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Memory on Trial: Neuroscience, Eyewitness Evidence and the Reliability of Human Recollection

~ *Tanya Kumari*

The eyewitness has always held near-sacred authority in court. “I saw it with my own eyes” is treated as stronger proof than fingerprints or forensic reports. Yet four decades of cognitive neuroscience tell a different story: memory is not a recording that can be paused and replayed. It is reconstructed anew at every stage encoding, consolidation, and retrieval and is vulnerable to distortion at each one.

Memory as Reconstruction, Not Replay

Once recalled, a memory briefly becomes labile, open to alteration before it is re-stored in a process called reconsolidation. Stress, poor lighting, weapon focus, cross-racial identification, and even a police officer’s phrasing can corrupt a trace before it reaches the witness box. A landmark review concludes that even vivid, confident memories of violent events remain susceptible to distortion¹. This is not a flaw shared by synapses; new information can overwrite or blend with old traces.²

Elizabeth Loftus and John Palmer’s classic 1974 study remains the field’s most cited demonstration: participants asked how fast two cars were going when they “smashed” into each other recalled higher speeds and falsely remembered broken glass than those asked about the same collision using “hit.” This “misinformation effect” has been replicated hundreds of times since. Two courtroom-specific distortions matter further: weapon focus, where attention to a weapon

¹ J.W. Lacy & C.E.L. Stark, The Neuroscience of Memory: Implications for the Courtroom, 14 Nat. Rev. Neurosci. 649 (2013).

² O. Hardt, E.O. Einarsson & K. Nader, A Bridge over Troubled Water: Reconsolidation as a Link between Cognitive and Neuroscientific Memory Research Traditions, 61 Annu. Rev. Psychol. 141 (2010).

impairs memory for a perpetrator's face; and an inverted-U relationship between stress and memory, where the amygdala sharpens recall of an event's "gist" while degrading peripheral detail³. Confidence is a poor proxy for accuracy feedback, and repeated interviewing inflates it without improving it. Mistaken identification is featured in roughly 75% of DNA exonerations, whose exonerees served an average of 13.6 years before release.

Rethinking the Lineup

The last decade complicates the picture of eyewitnesses as simply unreliable. A 2025 review shows scientific consensus on two core questions whether sequential or simultaneous lineups are more accurate, and whether confidence means anything has reversed since 2011⁴. Applying signal-detection theory, researchers found simultaneous lineups diagnostically superior: presenting all members together lets a witness discount features every member shares. Confidence recorded immediately after a fair, double-blind identification is a meaningfully reliable indicator of accuracy. By 2023, only 34% of experts still favoured sequential lineups, down from a majority in 2001, while 89% credit immediate confidence with real diagnostic value.

The deeper lesson is that reliability turns on contamination, not on memory being inherently untrustworthy. A witness's first identification, made under fair, non-suggestive conditions before any feedback or repetition, can be genuinely diagnostic, sometimes pointing toward innocence. It is every identification made after that first, uncontaminated test that the misinformation literature warns against.

The Indian Framework and Judicial Response

India's evidence law was recodified by the Bharatiya Sakshya Adhiniyam, 2023 ("BSA"), effective 1 July 2024⁵. Section 55 requires oral evidence to be direct, and Section 124 presumes competence unless "tender years, extreme old age, disease" or similar factors prevent rational testimony a threshold that does not screen for the fallibility neuroscience finds in all memory.

³ B. Roozendaal & J.L. McGaugh, Memory Modulation, 125 Behav. Neurosci. 797 (2011).

⁴ L. Mickes, B.M. Wilson & J.T. Wixted, The Cognitive Science of Eyewitness Memory, 29 Trends Cogn. Sci. 655 (2025).

⁵ Bharatiya Sakshya Adhiniyam, 2023, No. 47, Acts of Parliament, 2023 (India).

More significantly, Section 39 widens admissible expert opinion from a closed list to “any field” the court considers relevant, opening a path not yet used for cognitive-neuroscience testimony on memory reliability.

Indian courts have independently developed caution around uncorroborated identification, largely through demeanour-based scrutiny rather than memory science. In *Narendrasinh Keshubhai Zala v. State of Gujarat* (2023 INSC 241)⁶ The Supreme Court set aside a conviction resting on a single eyewitness. In *Udayakumar v. State of Tamil Nadu* (2023 INSC 239)⁷ It quashed a conviction founded on one identification, citing prior familiarity between the witness and the accused. Most recently, in *Raj Kumar @ Bheema v. State (NCT of Delhi)* (2025)⁸ the Court expressed unease at an identification made nearly eight years after the crime, following the witness’s exposure to the accused’s photograph, precisely the contamination the science predicts.

A Comparator: New Jersey’s Henderson Reforms

In *State v. Henderson* (208 N.J. 208 (2011))⁹ The New Jersey Supreme Court overhauled its standard for eyewitness evidence after a conviction rested on an identification obtained through police “nudging.” Defendants showing suggestive influence are now entitled to a pre-trial reliability hearing, and jurors receive instructions drawn from cognitive psychology. The court relied almost entirely on behavioural research rather than neuroimaging, a choice Schacter and Loftus (2013) defend, since brain imaging remains too removed from courtroom conditions to assess reliability directly.

The Limits of Brain-Based “Truth Detection”

Section 39’s wider gateway raises a further question: should courts admit fMRI-based “lie detection” once neuroscience testimony becomes generally admissible? The literature counsels caution. Laboratory imaging relies on simple stimuli averaged across trials, the opposite of a single

⁶ *Narendrasinh Keshubhai Zala v. State of Gujarat*, 2023 INSC 241.

⁷ *Udayakumar v. State of Tamil Nadu*, 2023 INSC 239.

⁸ *Raj Kumar @ Bheema v. State (NCT of Delhi)* (2025).

⁹ *State v. Henderson*, 208 N.J. 208 (2011).

criminal trial, and remains vulnerable to deliberate countermeasures (Schacter & Loftus, 2013). Legal scholarship situates such technology within a history of forensic tools polygraphy, phrenology that promised objective access to the mind and failed.¹⁰ Because memory is itself reconstructive, no imaging technique can be more reliable than the fallible signal it measures.

Bridging the Gap

Indian courts' instinctive demand for corroboration already converges with what neuroscience knows about memory's fragility, even without saying so. Section 39's broadened gateway offers a genuine opportunity to formally admit cognitive-science evidence on encoding, delay, and confidence-accuracy calibration, rather than relying solely on judicial intuition about demeanour.

Two refinements should guide that development. First, the focus should be on contamination, not blanket scepticism: India's Test Identification Parade, conducted close to arrest, is in principle exactly the early, uncontaminated test the newer science credits, provided it is double-blind, non-suggestive, and unspoiled by prior exposure of the kind flagged in *Raj Kumar @ Bheema*. Second, courts should sharply distinguish well-established cognitive-behavioural testimony from speculative neuroimaging "truth detection," admitting the former far more readily. Until that distinction is drawn, Indian courtrooms will keep treating memory as more reliable than the brain that produces it and keep underusing the one form of eyewitness evidence, the early unspoiled identification, that science suggests deserves more credit than it receives.

¹⁰ J.S. Bard, "Oh Yes, I Remember It Well": Why the Inherent Unreliability of Human Memory Makes Brain Imaging Technology a Poor Measure of Truth-Telling in the Courtroom (SSRN 2012).