

Neurofeedback, Affect Regulation and Attachment: A Case Study and Analysis of Anti-Social Personality

Sebern F. Fisher

Abstract

This case study examines the effects of neurofeedback (EEG biofeedback) training on affect regulation in a fifty-five year-old man with a history marked by fear, rage, alcoholism, chronic unemployment and multiple failed treatments. He had been diagnosed with ADHD and attachment disorder and met criteria for anti-social personality disorder. The case will demonstrate the effectiveness of neurofeedback in quieting this man's pervasive fear, his baseline affect, while increasing his ability to regulate affect and enhancing his capacity for adult attachment. His progress will be measured with the Symptom Checklist 90 (SCL-90 R).

Keywords: Neurofeedback, EEG biofeedback, fear, rage, affect regulation, attachment disorder, anti-social personality disorder, empathy.

Introduction

"I am running on pure fear." This was one of the first statements Lyle made when he came for his initial assessment. He had sought out neurofeedback training after reading about it on the Internet. He stated that he was at the end of his rope. He reported that he had tried psychotherapy, and that talking about his past only made him feel worse. He had tried many medications and they hadn't helped him either. He said, somewhat matter-of-factly, that if neurofeedback didn't help him he would end his life.

Neurofeedback is biofeedback to the brain based on the operant conditioning of frequencies at which the brain fires. The training process begins with an in-depth clinical assessment that includes a standard clinical and family history, as well as a medical history and a physical status report that covers physiological markers such as sleep, blood pressure, and bowel function. This intake is formulated to give the clinician an overview of the patient's arousal as it manifests emotionally, psychologically and physically. It provides a profile that indicates whether the patient is over or under aroused, has an instability of arousal or mixture of arousal symptoms. When the assessment is completed, sensors are attached to the patient's head to record the real time EEG (electroencephalogram) on a computer. The trainee looks on a second screen at a video game that corresponds directly to this EEG and plays the game by shifting the amplitude of targeted frequencies in his brain. Brain frequencies relate to states of arousal. As an example, if someone is making a robust amount of 8-11 Hz (alpha waves) in the right hemisphere, they are likely to feel calm. If they are producing appropriate amplitudes of 15-18 Hz (beta) in the left hemisphere, they are likely to feel alert. The patient is rewarded for increasing appropriate frequencies in the appropriate hemisphere, as established with the assessment, while decreasing frequencies that might interfere with optimal functioning.

It was clear from his assessment that Lyle was over aroused and having great difficulty regulating his emotions, particularly fear and rage. Affect regulation is the province of the right hemisphere (RH). More specifically, rage and fear are generated (primarily) by the amygdala in the right hemisphere. The right hemisphere is the non-verbal side of the brain, - in the vast majority of people the language centers are in the left hemisphere - and the amygdala is deep in the sub-cortical temporal lobe. This brain topography may provide a clue to why Lyle felt "at the end of his rope", particularly with talk therapies. His history and his own report strongly

suggested that his fight-flight-freeze RH amygdala was hyper reactive, and that it could not be reached with left hemisphere language.

The outcome of this case suggests that neurofeedback training is an effective approach to disorders that are driven by fear. The author agrees with LeDoux (1996), that “fear is a core emotion in psychopathology.” The results of this case suggest the potential of neurofeedback in all fear based disorders, across DSM IV categories. Neurofeedback has been clinically demonstrated to be effective with many severe disorders and the mechanism in common may in fact be that neurofeedback enhances affect regulation, particularly the regulation of fear.

Case Summary

This step by step case study of neurofeedback will follow the effects of this training on this patient’s increasing capacity for affect regulation and evolving sense of empathetic engagement with the other, as well as its impact on certain key physical symptoms he reported. Emerging theory of brain development and early attachment, particularly the work of Allan Schore, will provide an additional framework for analysis. When he began treatment, Lyle wanted no part of psychotherapy and interacted with the therapist instrumentally, as someone who would provide him access to neurofeedback. As he trained over the course of 87 neurofeedback sessions, approximately 44 hours of actually training time, and he felt fear ebb out of him he became increasingly warm, empathically attuned and well attached.

