Product Information Sheet – SCP Suite

What are Slow Cortical Potentials?

Slow Cortical Potentials, or SCPs, are very slow, event-related shifts of the EEG. Unlike the spontaneous, oscillatory activity of higher frequency brain waves traditionally used in Neurofeedback (e.g. Delta, Theta, Alpha & Beta), SCPs are in the range of 0-1 Hz, with 0Hz representing the DC baseline of the EEG signal. SCPs are best captured using protocols comprising discrete, time-locked events, with measurements of low frequency EEG initiated by an external stimulus such as a tone or visual presentation, and lasting up to 8 seconds. While the actual physiological source of SCPs is still a topic of debate, they are considered to be a consequence of synchronous activity of large cell assemblies which are responsible for the initiation of goal directed behavior.

The clinical program on which the SCP Suite is based describes a three-phase protocol used to teach clients to voluntarily increase or decrease cortical potentials[1,2]. It has been demonstrated that negative shifts of potential represent cortical activation and positive shifts represent cortical inhibition. Cortical activation is related to an increase of physiological resource allocation and favors such processes as attention and cognitive function. Cortical inhibition, on the other hand, is linked to the reduction of cortical excitation, leading to a calming of mental processes. In general, training to voluntarily generate negative or positive shifts of SCP levels helps your clients by improving their self-regulation capabilities.

The Slow Cortical Potential Suite

The SCP Suite (SA7985) was designed based on the original SCP research from the University of Tubingen, Germany. Inspired by the work of Ute Strehl & Neils Birbaumer on clinical SCP[1,2], it includes everything you need for SCP (Slow Cortical Potential) training. Positive and negative SCPs are trained consecutively in a fully automated scripted session. The feedback includes carefully selected animations, which provide pleasing instructions & feedback on the SCP required. The suite also takes advantage of the full power of BioGraph Infiniti, by using Quick Start favorites, which allow you to start a scripted session and review, report and analyze statistics with the click of a single button or even a desktop shortcut.

SCP Suite features:

- **Direct** implementation of the clinical protocol developped by Ute Strehl[1,2]
- **Quick Start Favorites** are pre-defined for you. Start a session & review with a single click. Even from a desktop icon!
- **Quick, easy interface** for SCP training. Simply start a script, and follow the indications.
- **Feedback training** using positive and negative SCPs.
- **Transfer trials** for real-world transfer of learned SCP training.
- **Artifact correction** using dedicated EEG sensor for eye-movement detection.
- **Feedback tools** include specially selected animations in both single & dual screen configurations.
- **Simple reviews** include single trial and whole session counts & means for all activities.
- **Excel reports** are available for every part of the program and detail each session and performance results
- **Training cards** are included to reinforce client learning outside of the clinic.

Which encoder is it for?

- ProComp5 and ProComp Infiniti

What hardware & software do you need to run the SCP Suite?

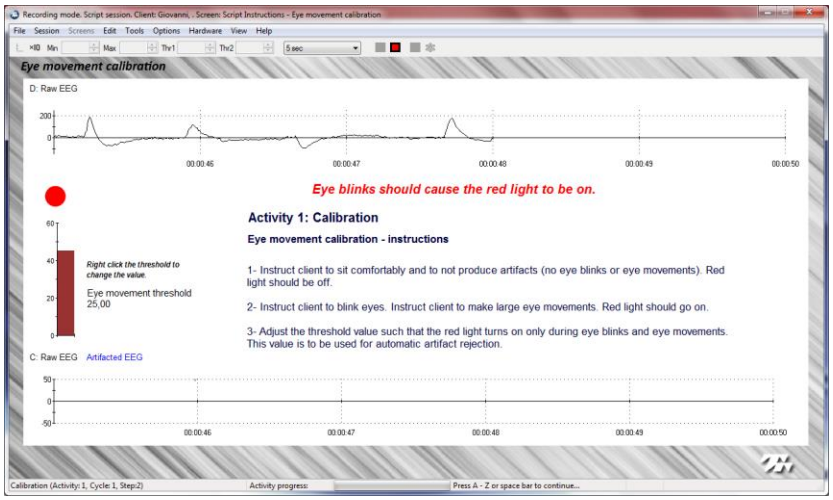
Hardware needed:

