The Neuroscience and Law Center presents

THE FUTURE OF NEUROSCIENCE AND LAW

February 21, 2018
8:30 a.m. - 5 p.m.
Skadden Conference Center

CLE MATERIALS:
SUPPLEMENT
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• Post Traumatic Stress Disorder (PTSD): Why It is Both Over-diagnosed and Under-diagnosed
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Responding to Individuals with Serious Mental Illnesses: Innovations and Opportunities for Reshaping the Ethic of Care in the Criminal Justice System

Leah Pope, PhD
Substance Use and Mental Health Program
Vera Institute of Justice

Overview

• Serving Safely: National Initiative to Enhance Policing for People with Mental Illnesses & Developmental Disabilities
• Enhanced Pre-Arraignment Screening Unit
• Indigent Defense Project
• Manhattan Criminal Court Resource Center
Sequential Intercept Model

- Up to 10% of all police contacts with the public involve a person with serious mental illness.
- People with serious mental illness are overrepresented in jails.

**Source:** Bureau of Justice Statistics, National Inmate Survey, 2011-2012
National Initiative to Enhance Policing for People with Mental Illnesses & Developmental Disabilities

• Build upon existing resources
• Extend capacity of the field
• Respond strategically to people with IDD & MHD

Intercept 2: Arraignment
PASU v. E-PASU

<table>
<thead>
<tr>
<th>PASU</th>
<th>E-PASU</th>
</tr>
</thead>
<tbody>
<tr>
<td>EMTs</td>
<td>Patient Care Associate and Nurse Practitioner</td>
</tr>
<tr>
<td>Paper-based screening</td>
<td>Electronic Screening Tool</td>
</tr>
<tr>
<td>Relies solely on self-report</td>
<td>Access to health histories (ECW + PSYCKES)</td>
</tr>
<tr>
<td>Relies on hospital emergency rooms</td>
<td>Avoids unnecessary hospital runs by prescribing commonly needed medications</td>
</tr>
<tr>
<td>No process for jail diversion</td>
<td>Employs a diversion liaison</td>
</tr>
<tr>
<td>No process for care coordination</td>
<td>Uses electronic system for triage notification at jail admission</td>
</tr>
</tbody>
</table>

E-PASU Health Screens

| Summary of EPASU self-report data (May 18, 2015 – October 31, 2016) |
|---------------------------------------------------------------|---------------------------------------------------------------|
| N                                                     | Percent                                                   |
| Total number of Level 1 screens                           | 10,695                                                       | 99%                                                  |
| Total number of Level 2 screens                           | 3,053                                                       | 29%                                                  |
| Current Medical Problems                                  |                                                             |                                                      |
| - Breathing problems                                       | 772                                                         | 7%                                                   |
| - Heart problems                                           | 422                                                         | 4%                                                   |
| Level 1 Behavioral Health Questions                       |                                                             |                                                      |
| - Drink alcohol every day/most days                        | 418                                                         | 8.9%                                                 |
| - Currently in drug or alcohol program                     | 352                                                         | 4.0%                                                 |
| - Currently in mental health program                       | 164                                                         | 2.0%                                                 |
| - Currently living in supportive housing or residential program | 687                                                         | 9.0%                                                 |
| Level 2 Behavioral Health Questions                       |                                                             |                                                      |
| - Currently taking psychiatric medications                | 760                                                         | 7.1% (24.9%)                                         |
| - Currently in treatment                                  | 601                                                         | 5.6% (19.7%)                                         |
E-PASU: Outcomes for People with Behavioral Health Needs

<table>
<thead>
<tr>
<th>Behavioral Health Need</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>N</td>
<td>%</td>
</tr>
<tr>
<td>Total</td>
<td>3,968</td>
<td>1,089 27.4</td>
</tr>
<tr>
<td>Mean number of arrests in past 5 yrs</td>
<td>10.1</td>
<td>3.7</td>
</tr>
<tr>
<td>Incarcerated in past 12 months</td>
<td>471</td>
<td>268 24.6</td>
</tr>
<tr>
<td>Sent to jail</td>
<td>901</td>
<td>384 35.3</td>
</tr>
</tbody>
</table>

E-PASU: Facilitating Diversion

- EPASU patients with behavioral health needs were arrested primarily for misdemeanors (55%), nonviolent felonies (17%) and violations (10%)

- Fewer than half of potential diversion candidates consented to sharing their clinical summaries with a defender prior to arraignment

- Defenders use of clinical summaries depends on a variety of factors
Intercept 3: Jail/Courts

How do you balance interest in helping your client treat their mental health disorder and a short, non-restrictive placement for your client?

