

Z-Score Quick Guide

This document describes how to prepare, configure and review a Z-Score measurement in BioTrace+.

For more information about NeXus, our BioTrace+ software, please visit our website or contact us.

www.mindmedia.com

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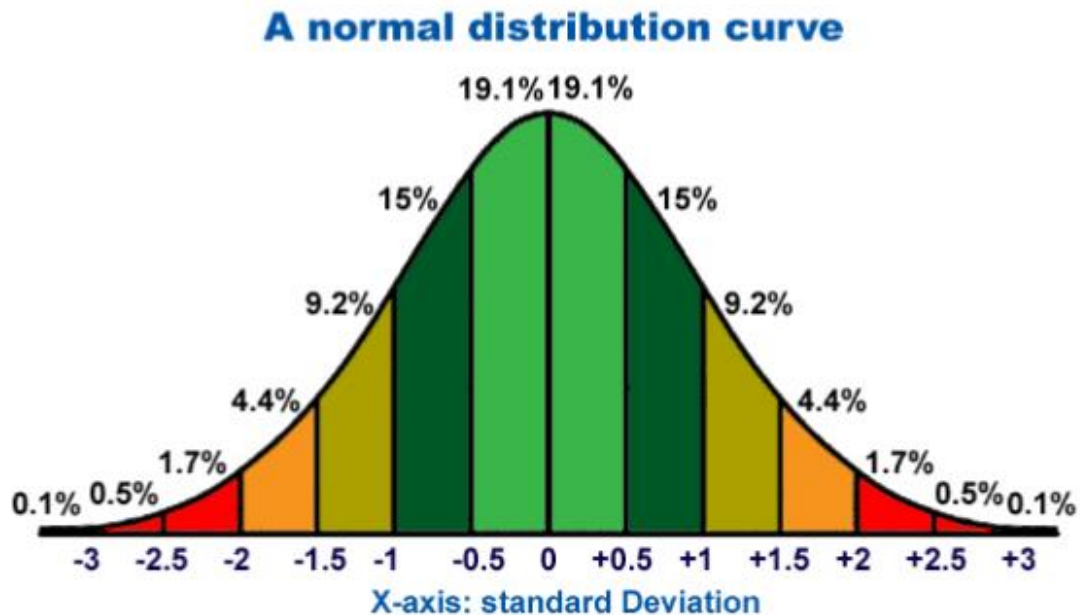
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Introducing Z-Score

In statistics, a **Z-Score** (sometimes called a **standard score**) indicates how many standard deviations a data value is above or below the 'mean' (assuming a Normal or 'Z' distribution).



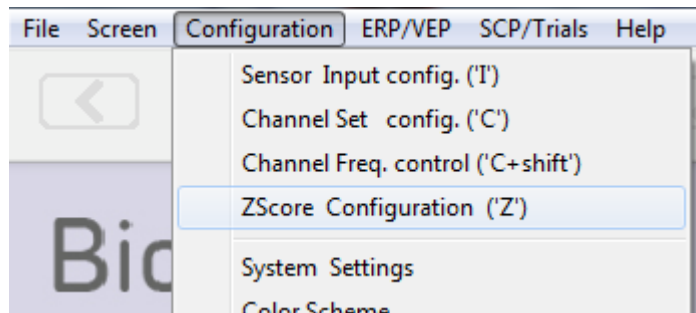
To determine Z-Score one needs to compare to a qEEG database. In BioTrace+ Z-Score training is based on Neuroguide by Applied Neuroscience, Inc. EEG data can be exported in many different formats to different (qEEG) programs.

qEEG databases in Neurofeedback typically are 19-21 channel databases according to the 10-20 system. A Z-Score indicates how EEG values from the different positions deviate from the "norm" with people of the same age and with their eyes open or eyes closed.

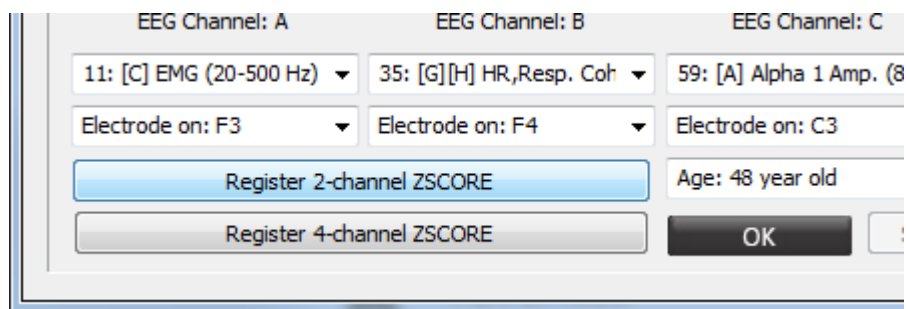
Z-Score within BioTrace+ is primarily designed as a **training tool**, giving a real time indication of deviations. Nevertheless there is the option to use it as an assessment **tool** with certain limitations. BioTrace+ offers 2 and 4 channel Z-Score training. 19 channel Z-Score training can be done by combining Neuroguide 19 channel Z-Score with the NeXus-32.

