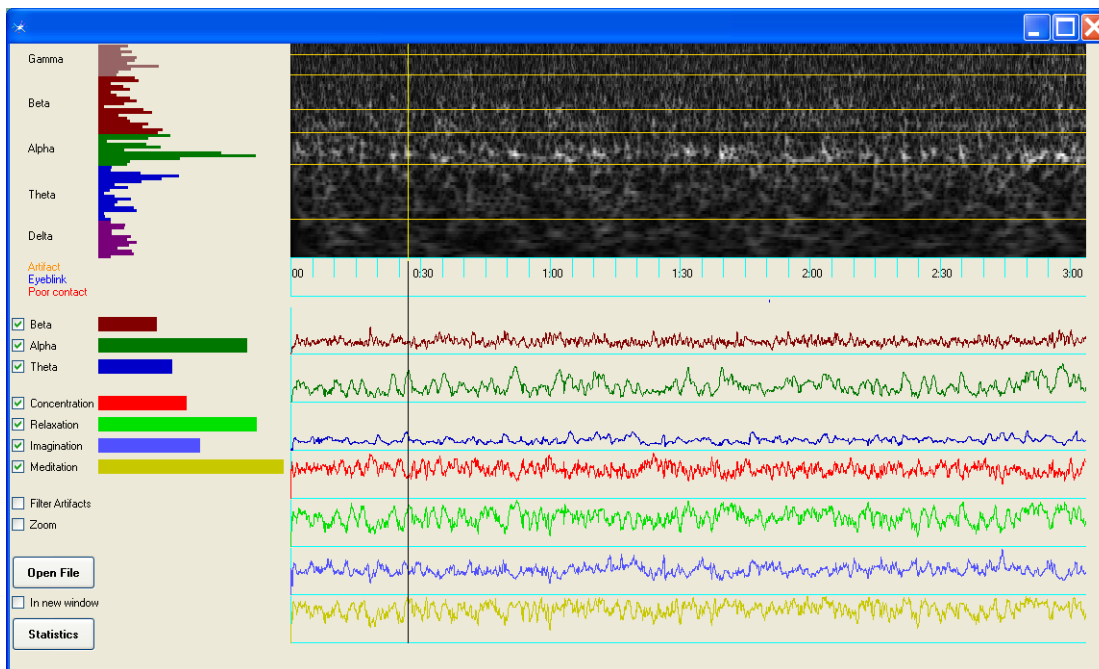
The blue dot  lights up when the user blinks with his eyes.

The orange bar indicates how much time is passed and how much time there is left till the session ends.

Use the plus and the minus keys to alter the level of the voice instructions.

Press Escape or  to close the session.

9. Graphic representations of brainwave files.



A recorded EEG-data file can be represented in many ways.

If you open the EEG-data window it displays the brainwaves of the last loaded or recorded file.

The left side of the screen reflects the actual brainwave signals at any given moment.

The right side of the screen reflects the fluctuations of the brainwaves in time.

At the top left you see the different brainwave areas represented by a number of colored bars.

The levels of the different bars reflect the dominance of a specific frequency in the brainwave spectrum.

To the right you see white dots and stripes that represent the strongest brainwaves in the spectrum.

Click or drag the mouse in the wave area to move the cursor to a specific location in the brainwave file.

On the left side of the screen you will see all displays update to the selected location in the file.

If the **Zoom** check box is switched **off** you see a presentation of the whole file. If the **Zoom** check box is switched **on** you can see only part of the brainwave file. Depending on the size of the window it will be about 45 seconds. If the file is longer you can use the scrollbar below to see the rest of the file.

If zoom is on every horizontal pixel shows 40 millisecond = 1/25 sec of the file (10 sec = 250 pixels).

Below the white dots and stripes area the three artifact signals are displayed.

If artifact are detected you will see disturbances in the brainwave signals occur.

If the **Filter Artifacts** check box is switched **on** the worst artifacts will be blanked out.

On the middle left of the screen the activity of the 3 **brainwave bands** is displayed.

Beneath them you see the 4 different **protocol signals** that are derived from the 3 brainwave bands.

With the check boxes to the left of the signals you can select which waves are being displayed.

