**Executive Summary Report**

1. **Client Information**

The following report regards Example adult, a 46 year old female who presented for an assessment of brain activation patterns recorded by sample on 8/17/2015. The client grew up with her birth family and was the second of a total number of 3 siblings. There is a known history of neglect. The client has received 12 years of school education and she reported "homemaker" as current occupation. The client is right handed. Both alcohol (more than 4 times per week) as well as recreational drugs (more than 4 times per week) are used by the client. There is no reported history of significant head injuries or seizure activity.

# Medications

The use of psycho-active medications changes the playing field for brain training. The addition of chemicals to the brain with the goal of adjusting neurotransmitter levels may change patterns in the assessment. It also may artificially inflate the levels of specific neurotransmitters in the brain. Training often produces such chemical changes as a natural result of how the brain is now operating. The result can be that training may actually appear to produce negative results as levels of a brain chemical that was previously in short supply become excessive due to the combined effect of training and medication.

Working with medicated clients should only be done after gathering information on the symptoms of over-medication with each of the drugs being taken. A page with a list of each medication and its indications of over-dosage, is created and referred to throughout the training. As symptoms appear, the client’s physician can be notified and can reduce medication levels as the brain itself takes over.

## *Medications reported as being taken at the time of the recording are listed below:*

*Anti-anxiety: 1*

# *The client reported the following areas of significant difficulty:*

*Attention: 3 out of 4*

*Stress: 3 out of 5*

*Control: 4 out of 7*

*Anger: 2 out of 4*

1. **Data Quality**

One site was found to be asymmetric: T5-T6

There are no excessive coherence values that would suggest muscle artifact.

Data is complete for all minimally required sites.

In summary, one potential quality issue was found. Check the data and see if there is an impact on the TLC training plan.

1. Assessment Findings

# Brain Activation Patterns

The human brain can be considered to be a complex chaotic network, with trillions of signals passing through it at any moment as groups of neurons fire together. In resting states, large areas of the cortex are synchronized with older areas of the brain which produce slower rhythms. In task situations, local groups work independently with faster rhythms produced in the cortex. They also communicate with other groups, at various distances and locations to cooperate on tasks and share information.

The cortex, like most chaotic systems, tends to evolve certain “habits” in how it acts and responds to inputs. These “stable activation patterns” form the basis for much of how we act, feel, learn and perform. They can have an impact on stress responses and how our bodies operate as well. Brain training focuses on identifying—and changing—such habits when they are no longer effective. The goal of training is not necessarily to change brain patterns but to increase the range of options, flexibility in shifting up and down the scale and capacity to sustain patterns long enough to perform tasks.

Results of training the middle-frequency patterns related to awareness and presence—the resting-ready observer state—can often be measured over the course of training. Peak frequency, blocking alpha at task, etc. may show stable changes from beginning to end of training. But coherence, frequency and balance training are not about removing a pattern but about improving access to additional ones. The client’s steady-state may change little, but what he can do and in what situations can change significantly.

The following are the findings of this assessment in the areas of brain energy levels (Frequency Patterns), their distribution within the brain (Symmetry Patterns) and the ability of cortical areas to operate independently and to share information efficiently (Connectivity Patterns).

Where a brain pattern is found, the areas are identified, and the effects these patterns may have on mental/physical states are stated. The Whole-Brain Training Plan produced in this assessment is a recommended set of where and what to train to help break up identified “energy habits” and allow the brain to establish a new, more functional set.

# Frequency Patterns

Cortical neurons fire at different speeds (frequencies), which represent different energy levels. Fast-dominant brains continue firing at working speeds, even when there is no work to do, wasting energy; slow-dominant brains are unable to activate to perform cortical tasks for very long. Frequency patterns show us the ability of the brain to idle when appropriate and to activate necessary areas when there is a task.

