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Quantitative EEG Report and IVA continuous performance test, binocular screening

Patient name: Xxx

DOB: mm/dd/yyyy

Referral: parents

Date of recording: mm/dd/yyyy

Date of report: mm/dd/yyyy

Problems: Anxiety, irritability, ADHD symptoms, NVLD

Procedure:

1. An initial 1-hour clinical interview and history/symptoms questionnaires were used to determine history, symptoms and preliminary diagnosis (es).
2. A test of attentiveness and response control, the Integrated Variables of Attention (IVA) continuous performance task. We always do this test, whether or not the presenting complaint has to do with inattention. Sometimes one has subtle attention problems that one may not have noticed, that play into other problems like anxiety or depression. The IVA measures errors of inattention (missed targets), commission (responses to non-target stimuli), hyperactivity (extraneous responses), reaction times, variability and stamina of response times to both auditory and visual targets. A "1" or a "2" is presented either on the screen or as speech by the computer. The goal is to press a mouse button quickly when the "1" is presented. The main scores produced are Auditory and Visual Response Control Quotients and both Auditory and Visual Attention Quotients, as well as Full Scale Response Control and Full-Scale Attention quotients. The quotients are age and sex normed and are designed like IQs, with a mean of 100 and S.D. of 15. Full Scale Response Control is a composite of auditory and visual scores for Prudence (avoiding reacting to the non-target 2's), Consistency (the standard deviation of the mean reaction time) and Stamina (maintaining the first-half reaction time into the second half of the test). Full Scale Attention Quotient is a composite of Vigilance (hitting the button when target 1's occurred), Focus (the standard deviation of the middle 50% of reaction times) and Speed (the mean reaction time). Separate Response Control and Attention Quotients are also generated separately for Auditory and Visual modalities, along with subscale scores for the individual measures like Vigilance, Focus and Speed.
3. A visual screening was conducted which detects common developmental visual disorders, measuring fusion/fusion reserves and stereopsis by presenting binocular

images with gradually increasing degrees of spatial separation in both convergent and divergent directions. The convergent fusion problem often causes complaints of sore eyes when doing a lot of close visual work, like reading. Poor convergence also usually decreases reading speed and comprehension. Limited divergence will diminish optimal sports performance or even cause clumsiness by limiting accurate depth perception. If findings are not within normal limits, the problem can be reduced or eliminated with vision therapy.

4. 19 channels of digital EEG were recorded with a NeuronSpectrum-3 19 channel EEG recording system using a Lycra cap which carried the electrodes in the standard International 10-20 System montage of electrode positions. Sampling was at 500 samples per second with 16-bit amplitude resolution and impedances were maintained below 5 KOhms. Eye blink and movement artifacts were removed prior to examining the data with the Neuroguide eyes closed and eyes open reference databases (R. Thatcher, Ph.D., https://www.appliedneuroscience.com – see Appendix C for a partial list of institutions using this database). Five-minute recordings were made for each of the following conditions: eyes open, reading, listening, writing and drawing. Eyes closed recordings were made before and after the eyes open/task recordings and were also 5 minutes each. The eyes closed recording was repeated at the end of the session to allow us to determine stability and test-retest reliability.

BACKGROUND: Xxx lives in XXXX with her parents XXXX and XXXX, and her siblings. She attends XXXX in XXXX.

XXXX provided this background information via our intake questionnaire:

Xxx was [clinical information]

Briefly describe your child's infancy (For example, sleeping, eating, crying habits, easy or difficult to care for):

[clinical information].

Briefly describe your child's toddler years(for example, language use, plays with other children, temper tantrums, sleep problems, easy or difficult to care for, ease or difficulty when routines changed):

[clinical information].

Briefly describe your child's preschool years (For example, playing well with other children, behavior problems, language skills, activity preferences):

[clinical information].

Briefly describe your child's early school years (For example, learning or behavior problems, self-esteem, quality of friendships):

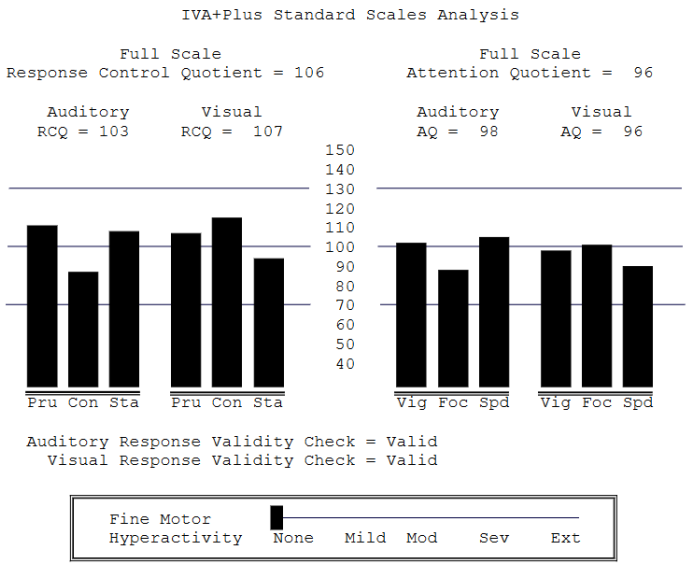
[clinical information].

RESULTS OF OBJECTIVE TESTS:

IVA: These "quotient" scales have an age & sex-normed mean = 100 ±15. Xxx's attentive performance was mildly impaired:

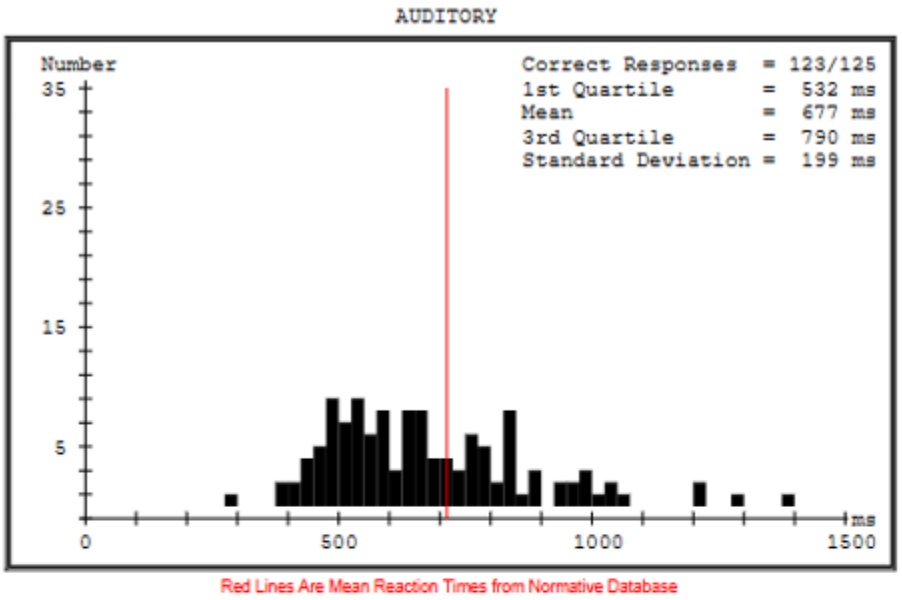
Full Scale Response Control Quotient = 106

Full Scale Attention Quotient = 96

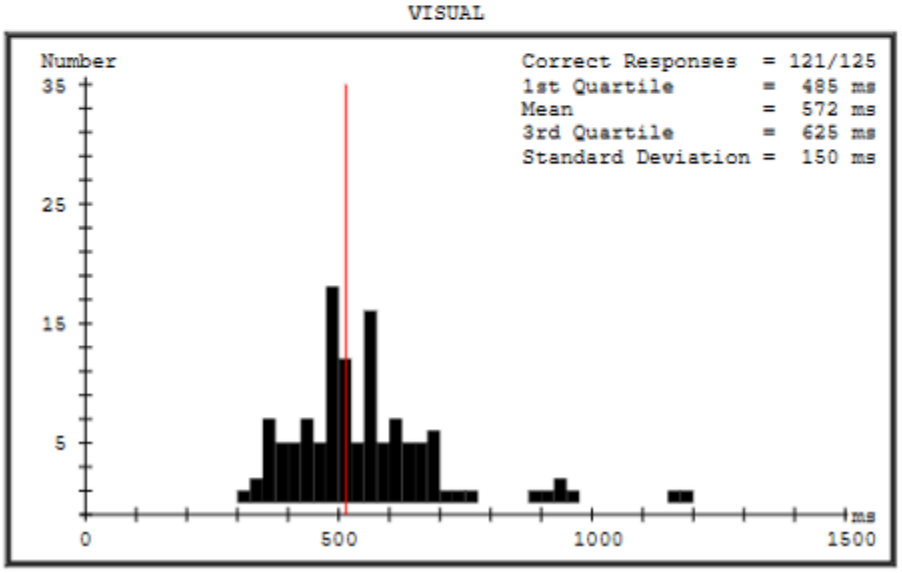


Full Scale Response Control is a composite of auditory and visual scores for Prudence (avoiding reacting to the non-target 2's), Consistency (the standard deviation of the mean reaction time) and Stamina (maintaining the first-half reaction time into the second half of the test). Full Scale Attention Quotient is a composite of Vigilance (hitting the button when target 1's occurred), Focus (the standard deviation of the middle 50% of reaction times) and Speed (the mean reaction time). Quotient scores have an age/sex normed average of 100 and 15 points above or below that is less common. 30 points above or below is very uncommon and indicates a clinically significant problem is present.

The histograms of reaction times and further statistics are shown here:



Red Lines Are Mean Reaction Times from Normative Database



Part of the test was designed to assess sustained attention and contained relatively few targets. These scores were as follows:

Sustained Auditory Attention Quotient = 102

Sustained Visual Attention Quotient = 95

Interpretation: Basic attention (no complex processing required for this task) is within normal limits. This does not imply that complex listening, reading, math, etc. will be fine; this is very simple, direct attention and doesn't involve high levels of interpretation or thought.

Binocular screening results: Xxx attained prism diopters 22 convergent and 6 p.d. divergent on the six-card set of fixed demand Bernell tranaglyphs. These are red/green "3-D" images with increasingly wide separations between the left and right eye image, requiring increasing amounts of "fusion reserves" in the visuomotor brain systems. Optimal fusion is 30 p.d. convergent/18 p.d. divergent.

Interpretation: Xxx's convergent fusion to close objects is very good, very close to optimal. There should not be an issue with eye strain or tired eyes when doing a lot of reading or screen work.

Divergent fusion is significantly impaired, reducing precision long distance depth perception, which prevents optimal sports performance and can cause background anxiety because of uncertainty of the exact position of the body in space. With 6 p.d. divergence (instead of 18) people may notice a problem with sports activities, like catching a ball. Competitive athletes may get "sports vision training" to optimize this visual function. Developmental optometrists have optimized these functions with "vision therapy", and we've learned basic vision therapy techniques from such an optometrist, who had been in our practice. Dr. Sealock's work with her might not be done. If he's taken this as far as he can, we will try while doing neurofeedback, which often makes further improvements possible.

Our screening does not test for more complex visual issues, only basic convergent and divergent fusion and stereopsis ("3-D" perception). An eye doctor should be consulted to determine eye health and visual acuity (which is what glasses or contacts correct).

