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FEATURE ARTICLE

QEEG Accepted in Death Penalty Trial in *Florida v. Nelson*

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Quantitative electroencephalography (QEEG) was accepted for the first time in a Frye Hearing in the death penalty phase of a murder case in Florida. Issues of reliability, validity, and the basic science of QEEG were addressed in the case. Linkages of the defendant's conduct, QEEG results, other testing, and history demonstrated his state of impairment, resulting in a sentence of life without parole. Implications for the future of QEEG and a hierarchy of usage argues that its acceptance in life-and-death decisions makes insurance reimbursement denials for QEEG and neurofeedback, based on the same science, unreasonable.

Introduction

If science cannot make a difference in the trenches, it is a hollow academic exercise. Action without science is only partially informed, and science without action remains rarified but not real.

From the outside, the site looked rather unimposing, like a humble office building. When I crossed the threshold, my senses were assaulted by sound and movements and the crush of flesh and crowds. We went through the obligatory airport-style screening, and a corrections officer asked for our court order and captain's letter. ''We are here to do a QEEG on Grady Nelson.'' ''Open your bags.'' We unpacked our bags and their contents were inventoried against the list previously submitted to the captain of the guard. Cell phones and keys were confiscated, and our drivers' licenses were taken and checked; in trade, we received a number and badge.

''Welcome to the Miami Dade Detention Center.'' My eyes were greeted by orange uniforms, some people in leg chains, others walking along a tiled line, and guards in uniforms whose numbers seemed quite thin compared to the sea of iridescent inmate orange.

After a ride in a crowded old, dented, and dirty elevator and many long corridors later, we entered a large classroom with five office-sized desks, chairs, and a gurney. We moved toward the window, hungry for some contact with the outside and natural light. There was a pallor of grimness, dullness, and death in the air.

A guard entered with a nearly 6-foot, rather quiet, gentle-looking, somewhat bald man. To our surprise, the guard left and locked us in the room with Mr. Nelson, who placed himself sitting up on the gurney. Deb, a registered electroencephalography (EEG) technician with 25 years of experience, and I introduced ourselves, and she began measuring the man's head and marking it with a marking pencil. I explained what a quantitative EEG (QEEG) is, overviewed the five parts of the test, and provided him with a consent form. I explained that nothing he said or did would be confidential, that all might be revealed in court and would be shared with his attorney and made known to the State. He signed and consented. There was an air of irritability, of a spring wound and ready to explode, yet to the naked eye Mr. Nelson was the epitome of quiet and calm. I began my Mini-Mental Status Exam and then began to ask about his background, substance abuse history, head injuries, occupational history, family history, and educational and military background.

The Case

There was no doubt that Mr. Nelson was accused and eventually convicted of a cruel, bloody, and heinous murder and child rape, of which most people would say, ''Anyone who did that must be crazy or sick.'' But when the time came for trial, that shock and question gave way to the same taste for vengeance and blood that energized the crime. We call that justice. Maybe it is, but thoughts like this had to be crowded out by my commitment to scientific objectivity and focused purpose, to determine what, if anything, an EEG and QEEG could contribute to assisting the court in making the decision about life or death.

Florida has a statute that requires that a jury must consider both aggravating circumstances (things that particularly make a crime worse than the average crime) and mitigating circumstances (things that would reduce the severity of punishment for the crime). In the weighing of these things, justice is served by life in prison without parole or death by lethal injection. Guilt and death are separate decisions.

The Issues and the Decision

Mr. Nelson underwent a neuropsychological examination. The State challenged the use of the QEEG, which had been introduced in the case, and that challenge was supported by Charles Epstein, MD, PhD, of Emory University. The legal questions were the following:

1. Is this a sound and accepted science or is it novel or ''junk'' science without reliability or validity?
2. Who are the community of acceptable users, that is, who uses QEEG and who can render an interpretation (Thatcher, Biver, & North, 2003)?

Specific questions raised in this case were the following:

1. What were the conditions under which the EEG and QEEG were conducted and how did these conditions affect the results?
2. What is artifact and what is real EEG, and what was submitted for quantification?
3. What connection is there between QEEG findings, impairment in function, and deregulation or damage to the brain, and how does that relate to the defendant's conduct?
4. Could the results be due to something other than brain deregulation, such as muscle movement?

