

Farwell Brain Fingerprinting in the case of *Harrington v. State*

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In *Harrington v. State*, Case No. PCCV 073247(Iowa District Court for Pottawattamie County, March 5, 2001), petitioner Terry Harrington sought to overturn a 1978 murder conviction on several grounds, including an allegation that newly discovered evidence in the form of Farwell Brain Fingerprinting® entitled him to a new trial.

Standard of review. To obtain relief, the petitioner had to show that the newly discovered evidence was unavailable at the original trial, and that the new evidence, if introduced at the trial, would probably change the verdict. Additionally, in view of the fact that the proffered evidence consisted of a novel forensic application of psychophysiological techniques, the court was required to determine whether this scientific evidence was sufficiently reliable to merit admission into evidence and, if admitted, whether the weight of the scientific evidence was sufficiently compelling to change the verdict.

The U.S. Supreme Court has held that the standard for admissibility of novel scientific evidence is a showing of reliability based on (1) whether a theory or technique can be (and has been) tested; (2) whether it has been subjected to peer review and publication; (3) whether, in respect to a particular technique, there is a known or potential rate of error, and whether there are standards controlling the technique's operation; and (4) whether the theory or technique enjoys general acceptance within a relevant scientific community. *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, 509 U.S. 579,

594 (1993) (construing Federal Rule of Evidence 702). The Iowa Supreme Court has not formally endorsed this federal evidentiary standard, but in *Leaf v. Goodyear Tire & Rubber Co.*, 590 N.W.2d 525, 533 (Iowa 1999), it announced that the Iowa courts may use the *Daubert* factors in assessing the admissibility of novel scientific evidence.

Description of Brain Fingerprinting.

Farwell Brain Fingerprinting® is a real-time psychophysiological assessment of a subject's response to stimuli in the form of words or pictures presented on a computer monitor. As a forensic method, the test assesses the subject's knowledge of a crime scene or of the instrumentalities or fruits of a crime, and it can also be used to assess knowledge of the particulars of an alibi scene or sequence of events. In the homeland security field, it can be used to detect knowledge of specific training or inside information, e.g., knowledge of Al-Qaeda terrorist training or the internal workings and personnel in a particular terrorist cell.

Brain Fingerprinting uses electroencephalography (EEG) to measure event-related potentials, known as the P300 (electrical events beginning 300 milliseconds after exposure to a stimulus), that are characteristic of the information processing that accompanies recognition of stimuli in comparison to a remembered context. Dr. Farwell has extended the analysis of this event-related potential further in time to take account of additional information that has not been analyzed hitherto, and he refers to this extension of the P300 as a "MERMER" ("memory and encoding related multifaceted electroencephalographic response"). Just as a personal computer emits a characteristic sound whenever its central processing unit is transferring information from or to the hard drive,

the human brain emits a characteristic P300 (and MERMER) electrical response whenever the subject responds to a stimulus by updating his memory context to take account of the stimulus. The P300/MERMER response is not evoked when the stimulus is irrelevant to the subject's memory context.

Accordingly, if the person is a witness to or perpetrator of the crime, his response to stimuli that betray accurate details of the crime ("probes") will evoke a P300/MERMER response. Other items known to the person regardless of whether he was present at the crime ("targets") also evoke the response and permit the tester to establish a baseline from which to compare the person's responses to the probes. Other stimuli that have no relevance either to the crime or to anything in the subject's memory ("irrelevants"), establish a baseline for a flat response (no P300/MERMER evoked). The signals obtained from the subject's response to multiple presentations of approximately one dozen each of probes and targets, and twice as many irrelevants, are averaged using analytical tools that are standard in the field of EEG psychophysiology. In this way, an overall result is obtained, demonstrating whether the probes have evoked a P300/MERMER recognition response or a flat non-recognition response.

A similar test can be administered to probe the subject's alibi defense; however, in the case of an alibi, all that can usually be determined is whether the alibi story has validity as the subject's remembered experience: it is not usually possible to determine whether the exact timing of the alibi experience places the subject away from the crime scene at the time of the crime.