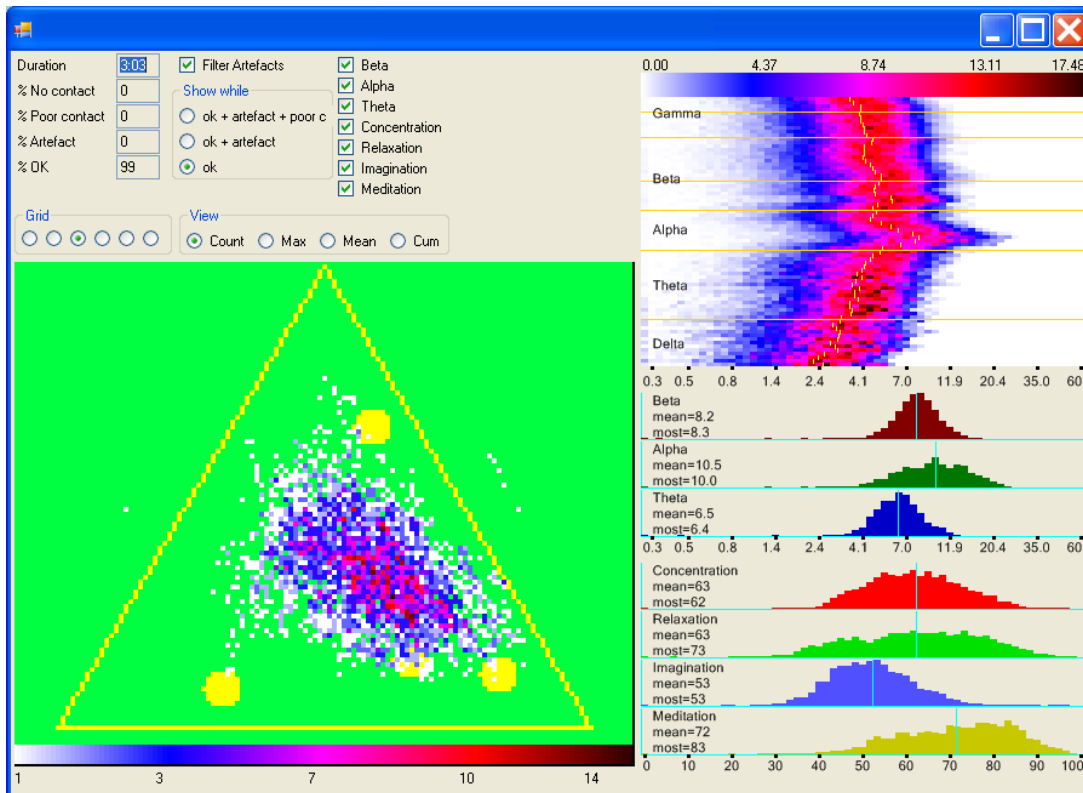
Use the **Open File** button to load a previously recorded session.
The **In a new window** check box opens more files in different windows.

Clicking on the **Statistics** button opens the statistics window. This window will be discussed in chapter 10. Normally it will display the statistics of the whole brainwave file. Additionally you can select a part of the brainwave file to see the statistics of that specific part.

Click and drag the cursor over the time line just below the white dots and stripes area. An **orange bar** will appear which highlights the chosen time frame. If you then click the statistics button, only the chosen time frame will be analyzed and displayed.

You can open several statistics windows with different time frames by selecting them in the EEG-data window and then repeatedly clicking on the statistics button.

10. Statistics Window.



The Statistics window displays the analyzed results of a recorded EEG session.

The top left part of the window shows some global information about the selected file.

Duration shows the length of the selected time frame. The % numbers reflect percentages of the time that there was **no contact**, **poor contact** or **artifacts** if any. The % **OK** number is an indication of the global quality of the recorded file. If the **Filter Artifacts** check box is on, artifacts are set to zero in the right display (see also at the EEG-data window). With the **Show While** options, artifact and poor contact values can be omitted. The displays of the brainwave bands and the protocols on the right side of the window can be switched on or off with their related check boxes.

In the green area with the yellow triangle the file is represented as a field of colored dots. Each position of a dot in the triangle is a reflection of a state of mind, with a specific relation between the levels of the theta, alpha and beta bands.

The **corners** of the triangle represent the following values: Left = high theta, no alpha and no beta – Right = high alpha, no theta and no beta – Top = high beta, no theta and no alpha.

The centers of the **sides** of the triangle represent the following values: Left = theta and beta are equal, no alpha – Right = alpha and beta are equal, no theta – Bottom = theta and alpha are equal, no beta.

The **four big yellow dots** represent the optimal relation of the levels of theta, alpha and beta bands of the four training protocols: **Imagination** = the bottom left dot - **Relaxation** = the bottom right dot - **Concentration** = the dot at the top - **Meditation** = the most central yellow dot. These four points

represent the optimal states of mind for your attention training, based on the selected protocol. The **colored bar** at the bottom of the window is used to indicate the intensity of the dots. White dots have a low intensity. Black dots have a high intensity. Dots at the edges of the triangle are artifacts.