Lyle presented as an unemployed and unemployable man given to episodes of extreme rage that included physical assault, property destruction, driving dangerously at high speeds, forcing drivers off the road, verbally threatening behavior and a history of alcoholism. When he came for neurofeedback, he had been sober for seventeen years and despite his state of constant turmoil, he did not think he would drink again. His social group consisted of AA members and his only social activity was attending AA meetings. His second wife is a bingeing alcoholic.

Family History

Lyle is the oldest of three sons who grew up in a lower middle class family. His father was a salesman who was often away and his mother was an alcoholic who suffered from depression and anxiety. She drank heavily and daily, and it was not uncommon for Lyle to return home from school to find her passed out on the living room floor. He shared a room with his younger brother and they both engaged in rituals to allow them to sleep. His brother banged his head rhythmically against the wall behind his bed and Lyle rocked and swung his head side to side, while songs played over and over in his head. He reported a repeating nightmare which would begin with his floating peacefully in space but which would then take a terrifying turn when planets and comets attacked him and the empty space became a hellfire. He would wake up in a cold terror just before his cosmic obliteration. He was a bully at school and shunned by his school mates. Although very intelligent he never did well in school, and he dropped out of college after one semester convinced he was a “loser”. This was the term that his mother most often used for him and his father, described as benignly absent, did little to contradict his son’s self construct. Lyle moved from job to job but was unable to fit in anywhere. He spent his nights drinking, almost always alone. Although Lyle is clearly an alcoholic, he was also clearly using alcohol to self-medicate his pervasive fear and to tame his explosive rage. His last job, which ended over ten years ago, was as a day trader. He described going to the office and sitting at his cubicle frozen in terror. He was fired because he was so afraid of losing money, of literally being a loser, that was unable to actually make a trade. His first marriage was brief and almost unnoted

in his narrative. He met his second wife in AA. He reported that when he joined he had “the gift of desperation” and he stopped drinking. His wife did not. He has been active in AA over the past decade and has also focused a great deal of attention on becoming a runner. Although he has become expert enough to compete, he does not consider this, at least in part, for fear of losing.

Lyle’s father and older brother died in his young adulthood; his father of cancer and his brother in one person motorcycle accident. Although his brother’s sudden and violent death shocked him, he reported that he felt little grief over either of these deaths. Lyle felt little other than rage and fear and these affects consumed him. He had no capacity for love or for empathy. His relationships were primarily instrumental in his terribly circumscribed world and in the therapy relationship as well. He hated and feared his mother who was in a nursing home. He suffered through his obligatory visits, resenting her and her ongoing criticism of him and actively wishing she would die. He felt obliged to oversee the affairs of his mentally retarded younger brother and did help him when he needed it. When he could no longer manage them with alcohol, when medication and therapy did not help and when running too failed to tame these demon emotions, Lyle came for neurofeedback. It was, he said, his last chance.

Case Conceptualization: Attachment, Brain Development and Neurofeedback

There is a growing consensus in all fields of psychotherapeutic thought that positive therapeutic outcomes depend on affect regulation. For the most part, cognitive behavior therapy relies on correcting false cognitions that are seen as driving affect dysregulation and/or teaching the patient skills aimed directly at emotion regulation (Linehan, 1993). Although perhaps more difficult to summarize, psychodynamic therapies generally rely on interpretation and insight. Less highlighted in both theoretical perspectives, is the role of the therapist as affect regulator. It is this author’s opinion that, whether it is articulated or not in any particular theoretical perspective, all therapy depends on the therapist’s capacity to regulate affect when the patient cannot. This is done, to the extent possible, through the therapist’s own capacity to regulate him or herself even in the center of the affective storm. She or he communicates this state of regulation through tone of voice, body language, eye contact and even touch. The therapist’s state then is more important to the patient’s regulation than the skills she teaches, the interpretations he makes or the insights she facilitates. In cases of serious psychopathology (by definition conditions in which there is a significant failure of affect regulation), the therapy is imperiled when the tumult of the patient overwhelms the self-regulatory capacity of the therapist or persists despite it. According to LeDoux (1996), Linehan (personal communication, 2006), Schore (1994, 2003a and 2003b) and Siegel (1999) fear is likely to be, fundamentally, the affect most in need of regulation. Clearly this was the case for Lyle.