Brain Fingerprinting, using standard P300 analysis, typically yields an "information present" or "information absent" result with a statistical confi-

dence in excess of 95% (and usually higher than 99%), and Dr. Farwell is able to increase the confidence factor when utilizing the additional signal information contained in the MERMER. In research trials and real-life applications, Brain Fingerprinting has a track record of more than 150 correct determinations of "information present" or "information absent," and no incorrect results. In about 3% of cases the test's analytical methods returned an indeterminate result, with no commitment to "information present" or "information absent". About half of these tests were laboratory trials wherein the information detected was related to a laboratory experiment (e.g., a mock crime), and half of the tests were real-life tests of information acquired by the subject/suspect in the course of daily life unrelated to any laboratory experiment. Dr. Farwell conducted three scientific studies funded by the CIA, one with the US Navy, and two in collaboration with FBI scientists in which the subjects were FBI agents. In the FBI, CIA, and Navy studies, there were no false positives, no false negatives, and no indeterminate results; all results were correct. Results were published in leading scientific journals in psychophysiology and forensic science.

The availability of fresh, salient, and detailed probes is essential to the efficacy of the test. Indeed, it is anticipated that, once the reliability of the science underlying Brain Fingerprinting is established, the principal line of attack for parties opposing the use of a Brain Fingerprinting test result in a trial will be to challenge the evidentiary value of the specific probes that have been employed. Note that this is a challenge not of the scientific process of Brain Fingerprinting testing, but of the investigation into the crime, a process that precedes the scientific Brain Fingerprinting testing and that discovers and specifies the crime-relevant information embodied in the

probes. Dr. Farwell acknowledges that Brain Fingerprinting cannot be successfully applied in cases where the subject has been exposed to all the known details of the crime scene, fruits and instrumentalities in circumstances unrelated to committing the crime. In such a case, no viable probes would be available, since probes by definition involve information that the suspect denies knowing by virtue of non-participation in the crime. Without such probes, a Brain Fingerprinting test would not be conducted.

The Brain Fingerprinting assessment of Harrington.³

In the Harrington case, Dr. Farwell developed a series of probes for the crime scene, and a separate series of probes for the petitioner's alibi, from previously undisclosed police files. Dr. Farwell administered the test to Harrington in May 2000 and, in October 2000, he rendered a report to the Iowa District Court analyzing the MERMER responses. Dr. Farwell supplemented the report with a separate analysis based solely on P300 signals on November 10, 2000. Both analyses produced a result of "information absent" regarding the crime scene probes and "information present" regarding the alibi probes, with a high degree of statistical confidence (over 99%).

Proceedings in the Iowa District Court.

The District Court held a one-day hearing on the Brain Fingerprinting evidence on November 14, 2000. The court took preliminary testimony on Dr. Farwell's credentials, the efficacy of the test and the reliability of the underlying science. The court also examined the test results, subject to a later determination whether this scientific evidence was sufficiently reliable to be admissible.

At the November 14 session, Dr. Farwell testified and was cross-examined on the basis of his test reports.

Additionally, two other psychophysiolgists with EEG expertise, Prof. William Iacono of the University of Minnesota and Prof. Emanuel Donchin of the University of Illinois at Champaign/Urbana, testified on Dr. Farwell's credentials, his test reports and the science underlying the Brain Fingerprinting test. Prof. Iacono testified at Harrington's request, and Prof. Donchin was called by the state.

Both experts validated the science underlying Brain Fingerprinting and acknowledged Dr. Farwell's credentials; however, while Prof. Iacono validated the forensic application of P300 science based on his own research, Dr. Donchin asserted that the tester's selection and presentation of the specific probes is the point at which science ends and art begins.

The investigative phase of preparing the Brain Fingerprinting test, which discovers the salient features of the crime that are used as probe stimuli, depends on the skill and judgment of the investigator, and is not a scientific process. The scientific phase of Brain Fingerprinting testing begins after the investigation has identified appropriate probes. The science of Brain Fingerprinting testing determines whether the subject responded to the probes, providing an objective result: "information present" or "information absent." This result does not depend on the subjective judgment of the scientist conducting the test. The test result is then presented to the trier of fact to assist in the determination of guilt and innocence.

Regarding Dr. Donchin's contention that the selection of probes in Brain Fingerprinting is the end of science and the beginning of art, Dr. Farwell agrees that the selection of probes – which is a feature of the skilled investigation and not of the scientific Brain Fingerprinting testing – is a subjective element of the process. He asserts, however, that this subjective element is the

kind of evidence that judges and juries are competent to evaluate: A non-scientist is well equipped with common sense and life experience to evaluate all the facts and circumstances of the case and determine whether a finding that the specific probes in question returned a scientific result of "information present" or "information absent" helps to establish the subject's guilt.

The District Court's ruling.

