

The Role of Medical Science: Physiology & False Memories



J. Douglas Bremner, MD
Emory University,
Atlanta, Georgia

www.dougbremner.com

Role of Medicine & Psychiatry in Criminal Judicial Proceedings

- Provide context and interpretation of forensic findings for jury
 - Protect accused against erroneous self-incrimination
 - Use science & medicine to establish causality, determine time lines, establish guilt and innocence
-

Key Issues in Case

- Establish time of death
 - Medical experts gave opinions not supported by medical science – e.g. stomach emptying
 - Lack of sufficient training, ability or expertise – e.g. lab technician adjusting range of detection for DNA, contaminated collection
 - Neutral process for collecting and evaluating evidence was violated
-



Photo of
chemical used
for detection of
small amounts of
blood leaked to
press with
information that
Knox blood
found in
bathroom

Key Issues in Case

- Interpreter acted as interrogator instead of neutral party
 - Illegal interrogation with coercion and false confession
 - Investigator pre-conceived notions with confirmation bias
 - Inappropriate leaks to press poisoned fair process of justice
-



Giuliano Mignini

Perugia prosecutor with pre-conceived notions about facts of the case, belief in Satanic cults and Masonic conspiracies.

Gastric Emptying Times & Time of Death

- Finite period of time for food to transit stomach to small intestine
 - 2-3 hours to pass through stomach
 - 82 minutes median time to arrive at duodenum (65-102)
 - Transit stops at time of death, stomach contents used to establish time of death
-

