

Lie Detection and Brain Death

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What are we talking about today!!!

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I. Lie Detection (First half of class)

A. Lecture Style

1. General Conflict of Opinion
2. Polygraph & Law
3. Neuroscience-Based Lie Detection
 - a) EEG
 - b) fMRI
 - c) United States v. Semrau

B. Fishbowl Discussion

II. Brain Death (Second half of class)

- A. Why Care?
- B. Clinical Definitions
- C. Case Studies



Polygraph

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What is it?

- A machine that detects/records changes in physiological characters (pulse, breathing rate, etc.) → used as a lie detector
- William Marston (Harvard) began to use systolic blood pressure as a marker of deception/lying in 1915

What's the general conflict/discussion in regards to using a polygraph in court?

- Against
 - ◆ Is the involuntary administration of polygraph examination a breach of individual liberty? Is it accurate?
- For
 - ◆ Is the scientific technique of polygraph examination a desirable form of efficient investigation? It is accurate!

★ Ticking Bomb Scenario (National Security?)

- You have good reason to believe a person you are interrogating is aware of where a bomb is
- Is the involuntary administration of polygraph examination a breach of individual liberty?
- What about torture or other improper means for eliciting information?
 - Justifiable?



Why people say YES to using the polygraph in court!

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- There are extraordinary strictures against the polygraph compared to other just “questionable evidence” → why is a polygraph any different?
- Trial/Courtroom/Jury is mostly drama; there are better ways to find/decipher the truth
- If one believes that polygraphs can fail, and that human jurors can also fail, in their respectful efforts to assess the truthfulness of statements, is there any meaningful distinction between human and scientific failure?



Why people say NO to using the polygraph in court!

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- Many people wonder what's the difference between a polygraph and other physical examinations (drug tests, breathalyzers, etc.)
 - ◆ These tests determine an independently relevant fact and action condition
 - ◆ Polygraph does not independently establish a fact, it just tests a person's stated beliefs
- Turns subject → object
- Institution of trial
 - ◆ Human judgement is important
 - ◆ Truth can be discovered in no better way
 - ◆ People should be believed or disbelieved by peers not certified as truthful or mendacious by a machine
- People are worried that the jury would overvalue the polygrapher because of how scientific/legit they look
 - ◆ We talked about this last class in terms of bringing brain images into court!

- ◆ What would happen if we had a machine that was 100% accurate at all times?
Would a perfect detector enhance people's capacity to test for truth only at the cost of diminishing common humanity?

EEG (P300)

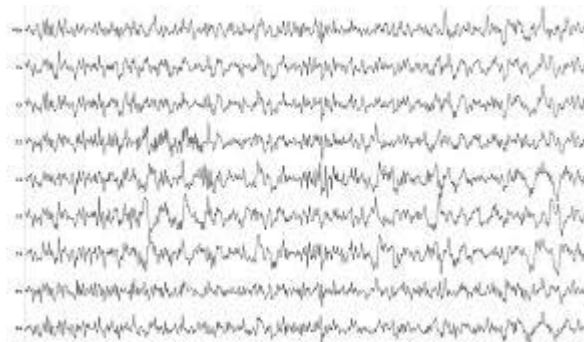
What does this even mean lol?

- Brain Printing
- P300 - an event related brain potential or a specific pattern of brain wave activity that is related to an event
- If a person got a P300, that means they recognized something significant - something they took note of
- In these tests, subjects are given 3 stimuli:
 - ◆ Target (person recognizes for sure)
 - You get a P300 + MERMER
 - ◆ Irrelevants (nothing to do with crime)
 - No P300, no MERMER
 - ◆ Probes (relevant stimuli that the person would never know unless they did it)
 - If they did it - P300 + MERMER
 - If not - no P300 + MERMER

P300 - Positive response (person is taking note of stimulus)

MERMER - negative deflection that follows P300

Analogy: MERMER is frosting on the cake of the P300



Q: Now, if I were sitting in prison, and for life, and I was rehearsing in my mind kind of the alibi or my defense, wouldn't you think that would elicit a probe when you do the P300 test, any of your probes relevant to my defense.