Registering Z-Score

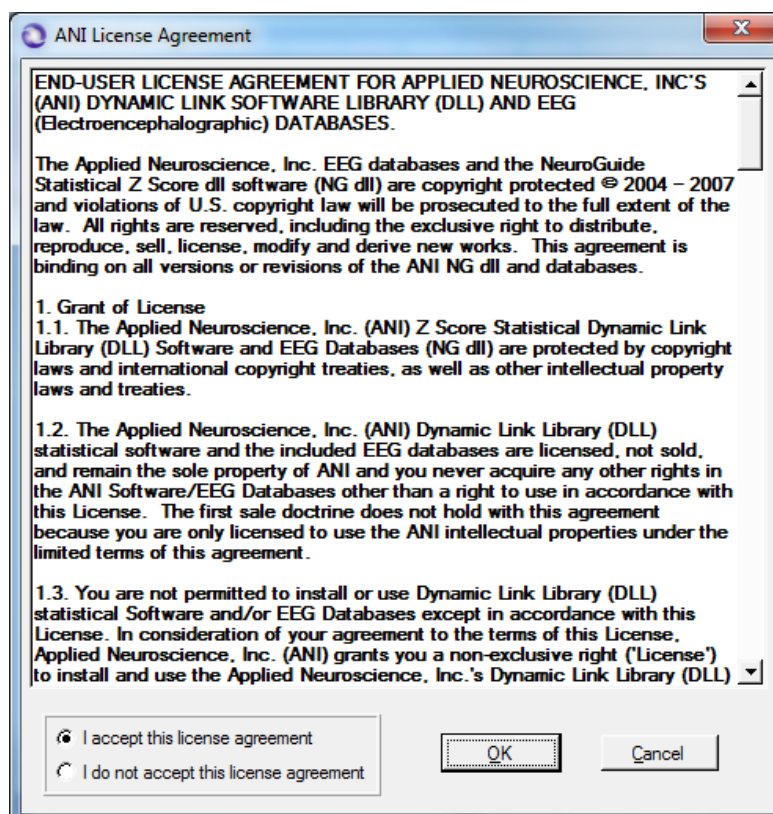
1. Select '**Z-Score Configuration**' under 'Configuration' in the top menu or press the **Z** key.



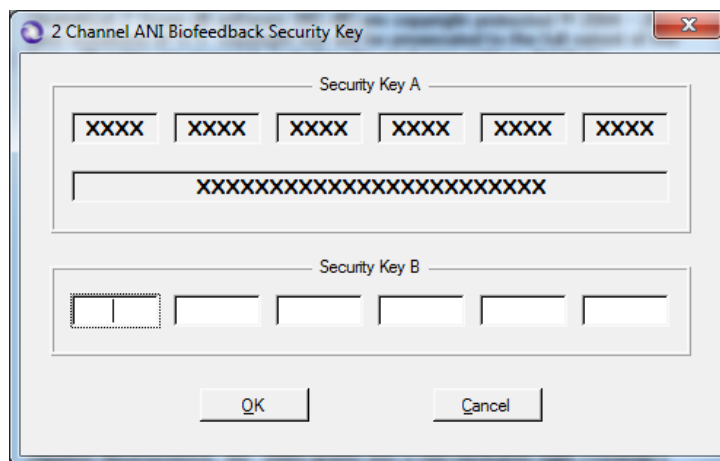
2. Choose to **register 2- or 4-channel Z-Score**.



3. Read and **accept** the license agreement.



4. Copy and **send** Security Key A including name and e-mail address to the supplier with the following subject line: "Request for Z-Score Security Key B".

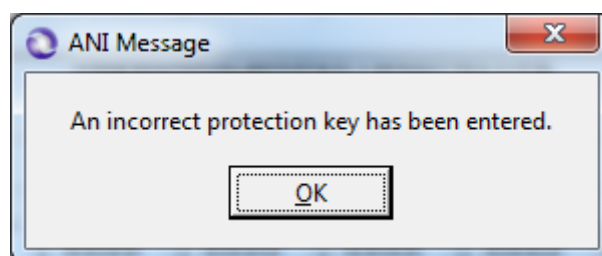


- Security Key B will be sent to you as soon as possible, usually within 2 to 3 days.
5. After receiving Security Key B, enter it and click **OK** to register Z-Score.

The window **will now close** and Z-Score is registered on your computer.

*To double check the registration, open a Z-Score screen and **replay** a session. Signals in the Z-Score objects indicate that Z-Score has been successfully registered.*

*Check and re-enter the Security Key B when the following **error** message appears.*



If re-entering the Security Key B does not work, contact your supplier for support.