Gastric Emptying Times & Time of Death

Hellmig et al 2006 J Gastroenterol & Hepatol

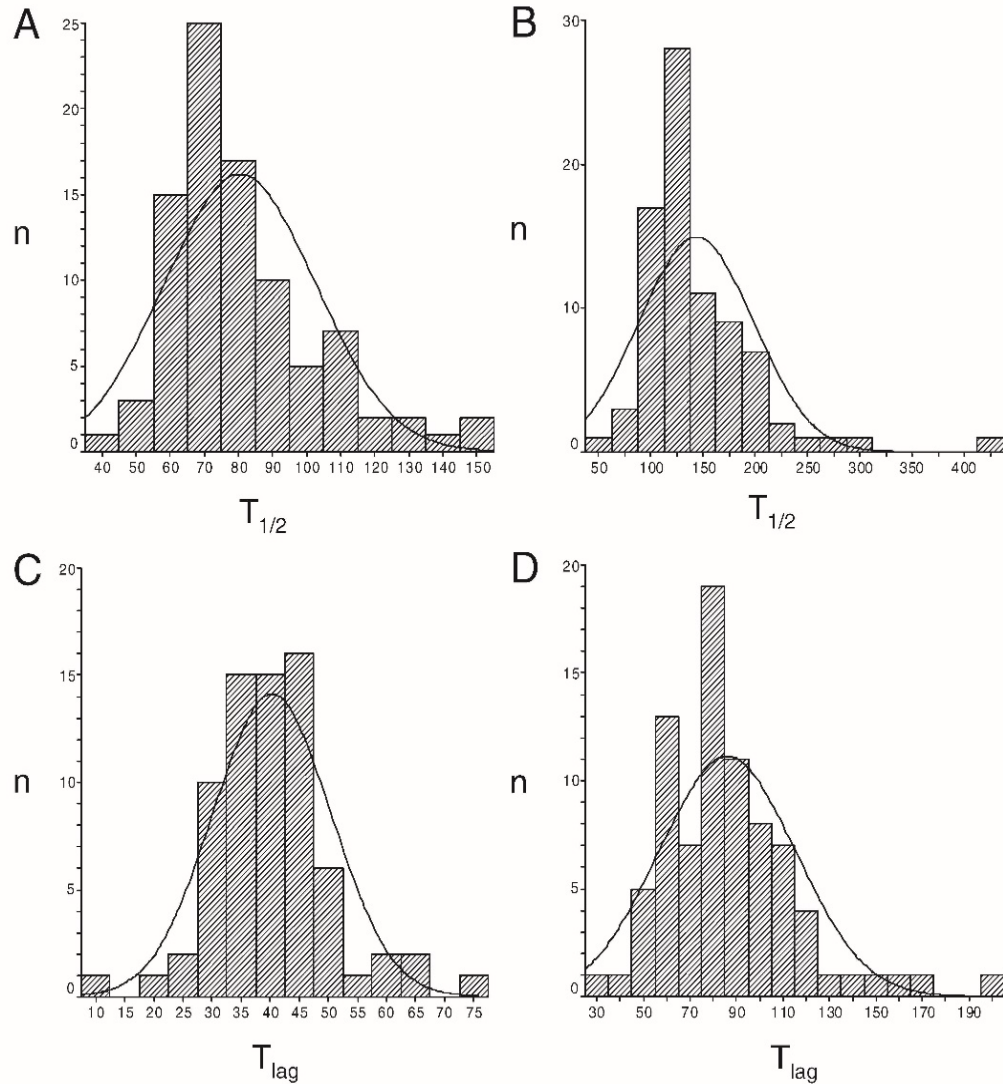


Figure 1 Distribution of grouped half gastric emptying time ($T_{1/2}$) for (a) fluid and (b) solid test meals, as well as lag phase (T_{lag} , time of fastest gastric emptying) for (c) fluid and (d) solid test meals.

Gastric Emptying Times & Time of Death

- Meredith Kercher ate with three English friends at 6 pm (6:30 pm at latest)
 - Confirmed by fact they watched 123 minute movie, arrived home at 9 pm.
 - Ten minute walk home, phone call dropped at 8:56 – narrow streets
 - Captured on CCTV at 8:51 pm
-