After briefs were submitted and other, unrelated grounds for post-conviction relief were tried, District Judge Timothy O'Grady issued his ruling on March 5, 2001. The court determined that Brain Fingerprinting was new evidence not available at the original trial, and that it was sufficiently reliable to merit admission of the evidence;⁴ however, the court did not regard its weight as sufficiently compelling in light of the record as a whole as meeting its exacting standard, and thus it denied a new trial on this and the other grounds asserted by Harrington.

The court stated the following:

"In the spring of 2000, Harrington was given a test by Dr. Lawrence Farwell. The test is based on a 'P300 effect'."

"The P-300 effect has been recognized for nearly twenty years."

"The P-300 effect has been subject to testing and peer review in the scientific community."

"The consensus in the community of psycho-physiologists is that the P300 effect is valid."

"The evidence resulting from Harrington's 'Brain Fingerprinting' test was discovered after the verdict. It is newly discovered."

Appeal.

The Iowa Supreme Court reversed the trial court and granted Harrington a new trial. *Harrington v. State*, 659 N.W.2d 509 (Iowa 2003). The supreme court did not reach the Brain Fingerprinting issue, 659 N.W.2d 509, 516 n.6, and decided the case on other grounds. Due to a *Brady* violation, Harrington was accorded a new trial, and the state subsequently dismissed the murder prosecution without prejudice for lack of evidence due to witness recantations and the passage of time. The only alleged witness to the crime recanted when confronted with the "information absent" results of the Brain Fingerprinting test on Harrington.

Conclusion.

We are pleased that the first trial court to perform the gatekeeping function in regard to Brain Fingerprinting has determined the test to be sufficiently reliable to merit admission into evidence. This is an achievement that has consistently eluded every form of polygraphy for decades, and it is based on a common perception in the relevant scientific community that P300 science, and the statistical tools used to analyze its results, are well accepted.

Although the district court did not find that the probes developed for the Harrington test constituted a compelling impeachment of the verdict, we believe that Brain Fingerprinting test results will have a substantial impact on juries, both in cases where the test helps to exonerate the subject and in cases where it reveals his guilt.

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3 Brain Fingerprinting testing had previously been instrumental in another murder case, that of James B. Grinder in Missouri. A Brain Fingerprinting test conducted by Dr. Farwell in 1999 showed that Grinder had the record of the 1984 murder of Julie Helton stored in his brain. Grinder, who had been the prime suspect for 15 years, had previously given several contradictory accounts, some involving his participation and some not. The Brain Fingerprinting test showed that the account that matched the record in his brain was the one in which he perpetrated the crime. One week later, faced with a certain conviction and almost certain death sentence, Grinder pled guilty in exchange for a sentence of life without parole. (Unrelated to Brain Fingerprinting, Grinder also confessed to three other murders.)

In 2004, Brain Fingerprinting testing was offered in support of the Oklahoma petition for post-conviction relief filed by death-row inmate Jimmy Ray Slaughter. In *Slaughter v. State*, No. PCD-2004-277 (Okla. Ct. of Crim. App., April 16, 2004), the Okla-

homa court of final resort in post-conviction matters declined to order an evidentiary hearing on numerous issues raised by the petitioner. These included not only an "information-absent" result for crime-scene items returned by a Brain Fingerprinting test, but also exculpatory DNA evidence and other exculpatory evidence. Slaughter was subsequently executed. The Oklahoma court declined to return the case to the trial court where it could reach the merits of the Brain Fingerprinting challenge, based on procedural grounds and on the appeal court's view that the petitioner's affidavit had produced insufficient evidence of the efficacy of the test and salience of the probes. "[B]ased on the evidence presented, we find the Brain Fingerprinting evidence is procedurally barred," *Id.*, ¶18. "What we have are some interesting, indeed startling, claims that are not backed up with enough information for us to act on them." *Id.*, ¶13. The authors submit that in further cases where evidentiary hearings on admissibility fully examining the issues explored in the *Harrington* court are allowed, the more likely result on admissibility of Brain Fingerprinting will be the result reached by the district court in *Harrington*.

4 The court admitted only Dr. Farwell's P300 Brain Fingerprinting analysis, and not the MERMER-based analysis, on grounds that the MERMER analysis had not been subjected to sufficient peer review and publication. A paper by Farwell and Smith on the MERMER has subsequently been published in a leading forensic science journal.

Reference:

Farwell, LA and Makeig, T (2005). Farwell Brain Fingerprinting in the case of *Harrington v. State*. *Open Court* X,3:7-10, Indiana State Bar Assoc.