Preparing and configuring Z-Score feedback

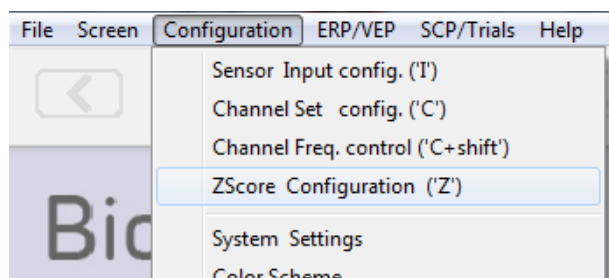
1. Choose a **Z-Score screen**

2. Connect the **sensors and electrodes** according to *How to connect*



Make sure to use a link ear reference, since the values are compared to the Neuroguide database with linked ear referenced values.

3. Select '**Z-Score Configuration**' under 'Configuration' in the top menu or press the **Z** key.



4. Select the **electrode** positions for each channel (A, B, C, D), the **age** and whether the **eyes** are open or closed. Click **OK**.

Z-Score Configuration and Channel selection

Select ZSCORE channels below

1: ZAP A:Delta	1-4 Hz	ZScore Absolute power	Channel: A
2: ZAP A:Theta	4-8 Hz	ZScore Absolute power	Channel: A
3: ZAP A:Alpha	8-12 Hz	ZScore Absolute power	Channel: A
4: ZAP A:Beta	12-25 Hz	ZScore Absolute power	Channel: A
5: ZAP A:HiBeta	25-30 Hz	ZScore Absolute power	Channel: A
6: ZAP A:Beta1	12-15 Hz	ZScore Absolute power	Channel: A
7: ZAP A:Beta2	15-18 Hz	ZScore Absolute power	Channel: A
8: ZAP A:Beta3	18-25 Hz	ZScore Absolute power	Channel: A
9: ZAP B:Delta	1-4 Hz	ZScore Absolute power	Channel: B
10: ZAP B:Theta	4-8 Hz	ZScore Absolute power	Channel: B
11: ZAP B:Alpha	8-12 Hz	ZScore Absolute power	Channel: B
12: ZAP B:Beta	12-25 Hz	ZScore Absolute power	Channel: B
13: ZAP B:HiBeta	25-30 Hz	ZScore Absolute power	Channel: B
14: ZAP B:Beta1	12-15 Hz	ZScore Absolute power	Channel: B
15: ZAP B:Beta2	15-18 Hz	ZScore Absolute power	Channel: B
16: ZAP B:Beta3	18-25 Hz	ZScore Absolute power	Channel: B
17: ZRP A:Delta	1-4 Hz	ZScore Relative power	Channel: A
18: ZRP A:Theta	4-8 Hz	ZScore Relative power	Channel: A
19: ZRP A:Alpha	8-12 Hz	ZScore Relative power	Channel: A
20: ZRP A:Beta	12-25 Hz	ZScore Relative power	Channel: A
21: ZRP A:HiBeta	25-30 Hz	ZScore Relative power	Channel: A

EEG Channel: A EEG Channel: B EEG Channel: C EEG Channel: D

11: [A] EEG (1-45 Hz) 35: [B] EEG (1-45 Hz) 59: [C] EEG (1-45 Hz) 83: [D] EEG (1-45 Hz)

Electrode on: F3 Electrode on: F4 Electrode on: C3 Electrode on: C4

Register 2-channel ZSCORE Age: 48 year old Status: EYES OPEN

Register 4-channel ZSCORE OK Show Video Cancel

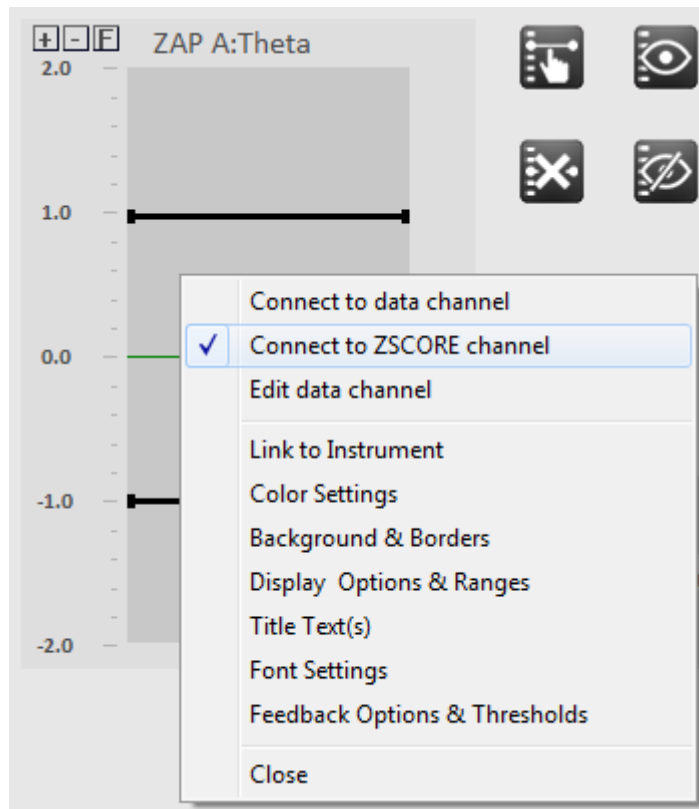
5. Start the **recording**.