<table>
<thead>
<tr>
<th>Option</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Least restrictive placement as first priority</td>
<td>45%</td>
</tr>
<tr>
<td>Client’s wishes as first priority</td>
<td>30%</td>
</tr>
<tr>
<td>Mental health treatment is leverage for least restrictive placement (interests align)</td>
<td>15%</td>
</tr>
<tr>
<td>Option of non-mandated care outside of criminal justice system</td>
<td>0%</td>
</tr>
</tbody>
</table>

Vera Substance Use • Mental Health Program
How do you balance interest in helping your client treat their mental health disorder and a short, non-restrictive placement for your client?

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<td>15%</td>
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<tr>
<td>Option of non-mandated care outside of criminal justice system</td>
<td>10%</td>
</tr>
</tbody>
</table>

“Our goal is always, whether the client has a mental health issue or not, is getting the least restrictive charges that is our main goal, and if mental health treatment can help that... I think it becomes tricky when the two end goals don’t meet up. And most of the clients with mental health needs are not going to say that they want treatment when they can just resolve the case.”

What are the most pertinent features of the case that will influence whether you recommend treatment as an alternative to incarceration?

<table>
<thead>
<tr>
<th>Feature</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strength of case and potential sentence or risk</td>
<td>50%</td>
</tr>
<tr>
<td>Client’s wishes</td>
<td>35%</td>
</tr>
<tr>
<td>Need for mental health treatment</td>
<td>20%</td>
</tr>
<tr>
<td>Strength of possibility of plea deal</td>
<td>15%</td>
</tr>
</tbody>
</table>
What are the most pertinent features of the case that will influence whether you recommend treatment as an alternative to incarceration?

- Strength of case and potential sentence or risk
- Client’s wishes
- Need for mental health treatment
- Strength of possibility of plea deal

"It’s always dangerous to mandate treatment or programs that could go on longer than the case itself. In this case, it really wasn’t that serious so it didn’t seem appropriate. Court mandated treatment drags on too long and can make the situation worse. It can also leave the client more susceptible to re-arrest if the case is still open."

Intercept 3: Courts
Manhattan Criminal Court Resource Center

Severity Of The Top Charge Entering Arraignment Citywide And By Borough (Arrests January – December 2016)

- Prevention & intervention
- Comprehensive care
- Recovery-informed practice
- Workforce development

Next Generation Interventions

Source: New York City Criminal Justice Agency (2015)

Vera Substance Use • Mental Health Program
Implicit Bias Defined

Implicit Bias is the process by which the brain uses mental associations that are so well-established as to operate without awareness, intention, or control.

1. We all have biases – this is a way for us to process & organize information. Bias doesn't make you prejudiced, it makes you human.

2. Our unconscious biases are often in conflict with our egalitarian value system and beliefs.

3. Implicit biases predict & determine our actions and decisions more than our explicit values.
THE LAW AND NEUROSCIENCE OF SHAKEN BABY SYNDROME

Deborah W. Denno
Arthur A. McGivney Professor of Law
Founding Director, Neuroscience and Law Center
Fordham University School of Law

People v. Johnson – California
September 24, 2004

- In 2004, 18 year-old Zavion Johnson was convicted of the 2nd degree murder of his 4-month-old daughter, Nadia.
- Johnson testified that he accidentally dropped Nadia while bathing her
- The state’s expert’s testified that Nadia’s injuries were evidence of abuse and classified her death as having resulted from SBS
- Johnson was sentenced to 25 years to life
After serving over 15 years in prison, a state judge set aside Johnson’s conviction.