- Choice of encoders:
  - ProComp5
  - ProComp Infiniti
- EEG-Z sensor (T9305Z), which includes the T8750 TT-EEG Monopolar/Bipolar Kit
- EEG Z3 Sensor (T7680), which includes the T8775 DC-EEG Monopolar/Bipolar Kit
- TT-A/V Sync Sensor (T7670)
- EKG Extender Cable (T8710M) required to connect Unigel electrodes for measuring eye artifacts using the EEG-Z
- Unigel electrodes (T3425)

Software needed:

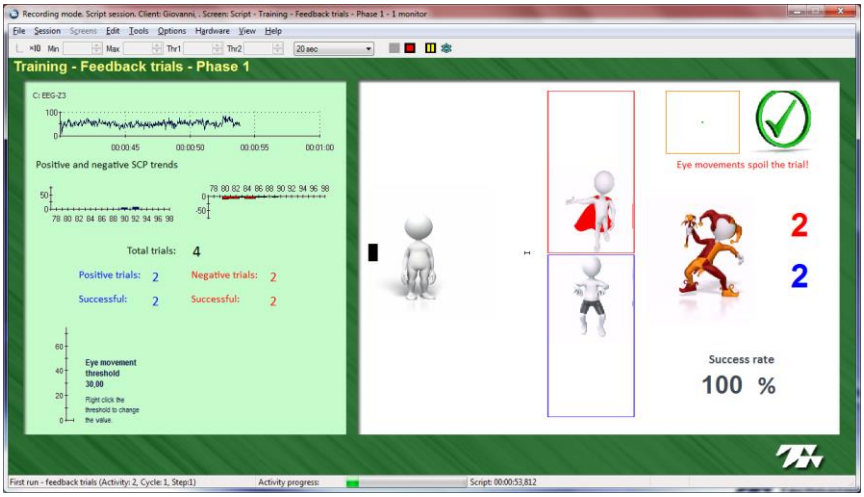
- **SA7900** BioGraph Infiniti v6.0.4

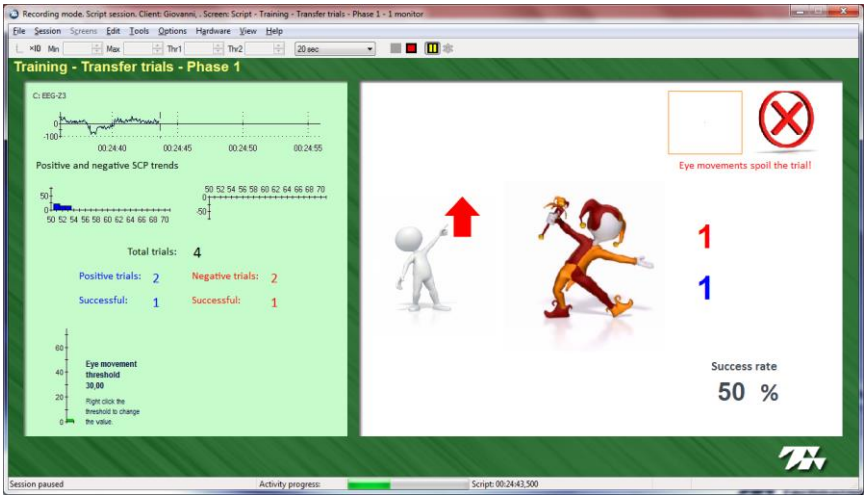
Screens overview



Artifact calibration using EEG-Z sensor

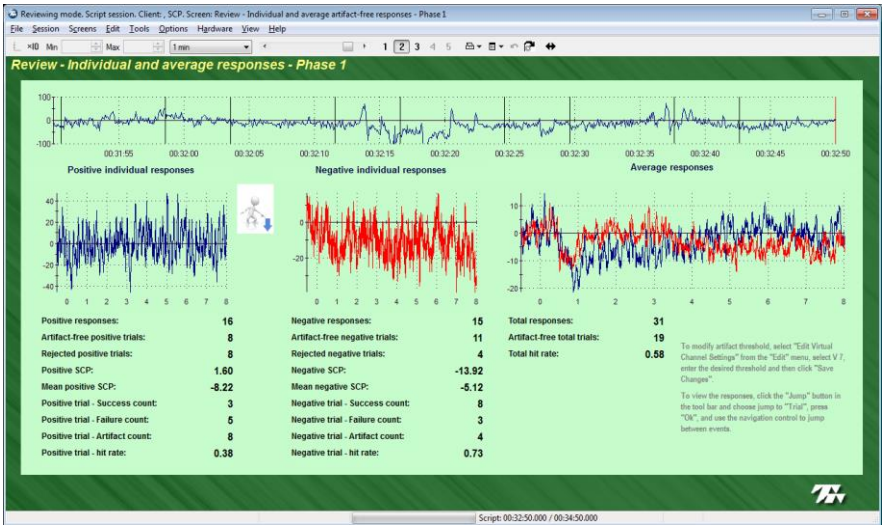
Feedback screen using custom animations





Transfer trial screen using custom animations

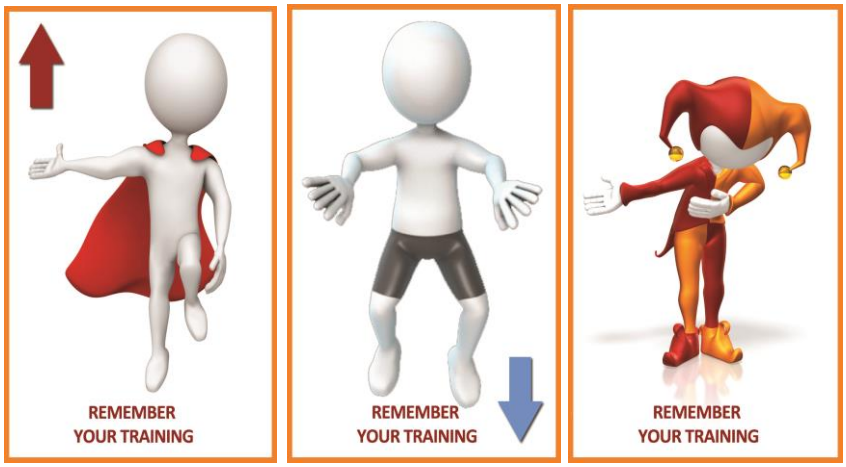
Sample review screen



	First Run	Second Run	Third Run		Fourth Run
	Feedback	Feedback	Feedback	Transfer	Feedback
Positive trial count	20	20	15	5	20
Positive trial - successes	6	6	5	1	4
Negative trial count	20	20	15	5	20
Negative trial - successes	8	5	5	2	8
Total failed trials	17	13	12	3	10
Total rejected trials	10	16	9	5	21

Sample Excel report

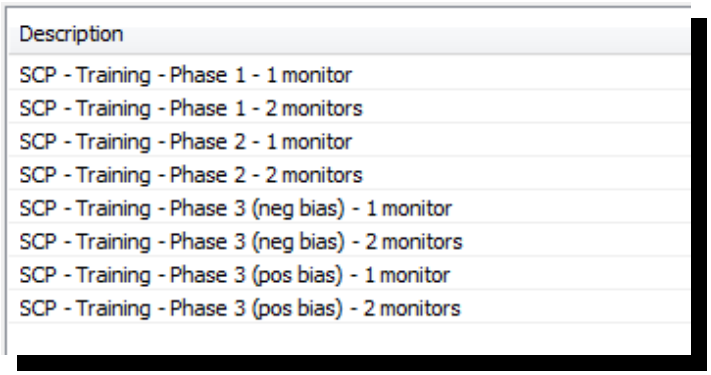
Training cards



What does the Suite include and how to use it?

This SCP Suite will allow the user to perform time-locked SCP training using a predefined trial structure. The program is composed of the following 3 phases of training:

- **Phase 1** is composed of four runs of 40 trials, each being composed of a rest, baseline and 8s trial equally distributed between negative and positive Slow Cortical Potentials. In Run 3, ten of the trials are transfer trials.
- **Phase 2** is also composed of four runs of 40 trials each being composed of a rest, baseline and 8s trial equally distributed between negative and positive Slow Cortical Potentials.However, in each of the four runs, ten trials are substituted with transfer trials.
- **Phase 3** is structured the same as Phase 2 with the single exception that the distribution of negative and positive SCP trials is biased to 66% of the selected direction. The clinician can chose the desired bias direction by running the appropriate script



The SCP Suite program is based on published research[1,2] which suggests that clinicians follow a rigid training regimen which includes 10 sessions within 10 days for each phase of the program. A resting period of 4 to 6 weeks in between each of the phases of training is then recommended.

