ReLax

SCIENCE LEARNING Kit

HANDBOOK

With the OP Innovations TrueSense Bio-Sensor
(Including 8 Self-Exploration Experiments)

OP INNOVATIONS

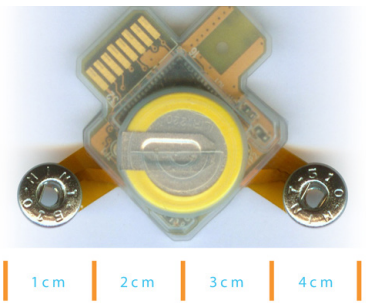
ReLax® en Science Booklet v1.1 2013-07

I. RELAXATION & WELLBEING

- ***Relax the muscles***
- ***Relax the mind***
- ***Train with Bio-Feedback***

Modern society and lifestyles impose severe stresses on human beings, young and old, from all walks of life. Medical research has demonstrated with ample proof that prolonged stresses, whether physical, mental or emotional, can adversely impact a person's health and wellbeing.

ReLax lets us look into our brain waves, to visualize and gain control over our hidden stress, and to achieve relaxation and wellbeing. The path is open for us to learn, to observe our very own self, and to detect the "traces" of our actions, emotions and thoughts.



Using ReLax is simple: (1) Plug Sensor into Controller, (2) Charge up Controller from any USB port or charger, (3) Detach Sensor from Controller, and (4) Wear the Sensor on forehead. No need for computer, smart phone or downloading of any APP. Your ReLax score is displayed by the LED lights on the Controller.

ReLax score: (LED display)

Red = muscle tension detected
Orange = mental tension detected
Green = low level mental tension
Blue = calm and relaxed

The goal is to achieve as many Green and Blue as possible by relaxing facial muscles and reducing wandering thoughts. A long press (more than 2 seconds) of the "-" button will turn-OFF the Controller, and a long press (more than 2 seconds) of the "+" button will turn-ON the Controller.

To enhance your ReLax experience: (1) Download and install (including USB driver) the ReLax APP from www.op-innovations.com into your computer, (2) Connect ReLax Controller and Sensor to your computer's USB port, and (3) Run it.

Live Mode:

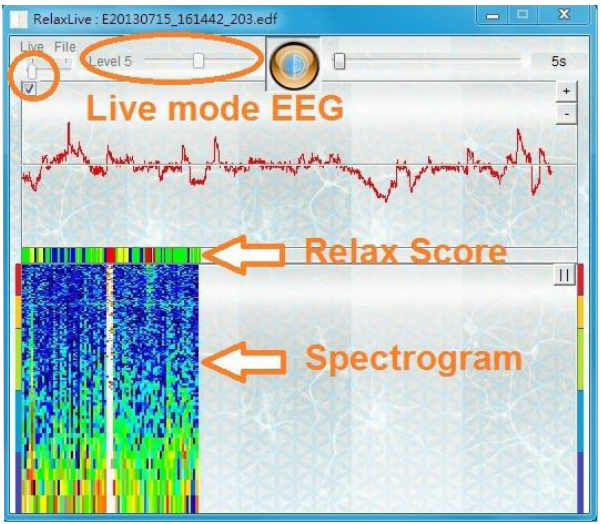
(1) Select your training level (0=beginner, through

10=advanced) and click-ON the Live Mode, the Controller and Sensor will be configured automatically;

(2) Remove the Sensor from the Controller, wear it, and start your practice session;

(3) In the Chart below, the top pane shows the live EEG signal.

The bottom pane shows the Spectrogram; with all your brain wave activity embedded (you will learn them over time). The middle pane shows the 4-color Relax score.



The goal is to achieve as many Green and Blue as possible.

Each practice session should last 5 to 10 minutes, and 1 to 3 sessions each day. You may increase the Level setting as you develop better control over your stress and tension. The practice session will be recorded automatically for later viewing and analyses.

The posture and activity during the practice session is also displayed in real time, to help manage your physical posture and activities.