Two state experts repudiated their original testimony and determined that Nadia’s injuries were consistent with the accidental fall described by Johnson.

In recent years, significant changes in the understanding of childhood head injury have led to the overturning of several SBS murder convictions.

Introduction

Shaken Baby Syndrome (SBS)

1. Prosecution depends nearly entirely on the medical diagnosis of SBS for its theory and argument.
2. Prosecution focuses on proving that defendant intended his/her actions as opposed to a lower level of mens rea such as recklessness despite no direct evidence of intentionality.
3. Prosecution emphasizes a causal connection between defendant’s mens rea and actus reus.
The Neuroscience Study

- Neuroscience Study – 800 Cases (1992–2012)
- Focus on victim cases
- Reliance on SBS to explain source of victim's injuries
- Medical diagnosis of SBS inextricably linked to requisite legal elements of a crime
- Prosecutorial misuse of victim neuroscience evidence

Victim vs. Defendant Neuroscience Evidence

800 Total Cases

- 286 Cases Concerning Victim Neuroscience Evidence*
- 514 Cases Concerning Defendant Neuroscience Evidence

* Of these 286 victim neuroscience cases, 247 cases (86.36%) contained only victim neuroscience evidence, while 39 cases (13.64%) contained both victim and defendant neuroscience evidence
Type of Victim Neuroscience Evidence

286 Total Cases

Categories are not mutually exclusive

Victim Ages

- 0 to Less Than 1 Year: 30.7%
- 1 to Less than 2 Years: 30.3%
- 2 to Less Than 5 Years: 14.5%
- 5 to Less than 10 Years: 14.2%
- 10 to Less Than 18 Years: 1.3%
- Minor Victim but Age Unknown: 4.5%
- 18 to 70+ Years: 4.5%
115 Cases that Involved a Diagnosis of SBS

171 Cases that Involved a Different Diagnosis

286 Total Cases

Victim Injuries

286 Total Cases

Defendant Sentences

286 Total Cases

Probation
0–10 Years
11–30 Years
31–50 Years
More Than 50 Years
Potential Life Sentences
Life Sentences
Death Penalty
Introduction of Neuroscience Evidence

286 Total Cases

Categories are not mutually exclusive and there are some cases where evidence is introduced by both the prosecution and defense.

* Of these 280 cases, the defendant challenged the prosecution expert's testimony interpreting victim neuroscience evidence in only 30 cases (10.7%) – refer to slide 16.

Expert Testimony

Incorporated into 277 of the 286 Cases

Categories are not mutually exclusive.
Mental State Element

286 Total Cases

- 156 Cases Where Victim Neuroscience is Introduced for Reasons Related to the Mental State Element of a Crime*
- 130 Cases Where Victim Neuroscience is Not Introduced for Reasons Related to the Mental State Element of a Crime

* This application often occurs during the trial, at the prosecutor’s request, for the purpose of establishing the defendant’s mental state (122 cases or 78.21%). It is cited on appeal in 83 cases (53.21%) to help establish or refute the defendant’s mental state.

Mental State Element Outcome

83 Appellate Cases

- 77 Cases Where Appellate Courts Resolved Defendant’s Mental State Issues in Favor of Prosecution
- 6 Cases Where Appellate Courts Resolved Defendant’s Mental State Issues in Favor of Defense

92.8% 7.2%
Sufficiency of Evidence

83 Appellate Cases

- 69 Cases on Appeal Involve Sufficiency of the Evidence Claims*
- 14 Cases on Appeal Do Not Involve Sufficiency of the Evidence Claims

* Of these 69 cases, the prosecution prevailed in 66 cases or 95.65%

Daubert/Frye Challenges

Of the 280 cases where prosecutors introduced victim neuroscience evidence, the defendant challenged the prosecution expert’s testimony interpreting that evidence in only 30 cases (10.7%)