The **Grid** and **View** options control the **Triangle** display. Artifacts are displayed outside the triangle. With the **Grid** function you can choose in how many parts the triangle is divided. If the grid is set to coarse then each point represents a greater ratio between the levels. If the grid is set to fine, each ratio between the levels occurred just once or occasionally. The best setting depends on the size of the window, the duration of the session, the number of artifacts and the dispersion of the dots.

With the **View** function you choose what the colors of the points represent. You can select a Counted, Maximum, Mean or Cumulative display. **Count** shows the number of times this ratio occurred. **Max** shows the maximum level of the signal of the number of times that this ratio occurred. **Mean** shows the average level of the signal of the number of times that this ratio occurred. **Cum** shows the number of times that this ratio occurred, accumulated and displayed in dB (decibels). It is the most relevant display.

The **right side of the screen** shows the details of the brainwave bands and the protocols for the selected time frame. On top you see a diagram of the brainwave bands related to their signal strengths. The **colored bar** and the numbers above indicate the duration of what a certain color represents. From white being the least occurring values, to black being the most occurring values. The **yellow line** in the middle represents the average values for the selected time frame. On the **vertical ax** you see the frequencies of Delta (2 hertz) to Gamma 2 (49 hertz) divided in to 74 bands (each horizontal line is one band). On the **horizontal ax** you see the signal strengths from 0 to 60 in a logarithmic scale (divided in to 61 buckets from 0, 0.3, 0.5, up to ≥ 60). The **colored lines** indicate how long (how often) a certain value occurred.

The **horizontal plane** of the **Beta, Alpha and Theta graphs** shows the signal strengths from 0 to 60 in a logarithmic scale. The **vertical plane** shows how long (how often) a certain value occurred. The **blue lines** indicate the **mean** values. **Most** indicates the values that most appeared in the selected time frame.

The **horizontal plane** of the **Concentration, Relaxation, Imagination and Meditation graphs** shows the signal strength from 0 to 100 %. The **vertical plane** shows how long (how often) a certain value occurred. The **blue lines** indicate the **mean** values. **Most** indicates the value that most appeared in the selected time frame.

11. References.

Here is the website of [The Mind Connection](#).

You can use the internet to find more information about the headset from [NeuroSky](#) that is used with the Neuro Feedback Training Software from The Mind Connection. Here are some links for solving problems with their MindWave headset.

How to properly wear the MindWave.

<http://support.neurosky.com/kb/mindwave/how-to-properly-wear-the-mindwave>

The application does not show brainwaves even though it looks connected?

<http://support.neurosky.com/kb/mindwave/the-application-does-not-show-brainwaves-even-though-it-looks-connected>

Using the wrong driver:

<http://support.neurosky.com/kb/mindwave/thinkgear-connector-is-disconnecting-often>

Loss of the driver CD. The software for the MindWave should be available from the MindWave Support page: <http://developer.neurosky.com/docs/doku.php?id=mindwave>

More information on brainwaves, neurofeedback training and therapy, creativity, healing and meditation is available through the [website](#) and [videos](#) of **Anna Wise**. Her books about **Awakening the Mind** and **THE HIGH PERFORMANCE MIND: Mastering Brainwaves for Insight, Healing, and Creativity** are very useful for beginners and professionals alike in the neurofeedback area. She used the Mind Mirror hardware and software which uses a slightly different set of brainwave bands:

<http://annawise.com/brainwaves-the-work-13>.

12. The story behind the brainwaves.

Five brainwave areas.

During a neurofeedback session you will experience the changes in your brainwave patterns as changes in the musical and graphical animations. Our brain continuously produces a large number of brainwaves with different wavelengths (frequencies) and intensity (amplitudes or else just referred to as 'volume'). The sum of all the simultaneously changing brainwave patterns results in a brainwave symphony. Brainwaves are small, electrical vibrations with increasing frequencies (hertz or vibrations per second). An electroencephalogram (EEG) registers this collection of tiny vibrations through sensors on the outside of the skull. The Mind Wave headset samples through a measuring point on the forehead and an ear clip.

In the brainwave spectrum we can distinguish between five areas. Delta waves have the slowest frequencies (1-3 hertz). Then the slightly quicker Theta waves (3.5-7 hertz) follow then the Alpha waves (7.5-12.5 hertz), the Beta waves (13-30 hertz) and the Gamma waves (32-48 hertz).

Gamma waves.

Gamma waves are active in Motor Functions and higher mental activity. Gamma activity is associated with sensory processing, mainly in the visual cortex. In the current protocols the Gamma waves are not controlling the sound and graphics feedback in any way.

Beta waves.

Beta waves symbolize normal awareness during the day. In this condition you are attentive and alert and your attention is focused on the world around you. Quick and logical processes and actions are taking place. In these processes arguments are collected, problems are solved and considerations and decisions are made. However, with dominant Beta waves someone can also be very tense and nervous or excessively concerned (an indication of stress). In this case memory works less than optimally and concentration problems can arise.