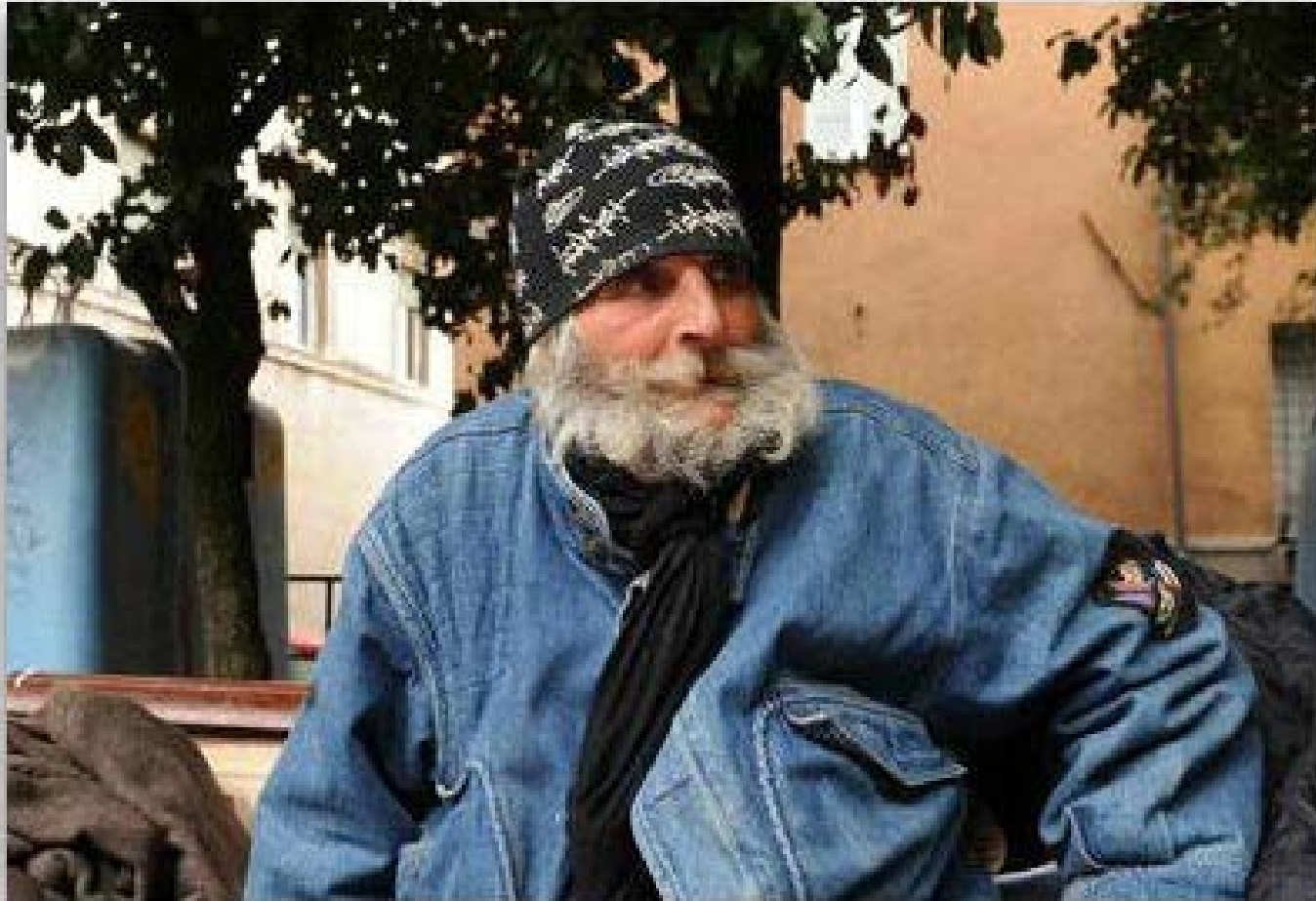
DIGIEYE - S. ANTONIO



01 Nov 2007 - 20:51:36.17 - Telecamera 7 : ING. CENTRALE

Gastric Emptying Times & Time of Death

- Meredith Kercher had no contents in duodenum at time of death
 - Time of death could not be beyond 9 pm
 - Prosecution based case on 11 pm time of death based on witness testimony
 - Medical experts falsely claimed wide possibility of transit times
-



Antonio Curatolo

Homeless heroin-addicted resident of Perugia, Italy placed suspects in local square at 11 pm, confused days



Amanda Knox & Perugia Police

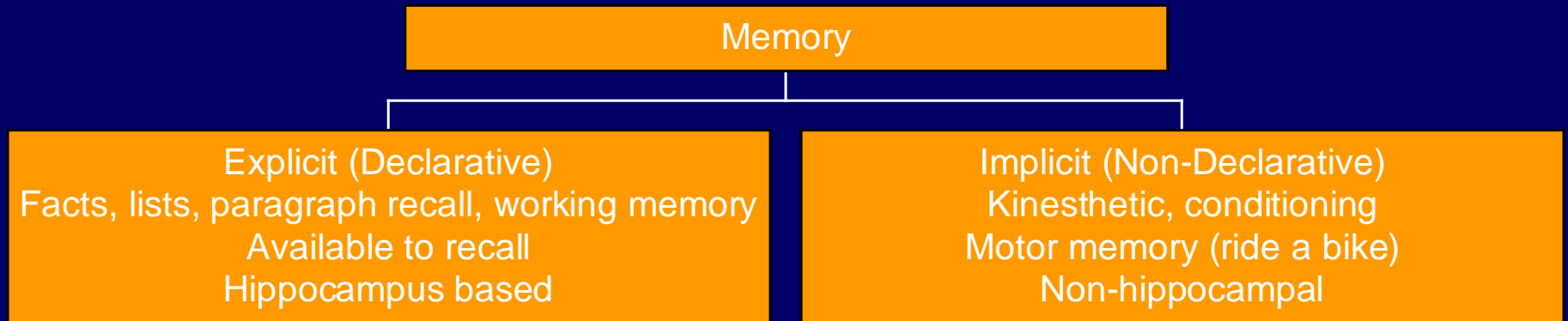
- *Perugia police used coercive and illegal interrogation tactics*
- *Increased likelihood of false confessions*
- *One quarter of convicted exonerated by DNA shown to have made false confession*
- *West Memphis Four*

Interrogation of Amanda Knox

- Lengthy interrogation without access to legal counsel or recording, misrepresentations
 - Interpreter aided interrogators, not neutral
 - 12 police rotating for all night interrogation
 - “Imagine” Patrick Lumumba at scene of crime – based on finding black hair
 - Signed statement retracted
-