## *Additional patterns*

*While this brain is not dominated by high-frequency activity the following patterns were found which are commonly associated with a fast dominant brain:*

### *High beta peak frequency*

*Beta operates in several bands, including 12-15Hz, 15-19Hz, 19-23Hz and 23-38Hz. This fastest group is not generally functional; it is more related to hyper-vigilance and trauma-based fear. High beta peak frequencies indicate a greater share of hibeta. Fast beta peaks are shown at* ***F3, F7, F8, Oz, T3, T4 and T6****.*

### *Low Theta/Beta ratios*

*Theta/beta ratio measures the relationship between sub-conscious and conscious processes. Low ratios show dominance of Beta (conscious) and can correlate with stress, anxiety, sensitivity, thinking-over-feeling. This brain shows these patterns at* ***F7, C4, Pz, Cz, Oz, T3, T4, T5, T6, P3, P4, O1 and O2****.*

# Midline

The sagittal line separates right and left hemispheres. Its frequency pattern may differ from them because a structure called the cingulate gyrus runs beneath it from the front to rear of the brain. This line contains the anterior cingulate, the vertex and the default-mode network.

*This brain does not show significant midline patterns.*

# Symmetry Patterns

Different geographical areas of the brain appear to work best with specific frequencies based on whether their work is integrative or processing. The left hemisphere produces a brighter, more positive view of experience—it approaches life. It handles routine operations and produces a more focused, detailed picture. The right hemisphere sees things more negatively, in terms of risks—tends toward avoidance. It is involved in responding to novel situations and produces more of a focus on context.

The rear of the brain receives and integrates sensory information from senses into a unified, constantly changing picture of experience which is sent to the prefrontal cortex. The front of the brain processes this material and organizes actions.

Asymmetries between front vs. rear and left vs. right sites for levels of integrative (alpha) and processing (beta) frequencies can correlate with a variety of mood and performance issues.

## *Left slower than right hemisphere*

*The left hemisphere is expected to be more activated than the right, but in this brain it is less activated. This may result in difficulty setting up and maintaining routines, lack of attention to outside experience. Language processing may be weak. Tendency toward low energy and depressive feelings. The following sites show this pattern:* ***C3/C4, T5/T6, P3/P4 and O1/O2****.*

## *Left hemisphere alpha dominance*

*This brain shows alpha greater on the left. This correlates with depressed mood, negative view of experience, perhaps difficulty with language processing. The following sites show this pattern:* ***F3/F4, C3/C4, T3/T4, T5/T6, P3/P4 and O2/O1****.*

## *Front slower than rear*

*Frontal lobes should include the most activated areas of the brain, since they perform executive functions. Posterior brain areas receive sensory information, link it with previous experience and integrate the various sources. Middle and lower frequencies are useful.*

*This brain has a front/back reversal because of low frontal activation. Issues with motivation, attention and other executive functions would be consistent with this pattern. Difficulty with processing, making decisions and critical thinking might appear. The following sites show this pattern:* ***F8/T6, F3/P3, F4/P4 and Fz/Pz****.*

## *Frontal alpha dominance*

*Frontal alpha reversals can be the result of higher than expected levels of alpha in the front or low levels of alpha in the rear of the brain.*

*This brain shows high frontal alpha levels. This can correlate with depressed mood, a tendency to drift instead of engaging, difficulty maintaining focus, poor working memory and disorganization. The following sites show this pattern:* ***F8/T6, F3/P3, F4/P4 and Fz/Pz****.*

# *Spike Patterns*

*HiBeta spikes—dominant bursts of the hibeta frequency found with eyes open and closed at the same site—are often found found on the side of the brain. Hibeta is a hyper-vigilance state, often related to traumatic experience. Training can balance the two sides or reduce extreme over-activation at the spike site.This brain shows Hibeta Spikes at* ***F7****.*

# Connectivity Patterns

Brain functions generally involve activation of specific areas, which operate independently and share information efficiently. Between functions brain areas should ideally shift into lower activation states so as not to waste energy. The ability to rest between (and during) tasks, to activate and function independently and to cooperate efficiently are determined by measures of connectivity: Coherence (the stability of a linkage) and phase (the timing of the linkage) in various frequencies. The combination of coherence and phase is known as Synchrony. Depending on the state and frequency, these values should be higher or lower.