Anywhere Mode:

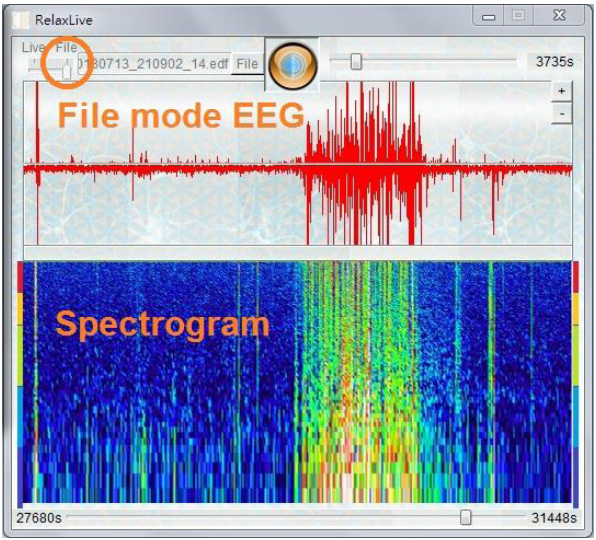
The Anywhere Mode is automatically enabled by exiting Live Mode on the computer or after charging Controller and Sensor: (1) Place Bio-Sensor on center of forehead, (2) Remove Controller from the USB port (the 4-color ReLax score is automatically displayed), and (3) Carry the Controller with you any time, any where to receive continuous, real time readings.

File Mode:

To view previously recorded practice sessions, simply select the File Mode, browse the file to be viewed, and click-ON the File Mode.

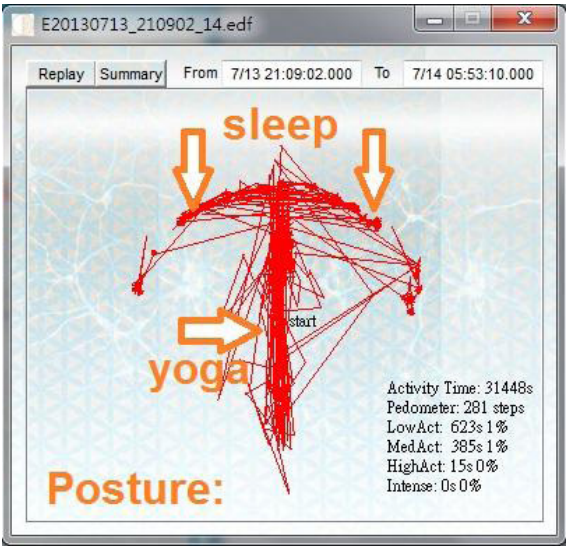
It is generally accepted and agreed that, whatever the technique employed, the more relaxed a person can be,

the more peace, joy and physical, mental and spiritual wellbeing one can achieve.



The basic principle is quite simple: stress manifests at physical (muscle tension) and mental (brain activity) levels. By measuring muscle activities (EMG) and brain activities (EEG) directly, there is a good indication on whether we have achieved relaxation. Any facial muscle that is not totally relaxed, will contribute to a small but detectible EMG signal signatures that are quite distinguishable from brain activities.

Through tightening-relaxation routines, deep breathing or mental focus, each and every facial/head muscle can be relaxed totally, and there should be negligible muscle signal.



After all muscles are relaxed, one can start mental exercises (such as consciously breathing, chanting mantra silently, or other techniques) to reduce and stop all thoughts and mental processes, and progressively reduce the super-β (γ) wave, the β wave, and to possibly heighten the α wave, then even slow down α wave into θ wave or δ wave regime, generally associated with very deep relaxation levels.

II. BRAINWAVE BASICS

Our brain contains huge number of individual cells called neurons. Neurons communicate with each other through electrical firings, and individual neuron firing is too weak to be detected at a distance. However, large number of thousands or millions of neurons with synchronized activities can be detected on various scalp locations and are called brain waves (measured in cycles per second, or Hertz) as shown in an EEG (electroencephalogram) chart. The various brain wave frequencies are studied extensively and generally correspond to different types of brain activities.