A: It might. Again, as I have said, I'm not proving how the information got there. What I'm saying is this information is stored in the brain...



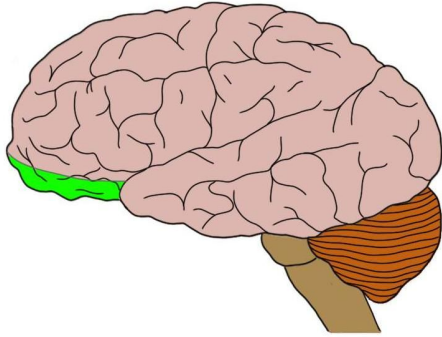
fMRI as a Lie Detector

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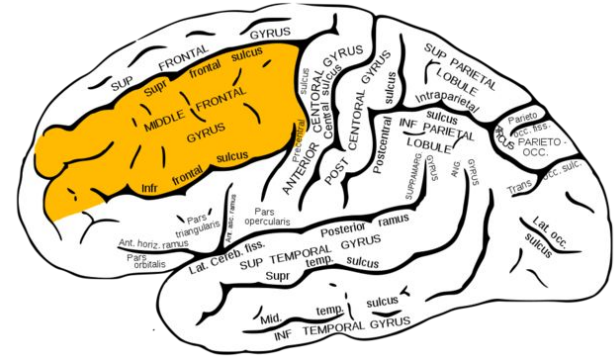
- fMRI technology has been used more frequently as a lie detector than EEG
- Brain more active when lying
- How does it work?
 - Develop neutral questions
 - Develop Specific Incident Questions (SIQs)
 - Scan participants
 - Compare scans
- BOLD responses in brain



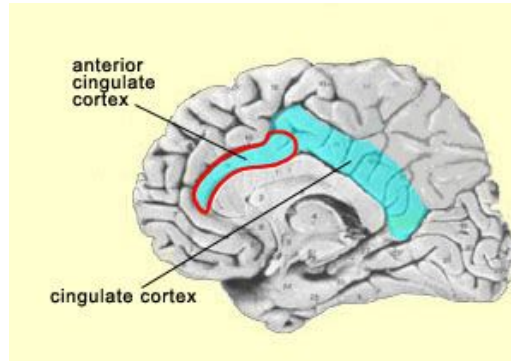
Neuroscience of Lying -- Brain Regions



Right orbitofrontal



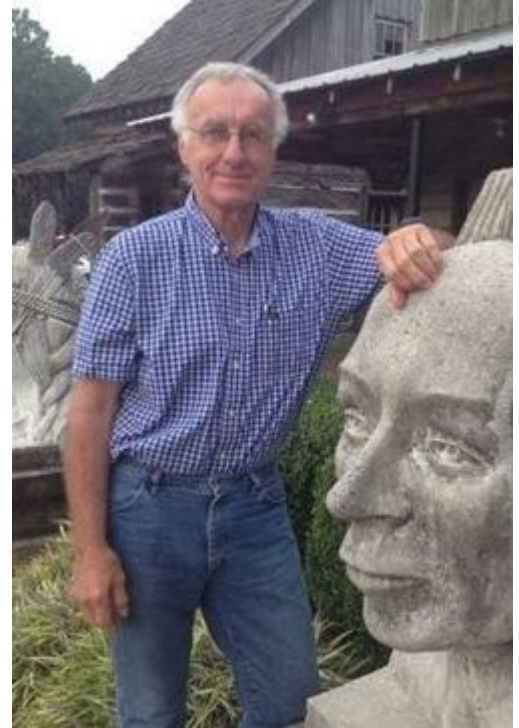
Right middle frontal



United States v. Semrau -- Context

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- Dr. Lorne Semrau -- licensed TN psychologist
- Government charged Dr. Semrau with Medicare/Medicaid fraud
 - ◆ \$3M worth of fraud
 - ◆ To prove this, they had to prove that Semrau *knowingly* broke the law
- Semrau pleaded not guilty