Customizing Z-Score training parameters

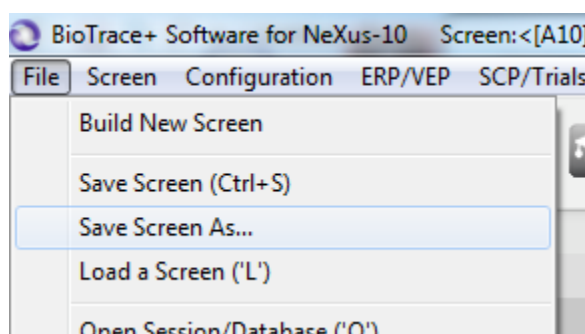
There are many different parameters that one can train on. Press the Z key for an overview.

In order to train different Z-Score parameters, take the following steps.

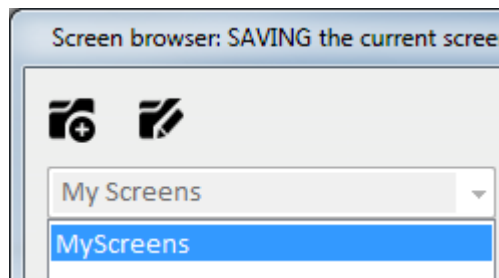
1. Open an existing **Z-Score screen**, for example '1 Channel Theta'.
2. Right click the **bar graph** that displays 'ZAP A:Theta'.
3. Select '**Connect to ZSCORE channel**'.



4. Select a **channel** from the list, for example '4: ZAP A:Beta'.
5. Change the other **settings** if applicable and click **OK**.
6. Select '**Save Screen As...**' under 'File' in the top menu to save the screen.



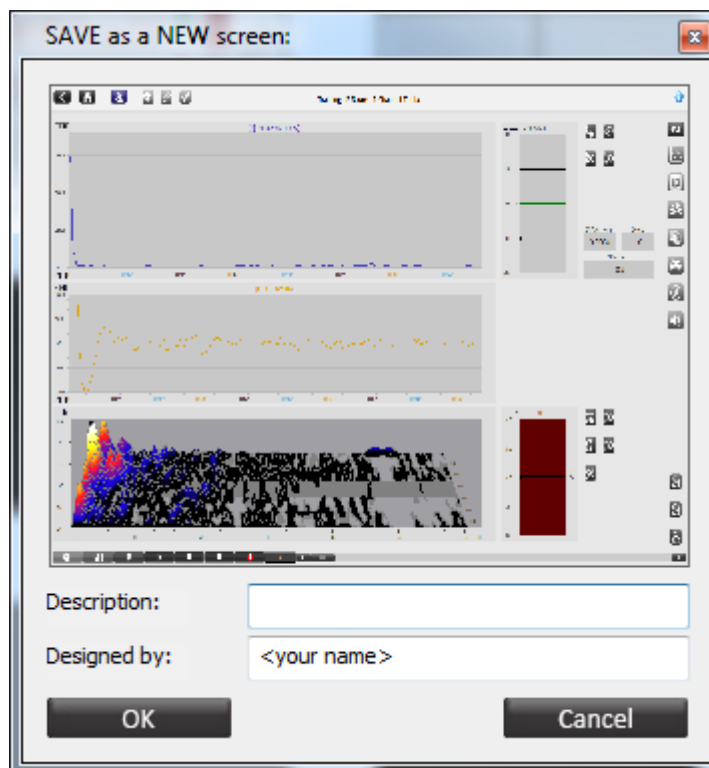
7. Select an existing or create a new **category**.



8. Click the 'Save this Screen' button.



9. Enter a **description** for the screen and your name and click **OK**.

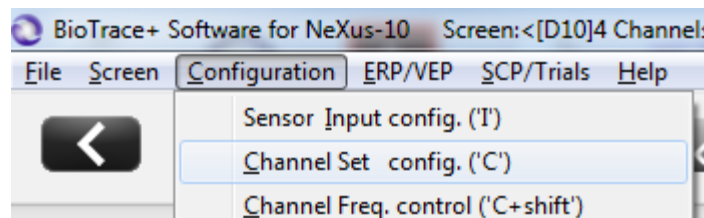


Please note that not all parameters use bar graphs with two threshold. Absolute (ABS) parameters only show positive values, therefore bar graphs with only one threshold are used (e.g. 2 or 4 channel ZAP training).