Most measured EEG signal contains more than just brain waves, it contains signals from nearby muscle activities (EMG), eye movements (EOG) and skin motions. For analysis, EEG signals are separated into frequency bands:

1. **EMG or Muscle wave:** generally from 80~3000Hz with most energy at 100Hz or above. It is generated by muscle membrane electrical potential changes. Since Muscle wave is much stronger than real brain waves by tens to hundreds times, it can easily "corrupt" most brain wave bands.

2. **Super beta (β) or gamma (γ) wave:** from 30~150Hz with most energy between 60~100Hz, associated with

visual processing, problem solving and memory work. Generally, the harder the brain works, the stronger the signal will be. When a task is well learned and the brain is becoming more efficient, the brain does not need to work as hard, so this may actually be the "poor efficiency" indicator.

3. Beta (β) wave: from 12~40Hz with most energy between 20~30Hz, associated with attention and fast activities. When a task is well learned and the brain is becoming more efficient, the brain does not need to work as hard, so this may actually be the "poor efficiency" indicator.

4. Spindles or Sigma (σ) wave: generally from 12~14Hz, a burst of waves with unique spindle shaped envelope; it is the most useful and easy to learn marker associated with normal and deeper sleep stages. It is a very narrow band signal, caused by synchronized activity of many neurons. The nature of narrowband, or synchronized neuron activity is usually associated with quiescent brain states, and is opposite to those active mental states (γ, β waves) with broadband signals. The σ wave center frequency varies from person to person, and sometimes can be quite far away from the "normal" range.

5. Alpha (α) wave: generally from 8~12Hz with significant variations, associated with relaxation and when eyes are closed. Certain fractions of the population have

weak to undetectable Alpha waves, and the Alpha wave center frequency varies from person to person. The nature of narrowband, or synchronized neuron activity is usually associated with quiescent brain states, and is opposite to those active mental states (γ, β waves) with broadband signals.

6. **Theta (θ) wave:** generally from 4~8Hz, associated with drowsiness. It is a transitional wave, with few distinctive features.

7. **Delta (δ) wave:** generally from 0.5~4Hz, associated with deep sleep or deep relaxation. It is often in the form of strong pulse train with varying intervals, and thus often covers through δ, θ, α wave bands when it occurs.

By monitoring the relative energy between frequency bands, it is possible to decode the dominant activity and states (relaxed, attention, excited, drowsy, sleeping, or simply muscle activities).

III. WHY IT MATTERS

- ***Better physical health***
  - *Aware of posture, activity*
- ***Better mental balance***
  - *Aware of stress, focus and relaxation*
  - *In tune with inner rhythms*
- ***Better understanding for wellbeing***

Each of us cares about our own physical health, mental balance and wellbeing. Our body is telling us what is going on all the time, if, only, we can quiet down, be aware, and listen to it. What most of us did not realize until now is that our brain is tightly connected with all parts of our body, so any physiological change affects our mental state, and any mental state change, likewise, affects our body. The missing gap until now is the availability of suitable and easy to use tool that can help us to decode the messages sent from our body through brain and related activities. With such help to our awareness, it becomes easier to develop deeper understanding of ourselves, and to devise, implement and monitor improvement programs to better ourselves and the quality of life.

IV. BIO-FEEDBACK

Humans are marvelously adaptive living beings, and many of our capabilities remain hidden and not well understood. Bio-feedback generally refers to the training of our body, mind and heart to learn, adapt and control specific stimuli from any or a combination of our senses. Bio-feedback may have been achieved or learned consciously, but also quite often achieved subconsciously or unconsciously. Scientists have tested and observed our fellow human beings' marvelous ability to learn, adapt various sensory stimuli and turned them into controlled responses, quite

often without being able to decipher how. One professor stated, "We still don't know how, but it works."