United States v Semrau -- The Cephos Corporation

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- Founded in 2004 by Dr. Stephen Laken
- Developed patented fMRI-based lie detection test
- Claimed procedure was 86%-93% accurate in identifying deception
- Laken and Gordon developed a set of specific questions that Semrau would answer in the scanner:
 - Did you bill CPT Code 99312 to cheat or defraud Medicare?
 - Do you like to swim?
- Specific questions & neutral questions would be compared

United States v. Semrau -- Court Proceedings

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- Semrau did two brain scanning sessions
 - ◆ 1. Did Semrau really not know he was committing fraud → GOOD
 - ◆ 2. Did Semrau really not know he was incorrectly billing services that should not have been separately billed → **BAD**
 - ◆ 3. Redid second scan because of “fatigue” → GOOD
- Problems:
 - ◆ Only gives overall picture of truthfulness
 - ◆ Gov’t not notified tests were taking place
 - ◆ Laken abandoned typical protocol
 - ◆ Violated *Daubert* standard
- Dr. Semrau convicted

The *Daubert* Standard

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- Evaluates admissibility of expert witness' opinion in court
 - (1) whether the theory or technique can be tested and has been tested
 - (2) whether the theory or technique has been subjected to peer review and publication;
 - (3) the known or potential rate of error of the method used and the existence and maintenance of standards controlling the technique's operation;
 - and (4) whether the theory or method has been generally accepted by the scientific community.

Questions for Discussion

1. One is innocent until proven guilty “beyond a reasonable doubt.” Even if a lie detection machine is just 75% accurate in lab testing, should this evidence be considered a “reasonable doubt” to prevent a guilty verdict?
2. Should lie detector results be considered physical evidence or testimony?
3. Do you foresee a future in which neuroscientific evidence is deemed more permissible in court proceedings?
4. In your opinion, how accurate is accurate enough for lie detection equipment?

Food for Thought: Brain Death

Very early in the morning of August 5, 2013, 37 year old Anthony Yahle had trouble breathing. Anthony's wife called 911, and he was taken to an Ohio hospital in cardiac arrest. That afternoon, his situation became grave. Anthony "had no electrical motion, no respiration . . . no heart beat, and no blood pressure," and accordingly Dr. Raja Nazir, the treating cardiologist, declared him dead. Upon this pronouncement Anthony's 17-year old son came into the hospital room with the family's pastor. Lawrence told his father "Dad you're not going to die today." A few minutes later, doctors noticed trace electrical signals on the heart monitor and continued resuscitation efforts that ultimately proved successful. While rare, there are similar reported cases of air getting trapped, which prevents blood flow.

Sustaining resuscitation efforts can eventually facilitate the flow. As Dr. Michael Sayre, spokesperson for the American Heart Association, said about the case: "you can be faked out."

Brain Death: Why Care?

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Implications of Death:

- Organ transplants
- Tax liability
- Criminal liability
- Insurance Policy
- Status of contracts and property ownership

So what?

- Modern medical technology has blurred the traditional lines of life and death
- Machines can keep you breathing and your heart beating... though you may never regain consciousness or the ability to independently perform these life sustaining actions
- Evolution of standards have been slow to catch up...

Who Killed the Man?

At approximately 10:30 P.M. on February 6, 1979, a New York City police officer found a man lying faceup in a Brooklyn street with a bullet wound to the head. The officer transported the victim in his patrol car to the Brookdale Hospital, where he was placed in an intensive care unit. Shortly after arriving at the hospital, the victim became comatose and was unable to breathe spontaneously. He was placed on a respirator and medication was administered to maintain his blood pressure. The next morning, the victim was examined by a neurologist. Due to the nature of the wound, routine tests were applied to determine the level, if any, of the victim's brain functions. The doctor found no reflex reactions and no response to painful stimuli. The mechanical respirator was disconnected to test for spontaneous breathing. There was none, and the respirator was reapplied. An EEG indicated an absence of activity in the part of the brain tested. In the physician's opinion, the bullet wound had caused the victim's entire brain to cease functioning. The following day, the tests were repeated and the same diagnosis was reached. The victim's mother had been informed of her son's condition and had consented to a transfer of his kidneys and spleen. Death was pronounced following the second battery of tests and, commencing at 9:25 P.M., the victim's kidneys and spleen were removed for transplantation. The respirator was then disconnected, and the victim's breathing and heartbeat stopped.