Lyle was the child of a depressed, alcoholic mother who abandoned him to her own state and to her addiction. By his account, she shows little evidence of a capacity to self-regulate. According to most theories of development and now, emerging neuroscience, the infant learns self-regulation through interaction with his mother. But it is not only that the baby learns behaviors from the mother. It is becoming evident (Schore 1994; Schore 2003a; Siegel 1999) that attuned interactions with the mother build neuronal density in the brain of the infant, particularly in the right hemisphere, or the affect regulation hemisphere of the brain. Without this attunement and the brain development attendant to it, affect regulation is at best attenuated. Further, the area of the brain most affected by neglect, physical and emotional, is the right pre-frontal cortex. The right pre-frontal cortex is the area of the brain that inhibits the activity of the amygdala. The amygdala stores fear memories. We can reasonably hypothesize that Lyle experienced states of fear as a baby and dependent child that his mother was unable to soothe and, from his own report, that he has lived with this diffuse underlying terror all of his life. In him, this baseline state of fear

has been given many names: ADHD, conduct disorder, anxiety disorder, reactive attachment disorder, and anti-social personality disorder, but, across diagnoses, fear is the core issue. We could also hypothesize that as a result of a significant degree of maternal absence at the critical stage of right hemisphere and particularly right pre-frontal development, Lyle lacked the brain structure and/or organization to inhibit the firing of his amygdala. According to Schore, Lyle's early experience with his mother would influence the development of the pre-frontal cortex and would in turn impact his brain's ability to shut down the firing of the amygdala, the nucleus of fear and rage. The fact that the amygdala is deep in the non-verbal right temporal lobe and that for people like Lyle it routinely trumps cortical inhibition can render talk therapies mute.

Although effects of early relational trauma seem to endure, so does the capacity for change. "...current brain research...indicates that the capacity for experience-dependent plastic changes in the nervous system remain through out the life span. In fact, there is very specific evidence that the prefrontal limbic cortex, more than any other part of the cerebral cortex, retains the plastic capacities of early development" (Schore 2003b, p.202). This model of experience dependent brain development and enduring brain plasticity may provide the best lens through which to view Lyle's progress. His case, and others like it, strongly suggests that neurofeedback can optimize brain plasticity through operant conditioning of the frequencies at which it fires and enhance brain function even when it has been developmentally impaired.

Training and Treatment Course

Lyle came with a myriad of presenting problems that included frequent uncontrollable rages, unrelenting fear, voices and songs in his head, restless sleep, psoriasis and a strong, unpleasant body odor that he could not get rid of, regardless of the number of showers. His marriage was more unimportant than unhappy, and he had no friends other than the regulars he saw at his AA meetings. He presented himself as unattached, instrumental, wary and desperate. During the initial interviews there was little sense that he could feel empathy or put himself in another's shoes. He was entirely pre-occupied with his own survival which seemed mysteriously but constantly under threat. His lack of affect regulation suggested that neurofeedback training would focus on the right hemisphere and eventually on the right pre-frontal cortex. What follows are session summaries of neurofeedback training, much of it in Lyle's own words. Most training was done either at the right temporal lobe and/or the right pre-frontal cortex. Protocol decisions in terms of what frequencies to reward depended on his response to the prior session. In his case, all changes that were made through the course of training involved dropping frequencies that were rewarded which, in turn, helped him to quiet his baseline state of arousal.

The neurofeedback system used in this case was EEGer from Neurocybernetics. We trained two to three times weekly as scheduling permitted for thirty minutes per session. Three "SCL 90s" were administered and the results are included as part of the outcome data.

Session 1: After his first thirty minute session and while still in the chair Lyle said, "I am calmer. The chatter is gone. This is powerful stuff".

Sessions 2-7: He reports that he feels no resentments and although he had been sorely provoked several times, he had had no rage reactions. This surprised him. He said that he was handling daily stress better; that his eyes weren't darting as much and that he startled less. His voice was still loud, his body odor was bad, his sleep was still restless, and he continued to talk at me. I reduced the frequency which was rewarded.