Bio-feedback can usually be set up as follows: a specific bio-signal input is selected (whether EEG, EMG, ECG), and such bio-signal may be filtered to extract or emphasize specific attributes (say, α wave, β wave, γ wave, θ wave, or a weighted combination of them) and displayed back to the user (most often through visual sense, but also through aural, tactile senses). After some period of learning (consciously or unconsciously), the user generally learns to "control" or "influence" the output toward the desired direction.

V. POSTURE & ACTIVITY

- ***Good health and adequate activity***
- ***Good posture***

Our spine routes and protects our nervous system from head to the rest of the body, while bearing the full weight of our head, body, upper limbs through all the activities we do throughout our life. Prolonged poor postures tend to degrade, damage and deform our spine and associated muscles and ligaments, create pressure points to nervous pathways, and cause long term problems to all our internal organs regulated by the nervous system.

Humans in modern society are feeling the brunt of too little exercise and movement. Furthermore, the advent of technology and its addicted usage generally creates the exact "prolonged poor posture" condition that's detrimental to our spine. For example, working in front of computer monitor, typing on the keyboard, watching tiny characters, graphics and videos on tablet or smart phone screens, we tend to stretch our head forward and down, putting stress on our neck and the rest of our spine. We slouch forward, further bending and stressing our spine. To minimize injury and accumulated damage, we need to keep our head and spine straight up most of the time, or at least more of the time, whether in motion or in static posture.

With awareness aided by bio-sensor tool, determined practice and patience, everyone can improve one's posture and have adequate movements and activities for better health and quality of life.

SELF EXPLORATION 1: POSTURE

(Bio-Sensor on center of forehead)

(1) Keep head up and straight; note its location on Posture Viewer;

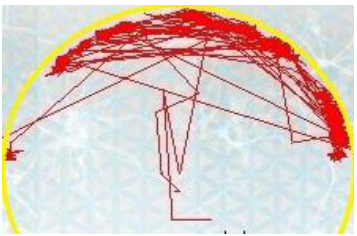
(2) Slowly tilt head down forward, then slowly upward;

(3) Slowly tilt head backward, then slowly upward;

(4) Slowly tilt head to the right, then slowly upward;

(5) Slowly tilt head to the left, then slowly upward.

How does your posture trace compare to the left side chart?



SELF EXPLORATION 2: SLEEP POSTURE

(Bio-Sensor on center of forehead)

(1) Change computer setting to AlwaysON (use power adapter) to record overnight;

(2) Start normal sleep;

(3) Upon wake up, check your posture trace.

How does your sleep posture trace compare to the right side chart?

VI. THE MUSCLES

- ***Commonly mixed up with brain waves***
- ***Muscle is stressed when mind is stressed***

We have muscles all over our head, including jaw and facial muscles. Many of them are small and subtle, responsible for "facial and body languages" that often reveal our true feelings. These facial muscle signals, although not brain wave per se, do tell us a great deal about our state of mind.

In our modern hurried, stressful environment, the facial muscles provide us with the first sign: when our mind is stressed, so is our body, and one of its expressions is tension of our facial muscles. When we can see our muscle tension persisting, we can build awareness, and then learn to relieve our stress.

It is easy to measure muscle activity using bio-sensor; simply place the sensor over any specific muscle of interest (i.e. thigh, arm or shoulder), and contract that muscle group. For athletes and sport trainers, the bio-sensor signal can record the initial strength, build up, endurance, and fatigue of the muscle faithfully. It can also tell you if your exhausted muscle has recovered yet, and by how much, to avoid injury.

