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## Recommendations for getting started

1. Plan to train yourself first. As perfect as your brain may be, there is no substitute for the experience of sitting in the client chair and actually feeling how training works and how it helps you change yourself. If your intent is to offer training to a friend or family member, doing it yourself and making your own changes in a great way to motivate your client as well.
2. It's not absolutely required but strongly recommended that you find a "buddy" or a few (including your client, if appropriate). Just like starting any new exercise program to change your life, working with someone speeds the learning and helps keep you motivated until you actually start seeing results. Share and discuss the book *A Symphony in the Brain* by Tom Robbins, and you should find plenty of folks who are interested.
3. Get training on finding sites and placing electrodes (see the [Brain-Trainer Skills Video Workshops](#) at brain-trainer.com). Spend an hour or two practicing these (learn to find sites even before you have all your equipment). These skills are crucial. Without them you will never get your best results. You won't consistently be training the proper areas and the real brain activity. The map of the sites on the head is not a good alternative unless you believe that could drive to Akron, OH by looking at a US topographical map.
4. When the equipment arrives, follow instructions to get everything installed. It usually takes an hour or so.
5. When you have things set up, and you've worked some on site-finding, it's time to learn about Montages. Look at the amplifier, and you'll see that the inputs to plug the electrodes into are marked 1+, 1-, or A+, A-, etc. Each channel of EEG (you can train one-channel, two-channel, 3 or 4-channels at a time) has:
  - a. One "active" electrode (which goes into the + input)
  - b. One "reference" electrode (which goes into the – input)
  - c. A Ground or neutral electrode (which goes into the G or N input)

The "montage" listing shows you which sites on the head go to which inputs in each channel. For example: C3/A1 means that C3 on the head plugs into the 1/A+ input and A1 plugs into the 1/A- input. **You MUST have a ground** (most amplifiers use one ground for all channels), and the ground can go anywhere on the body. It may or may not be specified in the montage.

**You MUST use conductant on the ground and ears (saline, paste, gel, etc.).**

C3 C4 (A1 A2) means that C3 goes into 1/A+ and C4 goes into 2/B+, A1 and A2 go into the 1/A- and 2/B- inputs and the ground can be placed anywhere.

6. Spend an hour or so to practice doing hookups with your buddies in 1 channel, using the montage Fp1- (A1) G(A2). Put the active electrode on the forehead and the reference and ground on the mastoids or earlobes. Learn to get clean connections first **WITHOUT** having to deal with hair. To test your connections:
7. Open the software, load a Design like TQ Assess and record a couple minutes of data. Pay attention to the spectrum analyzer and oscilloscope displays.

- a. The spectrum analyzer should be set to show to 60Hz. Especially look for very tall bars at 50 or 60 that don't seem to change much or for very tall spikes that occur at regular intervals on the spectrum. These are indications of electromagnetic artifact—electrical environmental noise masquerading as EEG.
  - b. The oscilloscope should show a waveform with a variety of amplitudes (heights) and a variety of widths (frequencies). The more regular and consistent it is, the more likely it is not coming from the brain. Sharper wave tops and bottoms are more likely artifact than rounded ones.
  - c. Send those files to [Karen](#) or [Pete](#) for feedback on signal quality and potential problems.
8. When you are getting good signals, repeat steps 4 and 5 placing your active electrode over a site on the head with hair around it. When you get good signals in one channel, try 2 channels. In two channels, look for symmetry in the two sides of the spectrum analyzer.
9. Have an assessment party: Get a couple interested friends/colleagues to come spend a few hours taking turns doing the assessment (someone as the client, someone reading instructions and someone being the trainer). Repeat the process, switching roles, so you complete 2-3 assessments and the process becomes routine. Again, send Karen or Pete those files for feedback. Don't expect these first runs will be much good, but as an exercise in finding sites and placing electrodes and going through the steps, they are invaluable.
10. If it looks like you are succeeding in getting good data, and the process feels pretty routine, go ahead and do (with your helpers) "real" assessments to submit. Make sure to complete the Client Report for each. Send the "real" assessments to Brain-Trainer for processing if you have purchased a [Whole-Brain Training Plan](#).
11. You'll get training plan(s) back for the assessments you ordered. You can also request (at least for the first few) that we schedule time online to review the assessment with you and show you how to use any of the suggested designs that are new to you. Then you begin testing them by placing the electrodes where indicated and running the indicated protocols. You test each of the options once and decide, based on the client's response, which ones to focus on.
12. Supervision/consultation can be scheduled by the hour or in a package.  
<https://brain-trainer.com/product-category/consultation/online-consultation-mentoring/>

Depending on people's schedules, you could complete steps 1-4 within 7-10 days (or faster) starting over one weekend and finishing over the next. Then you'd be ready to start training 1 (yourself) to 3 people. When you have been involved in training 3 people from assessment to an end point, you will truly understand the training process!