The SCP Suite scripts all contain the following screens in two versions accommodating one & two monitor displays:

- **Instruction screen:** These screens are the first active screens of the scripts and give an overview of the activities that are part of the ensuing script. They also remind the user to verify impedance before starting training.
- **Artifact calibration screen:** These screens follow the instruction screens and are used to calibrate the artifact thresholds for the dedicated EEG-Z sensor.
- **Feedback trial screens:** The feedback training screens are designed for simplicity. One animation simply indicates whether the SCP should be trained towards the positive or negative direction while the other animations provide a vertical feedback which correlates with the SCP direction.
- **Transfer trial screens:** Unlike feedback screens, transfer trial screens only provide feedback if the intended direction of the SCP shift was successful at the end of the trial.

The SCP Suite review screens include the following:

- **Signal verification:** These screens are used in review mode to obtain an overview of the session and of each activity.
- **Review screens:** Review screens are designed to facilitate session reviewing and for generating excel reports. They include trial & full session means for certain metrics as well as session performance metrics for accepted/rejected trials & trend graphs.

A desktop shortcut to the folder called "*SCP Suite favorites*" is created, which includes 9 Quick Start Favorites:

- SCP – Practice – Feedback trials – Phase 1 – 1 monitor
- SCP – Training – Phase 1 – 1 monitor
- SCP – Training – Phase 1 – 2 monitors
- SCP – Training – Phase 2 – 1 monitor
- SCP – Training – Phase 2 – 2 monitors
- SCP – Training – Phase 3 (neg bias) – 1 monitor
- SCP – Training – Phase 3 (neg bias) – 2 monitors
- SCP – Training – Phase 3 (pos bias) – 1 monitor
- SCP – Training – Phase 3 (pos bias) – 2 monitors

With these screens and favorites, you can accomplish two essential clinical tasks: training & review:

- **Training:** Training sessions are generally run as scripted sessions.
    - **Phase 1:**
        - SCP Training – Phase 1 – 1 monitor
        - SCP Training – Phase 1 – 2 monitors
    - **Phase 2:**
        - SCP Training – Phase 2 – 1 monitor
        - SCP Training – Phase 2 – 2 monitors
    - **Phase 3:**
        - SCP Training – Phase 3 (neg bias) – 1 monitor
        - SCP Training – Phase 3 (neg bias) – 2 monitors
        - SCP Training – Phase 3 (pos bias) – 1 monitor
        - SCP Training – Phase 3 (pos bias) – 2 monitors
- **Reviewing:** After data recording, you can switch to reviewing mode, and load these screens for reviewing & generating the Excel Session report.
    - Review – Average artifact-free responses – Phase 1
    - Review – Average artifact-free responses – Phase 2
    - Review – Average artifact-free responses – Phase 3 (negative bias)
    - Review – Average artifact-free responses – Phase 3 (positive bias)
    - Review – Average processed artifact-free responses – Phase 1
    - Review – Average processed artifact-free responses – Phase 2
    - Review – Average processed artifact-free responses – Phase 3 (negative bias)
    - Review – Average processed artifact-free responses – Phase 3 (positive bias)
    - Review – Individual and average artifact-free responses – Phase 1
    - Review – Individual and average artifact-free responses – Phase 2
    - Review – Individual and average artifact-free responses – Phase 3 (negative bias)
    - Review – Individual and average artifact-free responses – Phase 3 (positive bias)
    - Review – Signals – Phase 1
    - Review – Signals – Phase 2
    - Review – Signals – Phase 3 (negative bias)
    - Review – Signals – Phase 3 (positive bias)

Sensor/Channel Reference Table:

Input / Encoder	A	B	C	D	E	F	G	H
ProComp Infiniti			EEG-Z3	EEG-Z	TT-AV SYNC			
ProComp 5 Infiniti			EEG-Z3	EEG-Z	T-AV SYNC			

REFERENCES

[1] Strehl, U. (2009). Slow cortical potentials neurofeedback. Journal of Neurotherapy, 13(2), 117-126.

[2] Strehl et al. (2006) Self-regulation of slow cortical potentials: a new treatment for children with attention-deficit/hyperactivity disorder. Pediatrics. 118(5):e1530-40.