We were able to demonstrate the following:

1. The EEG was properly acquired and artifact identified.
2. The raw EEG record reflected brain deregulation and not muscle artifact.
3. Both the raw EEG record and quantification were abnormal, and the results were localized in a way that specifically was tied to frontal lobe dysfunction and lack of inhibition.
4. There was a history of symptoms, incidents, and neuropsychological testing consistent with traumatic brain injury (see Thatcher and Lubar 2009).
5. The mathematics and basic science underlying the QEEG date back to the 19th century, including the Fourier transform and spectral analysis.
6. A properly constructed database, in this case Neuroguide (Thatcher et al., 2003), which meets published criteria (Thatcher & Lubar, 2009), can be reliably used to identify abnormalities in the brain.
7. The policy statements of the American Academy of Neurology lacked scientific and professional foundation in the peer-reviewed literature (Thatcher et al., 1999).
8. Neuroscience is an interdisciplinary field, which may include trained PhD's and properly trained physicians as well.

The decision of Judge J. Hogan-Scola is instructive: (State of Florida v. Grady Nelson, 2010)

And it's clear to me, though it wasn't when we started this hearing—it was my understanding at the beginning that the position of the state was *that QEEG was new or novel science, and after reviewing everything, I totally disagree with that, but I don't think after the hearing that that was the State's position, but if it still is I do not think that QEEG is new or novel science.*

I think at the end of the hearing that the State's position was it is only new or novel in its application to TBI or traumatic brain injury and diagnosing it.

But I think it's quite clear from Dr. Thatcher's testimony as well as from the submissions, the articles I read submitted by both experts, that no one is going to come in and say that the computer spits out a diagnosis. What happens is that raw data is taken in the form of an EEG. It is segmented by artifacting and the submission into a computer program of which there are some numerous varieties, and I don't think the computer programs are new or novel science either. I think they are used by neuroscientists in all areas, in all fields in this modern day, and that's my take from both the testimony and the articles that I looked at.

And that what Dr. Thatcher says—and I'm assuming what Dr. Gluck will do, and we won't know until he comes in and testifies—he says that they use other adjunctive neurological tools such as a clinical evaluation as people in neuroscience do and they look at the computerized data and say this is consistent with the report of the patient or subject, or it is inconsistent or it is consistent in this regard and inconsistent and in another regard.

But my take on this is that the Judge's job in the being a gatekeeper is to decide … but everything I have heard, the methodologies are sound, the techniques are sound, the science is sound.

Because experts disagree does not mean that tools and techniques are unreliable, and I think that there is—I am satisfied by the preponderance of the evidence that the techniques and methodologies are sound and that the acceptance is wide enough. There's not unanimous acceptance. There are clearly

detractors and dissenters and Dr. Epstein is one of those. *But it was interesting because I saw so many reliances by Dr. Epstein on the QEEG.... So, I'm going to allow the defense to put on the evidence of the QEEG, and that's my findings and my ruling.* [*Emphasis added*]

Suggestions for the Use of QEEG in Court

This list is not meant to be exhaustive. There are many additional considerations, many of them technical, which are beyond the scope of this article.

1. A good history of the defendant should be obtained using multiple sources including collateral and documentary source material when available.
2. A thorough neuropsychological examination should be conducted.
3. The EEG/QEEG should be performed by someone experienced in the field who has been able to demonstrate competence either through experience, work product, or training.
4. A database should be selected that has met published criteria for validity and reliability.
5. The complexity of the EEG and QEEG should be explained to a lay jury, using metaphors in everyday language.
6. The findings in the EEG and QEEG should be linked to the defendant's conduct and to prior testing results, and the professional should be prepared to cite and explain the findings and the links to peer-reviewed literature.

Proposed Hierarchy of Usage for Quantitative EEG[1]

There is no more important decision than the decision as to whether a person lives or dies. The QEEG was accepted in this instance as part of that decision-making process. Here is a proposed hierarchy of use and acceptance. By contrast, it appears incredibly unreasonable then that when QEEG is accepted in a death penalty decision, used in surgical monitoring and intensive care units, and accepted in civil litigation, that any insurance carrier would deny reimbursement for the QEEG or for neurofeedback, a treatment based on the same basic scientific principles.

