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The Sanctioned Use of Brain Scans in Court

Every New Year, we look to the future and dream of what is possible. ReachMD Radio is proud to present our special series focused on future medicine.

Neurosciences have been working for years to find unfailing methods of lie detection; a breakthrough that could dramatically change law enforcement as we know it. One newer test aims to separate events a suspect has witnessed from actions they have committed, and despite little scientific consensus, the technology is being used in India as critical trial evidence. Could this affect the practice of lie detection in the United States and around the world? You are listening to ReachMD, the channel for medical professionals. Welcome to a special segment focused on future medicine. I am your host, Dr. Mark Nolan Hill, Professor of Surgery and practicing general surgeon. Our guests are Mr. Henry Greeley, Professor of Law and Director of the Center for Law and the Biosciences at Stanford University and Dr. J. Peter Rosenfeld, Professor of Cytology of Northwestern University.

DR. MARK NOLAN HILL:

Welcome Mr. Greeley and Dr. Rosenfeld.

MR. GREELEY:

Thank you.

DR. ROSENFELD:

Nice to be here. Thanks for the opportunity.

DR. MARK NOLAN HILL:

Mr. Greeley, can you give us a framework for the case in India which put this in the spotlight?

MR. GREELEY:

Sure, this is a very troubling case. It was a murder acquisition against a husband and wife who the prosecutors claimed had murdered the wife's previous fiancé using arsenic poisoning. The case was tried to a judge without a jury and the judge has a very nice long written opinion discussing the evidence. One piece of evidence that he discusses at some length is evidence from a wife, none from the husband of both a regular polygraph and a newer method called brain electrical oscillation system or BEOS.

DR. MARK NOLAN HILL:

What's that?

MR. GREELEY:

Well, the BEOS system is kind of hard to describe because it hasn't been described in any peer-reviewed literature and all I really have on it is a pamphlet from the creator of it. It's clearly an electroencephalogram-based system looking at electrical recurrence in the brain. It appears to be based on work done that Dr. Rosenfeld and others have done concerning the so-called P300 wave, a signal some people think that a person recognizes or a person's brain has recognized something. The BEOS creators or at least the police investigators, the Forensic Lab for the indian state of Maharashtra claims that BEOS can distinguish between knowledge somebody has because they actually experienced it and knowledge they have because they heard about it or read about it or in some other way encountered it other than personal experience, though we have no evidence other than to say so that this is true. What happened in this case is the police put the suspect in a room and read to her the police's story of the crime that in the first person as if she were saying as though she is sitting there and she is hearing the voice saying, "I decided to kill Adit. I bought the food, I bought arsenic, I put arsenic in the food, I gave him the food, and so on and they claimed that they were able as a result of this BEOS examination to determine that she had experienced all those things. At the trial, the BEOS work and the polygraph examination were both used as evidence, admitted this evidence without apparently lot of discussion about whether it was valid evidence or not and together with some, I think, relatively weak circumstantial evidence were used to find her guilty and her husband guilty and they both have been sentenced to life in prison.

DR. MARK NOLAN HILL:

Well, in general if I could ask both of you, what were your first reactions when you heard about this?

DR. ROSENFELD:

When you open this program, you said there was no scientific consensus about this technology. Actually, my impression is there is a

strong consensus, that there is nothing to it, that is, there is no, I didn't really mention, there is no peer-reviewed evidence that there is any science whatsoever behind this methodology and that was my reaction. Actually, I was asked to review the technology by a reporter for the New York Times India Edition who sent me an Internet blurb from the developers of BEOS, and I looked through it, studied it, and I just couldn't see anything to it. I said that there are some colleagues of mine who are experts in the area and they immediately reacted rather negatively to it as I did. It seems that every now and then, something comes along that buries up the field because there are series of people doing work to develop more physiological methods of assessing deception, and when something like this comes along and gets through newspapers and the other media excited, it tends to arouse skepticism from the scientific community and probably the legal community and raises other ethical issues in the legal community and then it gives everybody doing serious work in this area, kind of a bad name and the fear of the baby being thrown out with a bath water and that was my reaction.

DR. MARK NOLAN HILL:

So, if there is scientific consensus that this is not a valid approach, how then did it get all the way to the court and the judge actually used it in making this decision?

DR. ROSENFELD:

That I simply don't know. I can give you a legal answer, but it adds up pretty much to what Dr. Rosenfeld said, I can't figure out how this got admitted. I am not an expert on the Indian legal system. I did read the judge's lengthy opinion. He appears as far as I can tell to have admitted that in evidence because an expert, one of the examiners from the State Forensic Unit justified that it worked, there doesn't seemed to have been any of the kind of examination we would have in an American Court of how it worked, why it worked, what kind of air rate it has. There are a variety of different tests used in American States to try to determine whether scientific evidence should be admitted and what the new form and particularly, controversial form of evidences are usually applied pretty strenuously, and from none of that at all in the Indian opinion, a little disconcerting is what was stated in the opinion, that 2 different states in India, the state of Maharashtra which includes Bombay or Mumbai and the state of Gujarat, both have crime labs devoted to this technique without any apparent scientific backing for it. I think I also saw the same Internet blurb that Dr. Rosenfeld looked at which is the only background information I have been able to find about this system, and frankly, it looks like a marketing pamphlet more than anything else. It certainly doesn't give any scientific support for the really quite amazing claims these folks are making, that I understand that there is some work and some valid reason to think that there may be something like a recognition signal in the brain. That continues to be somewhat controversial in terms of how useful it might be in a lie detection context, but their claim that somehow they can distinguish between recognitions because you took part in the experience versus recognition because you heard about it or saw at someplace else is quite striking and that is one of those extraordinary claims that would require extraordinary proof. There does not seem to be any proof at all.