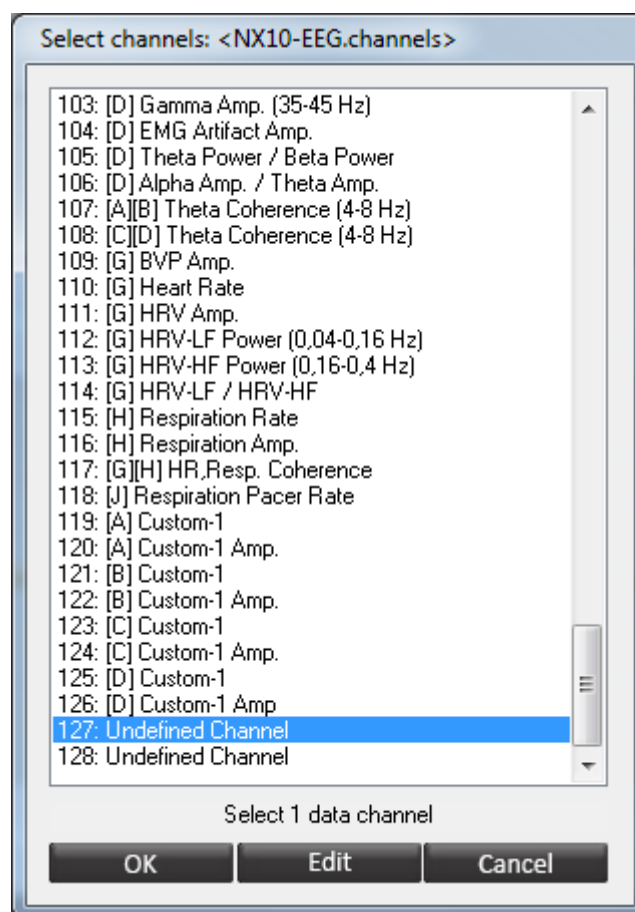
Reviewing Z-Score

Create Z-Score logging channels in the channel set to display channels in the Session Overview Screen to analyze Z-Score.

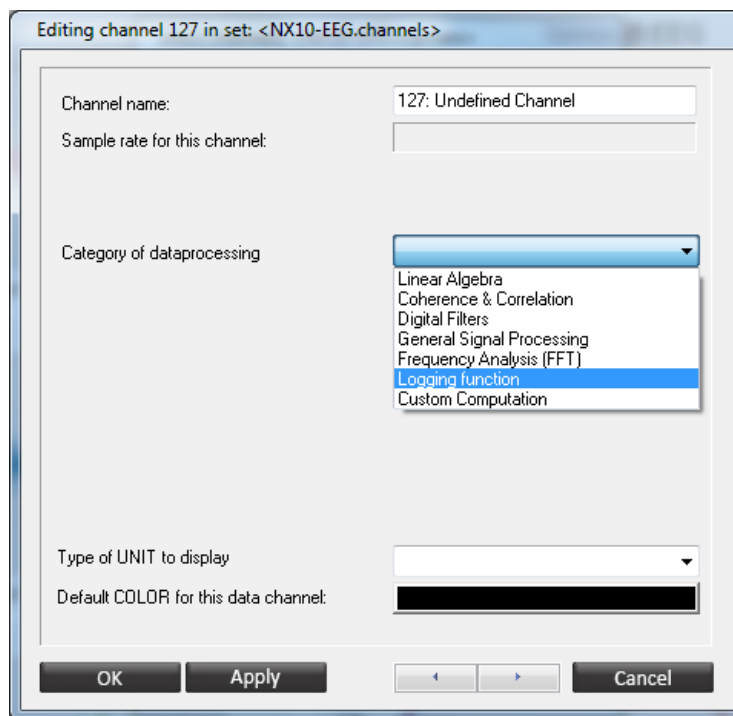
1. Navigate to a **Z-Score** screen.
2. Select '**Channel Set config.**' under 'Configuration' in the top menu or press the **C** key.



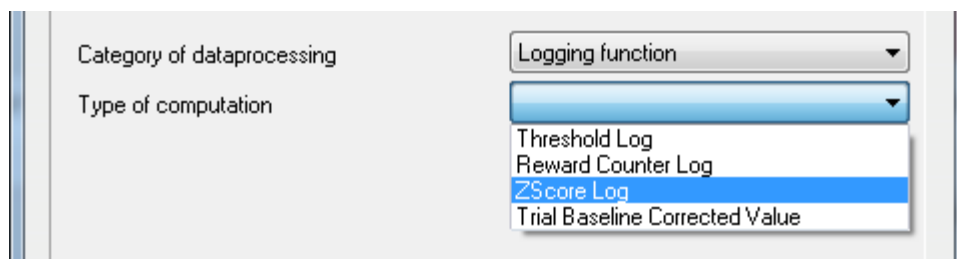
3. Select **undefined channel 127** after scrolling down.