Categories of Memory Function

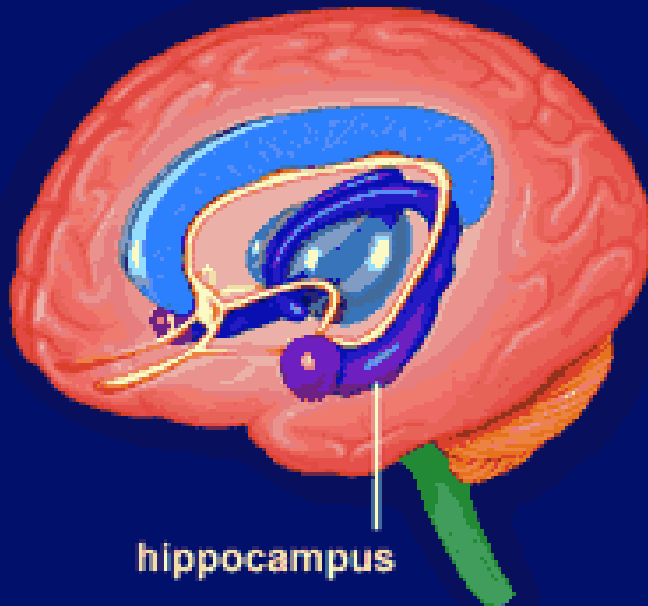
Mechanisms of Normal Memory



Mechanisms of Normal Memory Function

- Encoding
- Storage/consolidation
- Retrieval
- Explicit (declarative) vs implicit (non-declarative)
- Long term memory influenced by active inhibition as well as reinforcing of memory traces

Hippocampus



“Sea horse”

- Plays a critical role in learning and memory
- Creates a mental map of events in space and time
- Sensitive to stress
- Involved in dissociation and fear inhibition