EEG analysis

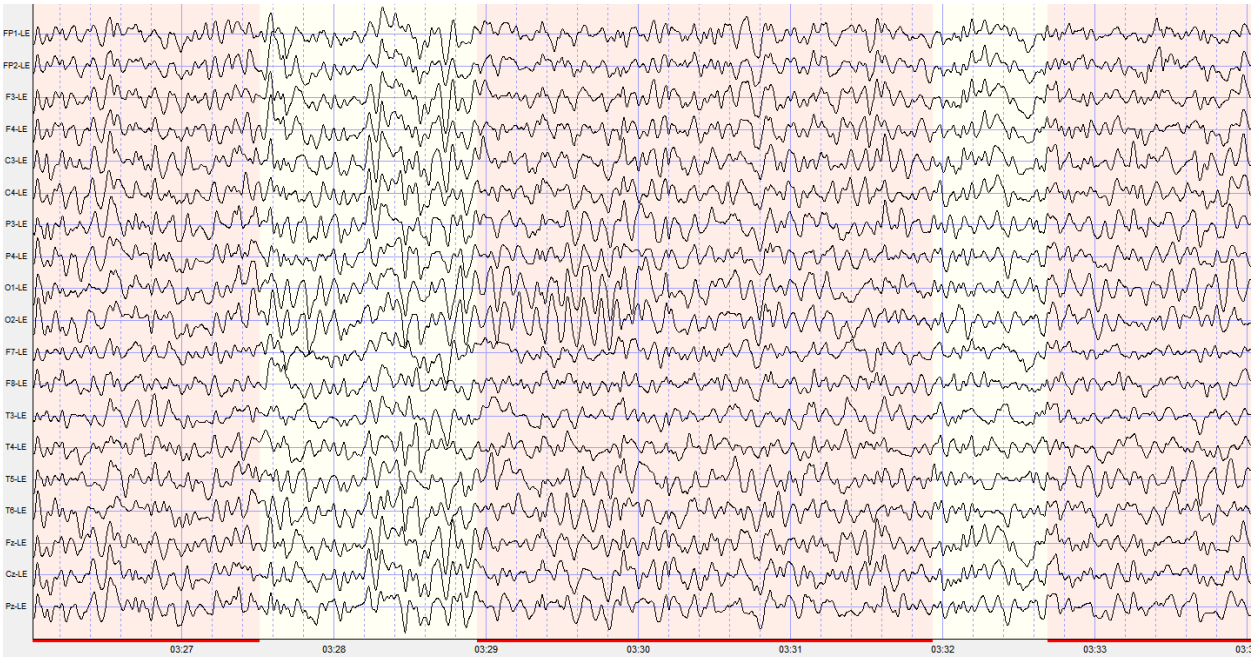
Quantitative EEG seeks to understand the concomitants of behavioral, cognitive and emotional difficulties by examining the rhythmic electrical activity of the brain. EEG is analyzed first by looking at the electrical oscillations that are detected at each of the 19 recording electrodes. There are patterns that are common and "normal" and there are patterns the eye can see that are not normal and are associated with inattention, cognitive problems or even anxiety. The EEG is not examined from the standpoint of detecting organic brain disorders or diseases; rather we are interested in patterns that are known to be associated with unpleasant cognitive or emotional states. Brain electrical rhythms are also analyzed with the Neuroguide normative lifespan database, which lets us see how the averaged EEG in each recording condition compares to the average EEG for the patient's age group; this is the "quantitative" part of the process. There are some terms to know when reading the statistical part of the report:

Explanation of terms in the statistical analysis of the EEG: "Power" refers to the size of the waves at each frequency. The more brain cells (neurons) that are oscillating together at a given frequency, the larger the rhythms that appear in scalp recordings. Generally, the faster rhythms (beta, high beta) occur when smaller groups of cells are more activated. The fast waves are normally rather small. The slower rhythm of alpha (8 – 13 waves per second or "Hertz," abbreviated as "Hz") occurs when large groups of cells are "idling" but are awake and ready to do something. The slower rhythms (delta, theta) when in proper proportion act to synchronize the excitability levels of widespread groups of neurons. When delta/theta becomes very large, however, it is an indicator of lower levels of excitement and regional – or whole brain – "sleepiness." In the "z-score topographic maps," later in this report, each recording electrode is represented as a dot on the head map. Z-scores are signed (+ = above the mean, - = below the mean) standard deviations from age-means. A z-score of +1.96 or more means the feature being measured is very unusual in the population and likely to be causing problems of some sort. Orange to red indicates 2 – 3+ standard deviations above age-norm means, while the darker blue means 2 – 3+ standard deviations below the mean.

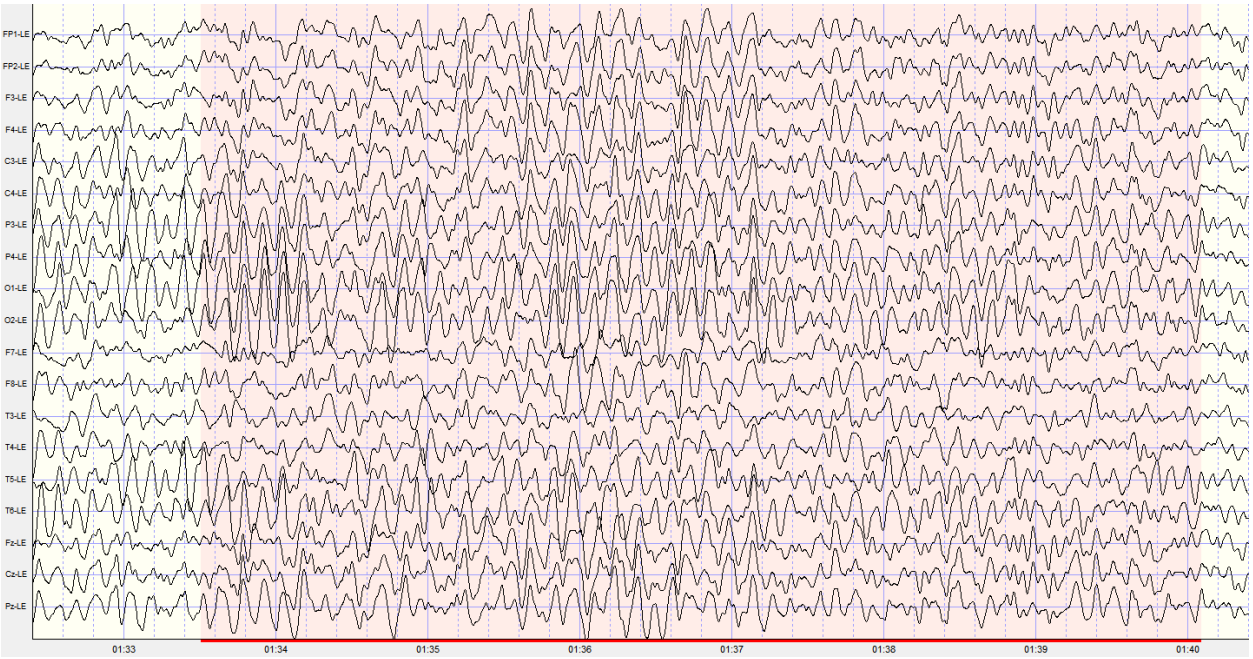
Another reflection of the functionality of regions of the brain is the coherence and phase lag of electrical rhythms between pairs of recording electrodes. Coherence is a mathematical calculation that reflects the degree of coupling between two brain regions. Phase lag refers to the degree that signals from two recording electrodes "lead" or "lag" behind each other. Coherence and phase measurements together reflect the functional connectivity of brain regions. Abnormally high or abnormally low connectivity is a concomitant of impaired function in the region. When this occurs in frontal/prefrontal regions, executive control is impaired. Executive control includes voluntary focus of attention, impulse control, and delay of gratification, organization, planning and remembering priorities. When poor functional connectivity occurs in the highly automatic sensory processing regions in the back of the brain (visual, auditory, somatosensory, long term memory recall), deficits in learning, comprehension and memory occur. Elevated coherence or phase lag is shown by red lines connecting recording sites. Blue lines show less than normal coherence or phase lag. The thicker lines mean greater deviation from normal.

Raw Data: The EEG was marked by no unusual electrical abnormalities that would require neurological evaluation. The following screen capture shows a representative 8 second segment of Xxx's eyes closed EEG recording at 50 uV screen display, linked ear references

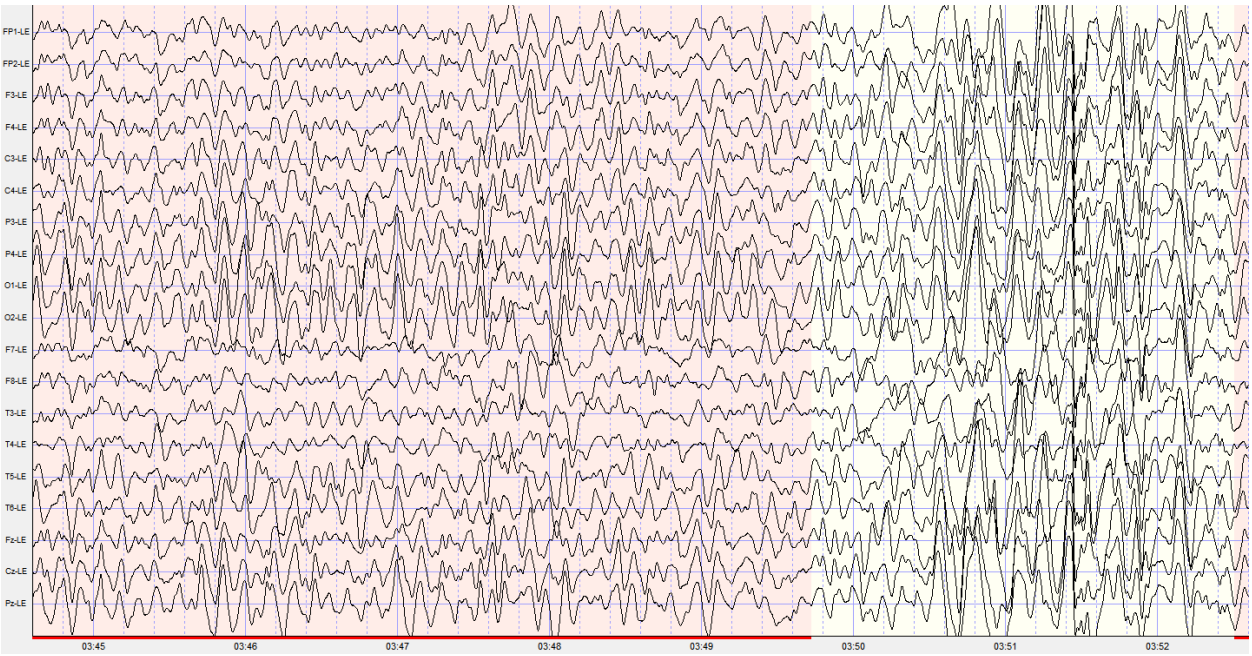
(the voltage at each scalp electrode is compared to the voltage at the ear lobes). Pink highlighted areas were free of artifact and used for statistical analysis.