## *Excessive synchrony*

*In working states, cortical areas produce faster beta frequencies which are expected to appear locally in the area performing a task. Unless two sites being measured are working together on a task, synchrony in fast frequencies should be low. When it is found to be high, it is first important to verify that there was not significant muscular tension present during the recording, which can create artifactual high fast-wave synchrony.*

*This brain shows high fast-wave synchrony at the following site pairs:*

***F3 and F4*** *which can be related to mental rigidity or obsessiveness, perhaps to anxiety.*

***C3 and C4*** *which can be related to excessive physical awareness or rigidity, perhaps difficulties with fine-motor coordination. It is not uncommon to see physical anxiety (panic attacks, migraines, irritable bowel).*

***P3 and P4*** *which can be related to either difficulty in processing or extreme sensitivity to touch, difficulty with math processing, problems with awareness of self in physical space.*

***O1 and O2*** *which can be related to either difficulty in processing—or extreme sensitivity to—light and visual stimuli, sleep disturbances, headaches.*

# Alpha Patterns

Alpha is a crucial brain frequency, since it represents the ability to idle, reducing energy demands, and shift almost immediately into processing states. It can also be considered the bridge between conscious and sub-conscious minds. It allows the brain to operate routine tasks in auto-pilot.

*The following alpha patterns are found in this brain:*

## *Peak frequency*

*This brain shows strongest (peak) alpha activity slower than expected. Peak alpha for adults is expected to be at 10 Hz. Children of 8 years of age may have alpha peaks around 8Hz. Slower peaks relate to difficulty with working memory, word-finding, sometimes sleep and cognitive brightness. Low peak frequencies are found at* ***all sites except of F7 and T3****.*

## *Frontal alpha*

*Alpha is usually found most strongly in the back of the head. When frontal areas are dominated by alpha, cognitive and executive functions tend to be poorly performed. Motivation may be weak. May also appear with anxiety. This brain shows strong frontal alpha with eyes closed and/or eyes open at* ***F3, F4, F7, F8, C3, C4, Fz and Cz****.*

# Sensory-Motor Rhythm Patterns

The frequency band above alpha (12-15 or 12-16Hz—often centered on 14 Hz) is considered to be the lowest cortically-generated frequency—low beta or beta1. However, when it is found in the sensory-motor cortex (the central strip running across the brain’s front-back midpoint from side to side), it is called Sensory-Motor Rhythm (SMR).

The sensory-motor cortex bridges the separating line between the front (motor) and the rear of the brain (sensory), In this area, sensory and motor information can be linked. It may also be a major site of mirror neurons, which appear to be related to empathy. It is heavily connected to both sensory screening (thalamus) and motor screening (basal ganglia) brain systems.

*This client’s SMR is below the 10-12% target at* ***C3*** *with eyes open. The lower the levels at the sensory-motor sites, the more likely one or more of the following problems will be present;*

## *Sleep-onset insomnia*

*Bursts of SMR during sleep onset are called “sleep spindles”. Low SMR levels are often related to sleep-onset insomnia, bruxism and restless sleep.*

## *Physical hyperactivity*

*SMR has been shown to relate to physical relaxation and control. Poor handwriting, fidgetiness, impulsivity, distractibility and motor coordination issues are common symptoms.*

*Circadian rhythms and hormonal/endocrine functions have responded to training to increase SMR levels.*

# Sleep Issues

Although some long-standing sleep problems—especially when complicated by the use of medications to assist in sleep—can take longer to resolve, improved sleep is often an early response to training. Where possible, improving sleep should be a high priority for all training, since it can often help to resolve a high percentage of other issues as well.

Exploring sleep should be an important part of the initial interview with the client. If this was done carefully, this report will include paragraphs on each identified issue and it will tell whether or not the expected brain pattern is present.

*This brain shows the following sleep-related pattern(s):*

## *Sleep-onset Insomnia*

*Does the client go to bed at a reasonable hour and generally fall asleep within 10-20 minutes? This can be related to either of 2 patterns.*

*Low levels of SMR in the sensory-motor cortex, keep the brain from shifting from drowsiness to physical sleep. Often unsettled or active sleepers; may grind their teeth or have restless legs in bed.*

*Fast right-rear quadrant with anxiety can also block sleep onset.*