

Body & Mind App: Biofeedback and Neurofeedback HOME TRAINING



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What is our starting point?

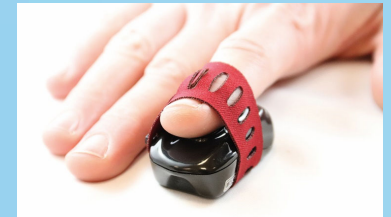
- Biofeedback and neurofeedback are established methods for the treatment of numerous problems and disorders.
- In addition, biofeedback and neurofeedback are also used in high-performance training for sports and management training

What is our starting point?

- The limiting factor: In most cases, training takes place only once a week under professional supervision:
 - High cost
 - Long training duration
 - Limited sustainability
 - Demanding in explanation and implementation

The solution

- Supportive training anytime, anywhere:
 - Quick and easy sensor placement
 - User friendly design and implementation
 - Can be combined with professional weekly training
 - Training with fun factor "on the side": Youtube videos as live feedback



What is Biofeedback?

- Biofeedback is a scientifically based method in which physical processes which our regular sensory systems cannot properly recognize are reported back and thus made conscious.
- The physiological processes registered using unique sensory solutions are displayed in graphic or acoustic form.

What is Biofeedback?

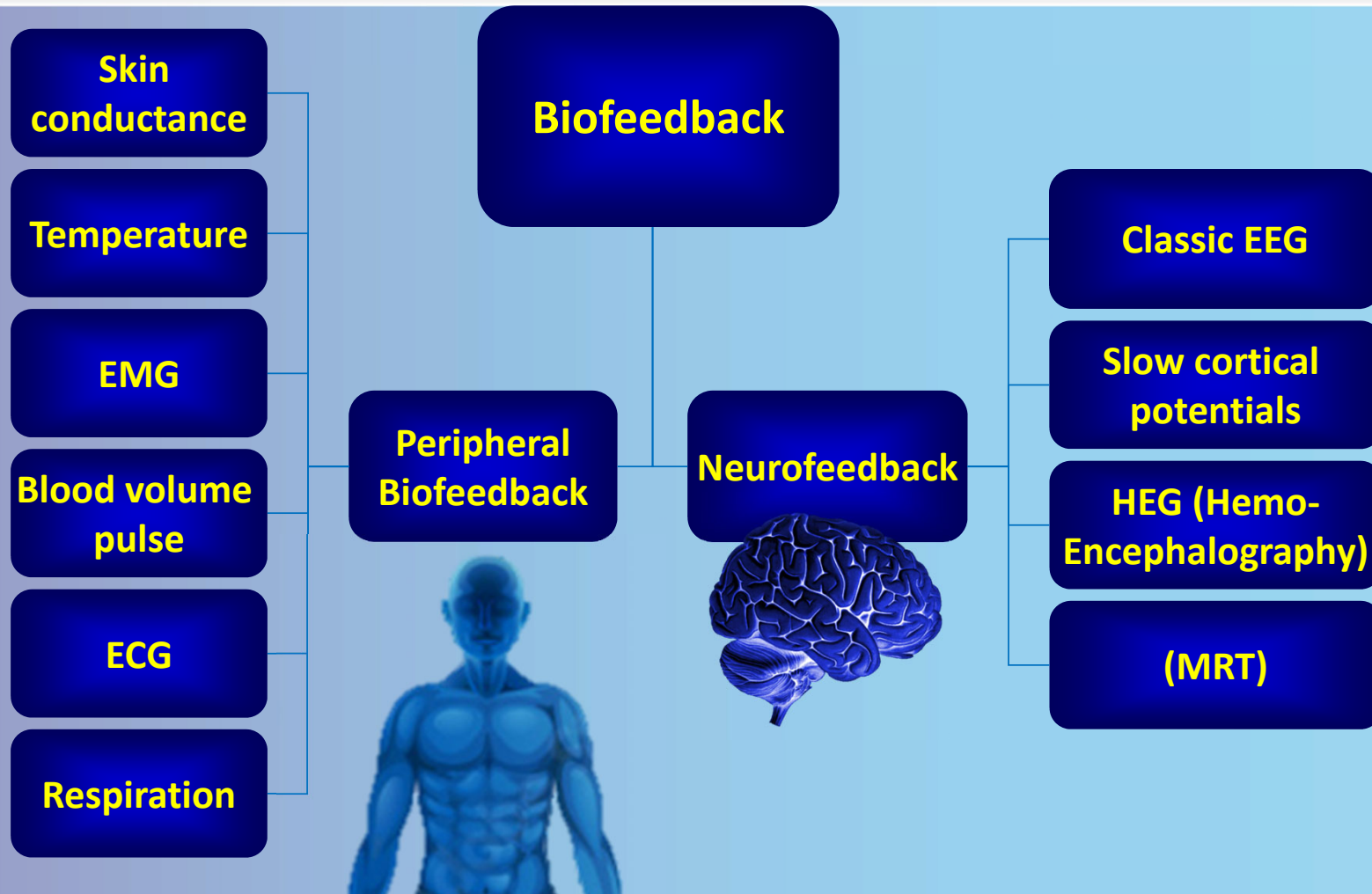
Biofeedback expands our sensory systems.

- How fast is your heart beat right now?
- How warm is your left index finger?
- How tense are your shoulder muscles?

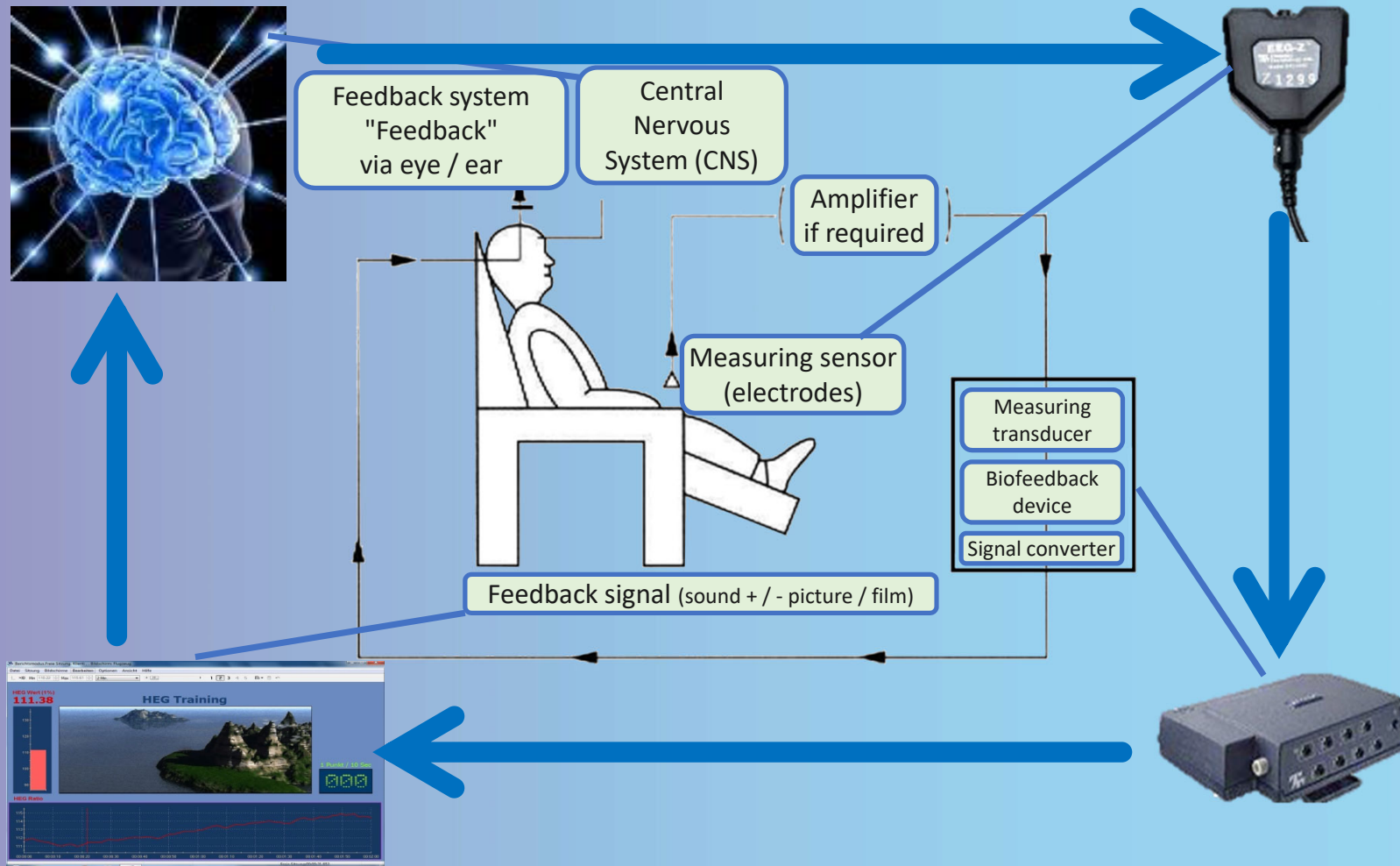
With biofeedback you can measure this...

- ... and provide feedback
- ... and learn from it.

What are the different types of biofeedback?