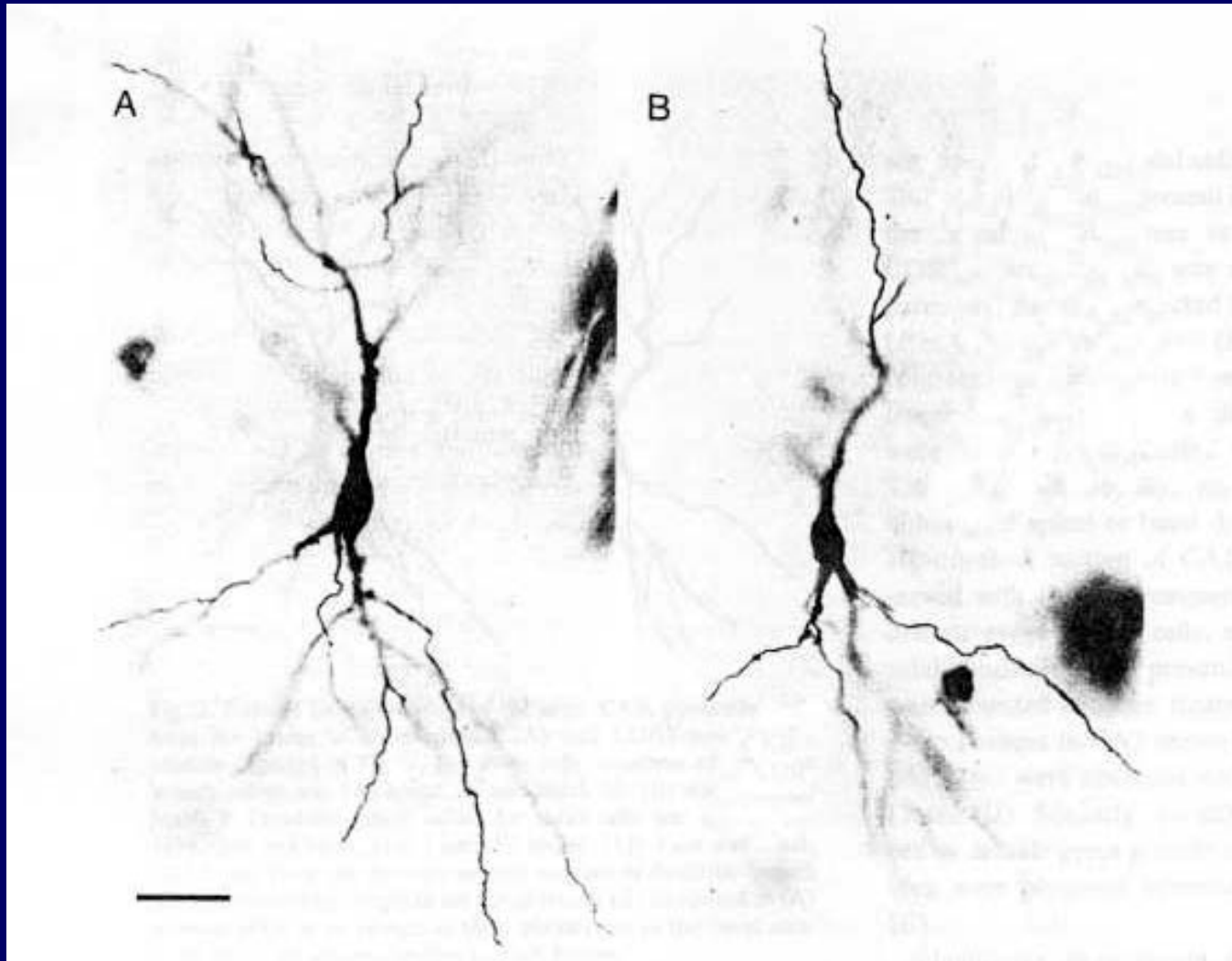
Trauma & Memory in Forensic Settings

- Memory subject to deletions, distortions, insertions
 - Studies of flashbulb memories - Challenger explosion - source amnesia, repetition effects
 - Story of spilling the punch bowl as a child at a wedding – confabulation with repeat interviews
-