Sessions 8-11: I introduced pre-frontal training at session 8. He reports what he calls “a ‘be here now’ sensation”. “I am neutral, a huge void and waiting; waiting to be part of society. I feel deeper; more within myself.” Remarkably, after the introduction of the right pre-frontal training, his body odor disappeared. Lyle described it as “the smell of fear.” He was, however, still impatient and driving twenty miles over the speed limit. He defended his driving by saying he liked it that way, aggressively cutting off inquiry as he had been known to cut off drivers.

Sessions 12-32: “I dream Space Race.” Space Race is the name of the video game that Lyle had chosen for feedback. I had been slowly dropping reward frequencies and changing placements, all on the right frontal and temporal areas. He reported that the songs were still playing, but less often and less insistently. At session 24, he reported nearly immobilizing fear and said he felt rage when he couldn’t capture the gem in the video game. This gratuitous arousal suggested that he could benefit from training at even lower frequencies and I made the change.

Sessions 33-43: At session 35, Lyle reported that he has been anxious to come to see me and to train. “My life has been quieter because I have gotten so much quieter.” He also spoke about loneliness, a new emotion for him, even as he was noticing that people seem more attracted to him. He didn’t have anyone who he felt would understand what he was experiencing within himself and with the brain wave training and now he found he really wanted that person in his life. He struggled with the notion that he had to learn to love himself and that that should suffice. Through this period of approximately three weeks, he also reported feeling closer to me, and feeling a level of emotional intimacy that was “a completely new experience”. Sleep and songs both got quieter. He began marathon training which included running up a steep hill six times in a row, and he reported that this was easy to do.

Sessions 44-75: Lyle reported, “I feel great. He said, “I am new at this relating business.” At session 55, he commented directly on what seemed like a fundamental shift in orientation from the instrumental to the interpersonal: “I feel much better when I come here because of my closeness with you and because of the training. I used to think it was all the training; that you didn’t matter.” This session was 7 months after Lyle began neurofeedback. He talked now of his younger brother with great tenderness. “It must be empathy. It’s new to me.”

Sessions 76-77: Lyle had discovered my existence and he also discovered a history and an internal life that he needed and wanted to talk about. He talked of his experience of motherlessness. He said that this felt nearly unbearable for him to feel but also newly possible. “[My mother] sucks goodness out of me. I have nothing to work with, inside me, because I didn’t really have a mother. This is very painful” He teared up as he spoke. “I am empty of a mother but it’s also an OK emptiness. That’s because I have you.”

Session 78: At this session, Lyle described a terrifying and barren internal landscape and the nearly bottomless grief he felt when he saw it. “This is a nuclear wasteland. I am looking at no one. Everything that enters here dies.” He said, “This is very painful, but I feel ready. This is what I have been running from for my whole life - here it is and I am OK.” As he prepared to leave he said, “I’ve turned a huge corner. I get it now. It just ‘is’.”

Session 79: When he sat down for his next session a few days later he described a very different internal landscape. “I have a garden now. I can see colors. I don’t know what I’ll grow into, but I will grow, with a garden to draw from and not a nuclear waste dump.” This formerly disinterested and instrumental man went on to say, “You are the other that allows me to

experience this. Everything is realigning; everything is starting to come alive. I have passed through neutral and feel reborn.” He cried through most of the session with equal parts of grief and gratitude.

Session 80: After these powerful and evocative sessions, Lyle experienced a setback. His wife became quite sick and when he could not get doctors to respond appropriately to her, he experienced himself as powerless, angry, and dysregulated in ways that felt old to him. He became verbally aggressive with people on the phone and threatening to an intake person at the hospital. He was quick to justify his aggressive behavior with a familiar perseveration about how ‘broken’ the systems were. He was determined to find someone to blame; someone to hate; someone who was responsible for how badly he felt. At the same time, he was feeling a new level of attunement with his wife and her situation. It was clear that he could not regain equilibrium without help. Empathically and firmly, I stepped in to regulate his arousal. He resisted my intervention initially, but then, as if suddenly recognizing my presence, he was able to shift state and calm down. In Schore’s language, I had lent Lyle the regulation of my pre-frontal cortex and due largely to neurofeedback, he was able to accept the loan.