The Biofeedback Principle



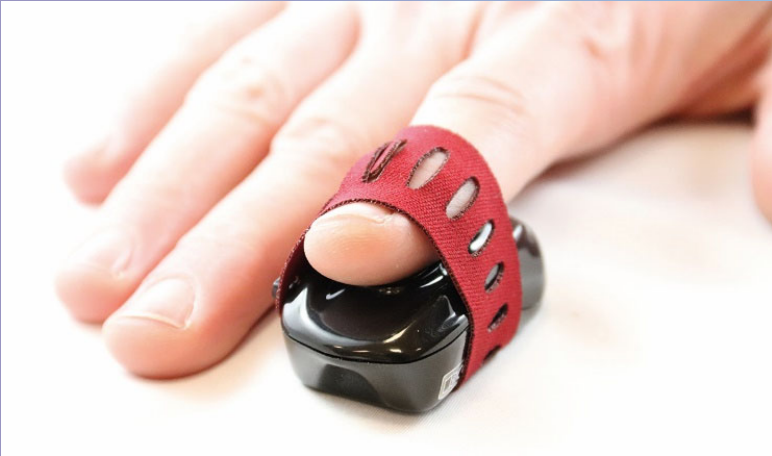
The Biofeedback Principle



**Biofeedback is
operant
conditioning**



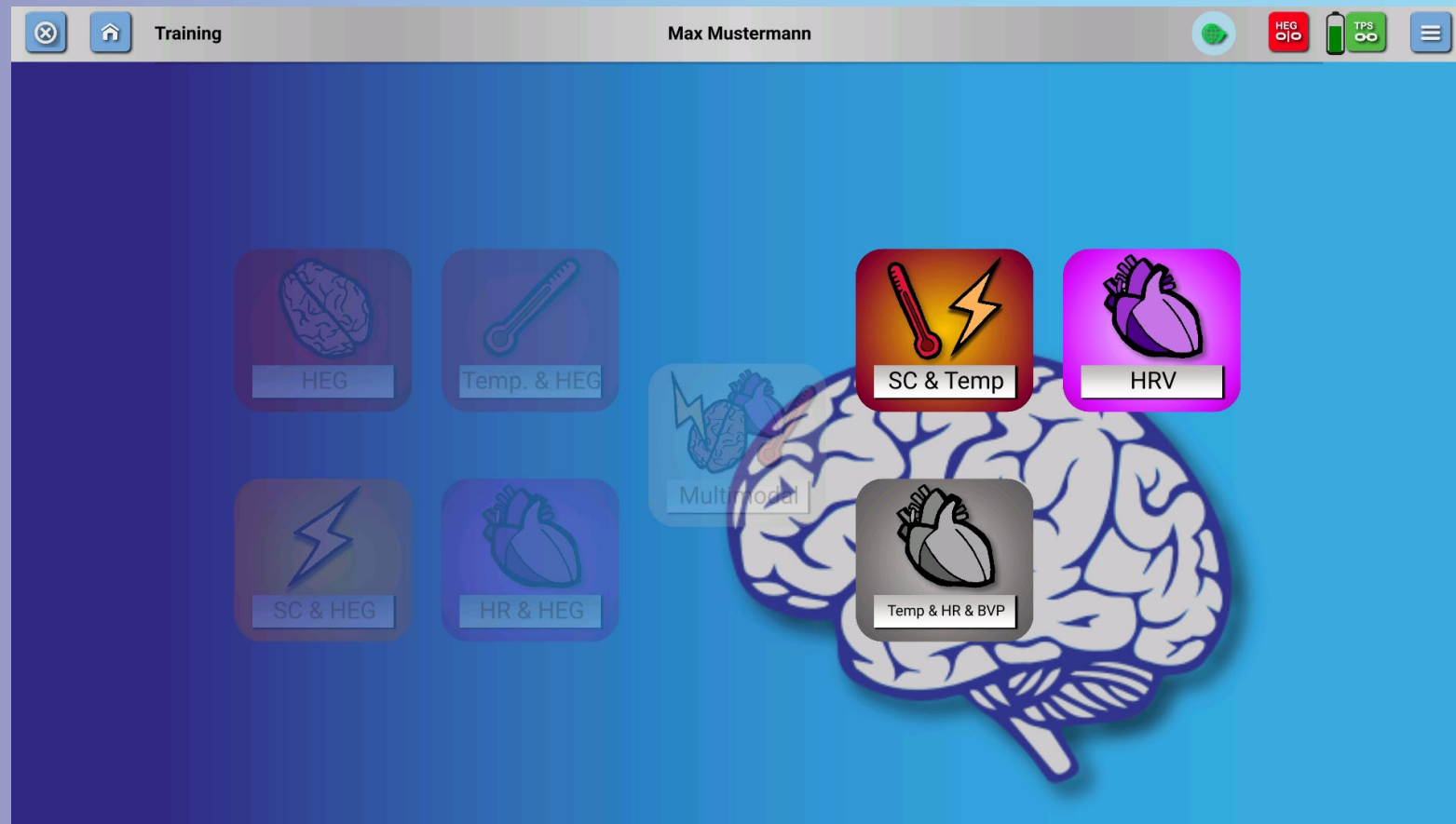
Practical implementation



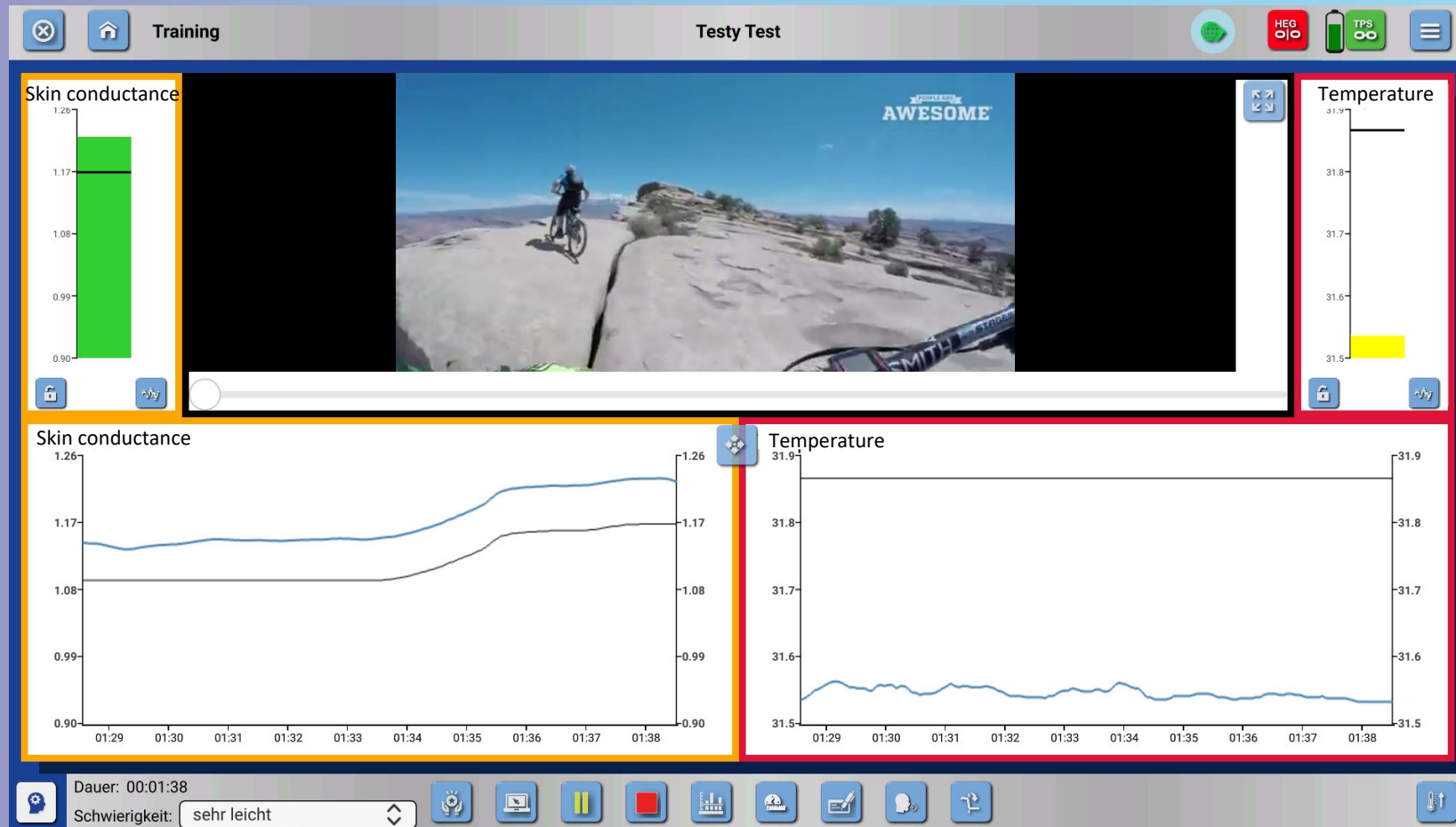
Derivation on the fingertip - preferably on the index finger of the not-dominant hand