SELF EXPLORATION 3: THIGH MUSCLE

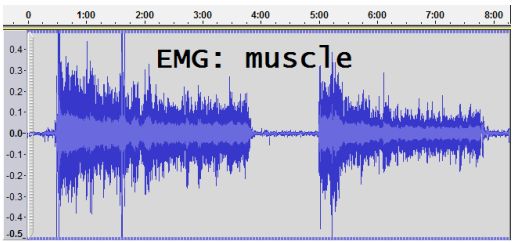
(Bio-Sensor on Thigh muscle)

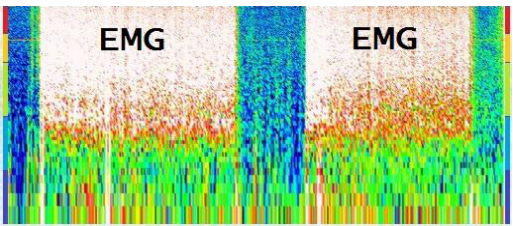
(1) Stand up and relax;

(2) Bend knee and lower your body in "horse stand", keep as low as possible for 3~5 minutes, and feel your thigh muscle exertion;

(3) Stand up, relax for 1 minute, and then repeat step (2).

How does your thigh muscle trace compare to the thigh muscle charts below?





SELF EXPLORATION 4: FACIAL MUSCLES

(Bio-Sensor on center of forehead)

(1) Relax all your facial muscles; see how low your base line muscle stress is;

(2) Slowly tighten your jaw, and then slowly relax back;

(3) Slowly frown your forehead, and then slowly relax back;

(4) Slowly cringe your entire face, then slowly relax back;

(5) See how low is your base line muscle stress now.

How does your facial muscle trace compare to the thigh muscle charts?

SELF EXPLORATION 5: STRESS/RELAXATION

(Bio-Sensor on center of forehead)

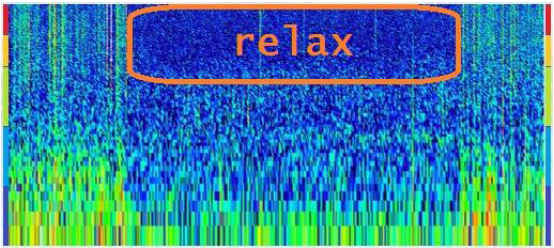
(1) Be quiet and still with eyes open, see how low is your base line brain wave activity;

(2) Empty your mind of all thoughts with eyes open; see your new base line;

(3) Close your eyes for a while; and then open to see your new base line;

(4) Repeat; see how low your new base line is.

How does your relaxation trace compare to this chart?



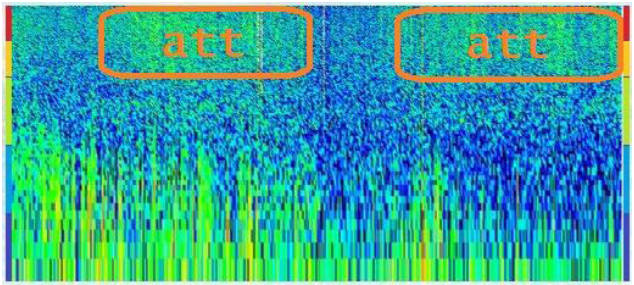
VII. FOCUS, FOCUS, FOCUS…
(What's really going on?)

- ***Subconscious mind may surprise you***
- ***Who decides on focus, attention***

When our mind is active, the γ wave and β wave will become active, but not necessarily under our conscious control. In fact, our sub-conscious mind (or, what we really think deep down) decides what is really interesting (or troubling) for our mind, often a great surprise to our conscious mind.

Visual processing (i.e. watching a movie or a video) consumes a lot of brain power, and is usually

accompanied by high level of γ wave and β wave activities. Subconsciously, our brain is capable of choosing whether or not to get excited based on our hidden desires and fears, with corresponding γ wave and β wave activity. The context, the effort, and the result must all be considered together to understand true "focus" and "attention."



The bio-sensor tool can help us identify our unique (and often hidden) likes and fears, and help us understand our thought pattern and any critical factors affecting it.

SELF EXPLORATION 6: EXTERNAL STIMULI

(Bio-Sensor on center of forehead)

(1) Be quiet and still, with eyes open, see how low your base line brain wave activity is;

(2) Empty your mind of all thoughts, with eyes open; see your new base line;

(3) Close your eyes for a while, and then open to see;

(4) Watch a pre-selected video clip intently; check how your brain responds;

(5) Repeat step (4) with different video clips, label and record them clearly.

