Deep Brain Evidence

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Shen Neurolaw Lab — *Every story is a brain story*

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Present Limits of Brain Evidence in Court

- Neuroscientific evidence is increasingly being introduced into the legal system, both in the U.S. and globally [1]
- To date, however, almost all brain evidence introduced in courtrooms has been surface-level measurement, e.g., EEG, MRI, fMRI [2]
- Moreover, all brain evidence has been collected before or after, but not during, the legally relevant behavior, e.g., fMRI scan of defendant after an alleged crime [3].
- Given current scientific limitations, courts struggle with Group to individual (G2i) inference challenges [4]

The Emergence of "Deep Brain Evidence" (DBE)

- As contrasted with surface-level brain evidence we introduce the term **"Deep Brain Evidence"** to refer to real-time, individualized brain evidence measured beneath the skull by deep-brain stimulation (DBS) recording devices
- Some DBS devices are "always-on." Adaptive deep brain stimulation systems capture local field potentials via electrocorticography recordings (Fig 1) [5].

Research Team & Methods

- Interdisciplinary team with expertise in neurolaw, neuroethics, and neuroscience to explore *courtroom* implications of Deep Brain Evidence
- Legal analysis of caselaw; neuroethics analysis of emerging DBS neurotech
- Part of a Dana Center for Neuroscience & Society Pilot grant & feedback at Neurotech Justice Summit [6]

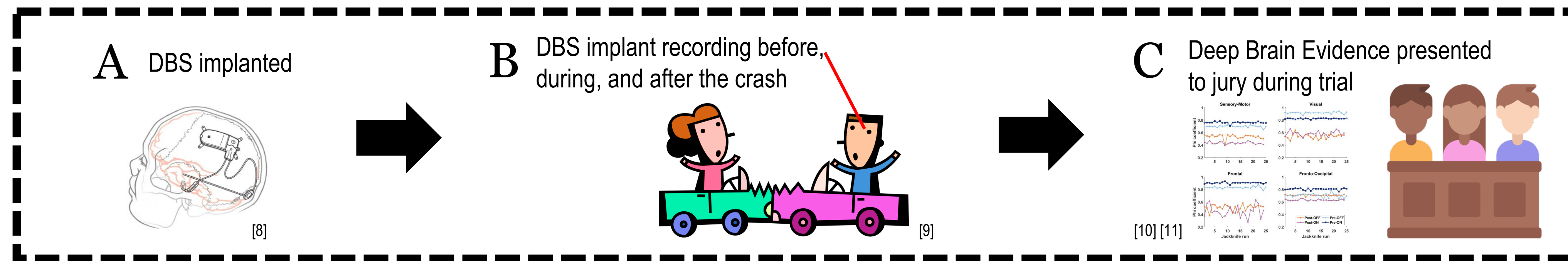**References:** Scan QR Code for References.
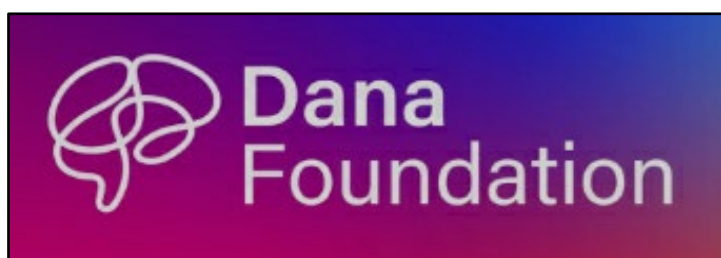
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Poster presents preliminary results. Please do not cite or quote without permission

Figure 1. From Medicine to Law: How Deep Brain Evidence Might Be Introduced in Court

A: Deep brain stimulation (DBS) device is implanted into an individual's brain for medical purposes, e.g., Parkinson's disease, seizure disorders, treatment-resistant OCD [7]. The AI-enabled DBS device records brain activity in specified areas 24-7. **B:** The individual is in a car crash, and the DBS device was recording brain data during the entire crash sequence. **C:** The individual is sued by the other driver in the crash, and at issue is the individual's mental state while driving.

Our key question: Can / should the DBS evidence be introduced in court?

A — DBS implanted [8]

B — DBS implant recording before, during, and after the crash [9]

C — Deep Brain Evidence presented to jury during trial [10] [11]

ANALYSIS:
Potential BENEFITS of using DBE in court

- **Individualized:** DBE is a solution to the G2i problem by providing courts with *individualized* brain evidence
- **Timely:** Always-on DBE could provide legal system with evidence of brain activity in a legally relevant actor *at the time of the legally relevant action*, analogous to courtroom use of FitBit data [12], e.g., brain activity while a plaintiff was driving or while a defendant was shooting
- **Baseline & Repeated Measures:** As compared with one-time brain scans, always-on DBE provides courts with repeated a baseline and repeated measures of individual brain activity

Potential CONCERNS with using DBE in court

- **"Seductive allure":** DBE not dispositive of legal issues, e.g., neural correlates of "intent" remain unknown, but jurors may be overly-persuaded by DBE evidence [13]
- ***Within-person* inference challenges:** Not yet clear how to interpret changes over time in individual brain activity; also, if time of legal event is unknown, hard to identify which recorded signals are relevant [14]
- **Limited scope:** DBE only records select brain networks
- **Privacy & constitutional rights:** Significant concerns about government and third-party access to an individual's brain data

RECOMMENDATIONS:
Assessing Evidentiary Admissibility of DBE

- <u>Lawyers and Judges</u>: Given low legal standard for *relevant* evidence, must analyze DBE's *probative value* [15]
- <u>Lawyers and judges</u>: Improve understanding of these issues via new training programs and resources
- <u>Judges</u>: Even if relevant, DBE may be unfairly prejudicial, warranting exclusion from evidence [16]

Considerations for DBS researchers

Previous publications regarding DBS consent typically consider:
- ✓ Intraoperative risks & safety concerns
- ✓ Possible versus probable postoperative outcomes,
- ✓ Likelihood of treatment efficacy
- ✓ Need for ongoing maintenance and programming
- ☐ NOT INCLUDED: *Potential legal implications of DBE*

Recommended Additional Language for Consent in DBS Research

The data gathered through this study could potentially be used as legal evidence, e.g. real-time evidence of your brain activity might be relevant in some criminal and civil proceedings. Your research records could potentially be opened by court order or produced in response to a subpoena or a request for production of documents. [If applicable: discuss Certificate of Confidentiality].