- Temperature
- Skin conductance
- Heart rate variability

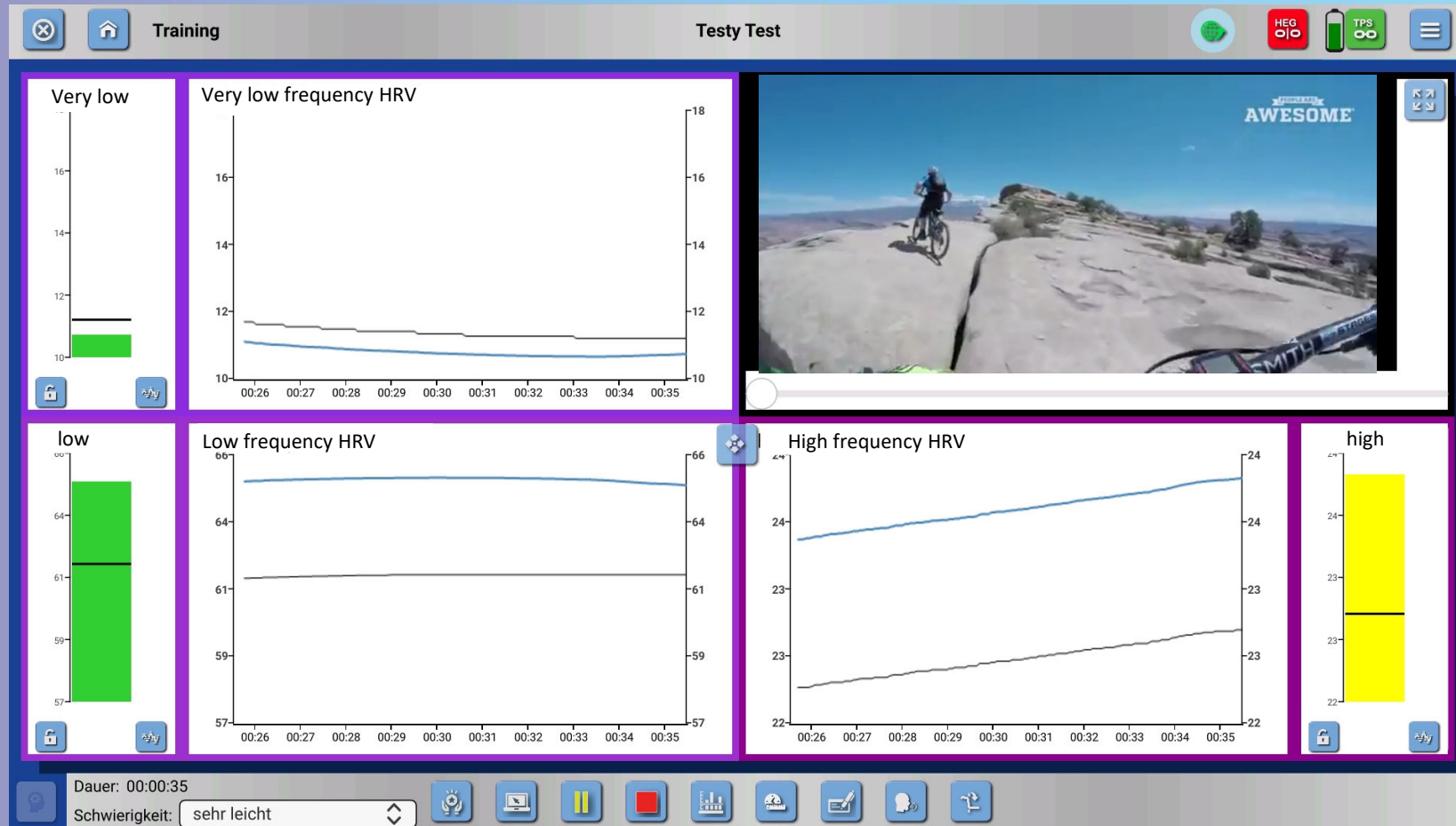
Biofeedback parameters



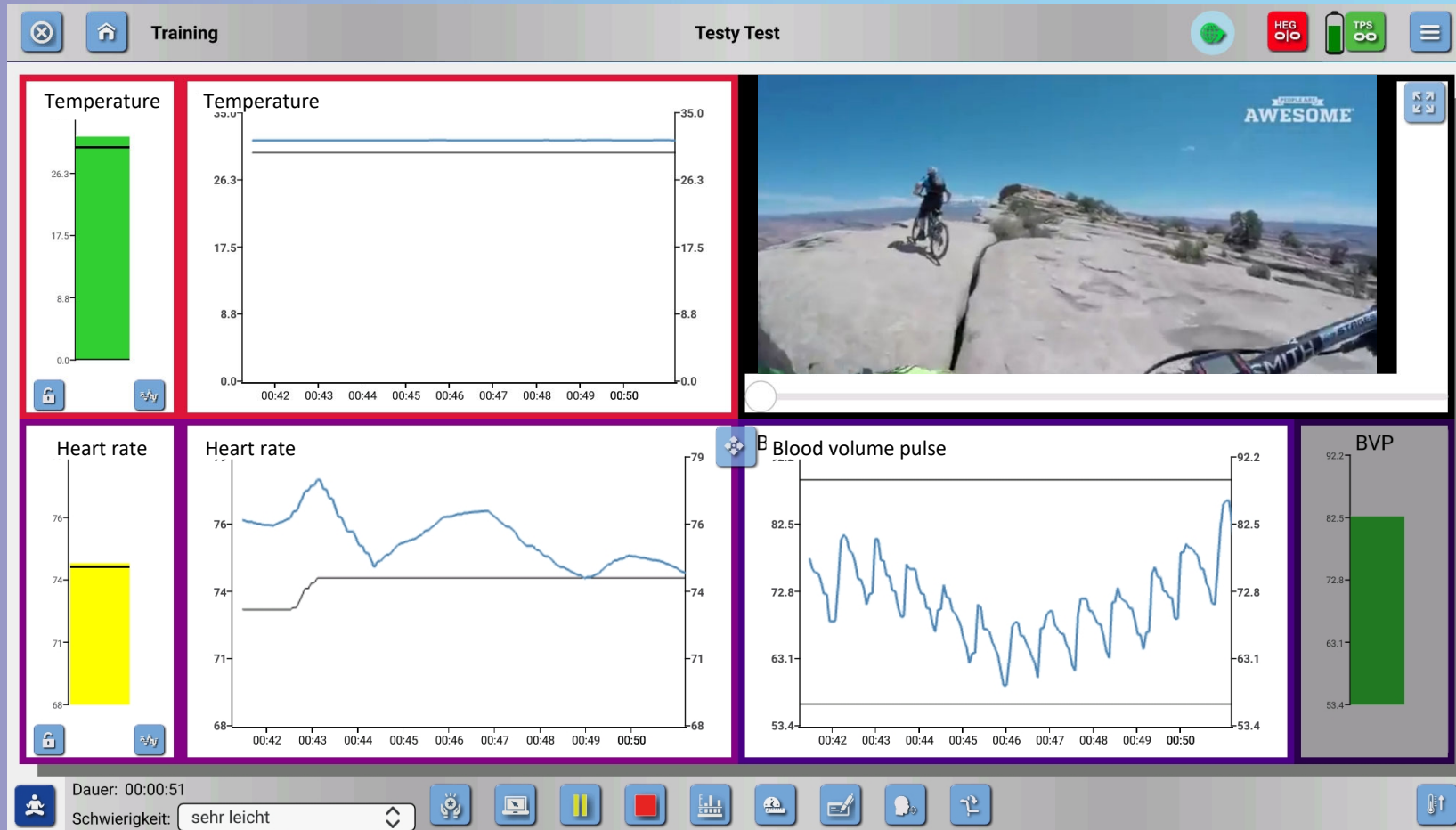
Skin Conductance + Temperature



HRV



Temperature + HRV + BVP



Neurofeedback

There are three types of neurofeedback:

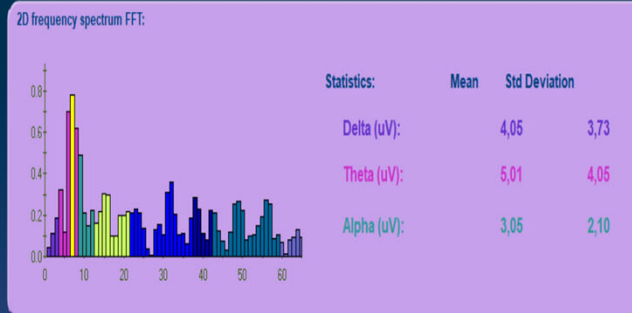
- EEG-based
- **HEG-based**
- EP/SCP-based

HEG neurofeedback or EEG neurofeedback?

- EEG neurofeedback is the oldest form of neurofeedback.
- EEG neurofeedback - like HEG neurofeedback - is used by many professionals.
- EEG requires extensive pre- and post-processing (cleaning, impedance check,...).
- EEG is very artifact-prone - any movement disturbs the signal.
- HEG is easy to start - without preparation
- HEG is very low in artifacts - movements do not interfere.
- In contrast to EEG neurofeedback, HEG neurofeedback can be used by laymen at home without any problems.

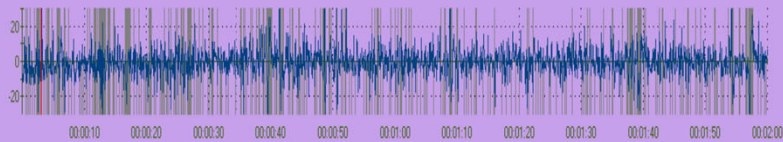
Comparison of EEG curves and HEG curves

EEG - Alpha Theta - Review



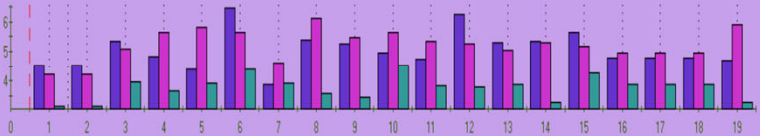
■ EEG waveform (with artifacts)

B: EEG (raw):



Epoch means:

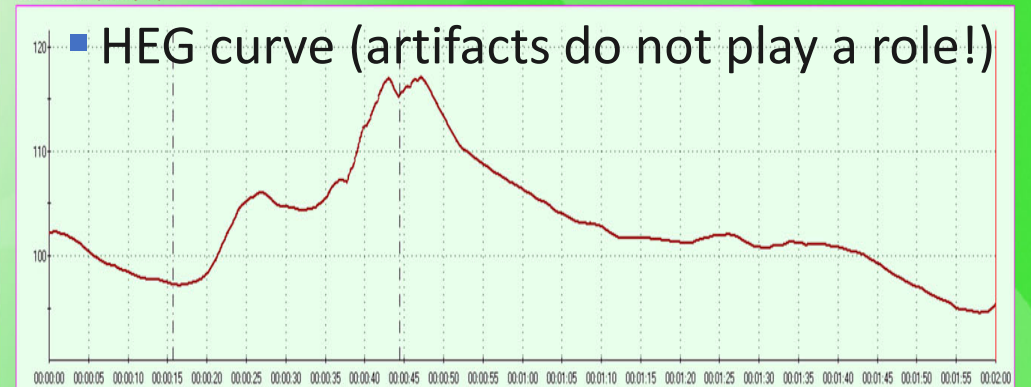
Delta (uV):
Theta (uV):
Alpha (uV):



HEG Analysis

V1: HEG Red	HEG Gain (%)	V2: HEG Infrared
0,72	5,83	1,36
HEG Ratio min	HEG Ratio Mittelwert	HEG Ratio max
88,42	102,41	162,67

HEG Ratio (Damper)



(HEG) Neurofeedback: Self-Regulation

- Neurofeedback helps the brain to better regulate each desired function.
- The brain then has a better capacity for this "self-regulation".