Session 81- 82: After finishing a session of pre-frontal training at very low frequencies, Lyle looked at me and said, “You are with me in the garden, holding my hand. I am not alone. I have nothing to fear.” I can go these places because you are my guide, my friend, my mother. I use to use the voices to make the terror go away. Now I go to you.”

Session 83: Lyle was feeling my presence in ways that psychodynamic therapies would describe as transference. It may be much more precise to say that he was describing core affect regulation. He was using the best language available to him and perhaps the most accurate to describe his newly born freedom from fear. He described a felt experience of safety such as an infant might feel with an attuned and loving mother. “I can just let go. I am one week old. I am in your arms. When I say these things, I have to quiet the protest of my left brain. This is my right brain.” He feels as if he is in his infant body: “I look into your eyes, you look into mine; I smile and you smile and I am safe. Safe and loved. His sleep, which had improved significantly within twenty sessions, continued to be deep and quiet. Calling on the experience dependent model of brain development and plasticity it could be reasonably hypothesized that at this point pre-frontal neurofeedback together with my attuned presence were activating Lyle’s right pre-frontal cortex which allowed the regulation of his amygdala.

Session 84: Lyle barely escaped a serious car accident that had occurred through no fault of his. He joked that he was now the driver that he used to force off the road. He drove at the speed limit or more slowly. He had pulled to the side of the road to regain his composure. He told me about experiencing an even deeper sense of safety when under threat. “When I was afraid, I left your arms and went into the womb. It was safe and warm, almost like magic. I was fine then.” His sense of safety extended to his relationships outside the therapy room. “When I imagine I am in your arms, like a baby, I can feel empathy for my wife because I am not afraid. I can really get it that she is not my mother.” He had new experiences at AA as well. In talking about a meeting he said, “I am beginning to really feel what they feel. I have heard these stories for years, but now I really hear them. I feel for them, like I feel for myself. It’s all much too much to feel all this and it’s OK too. The reality is that I am becoming a whole person. I don’t need anyone to fill the void.”

Session 85: “The maternal wiring was dormant. I didn’t know it was there, but it is. As hard as I tried in the past, I couldn’t activate it. Now it’s there. I feel it.” This was Lyle’s report

after approximately eight months of neurofeedback. He no longer felt alone in the world and he no longer lived in the constant haunt of fear. He described not only an enriched sense of self and a new empathic engagement with others, he also had begun think and speak in spiritual, almost transpersonal language. "I don't live in the darkness anymore. I am living in the light. I am part of all mother earth."

Session 86: Lyle identified a "screaming red monster" in his stomach that he wanted me to pull out. He thought this monster was the rage he felt as a motherless infant. But he quickly went on to say that he wanted to learn to love this part too, even though it is "repulsive". A brief time later in the session he said, "I feel brand new and that I understand nothing. And I feel that I am at the beginning of understanding everything." Lyle seemed to embody both the screaming red monster and the Zen monk at one in the same moment. He also reported that he'd run three seven-minute miles in an hour.

Session 87: Lyle began the session saying, almost in a state of wonderment, "I am just not afraid." When situations come up, I ask myself what you would do, and I do that." In some cosmologies Lyle's description would suggest an internalization of the therapist. In the model of this paper, it suggests his deepening capacity for regulation and for relatedness, as fear quieted in his brain. Again, he made a seamless segue from the interpersonal to the spiritual. He said, "I feel no separation from anything. I see it all. I could give up the material world, all of it. It isn't important. Peace in my mind, the time for contemplation, helping others. That's all I want." He ended that session saying, "What I am becoming is wonderful."