Necessary Revisions of Death

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Vague legal definition of death

- conceptualized death as the absence of life, unqualified and undefined.

Uniform Determination of Death Act:

1. irreversible cessation of circulatory and respiratory functions, or
2. irreversible cessation of all functions of the entire brain, including the brain stem, is dead.

Brain Death Definition:

- Irreversible cessation of all functions of the entire brain, including the brainstem

Characteristics:

- Unreceptivity and Unresponsivity
- No movement of breathing (> 1 hour)
- No reflexes (pupil)

Various Test/Challenges

Apnea Test:

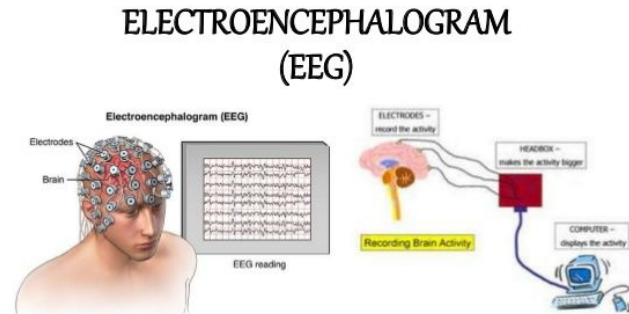
- ventilator is turned off and the physicians observe the patient's chest for spontaneous breathing

Electroencephalogram (EEG)

- Measure of electrical activity, flat/isoelectric EEG implies brain death

Challenge:

The “confirmatory” tests do not confirm anything. Brain death is synonymous with a certain clinical state and a certain set of findings (coma, apnea, and no brainstem reflexes in the absence of confounders) and no prototypical neuropathologic substrate exists.



Case Study: Organ Donors

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When is the person alive or a cadaver?

- Ensuring organ removal is not the cause of death (norm)

Challenges to the Dead Donor Rule:

- (with prior consent of the soon-to-be-deceased organ donor), it would be justifiable to remove organs prior to the donor being declared dead
- Some research suggests that DDR is not essential to public trust in organ donation and the transplantation system
- Do away with the stringent criteria for declaring death

Further Implications with Organ Donors

Rapid Organ Recovery (ROR):

- allow for recovery of organs following unexpected death, for example, following cardiac arrest or severe trauma resulting in significant blood loss (such as from a gunshot wound) outside the hospital
- What constitutes prior consent?
- if a person signed an organ donor card or is listed in a donor registry, should health care professionals presume they may initiate organ preservation? Must one have the permission of the next-of-kin to initiate organ preservation?

Death & Lawsuits on Recovery?

PHIPPS, J. Tara Hawkins sustained head trauma and was taken by ambulance to the emergency room at DeKalb Medical Center. She was 18 years old, unconscious, intubated, and pregnant. During several months of hospitalization there, Tara Hawkins never regained consciousness and was maintained with life-sustaining treatment, including the support of mechanical ventilation. Eventually, physicians at the hospital advised her mother, Nonnie Hawkins, of their concern that Tara Hawkins had likely suffered brain death; even if Tara Hawkins had, they advised Nonnie Hawkins, medical intervention could possibly preserve the life of the fetus until viability. After the baby was born, testing conducted upon Tara Hawkins confirmed for several treating physicians that she was brain dead. Tara Hawkins was thus pronounced dead; the mechanical ventilation was terminated, and all other life-sustaining treatment was ended. Nonnie Hawkins would later depose, “I never believed she was brain dead” and that “[t]hey just killed my child and told me she was dead.”

Arguments

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Chance of Recovery

1. Falsely informed that Tara was brain dead
2. Tara was observed crying
3. Tara was observed moving her hand on command
4. Tara was observed overbreathing the ventilator

Doctors (Defendants):

(a) A person may be pronounced dead by a qualified physician . . . if it is determined that the individual has sustained . . . (2) irreversible cessation of all functions of the entire brain, including the brain stem.

“[t]here is no duty in Georgia for a physician to continue to treat a dead patient.”