What is the benefit of neurofeedback training?

In general, the goal of neurofeedback is

- to change the neurophysiological basis of a psychopathology
and
- to improve the neurophysiological basis for new behaviors, feelings and attention processes.

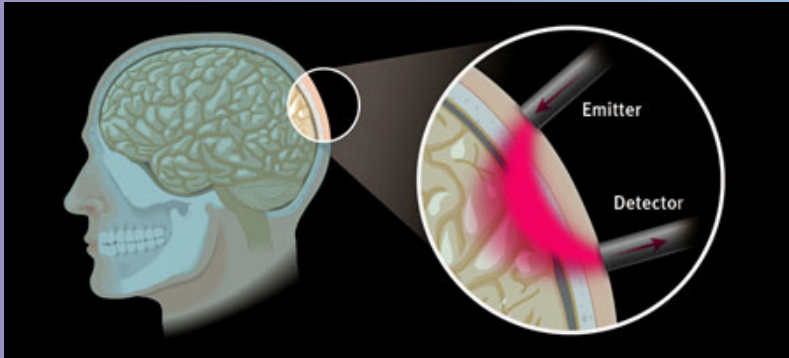
Neurofeedback

Neurofeedback is not a miracle cure or a magic bullet but a learning method, like learning a language, a musical instrument or a sport.

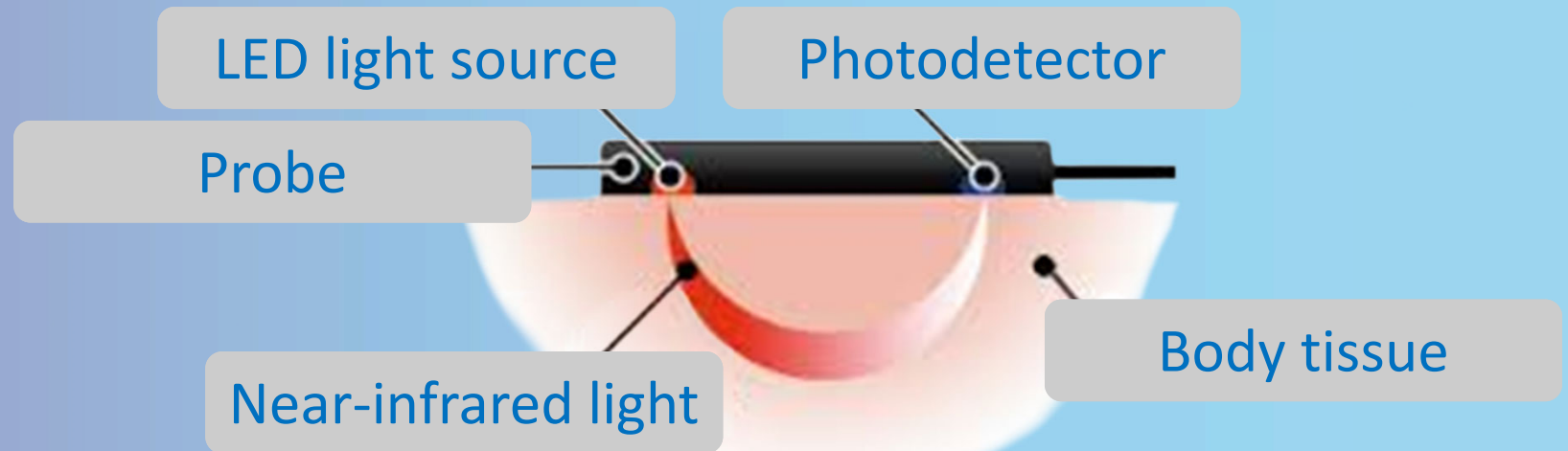
As with all learning, success depends centrally on the subjective motivation of the client.

It is important to increase this motivation!

Definition of HEG neurofeedback (NIRS-based)



- HEG stands for HemoEncephaloGraphy.
- The underlying technology is called NIRS. NIRS stands for Near InfraRed Spectroscopy.



NIRS Definition

- Near infrared spectroscopy, NIRSpectroscopy or abbreviated NIRS, is a physical analysis technique based on spectroscopy in the short-wave infrared light range.
- It is essentially the same as infrared spectroscopy used in the mid- and far-infrared range (MIR and FIR), but allows the use of other materials and radiation sources.
- However, it generally offers easier access and other forms of analysis.

What is HEG neurofeedback?

- In HEG-based neurofeedback, the change in blood flow intensity or the resulting oxygen saturation is measured primarily in the frontal area of the brain (prefrontal) and reported back to the trainee live.

Physiological basis of HEG

- When engaged in mental tasks (e.g. mental arithmetic), the regions of the brain involved consume energy faster than others
- The brain is extremely metabolically active:
 - 2 % of body weight
 - 20 % of oxygen consumption
 - 25 % of glucose consumption

The brain has an extremely dense network of blood vessels and capillaries.

History



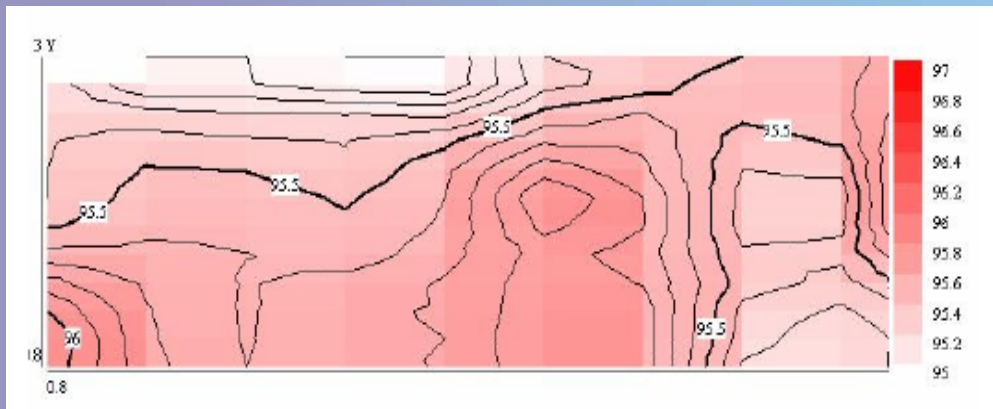
Dr. Hershel Toomim

- (nIR) biofeedback was developed in 1994.
- Subjects learned to control blood oxygenation in prefrontal areas using infrared spectroscopy as a technique.
- Clients were able to learn this ability to self-regulate using the principles of biofeedback. Since then, Hershel Toomim has called this technique Hemo Encephalography.
- Development of own devices
- numerous studies on HEG - on ADD/ADHD

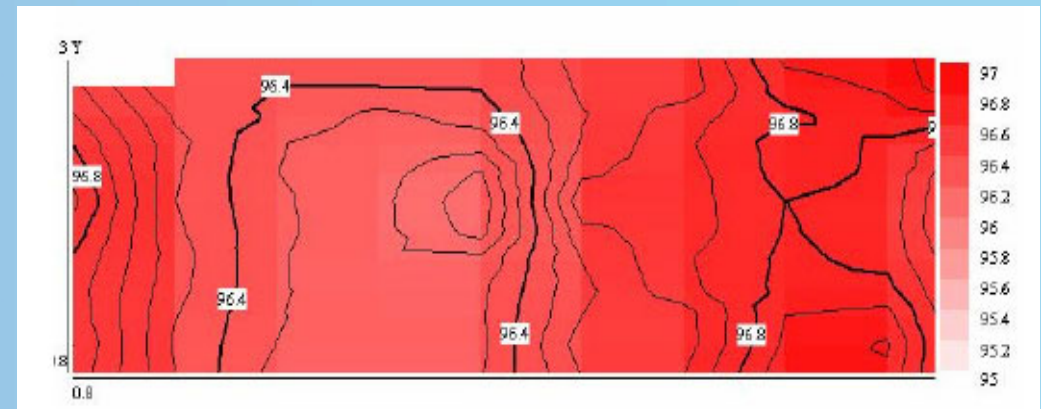
Measurable effects of HEG-Neurofeedback

- Change in blood flow / oxygen saturation in the measured area.
- Change in surface temperature:

Before training



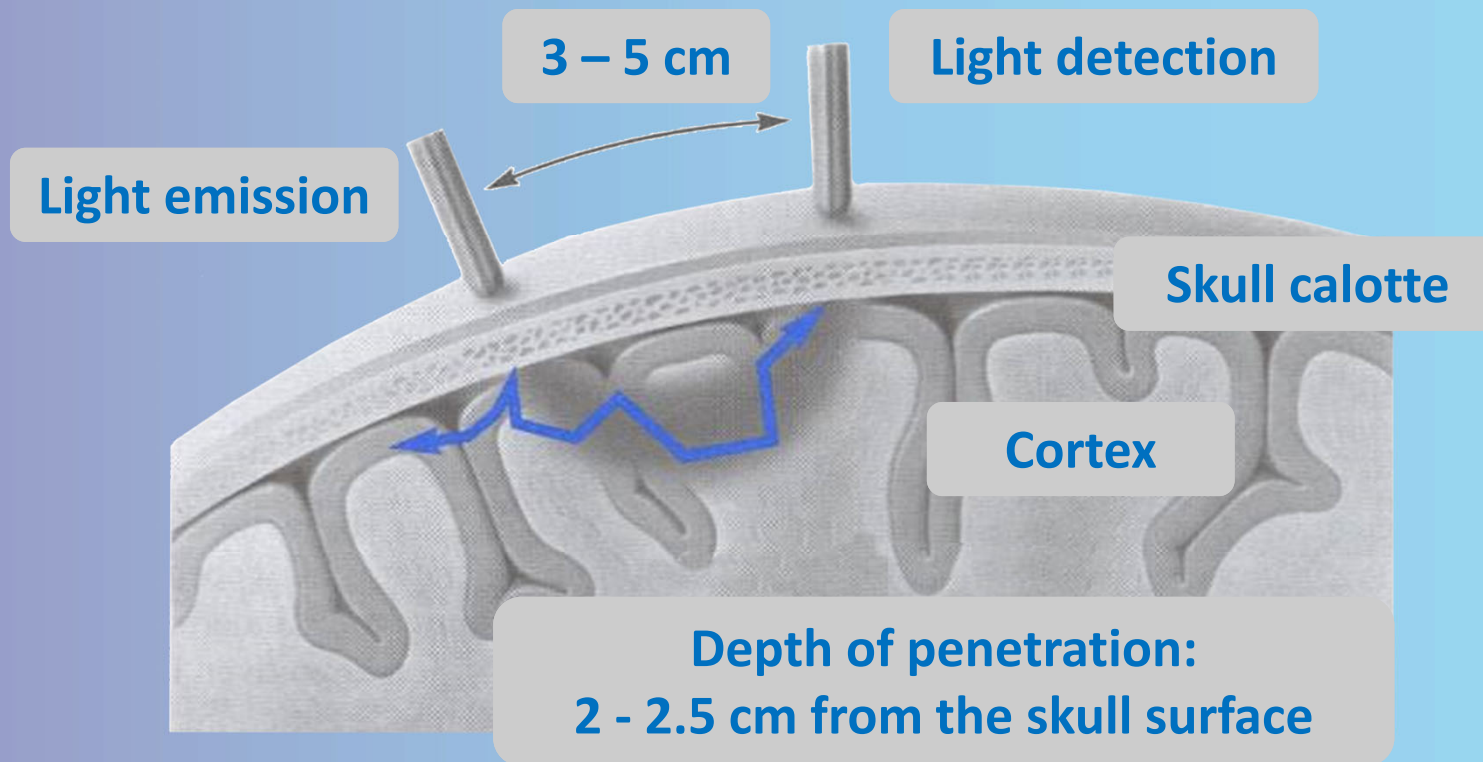
after 3 x 10 minutes of training



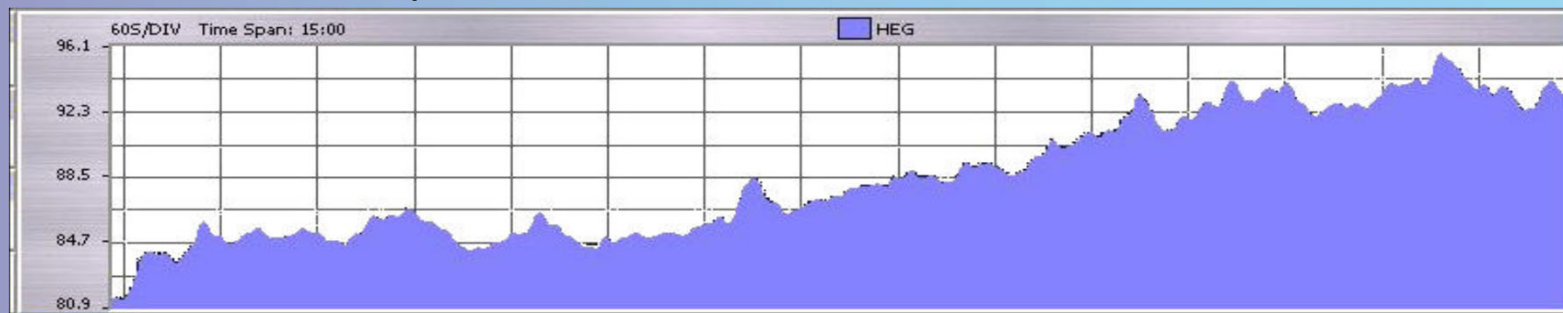
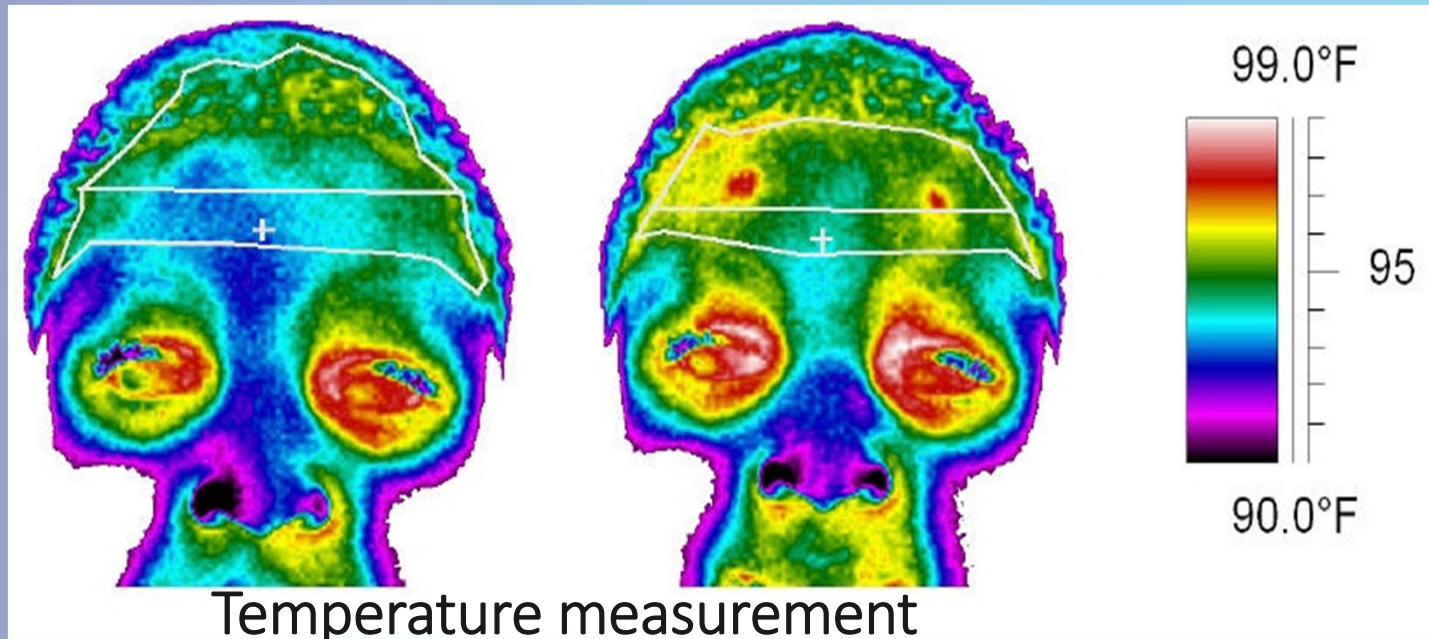
Areas of application for HEG neurofeedback

- Attention Deficit Disorder (ADD/ADHD)
- Learning support
- Migraine
- Affective disorders (e.g. depression)
- Relaxation
- Peak performance (high performance training)
- Further areas of application are being researched

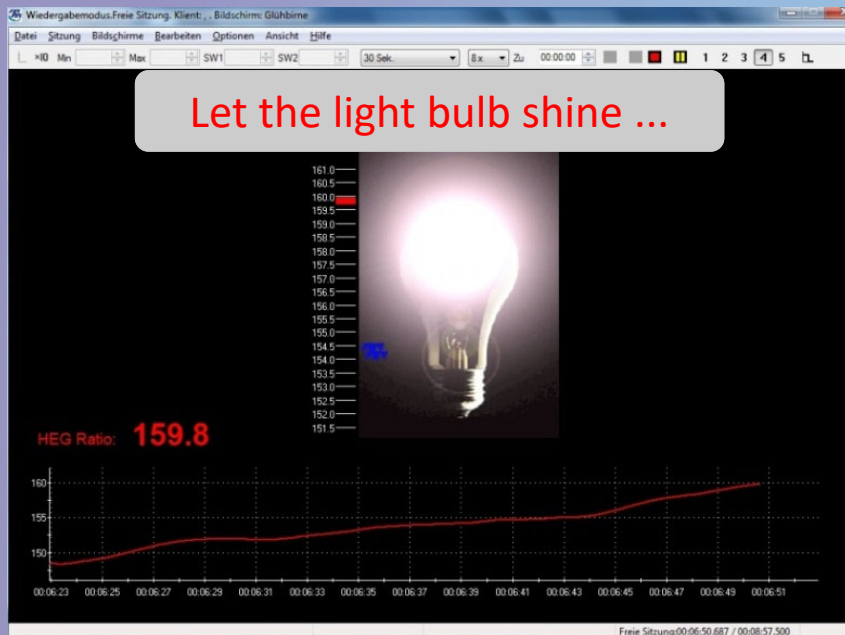
This is how HEG is measured



HEG effect made visible by thermal imaging camera

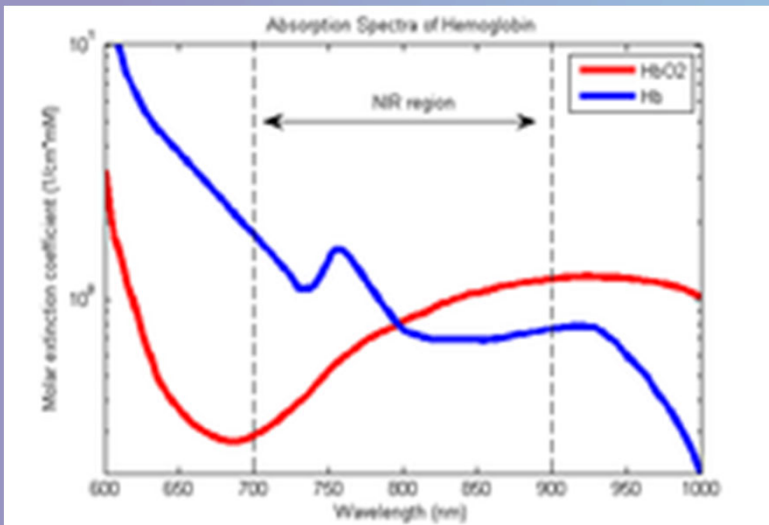
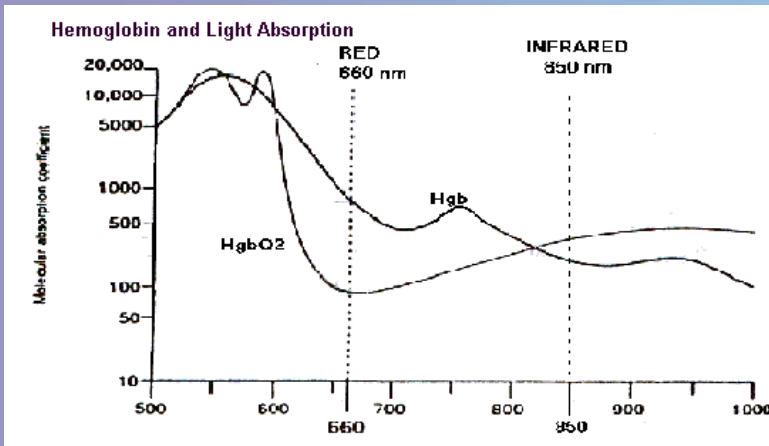