Hyman & Billings - Memory 1998

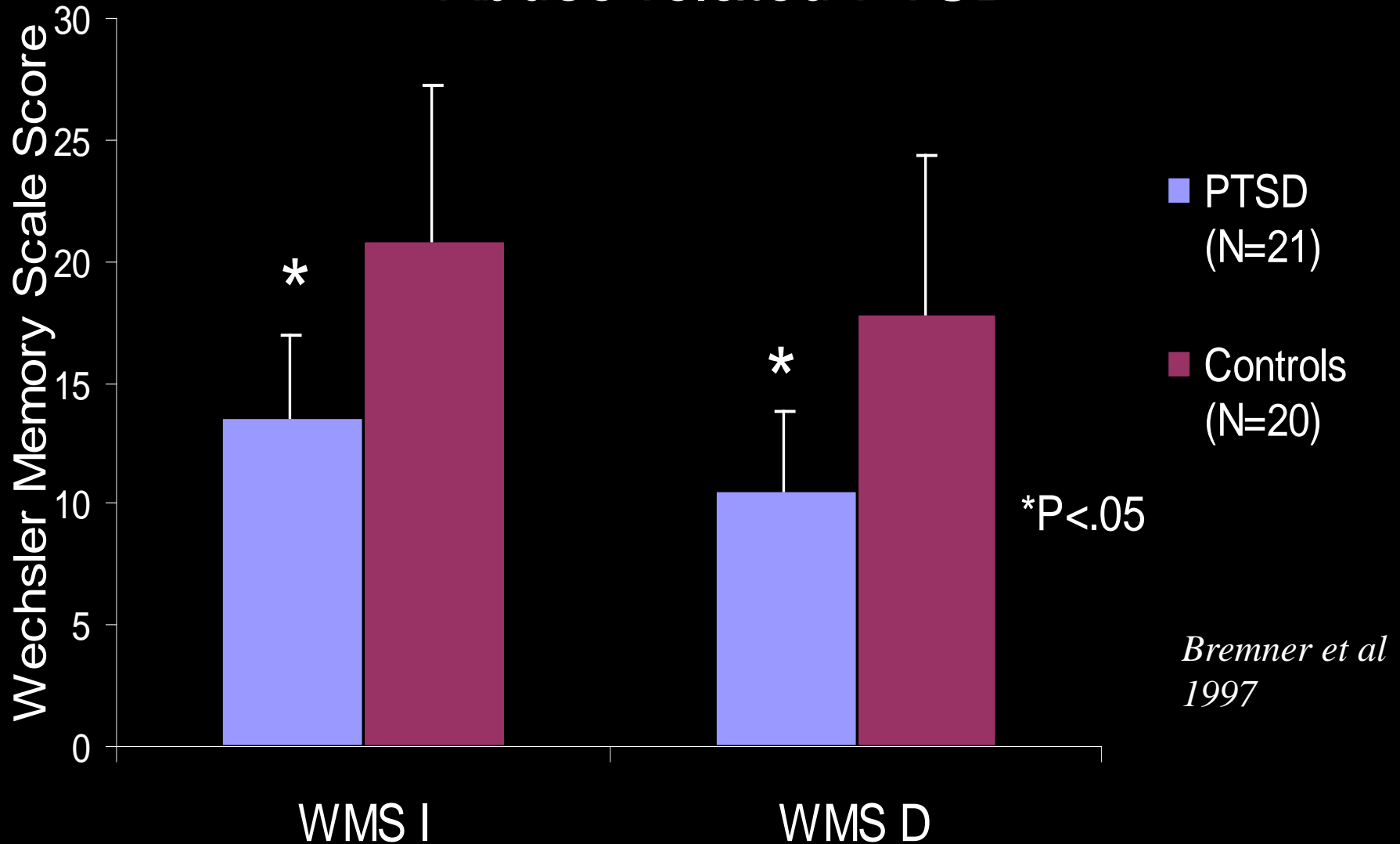
Non-Stressed

Stressed

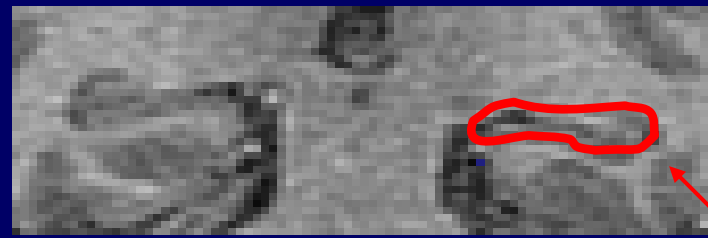
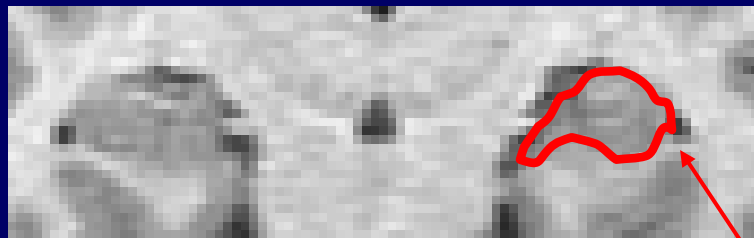
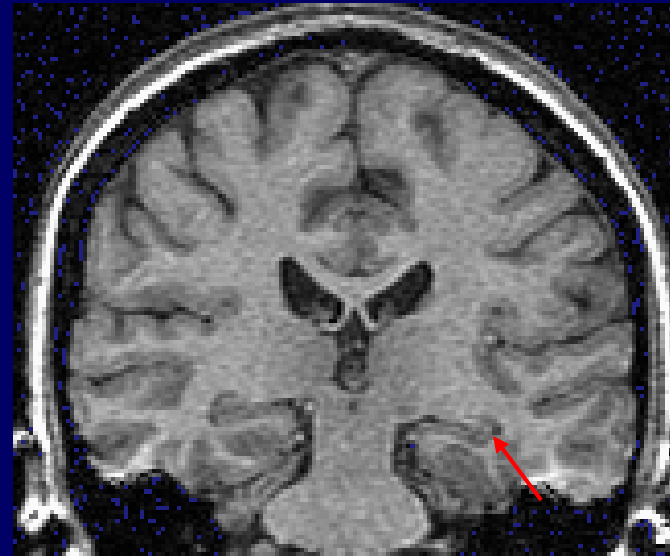
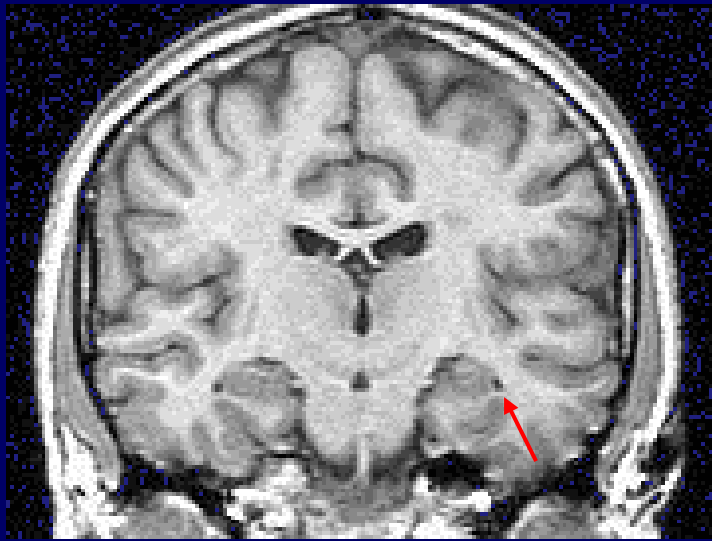