This is a largely normal eyes closed recording for a person of Xxx's age, with a clear posterior dominant (alpha) rhythm at about 10 Hz. There is, however, an apparent elevation in the high frequency (beta/high beta) power in a wide distribution. At times there were intrusions of low frequency waves in prefrontal regions the top 6 traces:

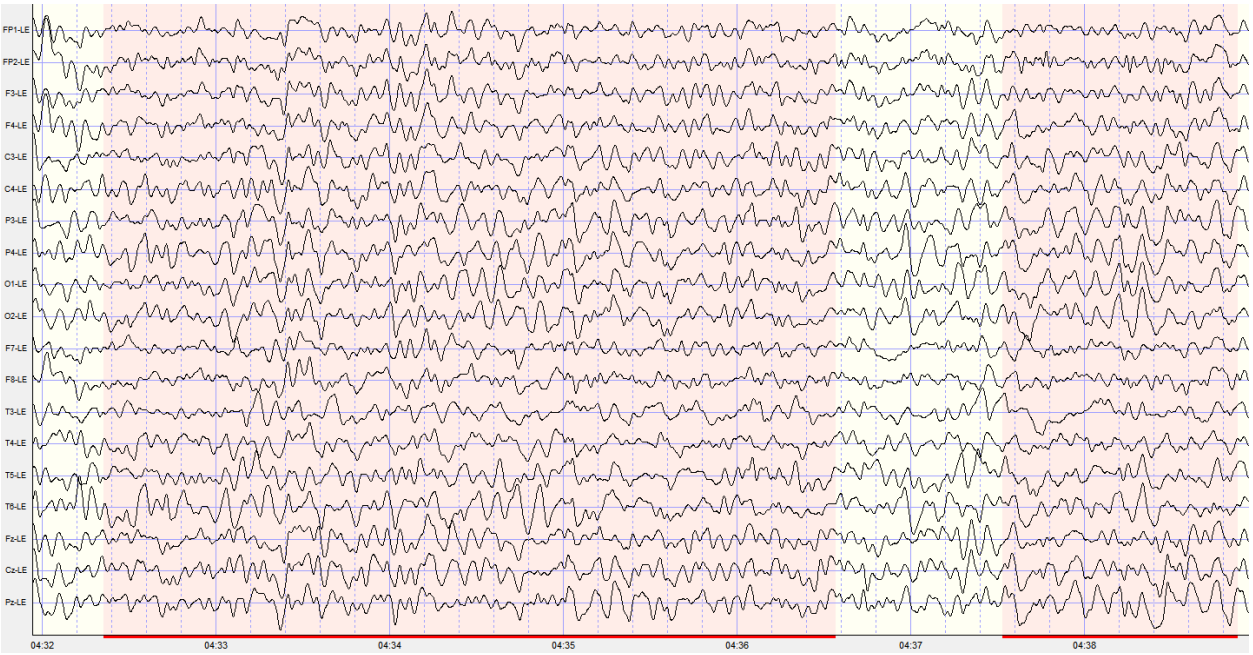


In the second eyes closed recording Xxx showed much the same pattern, long stretches of very average EEG, punctuated by bursts of low frequency power for several seconds:

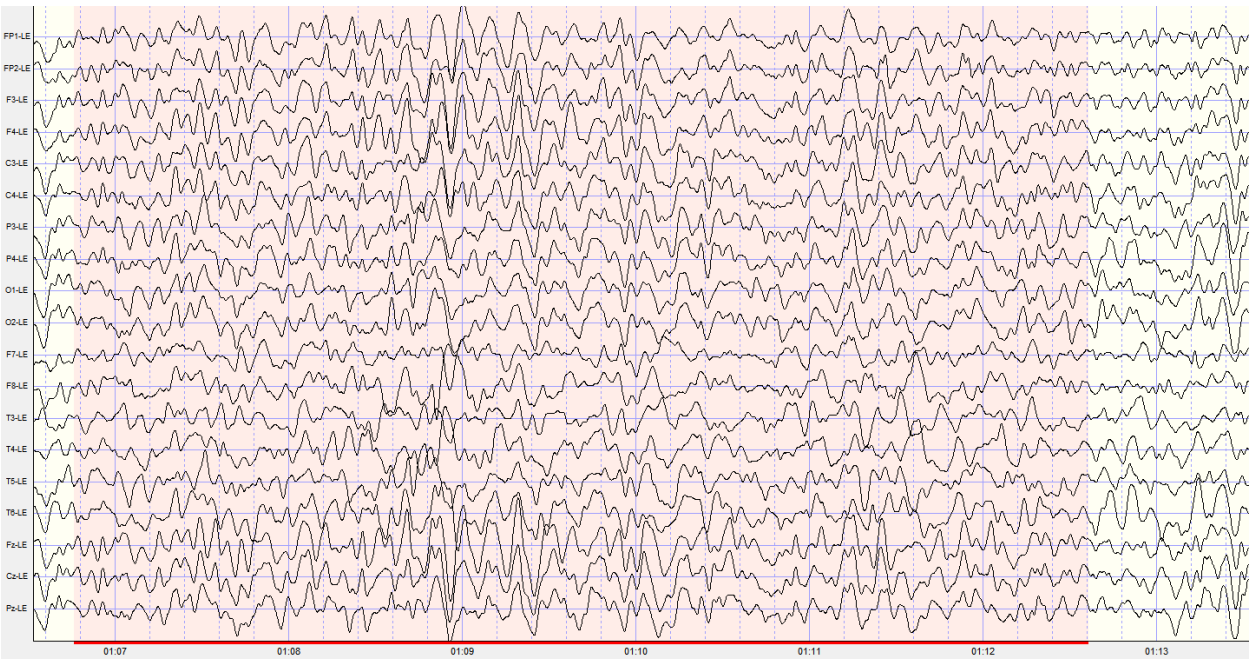


There was increased eye movement and muscle tension artifacts in the second recording.

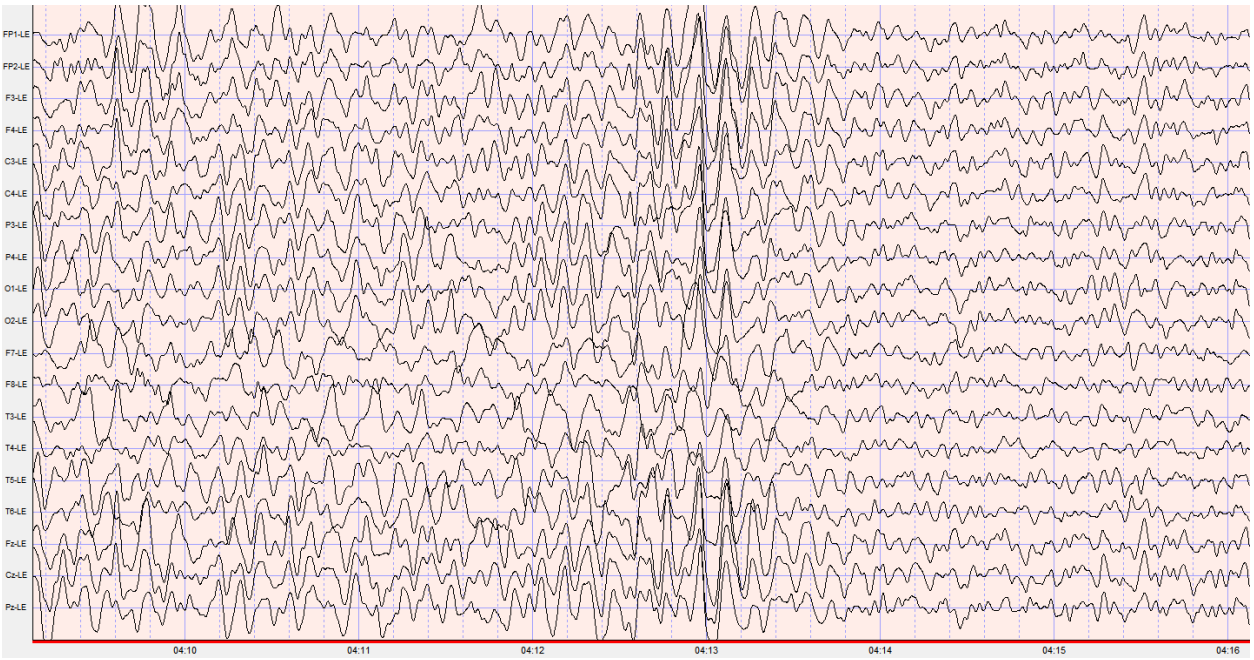
When the eyes are open and during tasks, the alpha rhythm should mostly disappear. This is called "alpha blocking", and it reflects the brain's resources being used for processing what is being attended to, which creates faster rhythms. The EEG was highly variable, showing periods of normal activation and alpha blocking, alternating with long periods of partial alpha blocking and episodes of very high amplitude theta. The following is a sample of Xxx's eyes open EEG, showing normal alpha blocking:



At other times, 2 – 3 second bursts of low frequency power occurred:

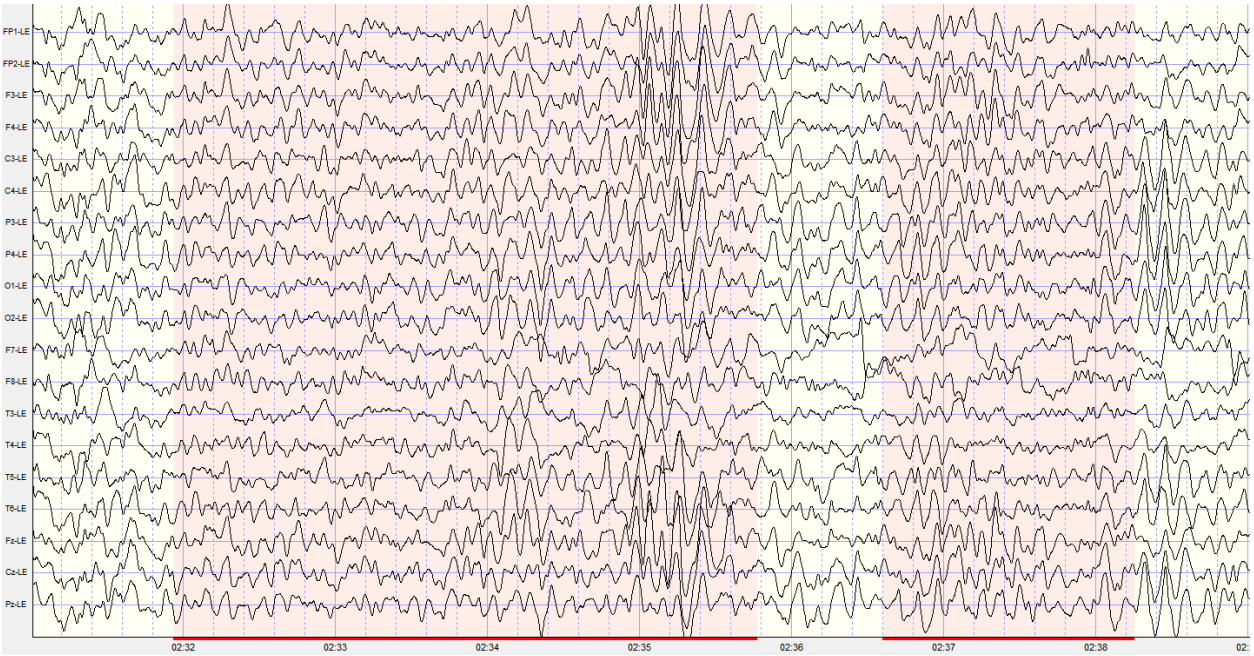


At times this pattern became extreme:



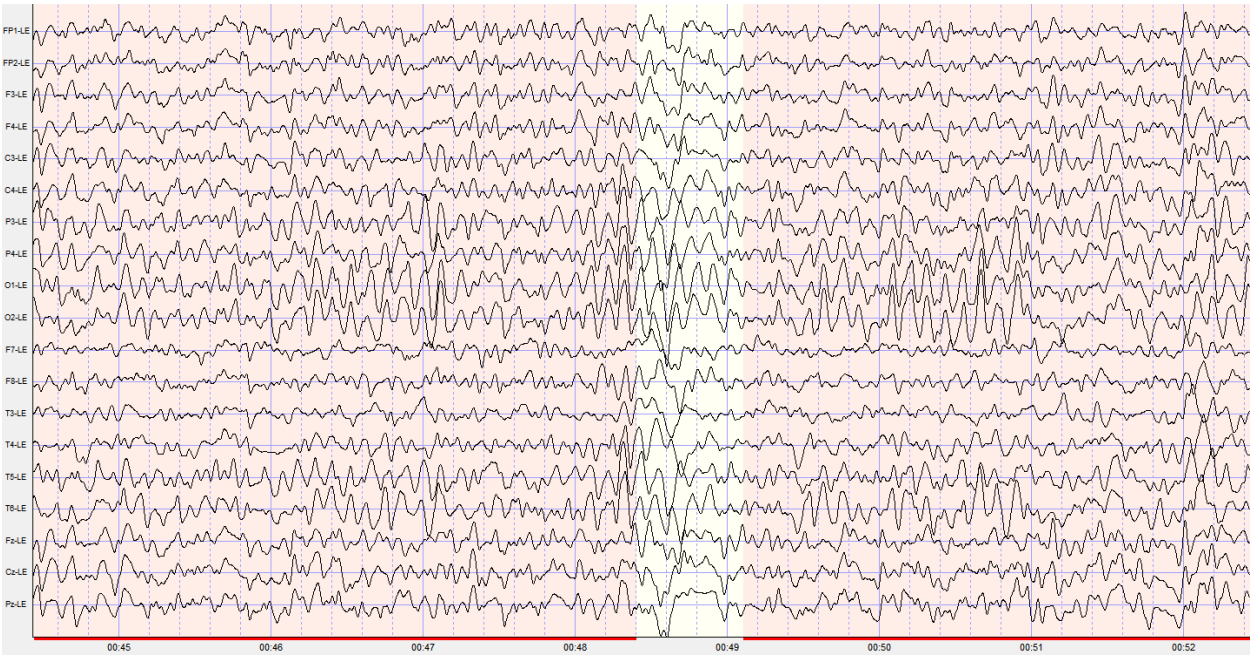
There was little muscle tension and a normal amount of blinking.

During tasks one expects more consistently "desynchronized" appearance in the EEG, as more complex, brief networks form and disappear with varying task demands. The following is a representative sample of Xxx's EEG during reading:

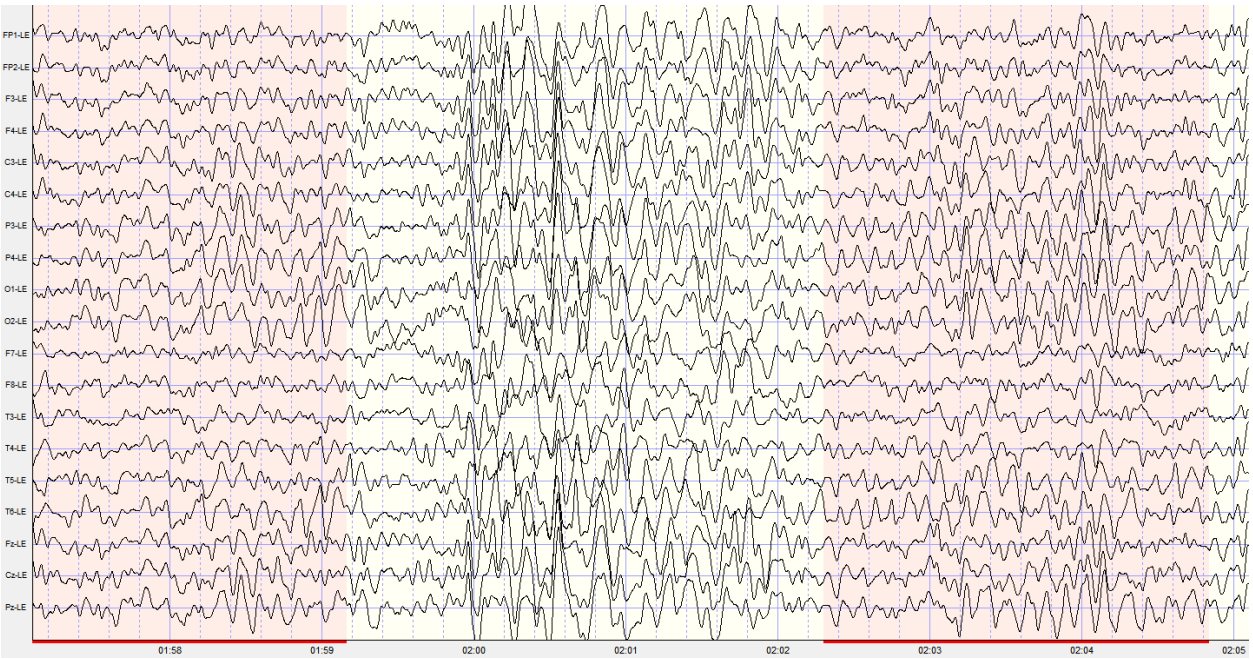


There was a mixture of low, midrange and high frequency waves, and a lot blinks. Lateral eye movements reflecting moving to the beginning of a new line of text, (opposite-going" waves on the leads next to the eyes (F7 & F8), were fairly balanced and well-formed.

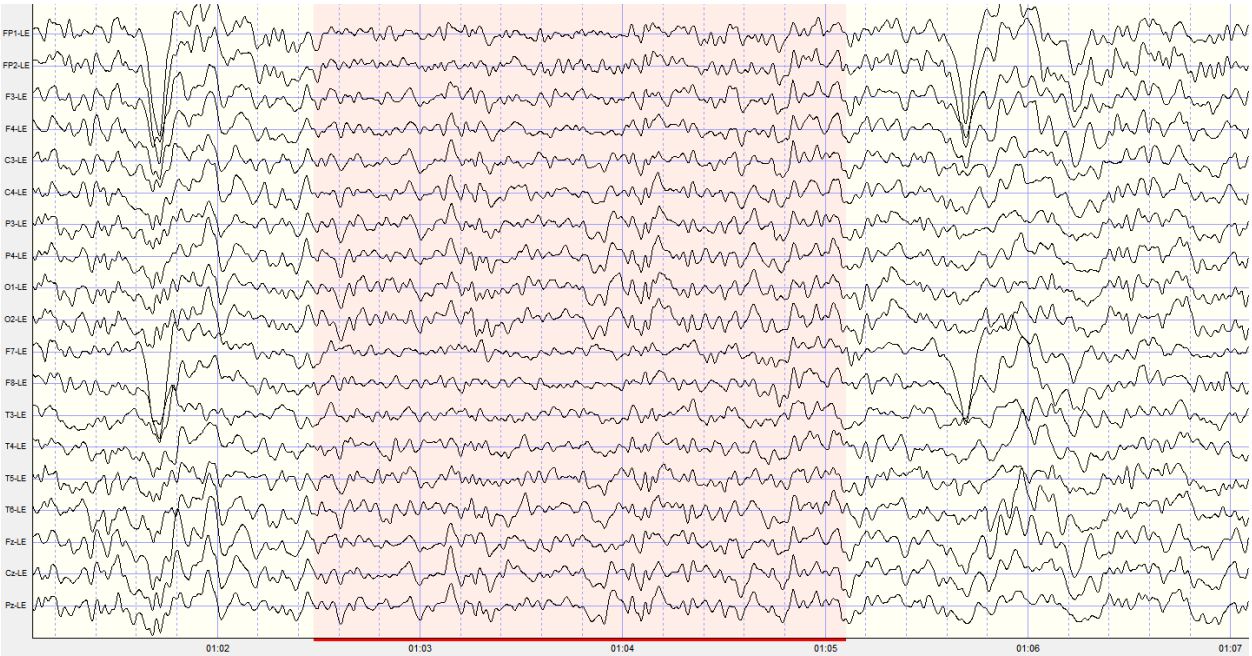
While listening there was often partial alpha blocking, suggesting a relaxed but attentive state:



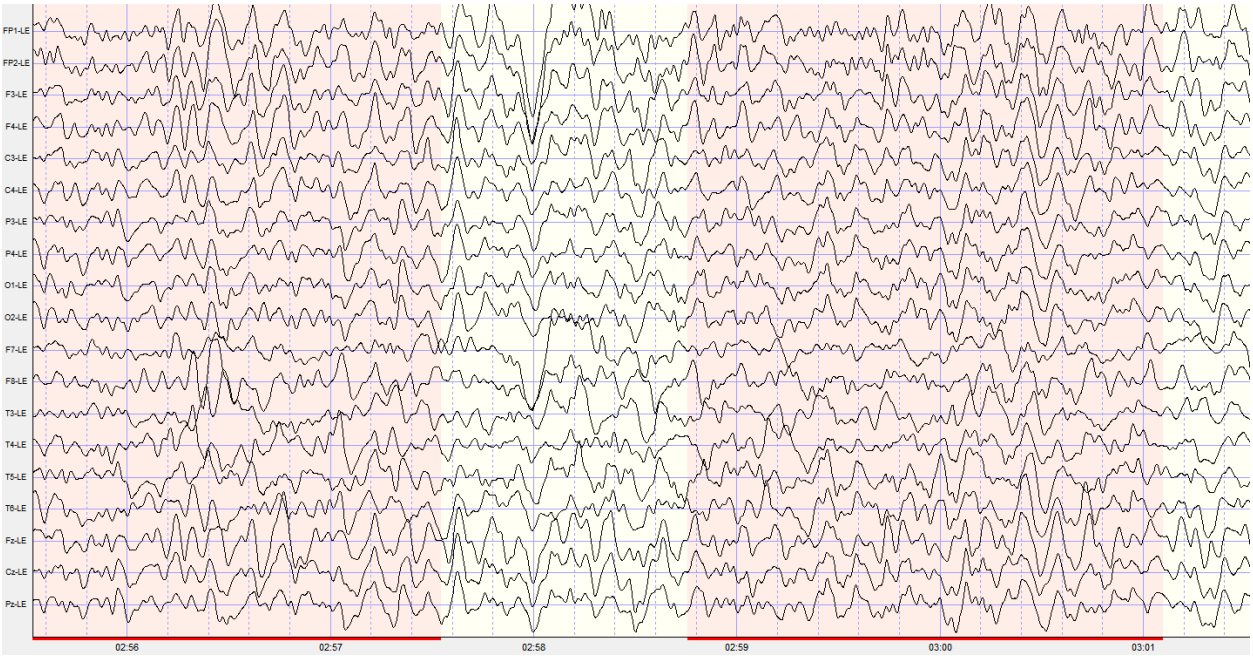
At other times there were bursts of high amplitude theta waves:



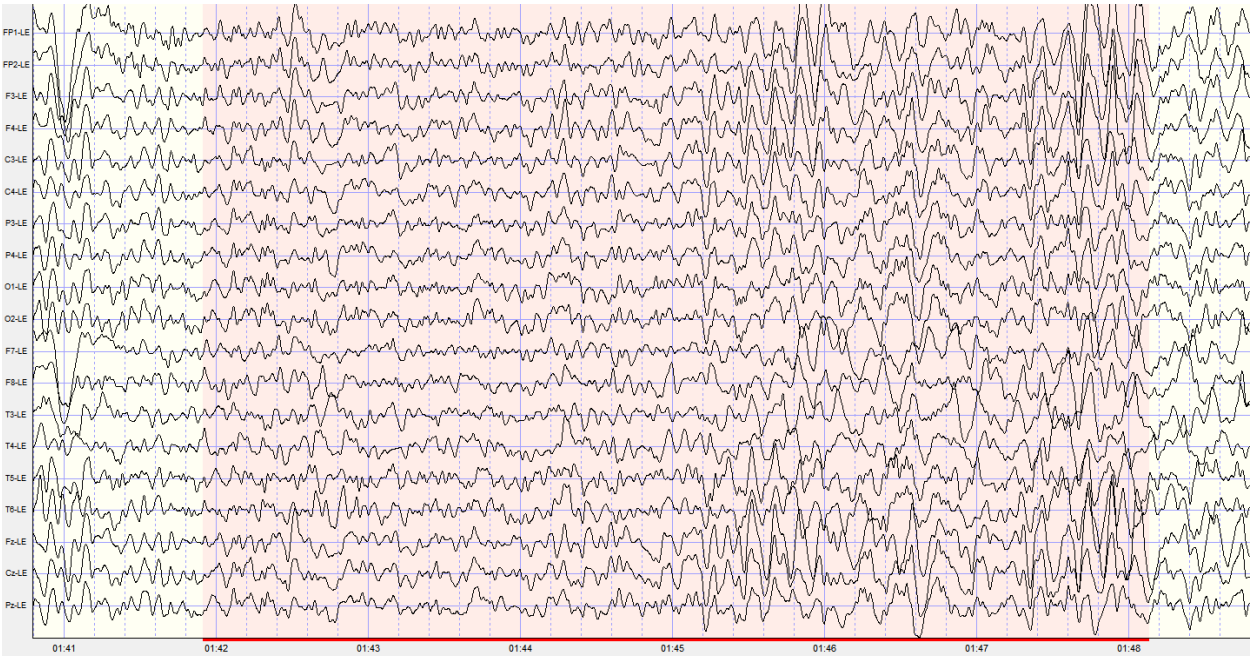
During writing there was, at times, very normal activation:



However, there were often large bursts of low frequency power, which disrupt executive control:



During drawing there was frequent alternating between a very activated brain state, as on the left of the following image, and very large low frequency power as on the right:



Interpretation of the raw EEG data

The emergence of high amplitude, low frequency power reflects brain networks suddenly oscillating in unison over very wide areas. This reflects networks going into a less conscious, less deliberate and less analytic status. What results are moments of inattention, lapses of judgment, failures to regulate impulses. During the art process that is actually a positive, because it allows creative, unconscious process to emerge. It is less adaptive when trying to absorb academic lessons or listen carefully to instructions. It means that Xxx must be working very hard to get through the school day. By the end of the day kids with this pattern are likely not just to be inattentive, but also irritable. Anxiety also results from having some regions of the brain working overtime to try to guard against lapses of attention and behavior.

Statistical analysis of the EEG:

Artifacts from eye, head and body movements, along with episodic muscle tension (EMG) were carefully removed to the degree possible by visual inspection during the editing process. It was not always possible to select data with no muscle tension artifact. Elevations in frontal high beta or abnormalities in high beta coherence or phase in frontal regions may reflect the presence of these artifacts.

The eyes closed data was examined with the eyes closed Neuroguide database; the eyes open and all task data was examined with the Neuroguide eyes open database.

Topographic maps were used to examine deviations from age norms for power, coherence and phase. This gives an image of what regions of the brain are having problems.

In studying summary z-score maps it is important to understand that they represent the average of data that was selected for analysis. That said, the maps do provide a good summary over a 5-minute period of the average brain state Xxx is in.

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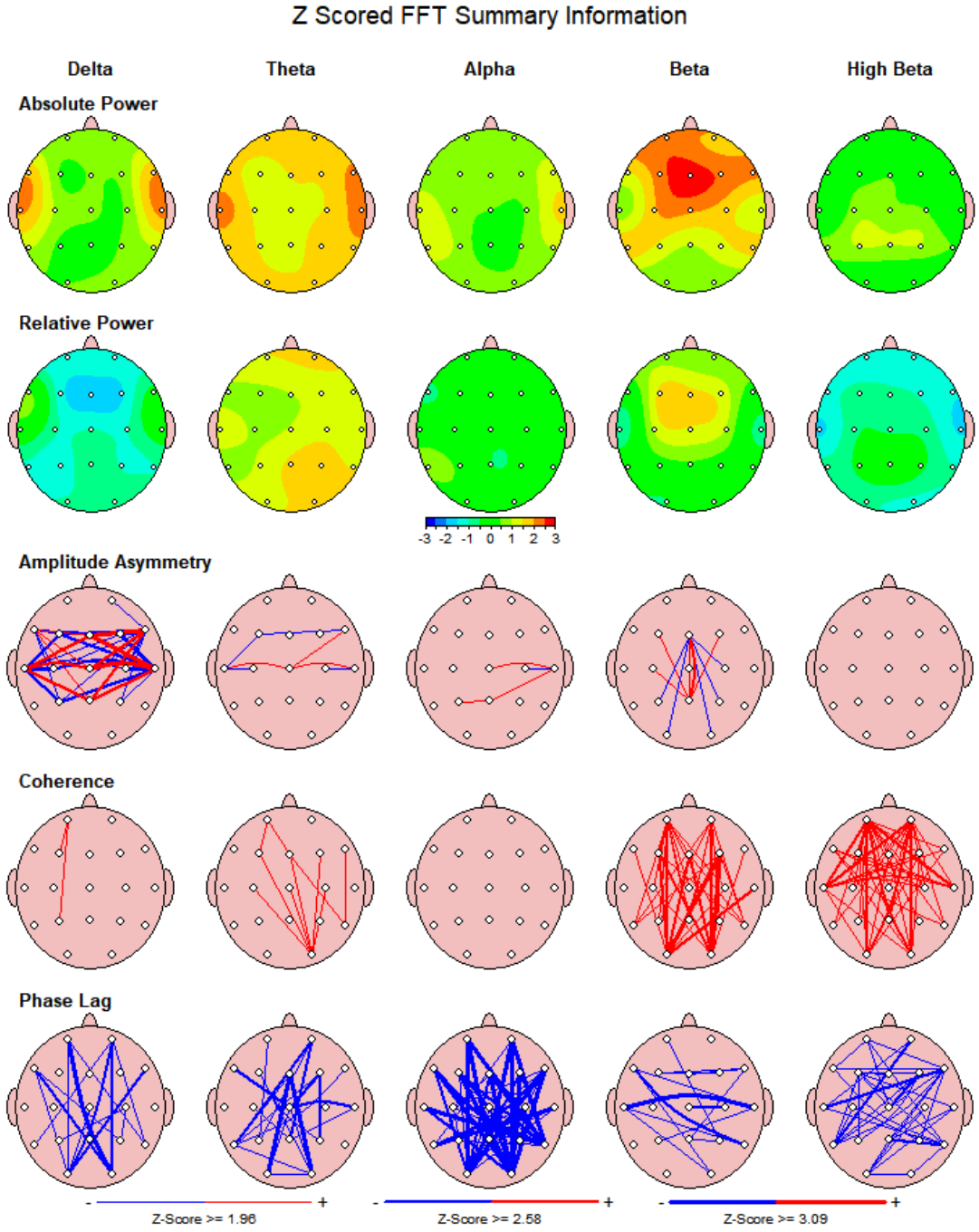
Eyes Closed Recordings:

Montage: LinkEars EEG ID: 2599_EC1a



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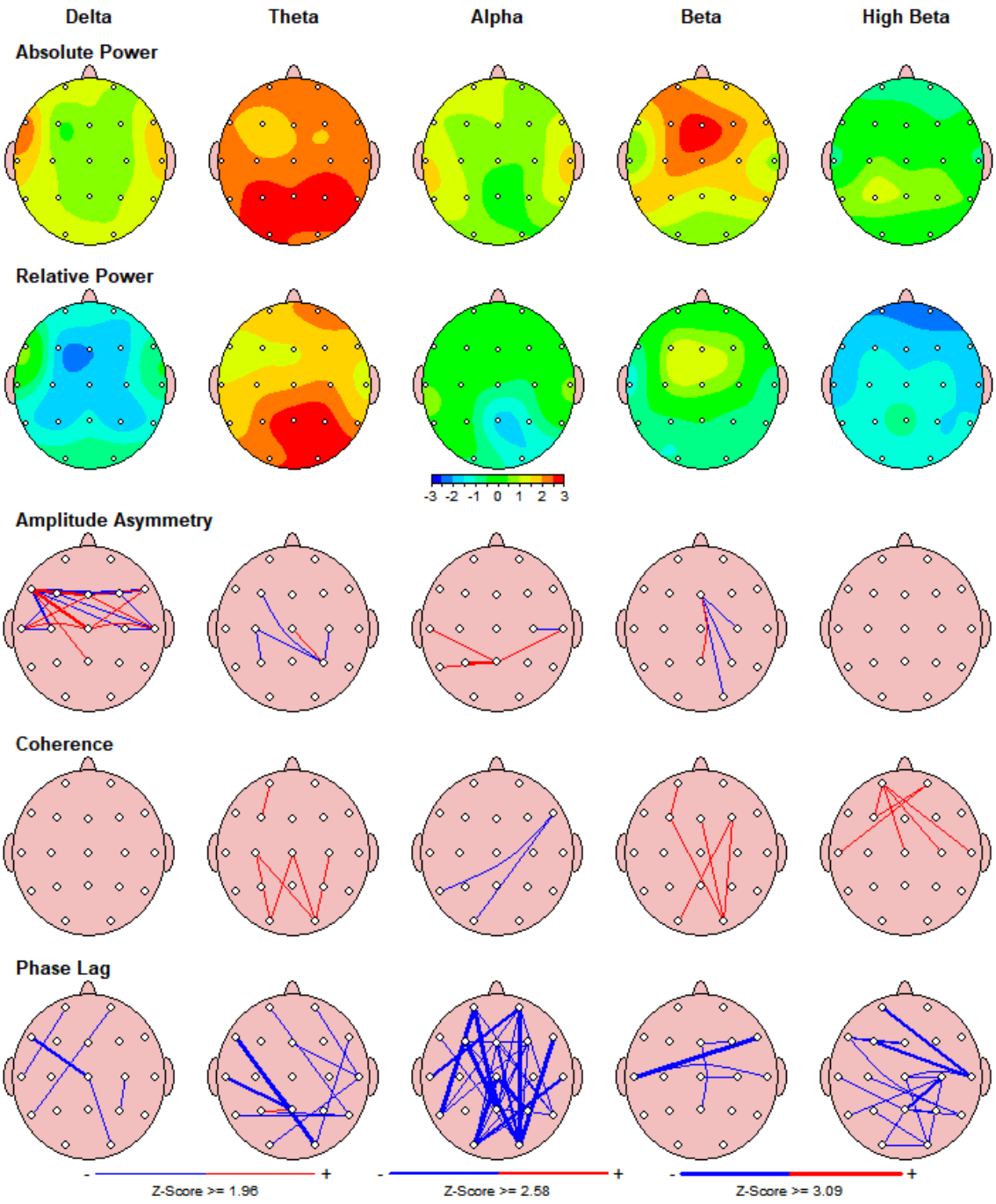
Montage: LinkEars