This is how HEG is measured



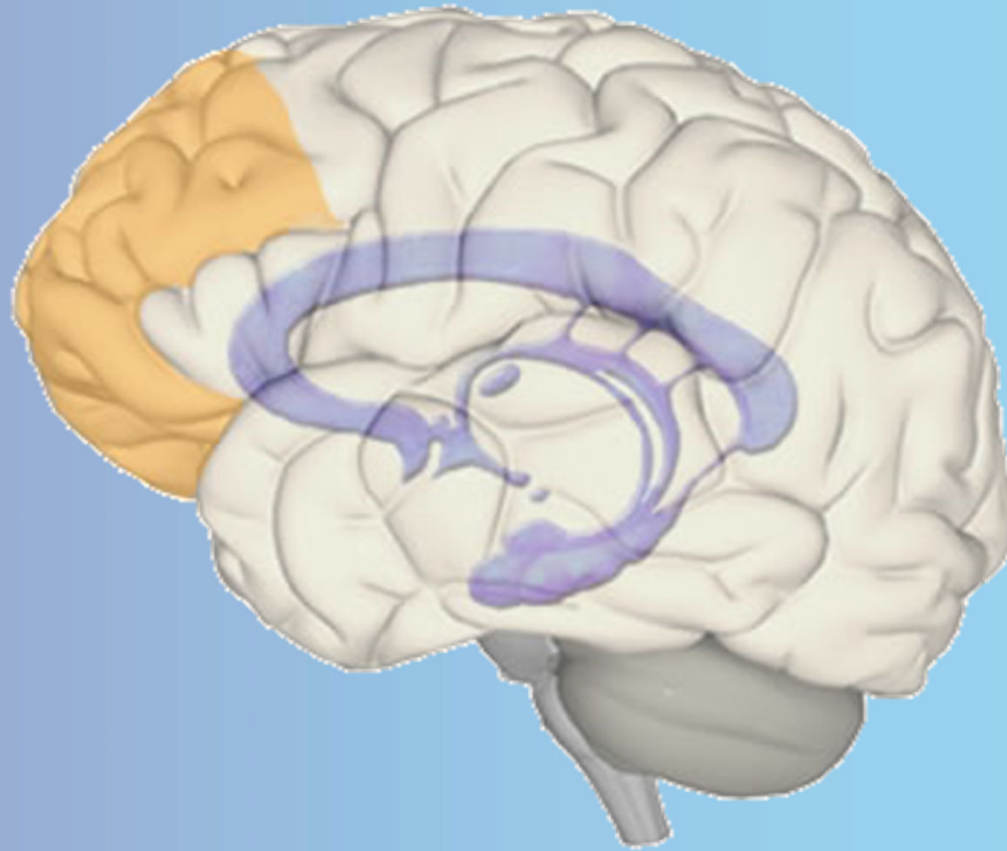
- The computer measures each light color and calculates the respective ratio.
- This ratio is reported back as a value.
- Better supply of oxygen to the brain
 - better blood flow
 - rise in the curve

HEG operating principle



- HEG device sends alternating red (660nm) and infrared (850nm) light towards the brain tissue.
- Part of the light is reflected back, picked up and measured.

The Prefrontal Cortex (PFC)



Action and control center of the brain

- Decision making
- Plan and action formulation and execution
- Concentration
- Motivation
- Emotion
- Memory
- Inhibition of other structures
- Social behavior

ADD / ADHD

- Distractedness, inattention, impulsivity, disorganization, short attention span, emotional problems.
- Dysregulation of the PFC, the attention system involves different brain areas, the PFC is the top of the organizational tree, and therefore relatively easy to disrupt
- Lower activation of the PFC in ADHD, sometimes reduced even more in tasks that require concentration and attention



Migraine

- Assumption (Carmen): Training strengthens inhibitory control of the PFC over parts of the brainstem that are thought to be generators of migraine



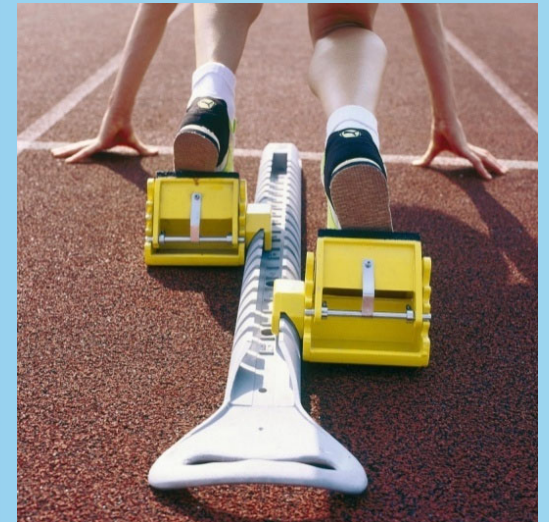
Relaxation

- Learning to "shut down" the prefrontal cortex.
- Increase ability of voluntary controlled activation/deactivation of the PFC.



Peak Performance

- In high-performance athletes, the process of focusing (e.g. directly before the start or the goal throw) can be measured and conditioned using nIR-HEG.
- To activate maximally at the right moment is crucial for best possible success!
- Deactivating at the right moment reduces energy consumption in the PFC and saves resources (which are needed in other areas).