How does your attention trace compare to the above chart? How does it compare to your expectations?

VIII. SLEEP

Sleep is the most essential and longest duration of human activity. The commonly used sleep stages (called HYPNOGRAM), includes:

- ***Awake***
- ***REM****: no spindles, no Delta (δ) wave*
- ***Sleep 1 (shallow)****: start of sleep spindles (σ wave)*
- ***Sleep 2****: more sleep spindles*
- ***Slow Wave (Sleep 3&4)****: with δ wave*

The most important marker for sleep stages is the sleep spindle (σ wave). Sleep cycles are simply alternating sleep and REM phases throughout the night. The bio-sensor tool can help you understand your sleep patterns and any critical factors affecting your sleep. Dreams are believed to occur during REM stage only; however, more recent research showed that dreams may occur during REM and Non-REM stages.

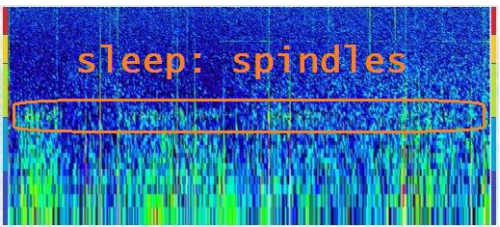
SELF EXPLORATION 7: SLEEP ACTIVITY

(Bio-Sensor on center of forehead)

(1) Change computer setting to AlwaysON (use power adapter) to record overnight;

(2) Start normal sleep;

(3) Upon wake up, check your sleep trace.



How does your sleep trace compare to the above chart? How does it compare to your expectations?

IX. MEDITATION

There are many different types of meditation techniques and styles. Some prescribe physical exercises, yoga or breathing exercises as preparation stage. Almost all of them require prerequisites to quiet down the mind (as discussed in earlier Stress Relieve section) before true meditation starts. That is, relax all the muscles, relax all mental activities, progressively reduce the super-β (γ) wave, the β wave, and to possibly heighten the α wave, then even slow down α wave into θ wave or δ wave regime, generally associated with very deep relaxation levels.

Whichever your preferred meditation style is, the bio-sensor tool can help you identify your unique characteristics and track your progress. If your body is tired, dozing (slumping head posture and drowsy marker) can be detected by the tool so you can be more aware, and adjust your daily routine accordingly.

SELF EXPLORATION 8: MEDITATION

(Bio-Sensor on center of forehead)

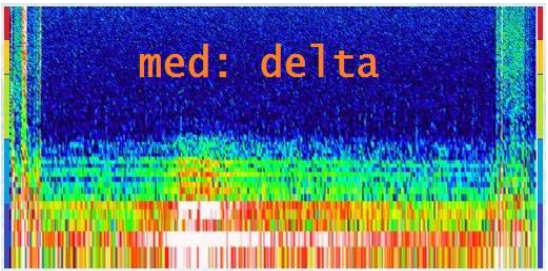
(1) Be quiet and still with eyes open, see how low is your base line brain wave activity;

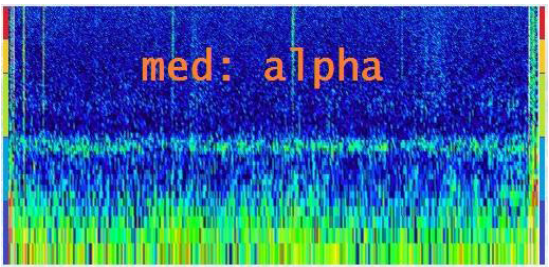
(2) Empty your mind of all thoughts with eyes open; see your new base line;

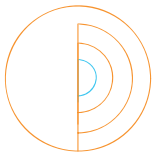
(3) Close your eyes for a while, and then open to see;

(4) Continue with your preferred meditation practice.

How does your meditation trace compare to the charts below?







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