EEG ID: 2599_EC1b

Z Scored FFT Summary Information



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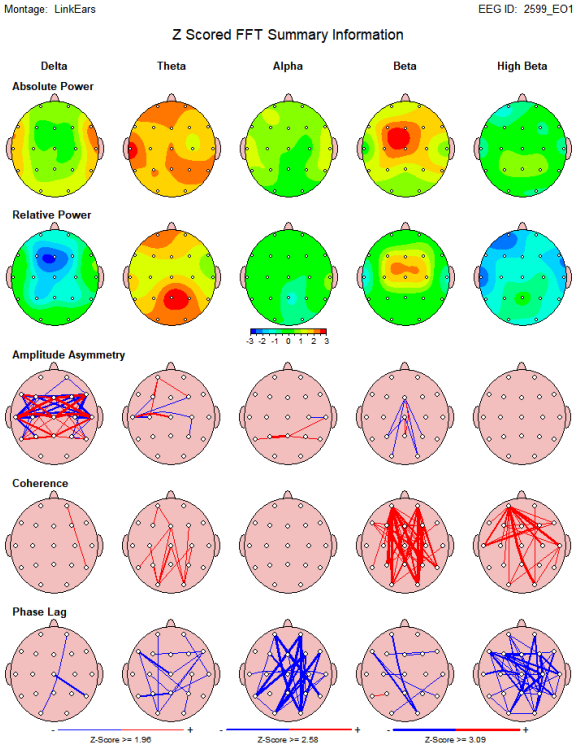
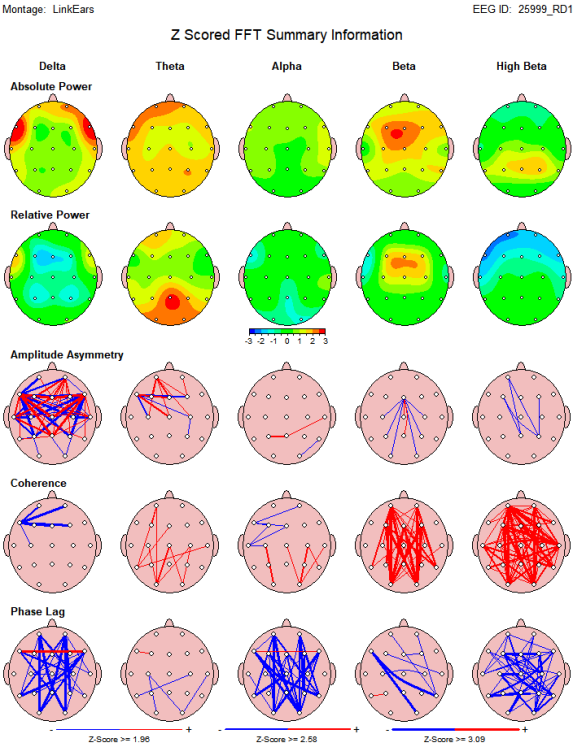
Summary topographic data for eyes open and the task conditions appear here and on the following pages. They are printed smaller to allow easier comparison amongst the conditions.

Eyes open



Reading



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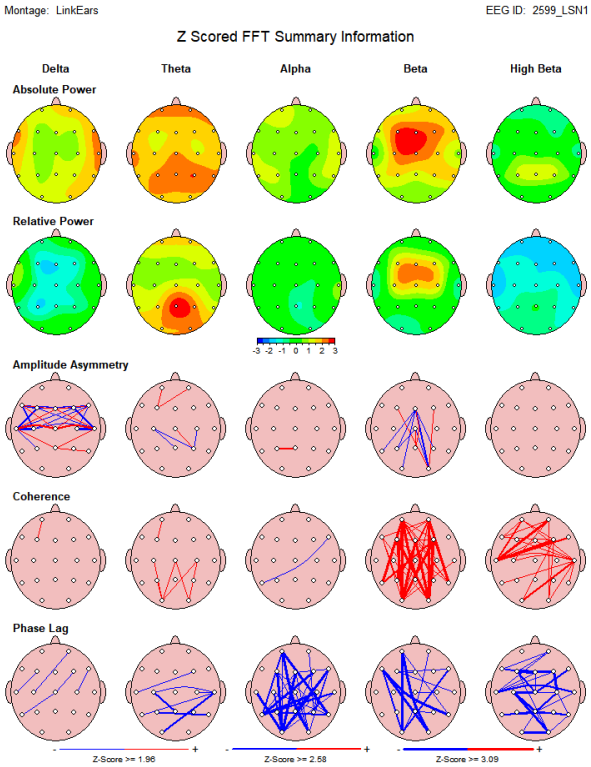
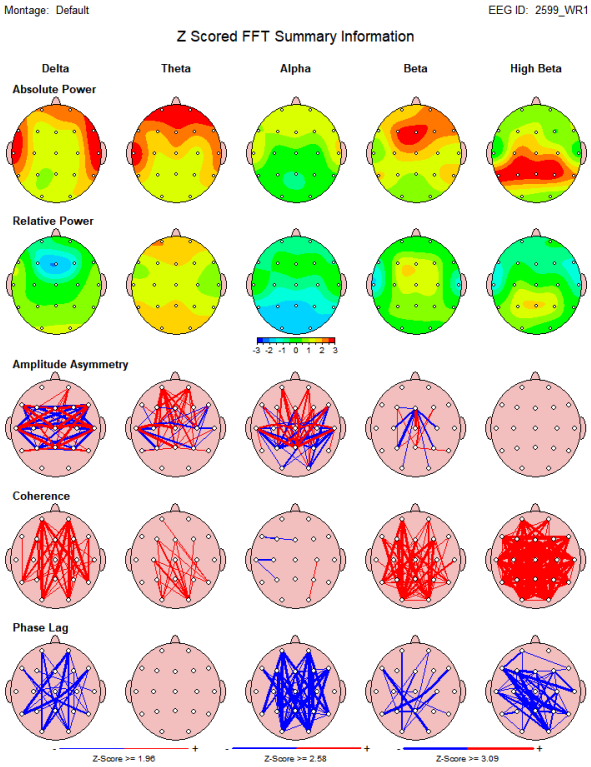
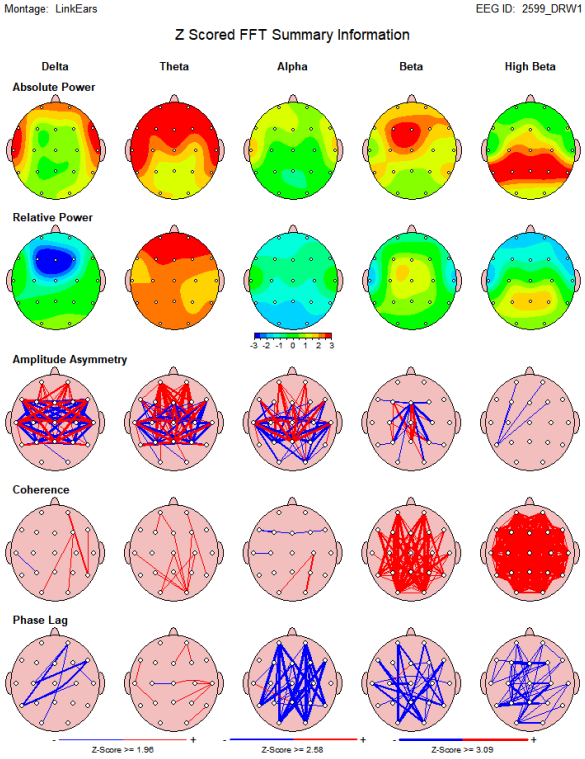
Listening



Writing



Drawing



Interpretation of the statistical data

1. The bursts and at times long runs of theta (4 – 7 Hz) seen in the raw data show in these topographic statistical maps as strongly elevated power in prefrontal regions. This causes inattention and other executive function problems. There is also a great excess of high frequency (beta) power, mostly in the frontal/central regions. This reflects a lot of neurons being very busy, very active, a great deal of focus on trying to "get it right." This is seen in people who are anxious, sometimes obsessive and in Xxx's case it might be a compensation for other large-scale systems trying to fall asleep on her. Sometimes this intense excitement also happens in the parietal association areas, the region toward the back of the brain that does automatic associations. This really lit up during writing and drawing. Again, this uses a lot of energy and can reflect anxiety as well as terrific effort.
2. There is persistent elevated coherence (hypercoherence) across tasks. Hypercoherence reflects a more monotonic focus on perceptions, feelings and ideas. This may serve a person well and allow a more single-minded approach to a task, but it also causes problems. Elevated coherence reflects reduced complexity in the brain's networks. People with hypercoherent EEGs tend to "get stuck" on interpretations of events, thoughts and feelings. The hypercoherence causes patterns in brain networks to persist too long and this causes a lack of flexibility. The excessive coherence that is seen in all conditions and in multiple bands is commonly seen in anxious people – think "deer in the headlights" – and it is another reflection of having to work very hard to get brain to perform.
3. Phase lags were generally short except in areas where muscle tension produced some longer phase lags. Short phase lags mean that information is moving across networks at unusually high speeds. This can make for a quick mind, but also commonly leads to impulsivity and anxiety from getting the executive resources overwhelmed with too much information too quickly.

ICD-10 diagnosis(es)

The symptom-based diagnoses of the Diagnostic and Statistical Manual (DSM-5) of the American Psychiatric Association, and the International Classification of Disease – 10 (ICD) lack scientific grounding in neuroscience. Unlike most medical diagnoses, the diagnoses don't point to known physiological causes of dysfunction. In fact, the criteria for many of the diagnoses, including "ADHD", can be caused by different underlying brain patterns.

Xxx meets criteria for ADHD, predominately inattentive type, F90.0 and Generalized Anxiety Disorder, F41.1

Recommendations

1. Xxx should be scheduled for two neurotherapy sessions weekly. Neurotherapy means coupling neurofeedback with individual cognitive behavioral therapy (CBT). CBT addresses issues as needed, e.g., management of negative emotional states with cognitive reappraisal, and the development of useful self-reinforcement, self-monitoring, sleep hygiene, diet and exercise, listening skills, assertive skills and resolving any emotional conflicts that may exist. We review progress with clients after 20 sessions and repeat the IVA test at that point. The usual course of treatment is around 40 sessions, often tapering to once weekly during the last 6 – 10 sessions if progress is satisfactory and a plateau is reached.
2. Neurofeedback can be used to train for less prefrontal theta, 4 – 7 Hz, training eyes open and during listening at Fz & Cz, F3 & F4, Fp1 & Fp2. Because Xxx gets anxious, heartrate variability biofeedback should also be engaged in a number of sessions. Vision therapy should wait until we know if Dr. Sealock's office is continuing training.
3. It is not usually necessary or useful to repeat the full qEEG process, unless more than 40 sessions are required or desired. Then "retargeting" is useful. We'll re-evaluate the situation at 20 and again at 40 sessions (approximately).
4. We'll do heart rate variability training in some of our sessions to acquaint Xxx with using physiological feedback. We'll ask Xxx to practice slow breathing (~6 breaths/minute) for a minute at a time, many times daily. These one-minute practices should be prompted by putting stickers or signs up in the home and work environment to remind oneself to practice in a wide range of places. This promotes improved parasympathetic tone and generalizes it to the environment, resulting in a more relaxed feeling throughout the day. Getting something different happening – regularly – in the real-world environment is extremely important. Failure to do that is the reason many anxiety treatment attempts fail. I've got a little book on this idea on Kindle if you're interested: https://a.co/d/ofaUuDYe
5. Xxx should begin learning truly deep relaxation with the Autogenic Relaxation script (Appendix A) at the end of this report or with some other 20 – 30-minute relaxation method. With adults I suggest recording the script in their own voice. Many people enjoy listening to a recording they've made of themselves saying these things, waiting and taking a slow, slow breath in between each statement. A person could also use any

sort of meditation or a Progressive Muscle Relaxation process (instructions are easy to find on YouTube) – the important thing is to start practicing getting deeply relaxed – and staying quietly awake and aware - for 20 minutes a day. It is also a good idea to practice mindfulness much of the time during the ordinary course of the day. This simply (easy to say, hard to do) means paying exact attention to exactly what you're doing, noticing what you notice, including sense perceptions, actions and thoughts. The key to this practice is not judging what you're noticing, just been a good observer of events, internal and external. Practicing some sort of deliberate deep relaxation at home is a helpful addition to our therapy form, since it develops self-control and the ability to act intentionally – without giving in to restlessness or boredom.