## Terminology for Sensor Connection

### Montages

Active and Reference electrodes provide EEG measurement (active or inert sites)

Measure signal BETWEEN the two sites, subtracting one from the other.

Ground electrode closes the circuit-DOESN'T MEASURE EEG! Can be set anywhere. Always use a ground!

**Monopolar** (referential) montage= One electrode over active site, other over "inert" site (mastoid or ear lobe)

**Bipolar** (sequential) montage= Both electrodes over active sites as in C3 C4 (always use a ground)

Each set of active and reference electrodes represent one channel of EEG.

On the Q-wiz, Channel 3 and Channel 4 share the reference with Channel 1 and Channel 2. On the Optima+ 4 and PhysioAmp, each channel can have its own reference.

### Montages and Protocols

**Frequency** (number of pulses a neuron fires each second); measured in Hertz (Hz)

One Hz equals one pulse per second.

**Amplitude** (energy differential between Active and Reference lead in a frequency band); measured in Microvolts (uV). One uV is one millionth of a volt.

A. EEG readings are actually differences between two points read against a "ground".

1. The difference in electrical activity is measured BETWEEN the two sites.
2. Activity found at both sites cancels out; this is called "common-mode rejection"
3. Ground may be any point on the body, even an active EEG site.
4. Brain-Trainer's Whole-Brain Training Plan will list protocols as follows:

**Active (+)**      **Reference (-)** (always use a ground, anywhere on body)

C4                      A2

B. **Monopolar** (single-point) montages read an active EEG site against an "inert" site

1. Inert sites, with little readable brain activity, include ear lobes and mastoid
2. Examples of "monopolar" montages would be:

Cz A2;    C4 Pz;    T3 T4.

3. Note: the Reference lead should generally be on the same side as the Active.
4. These are supposed to train a specific site by itself (Cz, C4 or T3)
5. In reality, they measure activity from the entire head, though signal tends to be dominated by activity near the active lead.

C. **Bipolar** (two-point) montages read one active EEG site against another.

1. Mirror sites (e.g. C3 C4; T3 T4; F7 F8) link the hemispheres.
2. Intra-hemispheric sites (e.g. F3 P3; C4 T4) train linked locations on one side.

### D. One- vs. Two-Channel Montages

1. Two channel training requires a machine capable of tracking separate channels
2. Each channel has its own Active lead wire, may share Reference, shares Ground lead.
3. Each channel may train same or separate protocols.
4. Two-channel training allows double the effect in a given period.
5. Some argue it teaches the brain to do multiple things at same time.
6. Avoids the need to titrate different frequency training.

### References

**L** means **Linked** : Linked references, where the two references are plugged into the two - inputs on the amplifier and linking is engaged ("Link" button on Q-wiz, Common reference "Internal connection" on Optima+, use of "jumper" on other amplifiers), so they are averaged to give the same signal for both references. For example:

P3 P4 L(A1 A2) (always use a ground)

**C** means **Common**: Common references are where both actives link to the SAME reference. C references are LINKED. For example:

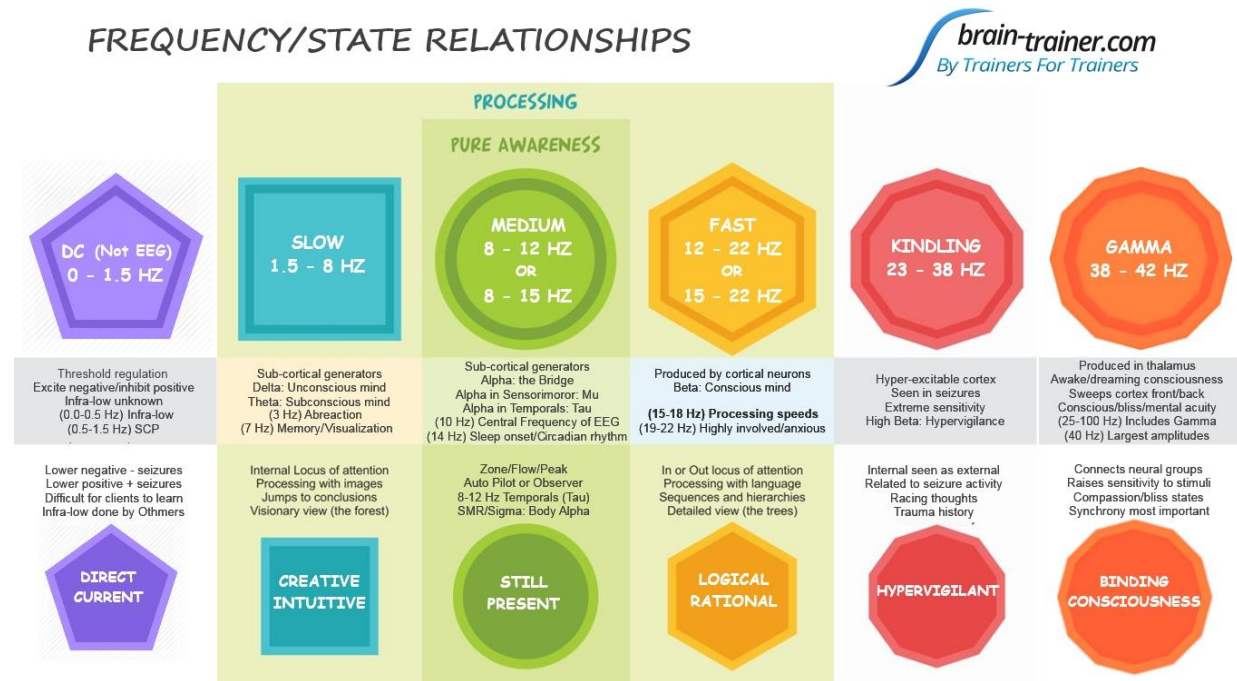
C3 P3 C(A1) (always use a ground) Both sites are using A1 as their reference. By pressing the *Link* button, you can plug a single electrode into either end of the reference plug, and it will serve for both channels, leaving the 2nd reference empty.

**I** means **Independent**: Independent references (are NOT linked), where each active electrode is measured in relation to its own reference. A classic example of this is:

C3 C4 I(A1 A2) (always use a ground) C3 links to A1 and C4 links to A2.

## Frequencies and States

Frequencies are measures of the firing speed (pulse speed) of neurons/networks. They are measured in pulses per second. One pulse per second is one Hertz (Hz).



### SLOW FREQUENCIES

*Processing speeds; Locus of awareness primarily internal; image-based processing  
Creative-intuitive thought; flash-thinking, leaps to conclusions.*

**DELTA (0.5-3.0 or 0-4Hz)**

*Primarily found during deep sleep; high waking levels can indicate a lesion  
Importance of 3Hz surges: old emotional trauma.*

**THETA (3-7 or 4-8Hz)**

*Normally seen during hypnagogic states (waking up/falling asleep)  
"Good" theta vs. "Bad" theta.  
Importance of 7Hz activity: memory consolidation, integration of material.*

### MIDDLE FREQUENCIES

*Awareness speeds; no processing; no thought; stillness.*

**ALPHA (8-11 or 8-12Hz)**

*Mental stillness; pure awareness without processing; should center on 10Hz for adults; slower speeds used for visualization; auto-pilot state; resting state.  
Importance of 10Hz activity: primary attractor for adult brains.*

**SMR/LoBETA (12-15 or 12-16Hz)**

*Physical stillness; body presence; often heavy and warm feelings; low muscle tone; Importance of 14 Hz activity in circadian rhythms, sleep onset, screening.*

### **FAST FREQUENCIES**

*Processing speeds; internal or external locus of awareness; language processing; Logical-rational thought; processing in sequences and hierarchies.*

*BETA (15-18 or 16-20Hz)*

*Detail-oriented processing. Calculation and extraction of meaning.*

*BETA2 (19-22 or 20-24Hz)*

*Extreme engagement, highly focused, curious; may be experienced as anxious.*

*HIBETA (23-38 Hz)*

*Hyper-vigilance; extreme anxiety; generally relates to PTSD or abuse history*

*GAMMA (38-40Hz)*

*40Hz: Shear frequency; integrative/binding frequency found in all areas of brain.*



## Electrode Sites

### 10 / 20 System Electrode Distances