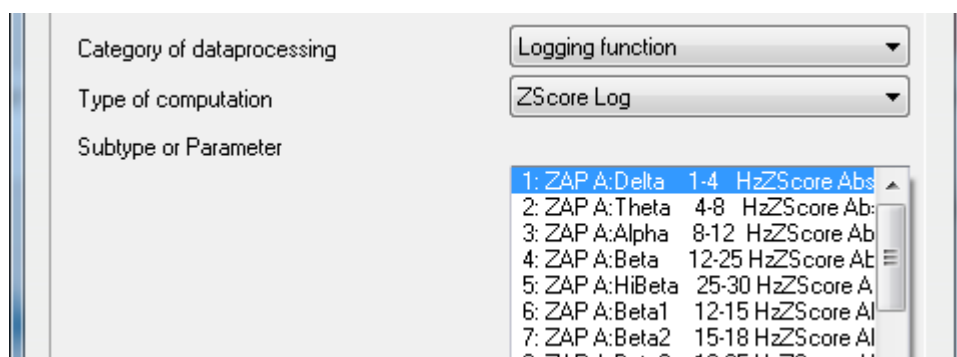
4. Click **Edit**.
5. Select '**Logging function**' for 'Category of dataprocessing'.



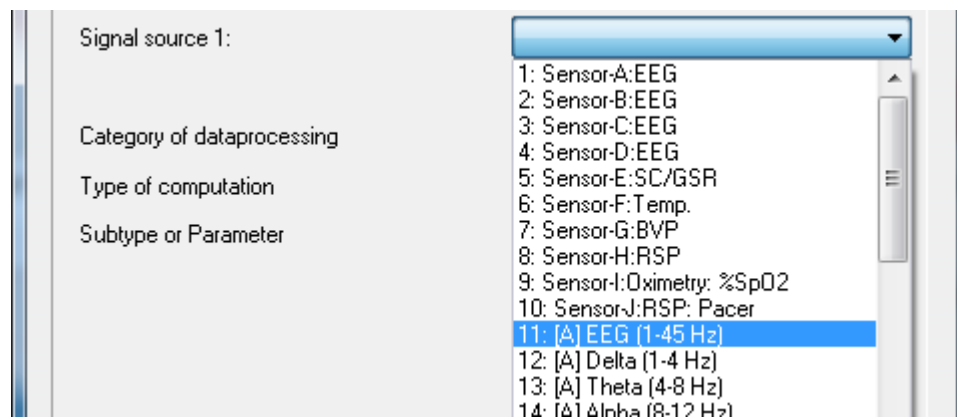
6. Select '**ZScore Log**' for 'Type of computation'.



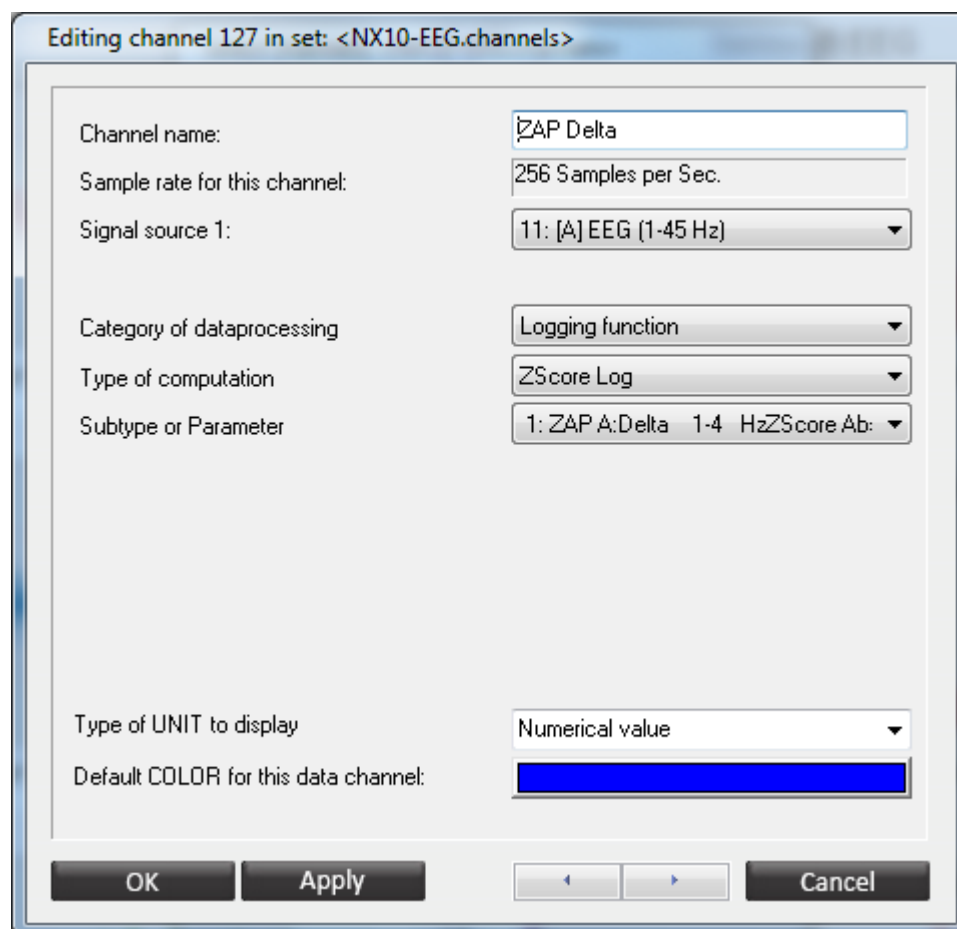
7. Select a **Z-Score channel**, for example '1: ZAP A:Delta 1-4 Hz ZScore Absolute Value'.