6. A "Stress Thermometer" ($25 direct from https://bio-medical.com/catalogsearch/result/?q=stress+thermometer) could be used to measure hand or finger temperature at home while relaxing, which gives an objective measure of relaxation. Warmer hands mean you are in less of a fight/flight/freeze state. Taping the thermal probe to the skin on the back of the hand between the thumb and forefinger gives a good measure of blood flow to the hand. Fully relaxed, the temperature will go up to about 94 degrees F.

7. We do basic vision therapy as part of some of our sessions, and this often normalizes binocular control but depending on what is causing the poor binocular control we may or may not be able to ameliorate it with our basic methods. If not, we'd refer to a developmental optometrist. In any case an eye doctor should be consulted annually to assure proper acuity (clarity close up and far away) and eye health.

8. Good sleep hygiene should be followed, meaning sleeping in a cool, thoroughly dark room, having a regular bed-time routine, and not worrying, reading, watching TV or doing work in bed. If not asleep in roughly 20 minutes Xxx should get out of bed and do something quiet until very drowsy, then get back in bed. This is repeated until sleep onset is within 20 minutes. For middle of the night awakenings or difficulty falling back asleep it is often helpful to do a deep relaxation activity like watching the breath come and go, contemplate the warmth of one's feet, or simply thinking the word "one" over and over again until asleep. Sometimes "telling yourself a dream" works nicely, because most awakening occurs during the dream phase, and this is disrupted by the awakening. One should never expose oneself to light in the middle of the night since this will disrupt the sleep phase. The brain "sets its clock" by the wake-up time, so it is important to have a regular, steady wake-up time. It is best not to expose the eyes to a lot of bluish light in late evening, so minimizing computer and TV exposure in the later

evening is a good idea. IOS and Windows now have a function built into the screen display software that automatically turns down the blue end of the screen lighting in the evening, but it has to be deliberately invoked and set. Many people simply get too little sleep duration; 7.5 - 8 hours is needed, with kids needing 9 – 10 hours of restorative (non-restless) sleep.

9. Nutritional status should be considered. Most Americans' diets are deficient in Omega-3 fatty acids. It is difficult to get a proper amount of these essential fatty acids; non-organically farmed food is lacking in these essential nutrients. Lack of Omega-3 fatty acids has been linked to depression, ADHD, heart disease, digestive disorders, cancer, inflammatory disorders and skin conditions. Supplementing omega-3s causes a modest improvement in ADHD symptoms (https://jaacap.org/article/S0890-8567(11)00484-9/fulltext). Omega-3s restore mechanisms that regulate brain function and this is likely helpful even in brain injury treatment: (https://www.ibp.ucla.edu/research/GomezPinilla/publications/Diet1587.pdf) . An inflammatory process is known to be associated with most if not all serious psychiatric and medical disorders. I recommend a daily supplement of Omega-3 from fish oil. I suggest consuming about 2000 mg of combined eicosapentaenoic (EPA) and docosahexaenoic acid (DHA) daily. Supplements are available that provide 1000 mg of EPA + DHA per capsule, so two capsules a day provide 2000 mg of these omega-3s. That's the dose range where I've seen some consistent results.

   A multivitamin/mineral supplement daily is also suggested, coupled with a diet high in antioxidants from whole grains and dark vegetables.

   Omega-3s are also in foods, particularly organic eggs, beans, nuts and "fatty" fish (anchovies, bluefish, herring, mackerel, salmon (wild has more omega-3s than farmed), sardines, sturgeon, lake trout, and tuna). Fish should be eaten 2 – 3 times a week. A good diet can theoretically supply all the nutrients, vitamins and trace elements one needs, but diets are often incomplete. With emotional and/or attentional problems, one wants to assure adequate Vitamin B-12, SAM-e, folic acid, magnesium, zinc, Vitamin C and Vitamin D.

   Particularly during the winter, Vitamin D levels should be supplemented. Your physician might test Vitamin D levels. Here is a discussion of dietary and alternative methods for treating problems like ADHD and anxiety: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4968082/ . Xxx's personal physician should approve of any supplements Xxx is taking.

10. Physical activity (aerobic and strength/resistance training) helps reduce reactivity to stress, increases feelings of personal power (no illusion!), feels good, and helps promote deeper sleep, so this is recommended several times a week at a level Xxx tolerates. A more formal exercise like modern dance, yoga or Tai Chi would also have great benefits in terms of body awareness, coordination and relaxed, deliberate movement.
11. It will be very important for both parents to "be on the same page" for this treatment. To that end, parents should ***study and discuss the guide*** provided with this report titled "Helping your child benefit from neurotherapy", Appendix B. Parent sessions with one of our therapists help learn these patterns, so consider scheduling a couple of these.

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Senior Fellow, BCIA Board Certified Neurofeedback
Diplomate (Licensed), International Quantitative Electroencephalography Certification Board

Appendix A: Autogenic Relaxation Script

Make a recording of yourself slowly saying each phrase. After each phrase, let the recorder run while you take three very slow, easy breaths. Then speak the next phrase. After you finish the recording, play it for yourself once a day. Close your eyes and let yourself listen to yourself saying these calming statements. After each statement, circulate the idea in your mind for a little while, until you hear the next thought.

Phrases to promote muscular relaxation:

1. I feel quite quiet.
2. I am beginning to feel quite relaxed.
3. The muscles in my toes and feet feel heavy and relaxed.
4. The muscles in my calves, thighs, hips and waist feel heavy and relaxed.
5. My abdomen, solar plexus, ribs and chest feel quiet, relaxed and comfortable.
6. My fingers, hands, arms and shoulders feel heavy and relaxed.
7. My neck, jaws and lips, eyes and forehead feel relaxed, comfortable and smooth.
8. The muscles in my whole body feel heavy, comfortable, relaxed and quiet.

Warmth phrases, to promote increased blood flow in the hands, fingers and feet:

9. I am quite relaxed.
10. My arms and hands feel heavy and warm.
11. I feel quite quiet.
12. My whole body is relaxed, and my hands are warm, relaxed and warm.
13. I can feel warmth flowing down my arms into my hands, down my legs, into my feet.
14. My hands and fingers are warm, pleasantly warm.
15. Warmth is flowing into my hands, they are warm, very warm.
16. My hands and fingers, feet and toes are warm, relaxed and warm.

Quietness phrases to promote the calming of the mind:

17. My whole body feels relaxed, and my mind is quiet.
18. I release my attention from the outside world, and I feel serene and still.
19. My attention is turned inward, and I feel at ease.
20. Gently, I visual, imagine and experience myself as relaxed and still.
21. I am aware in an easy, quiet, inward-turning way.
22. My mind is calm and quiet.
23. I feel an inward quietness.
24. I am at peace; I am at peace.

At night, let it all go here. Do something quiet, keep the lights low. If you're sleepy and it's around time to go to bed, go.

In the day if you have activities to carry on with, open your eyes, stretch, start to move about gently. Record this set of statements in a more activating voice at the end of your recording or as a separate track and play it while you're doing a little stretching:

Reactivation phrases to bring you back to the world of activity

1. I open my eyes and make contact with the outside world.
2. I feel life and energy flowing through my toes, feet, calves, knees, thighs and hips.
   I feel life and energy flowing through my waist, abdomen, solar plexus and chest.
   I feel life and energy flowing through my shoulders, arms, hands and fingers.
   I feel life and energy flowing through my head, neck, jaws and lips.
3. This energy makes me feel light and alive.
4. I feel refreshed and good.

Appendix B:

Helping your child benefit from

Neurotherapy and Cognitive Training

It is important to recognize that neurotherapy and cognitive training are not "stand alone" cures for Attention Deficit Hyperactivity Disorder. Both of these methods attempt to activate the child and make him or her more aware of focusing themselves on a task.

RECOGNIZE AND PRAISE THE SMALL CHANGES – If you notice and reward a small improvement you will gradually see more of the desirable behavior.

It is possible to help activate the child and make him or her more aware of focusing themselves on a task. *It is very important for you to try to notice your child's efforts to do this.* When you child seems to be a little more focused, a little bit more on a task, a little more "with it" make sure you let him or her know that you have noticed. The effects build up slowly over a period of months and perhaps years. The strengthening and maintenance of these effects depends to a significant extent on *your* attention and praise for the small, subtle changes you see occurring. The following is a list of events to look for.

- Completing assignments at school.
- Doing homework with less hassle, less urging.
- Spontaneously doing homework without being asked.
- Doing something after being asked only once or twice.
- Remembering to do something he or she had been asked to do earlier
- Becoming less impulsive, more thoughtful or considerate of consequences
- Beginning to talk about feelings instead of just acting on them
- Sitting still for longer periods of time
- Talking with interest about school subjects
- Talking with pride about some accomplishments
- Fidgeting less

- ***Make a special effort to "catch" your child acting in ways that you want to see them act and praise them at those moments.*** Keep the praise brief and focused on a specific behavior. Make this a time to get closer emotionally with your child and show plenty of love and affection.
- Teach your child good study skills, like arranging a regular time and place to study; study hardest subjects first while fresh; plan a reward when studying is done; don't study when tired- take refreshing brakes to "wake-up" with some fresh air, exercise or a cold drink.
- Avoid "should and shouldn't" in favor of saying "I want you to..." This is a more powerful and personal way of speaking that makes it clear this is what ***you*** want, not some abstract social norm. Don't threaten or yell. Kids with ADHD can be tough customers, and it's really easy to lose your patience. Remember they are struggling with impulse control and with being able to foresee the consequences of their actions.
- Practice good listening. Get your child talking about how he or she feels about school and home behavior, any effort he or she is making. Practice what is known as "active listening." Consider reading Dr. Thomas Gordon's excellent book, Parent Effectiveness Training. This book teaches many wonderful skills that will help your child talk with you, and it will help you understand your child.
- Avoid punishments, threats, and put downs. Remember that your child is learning to try out a brand-new voluntary skill. At first the efforts will be halting, and the results will not be very big. Keep in mind, however, your child will benefit to a large extent in proportion to how much encouragement they get for beginning these small changes.
- Encourage your child to look for differences in how easy it is for them to read and pay attention in general. Help them tune into moments when they find themselves alert and more relaxed and focused.
- Your job is very much to help your child learn self-monitoring, to discriminate between moments when they are more attentive versus less attentive, and when they are finding themselves more able to regulate this and to praise themselves for doing so. If you child is taking Ritalin or other medications for ADHD, they may already have improved their school behavior because of the medication. In this case most of the changes that you notice may be in the evenings at home and on weekends when they are not taking the medicine.
- Sleep is really important for kids with ADHD. Spend time helping your child develop a regular bedtime routine and talk with them about the importance of getting enough sleep.
- Remember that children with ADHD have trouble with organization and follow through. Help them plan study times and keep track of longer-term assignments.