Training and Treatment Outcomes

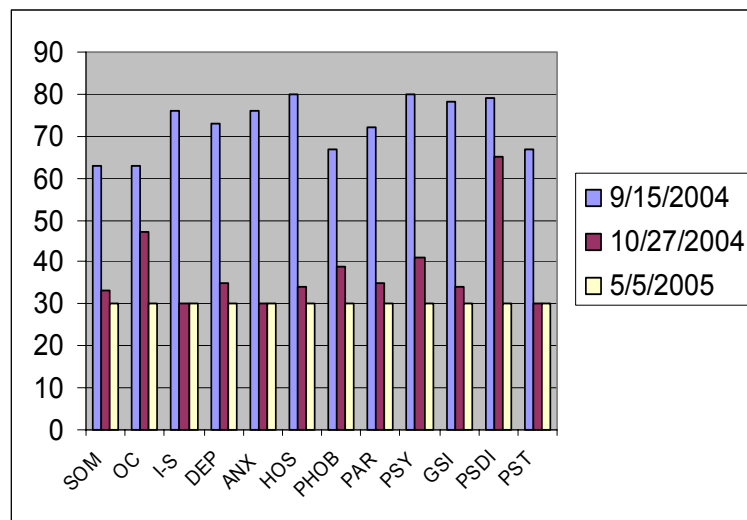
When reporting outcomes with the use of neurofeedback, it is especially important to make a distinction between training and treatment. Although initially Lyle wanted nothing to do with psychotherapy, he was fully engaged in treatment within 50 sessions of training. At the end then it is difficult to know how to attribute his success. Both Lyle and his therapist agree, however, that for him neurofeedback made psychotherapy possible. Operant conditioning of his brain waves provided him with the capacity to regulate his affect in a way that prior therapy and medications had not. The psychotherapy then offered him the expansive opportunity to talk about what he was experiencing as fear drained away. The experience of greatest importance to him was stepping into the interpersonal world through empathic engagement with himself and others.

Results

Lyle came for neurofeedback training saying, "I am running on pure fear". At 87 sessions or eight months of training and psychotherapy, he describes himself as no longer driven by fear. He had frequent rages, including dangerous episodes of road rage and by mid course, he no longer felt rage. He now describes himself as calm and he drives slowly and mindfully. He says he likes to see the beauty of the world and has to slow down to make that possible. He was plagued by voices and songs in his head. Although these never stopped completely, they were less frequent and much quieter. Sometimes he would listen for them and they would not be there. These voices were never symptoms of psychosis but rather the constant self talk and singing of a highly over aroused brain. Lyle complained of disturbed sleep when he began. Within twenty sessions he was "sleeping like a log" and this effect was sustained. The intense body odor disappeared, even when he was sweating and the psoriasis cleared up quickly as his arousal went down and has not returned. These outcomes reinforce

the increasingly common wisdom that stress is a major factor in disease. And finally, this was a man who felt that therapy could not help him and is now someone who engages readily and meaningfully in the therapeutic relationship. He is still unemployed and still experiences enough fear of failure to keep him stalemated in this important domain. He feels sure that this too will give way, as he completes his journey out of fear and into regulation and empathic attachment.

Table One: The SCL-90 R demonstrates significant changes in all measures. The Psychoticism (PSY) measure is falsely elevated in the first two tests due to his positive response to hearing voices and songs in his head. As described in the text, these were not psychotic phenomenon. The last test was considered invalid because he had no positive responses to any of the questions. This outcome, however, accurately represented his sense of himself. He had no complaints.



Lyle's case has several implications. His robust outcomes suggest that operant conditioning of the brain waves through neurofeedback can impact arousal and affect regulation. Further it seems that certain neurofeedback protocols bear on the functioning of the right hemisphere and may strengthen the inhibitory capacity of the right pre-frontal cortex over the fight-flight-freeze amygdala. If this turns out to be the case, it would seem to suggest that neurofeedback training, particularly of the pre-frontal cortex may mimic early developmental processes that allow optimal right hemisphere development and with it the capacity for improved affect regulation. Obviously, this one case can not sustain these conclusions but it can fairly raise them. This case provides further clinical data supporting LeDoux, Linehan, Schore, Siegel and others on the primacy of fear within the schema of affect regulation and supports Schore's contention that the right pre-frontal cortex maintains its plasticity throughout the life span. As the training regulated his affect, most specifically fear, this man experienced a new empathic sense of self and other, a new capacity for attachment.

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Author Contact Information:

Sebern F. Fisher
Private Practice
34 Elizabeth Street
Northampton, Massachusetts
Phone: 413-586-4230
Fax: 413-584-5974
Sebern@aol.com

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