Practical implementation

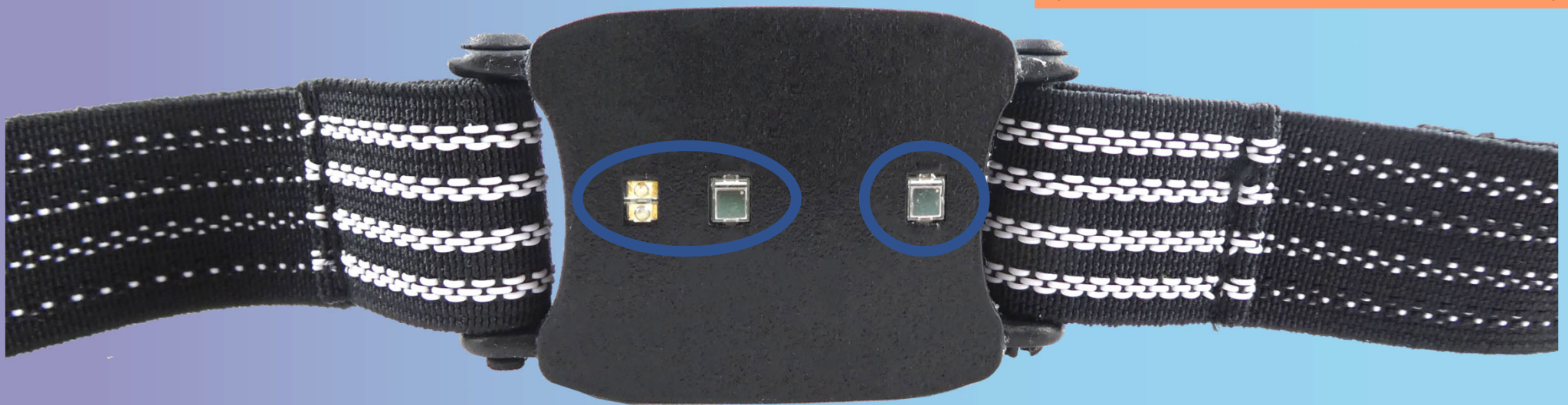


Prefrontal measurement

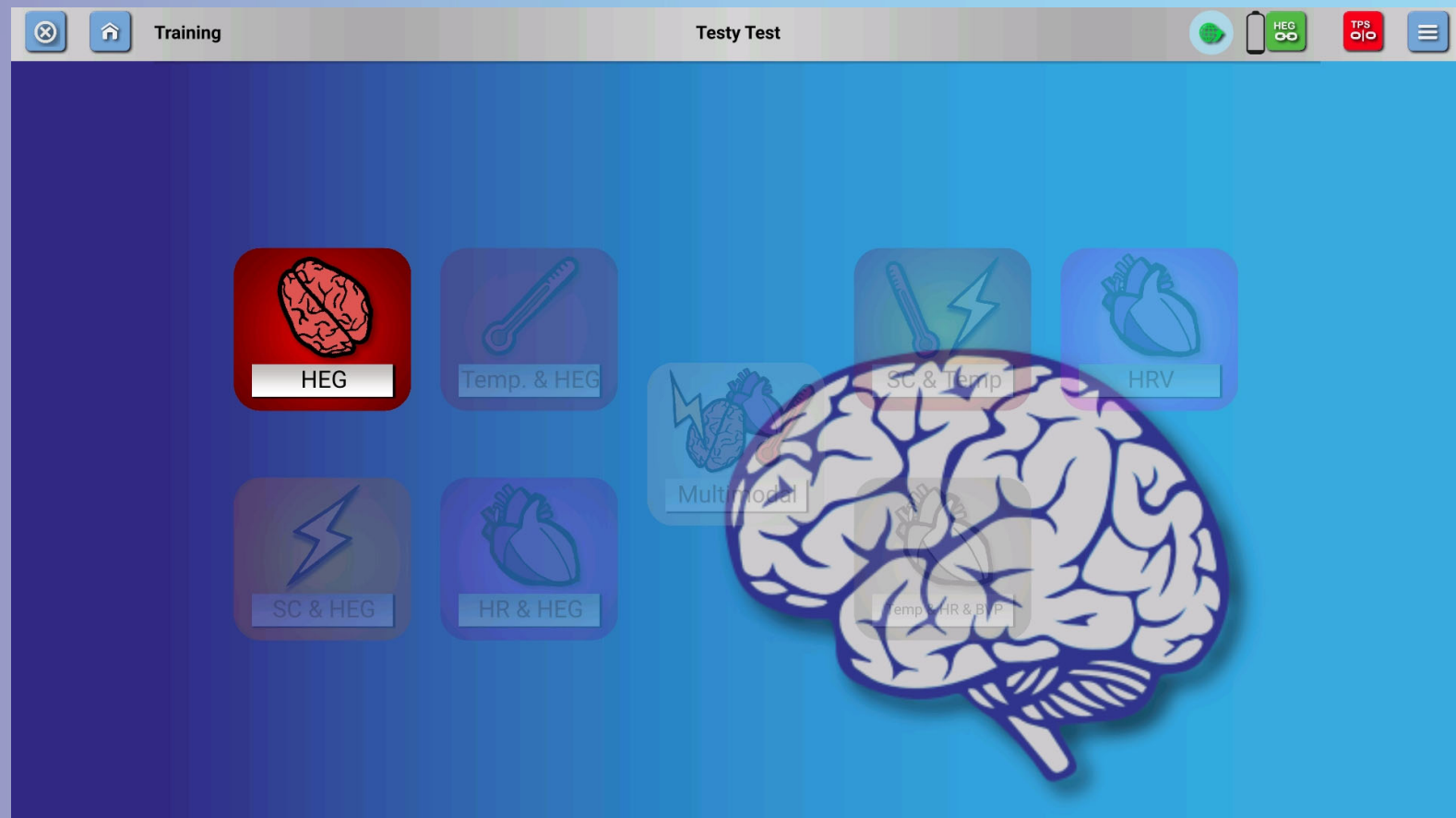
HEG neuro sensor

Signal emission
(red and infrared light)

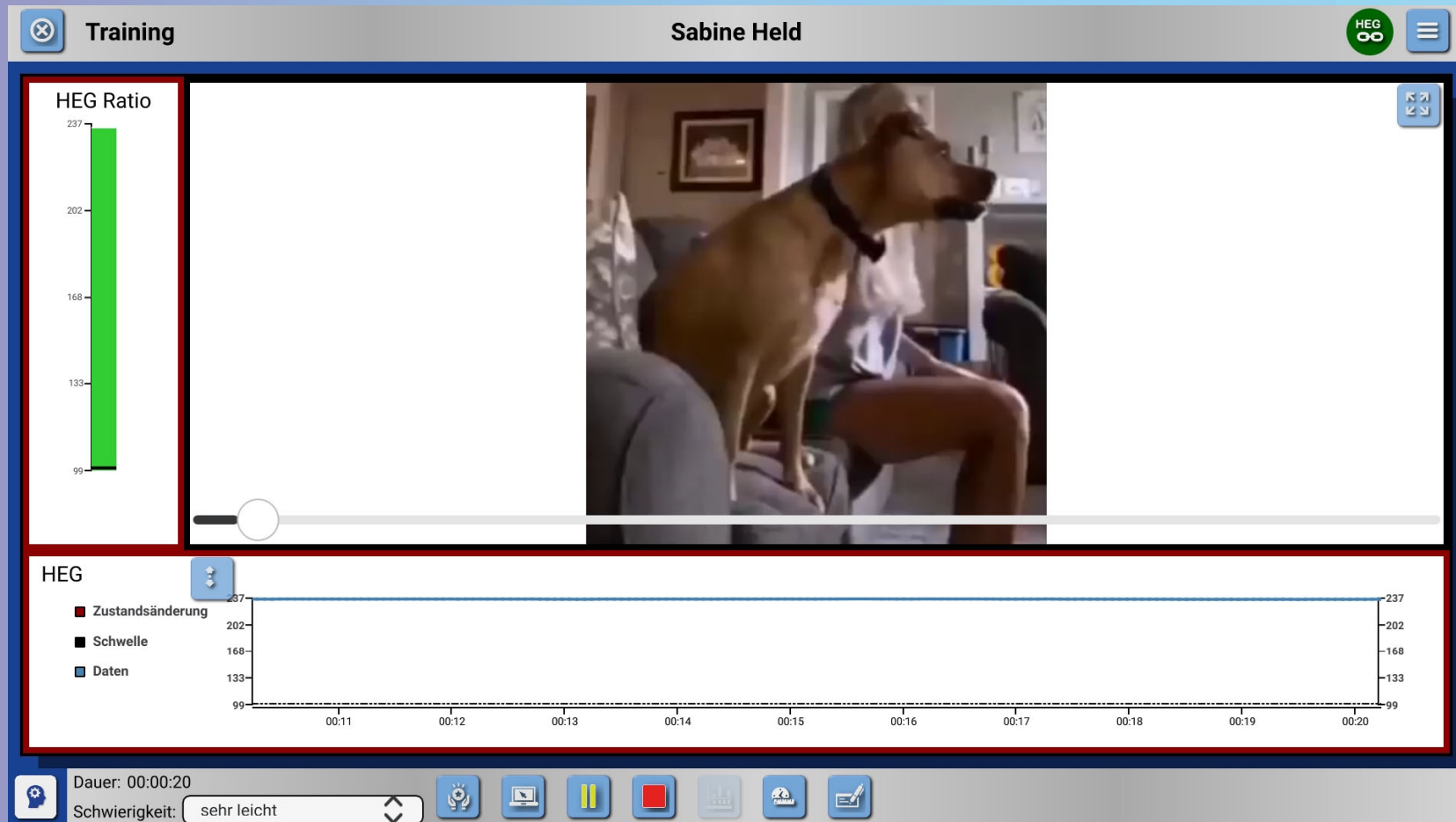
**Signal pickup refluxing
light off**
(approx. 2.5 cm depth of the cortex)