Appendix C: Universities and Institutions that use NeuroGuide™ in the analysis of digital EEG

Universities

Departments of Psychiatry and Neurology, University of Iowa School of Medicine, Iowa City, IA
Department of Psychology, University of California at San Diego, CA
Department of Psychology, University of Texas at San Antonio, Tx
Department of Human Development, Pennsylvania State University, University Park , PA
College of Business Administration, California State University, Sacramento, CA
Department of Psychology, Austin State University, Austin, Texas
Department of Communication Sciences and Disorders, Baylor University, Waco, TX
Department of Psychology, University of North Carolina, Wilmington, NC
Bradley University, Resource Management, Peoria, IL
Curry College, Milton, MA
Departments of Psychiatry and Behavioral Science, Konkuk University School of Medicine, Seoul, Korea
Department of Nuclear and Quantum Engineering, KAIST305-701, Guseong-dong, South Korea
Korea Advanced Institute of Science and Technology (KAIST), Seoul Korea
Sangmyung University, Seoul Korea
Seoul University of Buddhism South Korea, Geumcheon, South Korea
Shokei Gakuin University, Creact/Kyoki, Japan
Dept. of Psychology, School of Human Sciences, University of Wales, Swansea, UK
Dept. of Psychology, Brown University, Providence, RI
Dept. of Epidemiology, Stanford University, Palo Alto, CA
Maharishi University of Management, Fairfield, IA
Department of Psychiatry, School of Medicine, University of Missouri-Kansas City
Department of Psychology, University of British Columbia, Canada
Dept. of Cognitive & Biological Psychology, Vrije Universiteit Brussel, Pleinlaan 2, Brussels, Belgium
Technical Department, Campus Henri Serruys, Az Sint-jan Brugge Oostende av, Oostende, Belgium
Dept. of General Psychology and Cognitive Neuroscience, Friedrich-Schiller-University of Jena, Germany
Department of Psychology, Drexel University, Philadelphia, PA
Department of Psychology, Norwegian University of Science & Technology, Trondheim, Norway
University of North Texas, Denton, Texas
Department of Business Education, Arizona State University, Phoenix, AZ
School of Social and Behavioral Sciences, Stockton University, Stockton, CA
Department of Psychology, Drexel University, Philadelphia, PA
Biological Sciences Department, Michigan Tech University, Houghton, MI
Department of Psychology, Univ. of Tennessee, Nashville, TN
Department of Rehabilitative Medicine, University of Utah School of Medicine, Salt Lake City, UT
Département de Psychologie Université de Montréal, Montreal, Quebec, Canada
Fundacja Wspierania Rozwoju Kliniki Psychiatrycznej, Akademii Medycznej, Warszawie, Poland
Institute for Basic Research in Developmental Disabilities, Staten Island, New York
Department of Psychology, University of Alberta, Edmonton, Canada
Department of Psychology, College Montmorency, Quebec, Canada
Department of Psychology, Kettering University, Flint, MI

Jiangsu University, China
Capital Institute of Physical Education, China
The Hong Kong Polytechnic University, Hong Kong, China
The Chinese University of Hong Kong, Department of Psychology, Hong Kong, China
Department of Psychology, University of Central Missouri, Warrensburg, MO
Neuroscience Department, Columbia University , New York
Translational Neuroscience MIND Research Network, Albuquerque , NM
West Virginia University, Morgantown, WV
UNIVERSITÉ DU QUÉBEC, C.P. 500, Trois–Rivières (Québec)
Zanjan University of Medical Sciences in Iran
Ross Hyslop, Wuttke Institute, Scotland
Tarbiat Modares University, Iran
Shahid Beheshti University, Iran
Ahwaz Azad University, Iran
Tabriz University, Tehran, Iran
Kerman Neuroscience Research Center, Iran
Institute for Cognitive Science Studies, Iran
Tehran University, Iran
Shiraz Medical Science University, Iran
University of Social Welfare and Rehabilitation Sciences, Iran
Payam-e-Noor University, Iran
Ferdouisi University of Mashhad, Iran
Iran Medical Sciences University, Iran
University Of Social Welfare And Rehabilitation Sciences, Tehran, Iran
Warszawski Uniwersytet Medyczyny ul. Zwirki I Wigury, Warszawa
UNAM-JURIQUILLA, JURIQUILLA, QRO. MEXICO
University Putra , Malaysia Timbalan Pengarah Institut Teknologi Maju (ITMA) Serdang Selangor 43400 MALAYSIA
Department of Psychiatry, NYU School of Medicine, New York, New York
Dept. of Functional Neurology, Murdoch University, Perth, Australia
University of the Sunshine Coast, Sunshine Coast Mind and Neuroscience Thompson Institute; Maroochydore DC, Australia
Osaka University, Japan
Collège Montmorency, 475 Boulevard de l'Avenir, Laval (Québec) H7N 5H9

Hospitals and Medical Centers

Department of Psychiatry, Korea University Ansan Hospital, South Korea
Olda MNB Korea Medicine Hospital, Seoul, South Korea
Sociedad de Neurofisiologia Clinica, Hospital Espanol de Mexico, Mexico City,Mexico
Department of Medicine, Yonsei University, Seoul, South Korea
Gyeongsang National University Hospital, Seoul, South Korea
SMG-SNU Boramae Medical Center, Seoul, South Korea
Presbyterian Medical Center-Jesus Hospital, Seoul, South Korea

Chungnam National University Hospital, Seoul, South Korea
Soon Chun Hyang University hospital Cheonan, Seoul, South Korea
Department of Psychiatry, Dongguk University Ilsan Hospital, Goyang-si, Gyeonggi, South Korea
Department of Neuropsychiatry, Konkuk University Hospital, 4-12 Hwayang-dong Gwangjin-gu, Seoul, South Korea
Yeungnam Univ. Medical center, Daegu, South Korea
Department of Psychiatry, National Center for Medicine, Seoul, South Korea
Yuil Medical Center, Seoul, South Korea
Chun Cheon Sungsim Hospital, Seoul, South Korea, Seoul, South Korea
Dept. of Neuropsychiatry, Seoul National Univ. Hospital, Seoul, South Korea
Jongro-gu, Daehak-ro, 101, Medical Science building B101-2, Seoul, South Korea
GongJu National Hospital, South Korea, Youngsan-gu, South Korea
St. Andrew Hospital, South Korea
Ajou University Hospital, Yeongtong-gu, South Korea
Dongnam Health University, South Korea
Seoul National University Bundang Hospital, Bundang, Seoul, South Korea
Soon Chun Hyang University Hospital Seoul,
Dept. of Neurology, Catholic University Hospital, South Korea
School of Nursing, Xinxiang Medical University, Henan, China
Peking University Health Science Center, Beijing, China
Blue Konawe Kendari Hospital, Indonesia
Semen Padang Hospital, Indonesia
Department of Neurological Sciences, University of Vermont College of Medicine, Burlington, VT
VA Medical Center, McGuire Research Institute, Research Service, Richmond, VA
VA Medical Center , Richmond , VA
VA Medical Center, Behavior Medicine, Marion, IL
VA Medical Center, Overton Brooks, Shreveport, LA
VA Medical Center, Division of Biological Neurosciences, Hines, IL
VA Medical Center (VHAJAC), Neurodiagnostics, Jackson , MS
VA Medical Center VISN 17 Center of Excellence For Research on Returning War Veterans, Waco, TX
VA Medical Center, Cheyenne Vet Center, Cheyenne, WY
VA Medical Center, Department of Veterans Affairs, Austin, Texas
VA Medical Center, Department of Veterans Affairs, Fayetteville, NC
VA Medical Center, Ambulatory Care Center, Loma Linda, CA
VA Medical Center, Northern Arizona VA HealthCare System, Prescott, AZ
VA Medical Center, Orlando, FL
VA Medical Center, Salt Lake City, UT
Beer Sheva Mental Health Center, Hazadik Miroshalim, Beer Sheva, Israel
Polytrauma Support Clinic, Tennessee Valley Health System, Nashville, Tennessee
Department of Neurology, University of Colorado Denver (CU Denver)
DACVIM (Neurology & Neurosurgery) Veterinary Specialty Hospital of Palm Beach Gardens, FL
Lev-Hasharon Mental Health Center, POB 90000 Netanya, Israel
EEG and Sleep Laboratory, Prague Psychiatric Center/ National Institute of Mental Health, Czech Republic

Universidad Autonoma de Queretaro Facultad de Medicina, Clinica del Sistema Nervioso Central, Querétaro, Mexico
Advanced Brain Monitoring, Carlsbad, CA
Kyung Hee University Medical Center, Japan
Neuro-Rehabilitation, Caron Renaissance, Boca Raton, Fl
Caron Treatment Centers, Comprehensive Addiction Treatment, Wernersville Campus, Pennsylvania
UHAMKA-Jakarta Hospital, Indonesia
Abdul Muluk Lampung Hospital, Indonesia
Massenrempulu Enrekang Hospital, Indonesia
Abdul Manap Jambi Hospital, Jambi City, Indonesia
Kab. Biak Numfor Hospital, Indonesia
Bandung Hospital, Bundung City, Indonesia
Brebes Hospital, Indonesia
Meuraxa Kota Banda Aceh Hospital, Indonesia
Muara Teweh Hospital, Indonesia
Kota Cilegon Hospital, Indonesia
Jakarta Mental Hospital, Indonesia
Psychiatric Hospital of Iran University, Tehran, Iran
Zare Hospital, Tehran, Iran
Ziayian Hospital, Tehran, Iran
Erada Centre for Treatment and Rehab, DIAC, Dubai
Neuromodulation Lab, Lev-Hasharon Mental Health Medical Center Israel
The Institute of Physiology and Pathology of Hearing in Warsaw, Experimental Audiology Department, Warsaw, Poland
MD Anderson Cancer Center, Houston, TX

Military

Fort Carson US Army Military Base, Colorado Springs, CO
Fort Bliss Army Hospital, El Paso, TX
Integrative Medicine, National Intrepid Center of Excellence, Walter Reed National Military Medical Center
Camp Lejeune, USMC and Landsdorf Army Hospital, Germany
Landsuhl Army Hospital, CTR DE USA Medcom LRMC, Germany
Fort Campbell Warrior Resiliency and Recovery Center, Army Brain Injury Center , Fort Campbell , Kentucky
Malcolm Grow Medical Clinic, Andrews Air Force Base, MD
Military Medical Academy, University Hospital, Sofia, Bulgaria
MacDill Air Force Base, Tampa, FL
Ammar ebn Yasser, Military Academy, Heliopoles, Cairo EGYPT
Center for the Army Profession and Ethics, U.S. Army Training and Doctrine Command, West Point, New York
Eglin Air Force Base, Valparaiso, FL
Military Psychology Clinic, Danish Veteran Center, Danish Defense, Denmark
German Aerospace Center DLR e.V.Cologne, Germany