Implications for the Field of QEEG: Where Do We Go From Here?

It is clear that QEEG can play a role in life and death decisions. This places a heavy burden on us to be ethical and scientific. QEEG can have a profound effect on the civil and legal rights of citizens, and because of this we must demonstrate that our science is open to peer review and meets scientific standards. Analysis of the EEG is important, but QEEG is no longer a captive of its neonate analog EEG or its neurology birthmother. It has established itself as an interdisciplinary science that uniquely bridges the gap between science and practice. It gives us a window into the EEG that is objective and unique. This demonstrates that QEEG is worthy of the financial support of funding sources to advance and expand its science. It opens the inquiry into the neuroscience basis of criminal conduct. It will raise the issue of where the boundary of mitigation and personal responsibility will begin and end. QEEG does not excuse criminal conduct, but it can help us to distinguish between impairment and free choice, which should be a lynch pin in the scales of justice.

This decision places a burden on researchers to ensure that they do not produce sloppy and flawed research. Poor science not only impairs clear thinking in decision makers but also impinges on the civil and legal rights of citizens. Clearly then, it is our obligation that in producing good science we are also acting and that we are obliged to act in the public interest.

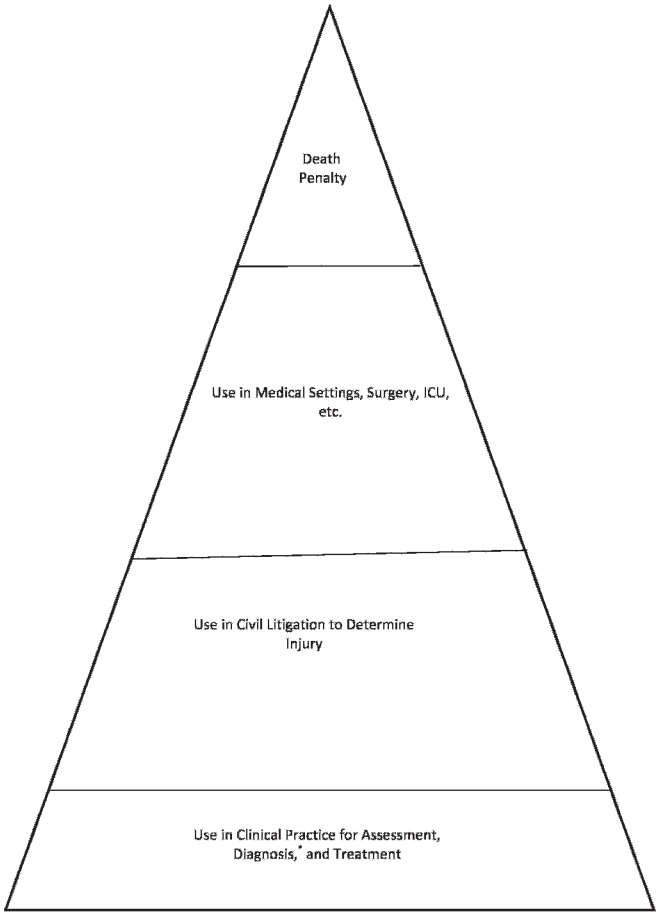

Figure 1. A hierarchy of quantitative electroencephalography usage.

This was today's victory, but it is also tomorrow's challenge. It is a challenge to continue our clinical and research work to produce sound healing and science. As a field, we are less threatened by the intentional lie than we are by half truths, myths, shoddy research, and secret agendas. What we do must be in the public light of our peers and accountable to scientific review. QEEG research and practice and neurofeedback must be openly done and openly arrived at. We must continue to link symptoms, locations, and QEEG abnormalities to each in ways that illuminate the degree of regulation or deregulation of human behavior. This will permit proper treatment, perhaps open up new methods of treatment, and make clearer the line between illness and personal accountability.

Participants in this case were Robert Thatcher, PhD; Gerald Gluck, PhD; Terence Lenamon and David Markus, counsel for Mr. Nelson; and Hilah Mendez and Abbe Rifkin for the State.

Note

1. The author wants to thank Dr. Joel Lubar for suggesting the idea of a hierarchy of use.

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