Stress results in decreased dendritic branching of neurons in the CA3 region of the hippocampus (Woolley et al. 1990)

Verbal Memory Deficits in Childhood Abuse-related PTSD



Hippocampal Volume Reduction in PTSD



NORMAL

PTSD

Bremner et al., Am. J. Psychiatry 1995; 152:973-981.

Bremner et al., Biol. Psychiatry 1997; 41:23-32.

Gurvits et al., Biol Psychiatry 1996;40:192-199.

Stein et al., Psychol Med 1997;27:951-959. DeBellis 1999-no change in children with PTSD

J Douglas Bremner, MD, Emory University

Trauma & Memory in Forensic Settings

- Desert Storm veterans showed significant inconsistency in recall of traumatic events after return, and 2 and 6 year follow-up
 - Veterans convinced of correctness of recall
 - Inconsistency correlated with severity of PTSD symptoms
 - Similar findings in rape survivors (Foa et al)
-

Southwick et al Am J Psychiatry 1993

Trauma & Memory in Forensic Settings

- Bosnian war crimes tribunal in The Hague
 - Key witness in prosecution of war crimes
inconsistent recall of traumatic rape event
 - Defense argument for effects of stress on memory, both acutely and with chronic PTSD
 - Prosecution argued hyper-mnemesia with traumatic events (soldier not there)
-

thread

pin

eye

sewing

sharp

point

prick

thimble

haystack

thorn

hurt

injection

syringe

cloth

knitting

sharp
wallet
prick
needle
thimble
knitting

thread

pin

eye

sewing

sharp

point

prick

thimble

haystack

thorn

hurt

injection

syringe

cloth

knitting

Increased False Memory with Deese Paradigm in PTSD

Table 3. *Proportion of recognized nonstudied critical lures, previously studied words, and nonstudied words other than critical lures*

Kind of word	Abused, PTSD women (<i>n</i> = 23)	Abused, non-PTSD women (<i>n</i> = 13)	Nonabused, non-PTSD women (<i>n</i> = 16)	Nonabused, non-PTSD men (<i>n</i> = 11)	<i>F</i>	<i>p</i>
Nonstudied critical lure	.95 ± .22	.78 ± .42	.79 ± .40	.86 ± .35	5.79*	.0007
Previously studied word	.93 ± .26	.90 ± .31	.99 ± .10	.93 ± .27	n.s.	n.s.
Nonstudied word other than critical lure	.26 ± .44	.13 ± .34	.23 ± .42	.12 ± .44	2.94**	.03

Note. PTSD = posttraumatic stress disorder.

*Abused, PTSD group greater than other groups by Duncan's multiple-range test, $p < .05$. **Abused, PTSD group greater than abused, non-PTSD group and men by Duncan's multiple-range test, $p < .05$.

Bremner, Shobe & Kihlstrom Psychol Sci 2000

Conclusions: Physiology & False Memories

- Medicine and science play critical role in criminal judicial proceedings
- Medical science needs to be held to the same standard in court as in scientific literature
- Journalists, lawyers, doctors and members of the judiciary need to be held accountable