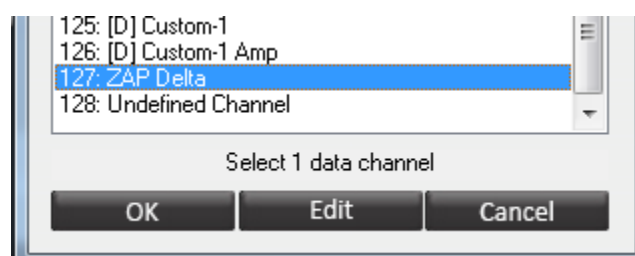
8. Select '**Signal source 1**' which should be EEG, for example '11: [A] EEG (1-45 Hz)'.



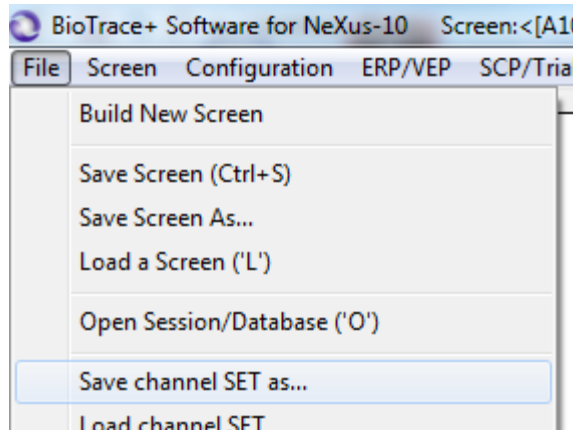
9. Enter a name for '**Channel name**' and optionally change the **color**.



10. Click **Apply**, **OK** and **OK**.



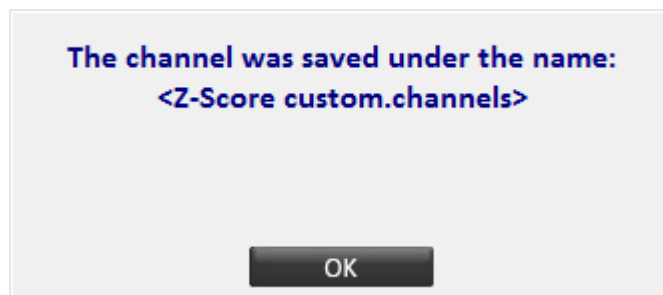
11. Select '**Save channel SET as...**' under 'File' in the top menu.



12. Save it as the current **(edited) channel set** or create a **new channel set**.

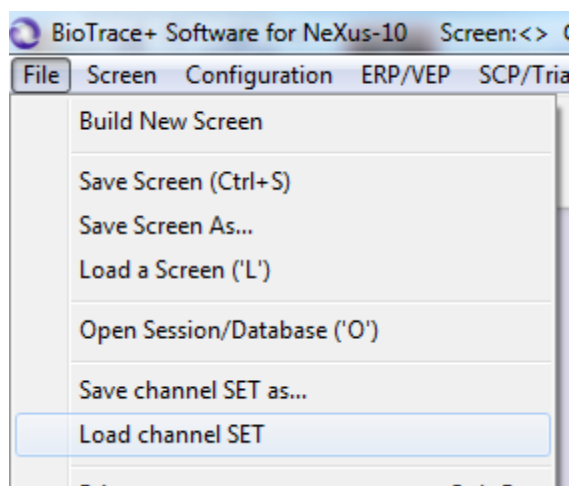
Please note: future updates might overwrite standard channel sets. To prevent this, save as a new channel set or make sure to back-up your channel sets.