DR. MARK NOLAN HILL:

If you have just joined us, you are listening to a special segment focused on future medicine on ReachMD, the channel for medical professionals. I am your host, Dr. Mark Nolan Hill and our guests are Mr. Henry Greeley, Professor of Law And Director of the Center For Law and the Biosciences at Stanford University and Dr. J. Peter Rosenfeld, Professor of Psychology at Northwestern University. We are discussing the sanctioned use of brain scans in the court of law.

Gentlemen, do you have a sense for why India was the first country to take this leap of faith in these tests?

DR. ROSENFELD:

I can't answer that; I do not know or have no idea how or why.

MR. GREELEY:

I don’t really know either other than to say that the BEOS System does have a claim to Indian inventor.

DR. ROSENFELD:

Oh, that's right.

MR. GREELEY:

And I think there may be some national pride involved in deciding that this homegrown technology is ready for prime time, but that's speculation on my part. I find it kind of mystifying.

DR. MARK NOLAN HILL:

Is this homegrown technology as you describe been presented internationally in journals or meetings?

DR. ROSENFELD:

No, not that I know of. No meetings that I attend.

MR. GREELEY:

I have not seen any record of any scholarly discussion of it in publication or in conferences.

DR. MARK NOLAN HILL:

Do you have any sense for how many current cases in India in which these brain scans actually may be entered as evidence?

MR. GREELEY:

The only thing I know about that is from the court's opinion in this murder case, the court does say it had been used in "a number of investigations" and had been admitted in evidence in several cases before. A number of and several are both pretty emphasized terms, but it sounds like more than one and less than one.

DR. ROSENFELD:

I also read the judgment of the judge and was struck by the fact that there was one case in which this technology was used in which there was a death penalty involved, which I thought was extraordinary.

DR. MARK NOLAN HILL:

Are there any other countries that are interested in this type of technology and bringing up the United States as well?

MR. GREELEY:

Well, there are certainly a lot of countries that are interested in lie detection technologies more generally including those with some direct brain or neuroscience basis. I do not know of any other country that is interested in the BEOS technology, although the digital marketing pamphlet that I examined said that officials from several countries have been in contact with the inventors. There is a company in the United States that has been trying for quite a few years to market a somewhat similar technology that they call brain fingerprinting thus far without a great deal of success. Peter, maybe you can say more about that.

DR. ROSENFELD:

Well, you know, I had reviewed a critical review of that method, I guess that was published in 2006. It is also a technology, it's somewhat more solidly based because it based on the P300 brain wave or event-related potential which does have a known relationship with recognition memory. However, the accuracy and use of resistance to counter measures of P300 is too something that fewer scholars challenge, so I would certainly say that this brain fingerprinting has not been widely accepted by scholars in the United States.

DR. MARK NOLAN HILL:

How is that fingerprinted at P300?

DR. ROSENFELD:

Well, if I were to present to you every 3 seconds a series of names and let's say 15% of the time, I presented to you with your own name, your electroencephalogram would take a positive shift with a reaction time of about 500 milliseconds from the presentation. You get a distinct trough in the brain wave that you wouldn't see through the other names that have no relevance to you, so something that's is rare and meaningful will elicit the P300 response and a number of us including the original brain finger printer have been studying the ability of using this recognition response as an indication of concealed information related to a crime which a perpetrator might not openly confess to. This is a promising technology, although I think the claims of brain fingerprinting that particular enterprise that uses it have got a bit too far. Originally, the brain finger printer used P300 as the basis of the lie detector, but then he developed what he says

is a special enhancement of P300, the details of which very much like BEOS of not been peer-reviewed, and in fact the proprietary, the details of them have been made publics and no one can replicate it. In fact, my graduate students, when they first learned about BEOS, referred to what is the Indian brain fingerprinting, but P300 is a valid index of recognition. How well that can be used in a courtroom situation or in other forensic situations is being studied actively.

DR. MARK NOLAN HILL:

Mr. Greeley, certainly as a Professor of Law, we would think that in all countries, when you get to the level of a courtroom and judges, that they use good common horse sense as well as scientific evidence, how can you even think that this judge and this courtroom could use this type of test when it has not been proven by the scientific community?

MR. GREELEY:

Well, I am not an expert in Indian Law or the Indian Judiciary or Indian culture and that makes me somewhat reluctant to comment on a courtroom proceeding, thousands of miles and many cultural units of distance away from mine. I don't understand how this could have been admitted. I found it appalling, but again, I am not an Indian lawyer or an Indian judge. I don't know how their system has evolved with respect to scientific evidence. I would say as an outsider that if it has evolved in a way that allows this evidence in and they really may want to reconsider their standards for admitting scientific evidence because this is really disturbing.

DR. MARK NOLAN HILL:

Gentlemen, finally is this by the international community a part of is just folly, making a decision based on inaccurate evidence?

DR. ROSENFELD:

Yeah and it's like making a decision based on the Magic 8 Ball. It's really quite disturbing.

DR. MARK NOLAN HILL:

I want to thank our guest, Mr. Henry Greeley and Dr. J. Peter Rosenfeld. We have been discussing the legally sanctioned use of brain scans in court. I am Dr. Mark Nolan Hill and you have been listening to a special segment focused on future medicine on ReachMd, the channel for medical professionals. Be sure to visit our website at Reachmd.com featuring On-Demand Podcast of our entire library and thank you for listening.

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