Alpha waves.

Alpha waves usually appear during relaxation when you are feeling calm and balanced. The world around you loses its importance and you can easily drift away into your daydreams. In the relaxed Alpha atmosphere your ability to receive information increases whilst memory access also improves. Dominant Alpha waves normally do not go together with fear and aggression. You do not get easily tensed up. Mostly the Alpha waves increase when you close your eyes or focus on your inner world. Alpha waves function as a bridge between the conscious and subconscious. Without this bridge you do not have access to your inner world and you cannot remember the dreams, visions and experiences you have during mental training or a moment of deep relaxation.

Theta waves.

Theta waves increase when your attention is entirely focused on your inner world. We experience the Theta atmosphere for example when we sleep or dream. Theta waves are involved with the processing, storing and remembering of experiences. Furthermore they play an important role with peak experiences and creative inspiration. Mostly you are not aware of these inner processes.

Delta waves.

Delta waves are mainly generated during dreamless sleep. The deeper you sleep, the slower they are. In a Delta atmosphere we are usually not aware of our situation and environment. In the current protocols the Delta waves are not controlling the sound and graphics feedback in any way.

Please note: When measuring lots of Delta waves during a neurofeedback session it is not immediately an indication that you have been fallen asleep. Fluttering of your eyelids (and in some cases also muscle movements) generate electric disturbances (artifacts) with approximately the same frequency as the slow Delta waves, but many times stronger. These disturbances particularly distort the registration of Delta waves.

Mental balance.

The left and right halves of your brain produce brainwaves independently from each other. In general your left half is more involved with logical and rational thinking, whereas your right half is more involved with creativity and imagination.

The ideal is a condition where both your brain halves are optimally co-operating. This co-operation results in a brainwave pattern where the signals from both brain halves are in balance. The MindWave headset has only one EEG channel. With multi channel EEG hardware the option of training the balance of both hemispheres opens up.

The focus of the attention.

In practice it appears that we continuously think about something when we are awake. At one moment your attention can be focused on the world around you, whereas, just a bit later, it can be completely focused on your inner world of experiences. The challenge of many neurofeedback games is to focus your attention away from the busy world around you towards your inner world, for a while.

Interpretation of brainwaves.

For the interpretation of brainwave patterns we can make a comparison to a concert. During a concert, the frequencies of the different instruments constantly change. We perceive this as a change in the pitch of the instruments. The volume and the timbre of these instruments are variable as well. During a concert you may be alternating between listening to an ensemble of instruments and listening to the sounds of the individual instruments. The same goes for the silent symphony of our brainwaves: you can focus on the complete brainwave pattern or on the activities of the individual brainwave areas.

Dimensionality of brainwaves.

The brainwave pattern remains relatively constant when we succeed in focusing our attention on the same level of perception for a longer period. Furthermore it can also change from one moment to another if the focus of our attention changes. You can test this by comparing neurofeedback with your eyes open (attention is usually focused more on the world around you) with neurofeedback with your eyes closed (attention is focused on your inner experiences). In an optimal situation, all the brainwave patterns and their related experiences are freely accessible to our attention and we are able to hold onto the experiences whenever we want to (dimensionality factor of brainwaves).

Please note: The extent to which the small electrical vibrations penetrate to the outside of our skull, varies from user to user. Furthermore, each single human being generates a unique, personal brainwave pattern. Due to this the results of the registrations can only be conceptually compared with the results of other users. But of course you are able to compare the results of your own neurofeedback session to your earlier sessions. This way you are able to keep up with your development and attainments in the field of brainwave training.

The High Performance Mind.

More information on brainwaves, neurofeedback training and therapy, creativity, healing and meditation is available through the [website](#) and [videos](#) of Anna Wise.

Original MindWave Signals.

Below you find a table of the brainwave frequencies and their corresponding mental states published by NeuroSky. These are the original signals, as measured by the MindWave headset. They are updated once every second and not in real time.

Brainwave Type Frequency range Mental states and conditions

Delta – 0.1Hz to 3Hz – Deep, dreamless sleep, non-REM sleep, unconscious

Theta – 4Hz to 7Hz – Intuitive, creative, recall, fantasy, imaginary, dream

Alpha – 8Hz to 12Hz – Relaxed, but not drowsy, tranquil, conscious

Low Beta – 12Hz to 15Hz – Formerly SMR, relaxed yet focused, integrated

Midrange Beta – 16Hz to 20Hz – Thinking, aware of self & surroundings

High Beta – 21Hz to 30Hz – Alertness, agitation

Gamma – 30Hz to 100Hz – Motor Functions, higher mental activity