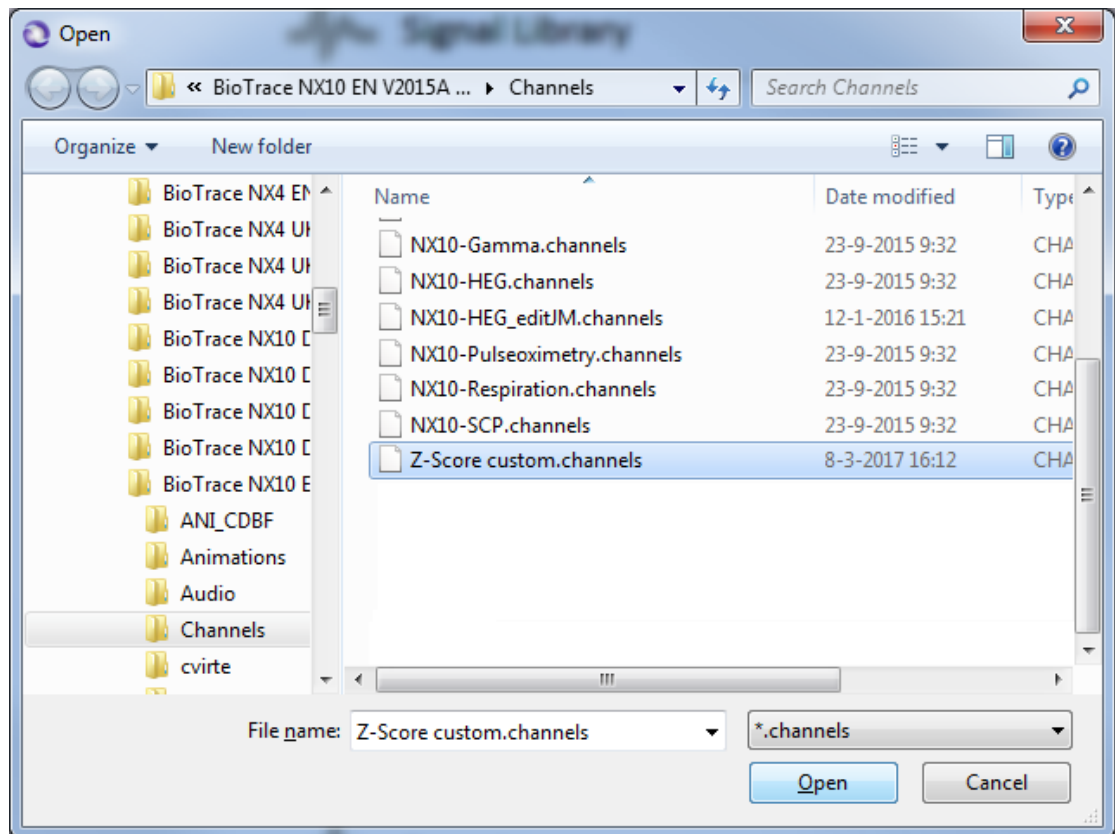
13. Click **Save**. Click **OK** when this alert box appears.



Skip the following steps in case the current channel set, linked to the loaded screen, is saved.

14. Select the screen the channel set should be used with. Select 'Load channel SET' under 'File' in the top menu and select the newly created channel set.





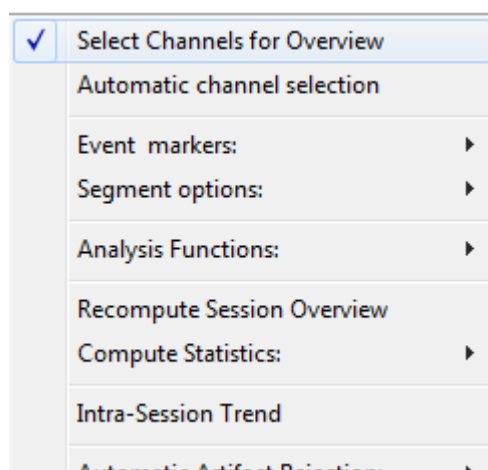
15. Click **OK** for three times.


16. Click the **Session Overview** button  or press the **TAB** key to go to the Session Overview and change the overview.



17. **Right click** anywhere in the Session Overview.

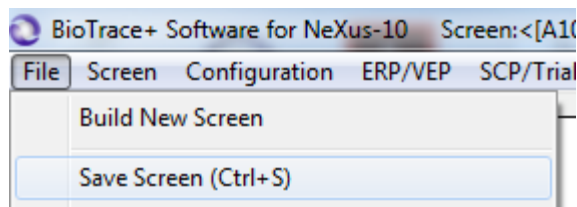
18. Select '**Select Channels for Overview**'.



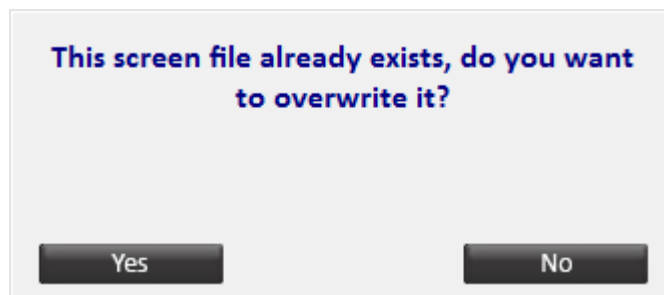
19. Select the created **channel**, e.g. **channel 127**. If desired, **deselect** other channels and click **OK**.
20. Click the **Real-time mode button**  or press the **TAB** key to go back to real-time mode.



21. Select '**Save Screen**' under 'File' in the top menu or press the **Ctrl + S** keys to save the changes.



22. Click yes when this message appears.



*Do **not recompute** the Session Overview after recording a session, as this permanently deletes all stored Z-Score values. This also means that no other Z-Score values can be computed after recording a session, when these were not present in the channel set while recording the session.*