Body & Mind App: HEG Neurofeedback



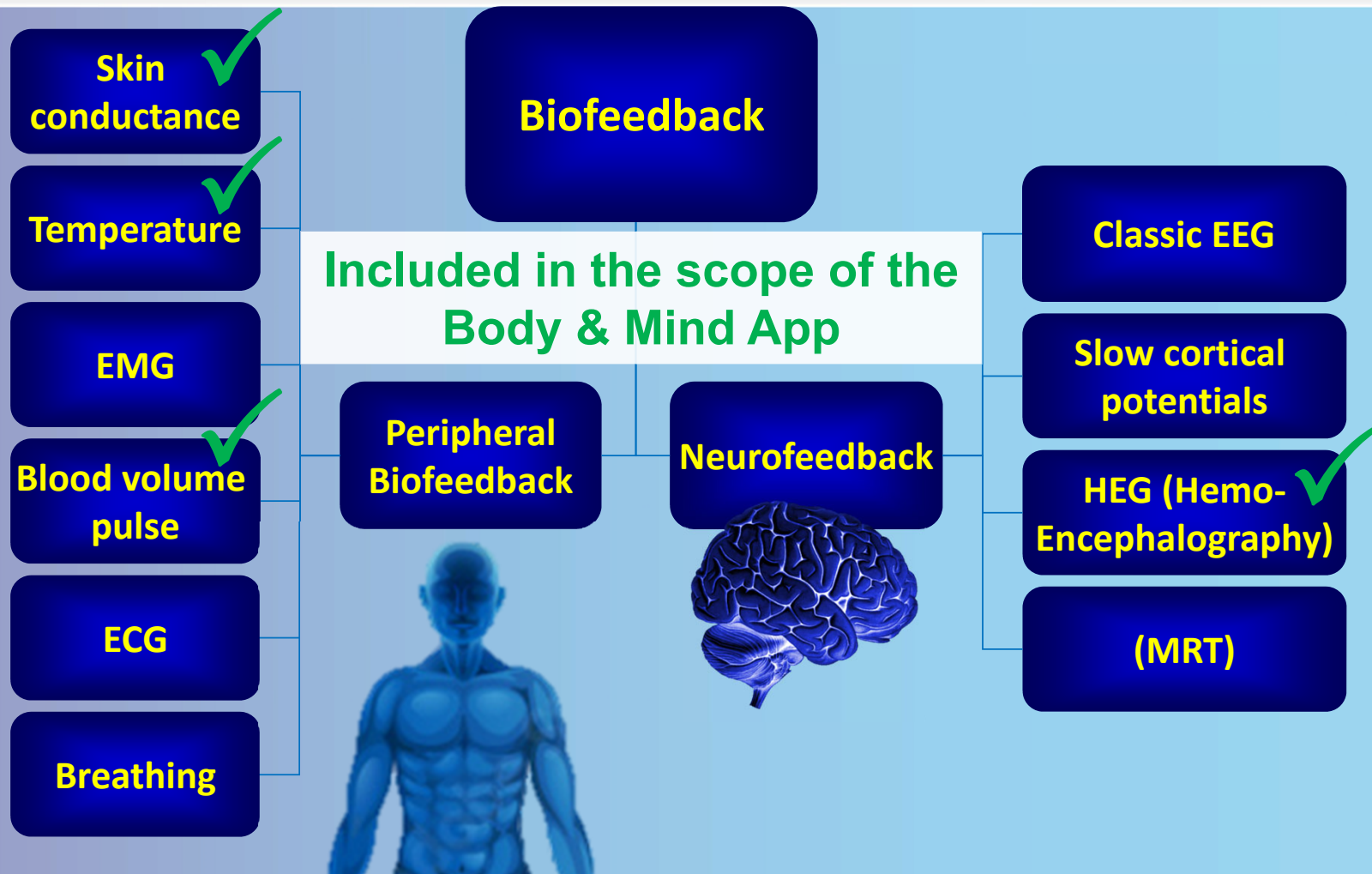
Body & Mind App: HEG Training



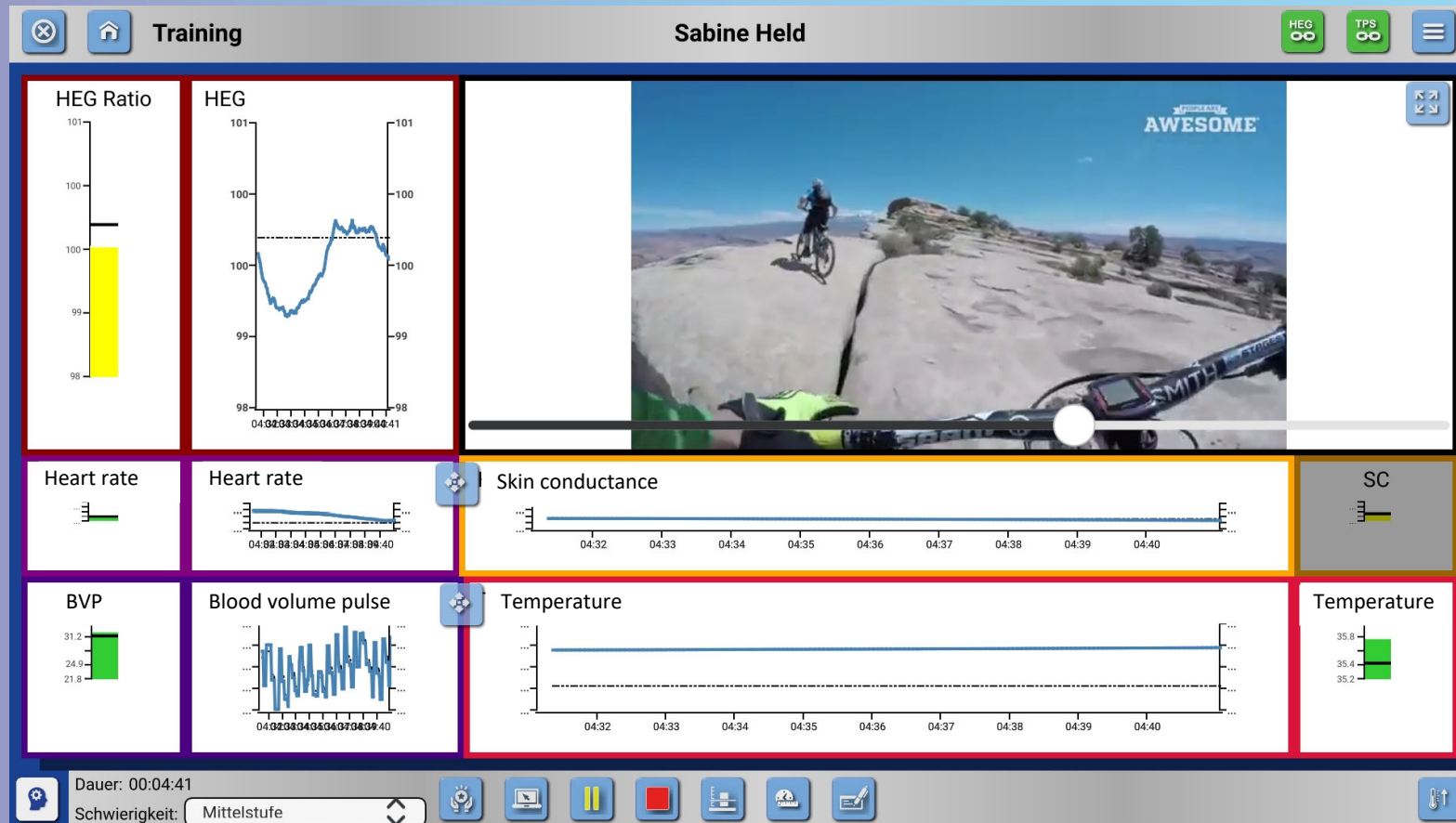
Body & Mind App: Training review



What are the different types of biofeedback?



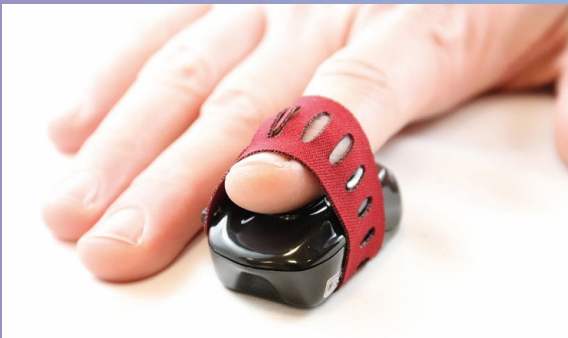
Combined Biofeedback & Neurofeedback Training



Required technology



- HEG-neuro sensor
- TPS sensor
- Body & Mind App - Smart Brain Training App (iOS or Android - free download)



App based training for relaxation and concentration



for Android and iOS

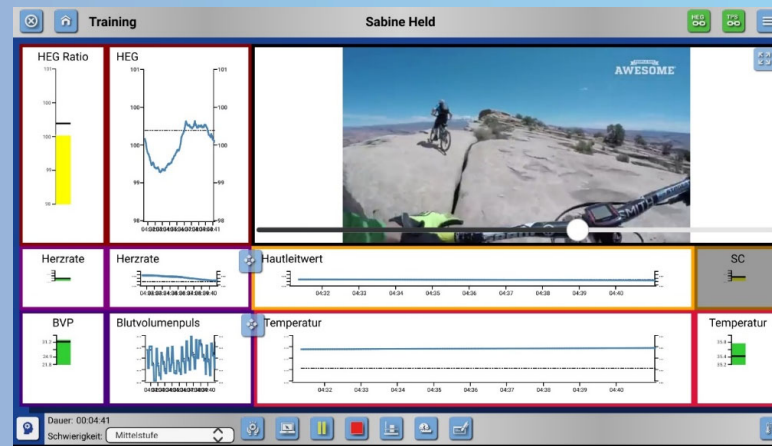
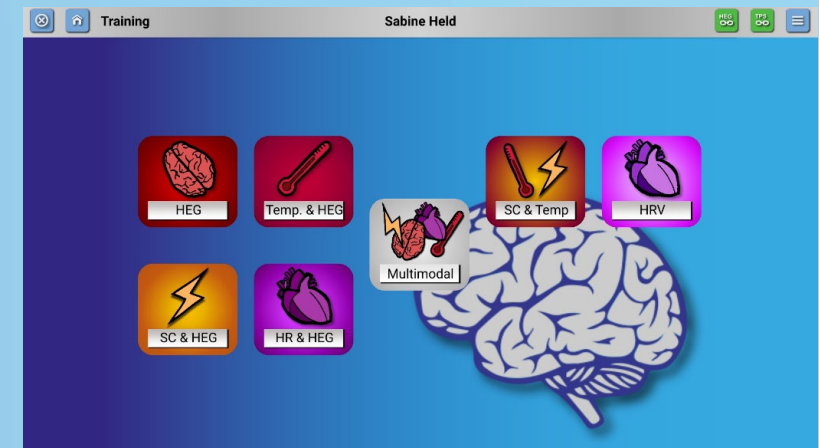


Android



iOS

Intuitive application



Training via app as a home solution

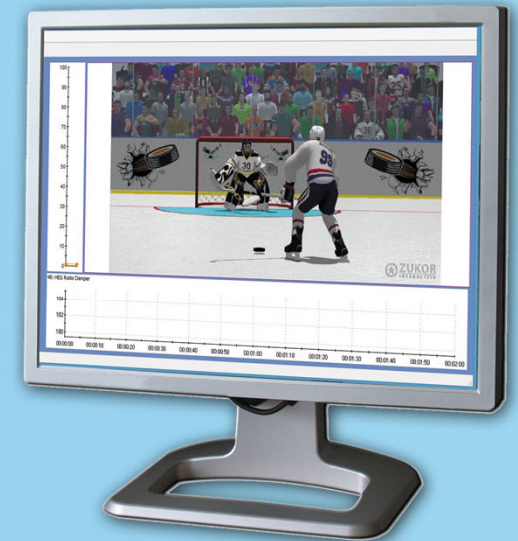
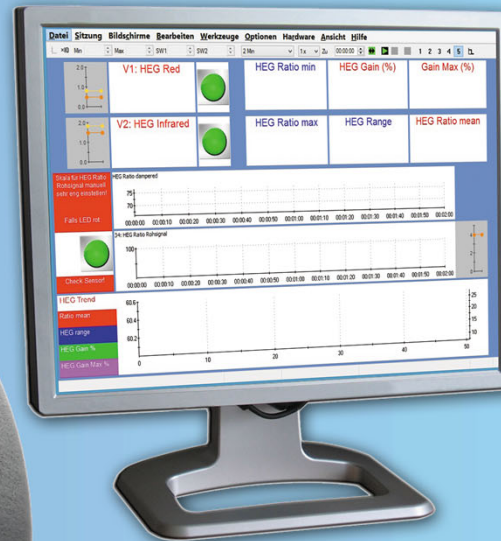
For concentration or
relaxation training
in between ...

on your own
smartphone or
tablet

- HEG Neurofeedback Sensor
- TPS sensor
- Videos as feedback
- Two training variants to promote
 - **concentration** and attention
 - Mental **relaxation**
- Evaluation of training progress
- In combination with the TPS:
 - **Temperature**
 - **Skin conductivity**
 - **Heart rate variability**

By the way ...

- HEG neurofeedback (with and without biofeedback sensors) can be conveniently integrated into the BioGraph Infiniti system at any time using the HEG neuro Connector:



Summary

- The Body & Mind app provides you and your clients with an elegant and compelling introduction to daily biofeedback/neurofeedback training at home and on the go
- Daily training enables faster training success
- The client / patient is actively involved and taken into responsibility
- You open up an additional range of services for your clients
- The Body & Mind app offers a unique combination of biofeedback and neurofeedback





Your questions, please



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