* Of these 10 cases, 8 or 80% are SBS cases
Adult Victim Cases

- 70% Adult Victims
- 30% Child Victims

* 17% of the Adult Victims were victims in cases in which prosecutors used neuroscientific evidence to reinforce a determination of the defendant’s mental state

Conclusion

- Prosecutors use neuroscience evidence to “concoct” the defendant’s level of intent to some degree
- Inappropriate reliance on victim brain scans has been effective for prosecutors
- Nearly half of cases involving victim neuroscience evidence based on Shaken Baby Syndrome
Conclusion

*Identified Trends:*

- Prosecutors are dominating the introduction of victim neuroscience evidence
- Most of the neuroscience evidence is in the form of CT scans, which appear in 83.2% of cases
- More than half the time, prosecutors introduce victim neuroscience evidence for reasons related to the defendant’s mental state
- Courts most often resolve defendant mental state issues in favor of prosecution
- Prosecutors are also dominating the use of expert testimony
- Defendants rarely question that expert testimony
Post Traumatic Stress Disorder (PTSD)

Why it is Both Over-diagnosed and Under-diagnosed

Lawrence Amsel M.D., MPH

The Future of Neuroscience and Law
Fordham Law School
February 21st 2018

Outline of Talk I

I Why is this diagnose different from all others

II What is PTSD
   1. Trauma
   2. Specific symptoms
      a. memories
      b. Avoidance
      c. Distress
      d. Hyper vigilance

III What is not PTSD

IV Why PTSD is so Commonly Misunderstood

V How to Sort out the Authentic from the Inauthentic

VI Respecting Individual Experience and Narrative

VII Future Directions
PTSD Misdiagnosis

Post Traumatic Stress Disorder (PTSD) is a commonly misunderstood disorder.

In many ways it is uniquely susceptible to both over and under diagnoses, to honest misunderstanding by our clients and colleagues, and, sometimes, to purposeful manipulation.

We will discuss why this is the case in a few moments, but first what is PTSD.

PTSD Diagnosis

The ABCDE’s

Summary Mnemonic

A. A specific trauma
B. Bothered by memories
C. Cannot go to many places
D. Depressive thoughts
E. Easily frightened
PTSD Diagnosis
The ABCDE’s

A. Exposure to a trauma

Exposure to actual or threatened death, serious injury, or sexual violence in one (or more) of the following ways:

1. Directly experiencing the traumatic event(s).
2. Witnessing, in person, the event(s) as it occurred to others.
3. Learning that the traumatic event(s) occurred to a close family member or close friend.
4. Experiencing repeated or extreme exposure to aversive details of the traumatic event(s) (e.g., first responders collecting human remains; police officers repeatedly exposed to details of child abuse).

B. Presence of one (or more) of the following intrusion symptoms associated with the traumatic event(s), beginning after the traumatic event(s) occurred:

1. Recurrent, involuntary, and intrusive distressing memories of the event(s).
2. Recurrent distressing dreams in which the content and/or affect of the dream are related to the traumatic event(s).
3. Dissociative reactions (e.g., flashbacks) in which the individual feels or acts as if the traumatic event(s) were recurring.
4. Intense or prolonged psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event(s).
4. Marked physiological reactions to internal or external cues that symbolize or resemble an aspect of the traumatic event(s).
PTSD Diagnosis

The ABCDE’s

C. Persistent avoidance of stimuli associated with the traumatic event(s), beginning after the traumatic event(s) occurred, as evidenced by one or both of the following:

1. Avoidance of or efforts to avoid distressing memories, thoughts, or feelings about or closely associated with the traumatic event(s).

2. Avoidance of or efforts to avoid external reminders (people, places, conversations, activities, objects, situations) that arouse distressing memories, thoughts, or feelings about or closely associated with the traumatic event(s).

D. Negative alterations in cognitions and mood associated with the traumatic event(s), beginning or worsening after the traumatic event(s) occurred, as evidenced by two (or more) of the following:

1. Inability to remember an important aspect of the traumatic event(s)
2. Persistent and exaggerated negative beliefs or expectations about oneself, others, or the world
3. Persistent, distorted cognitions about the cause or consequences of the traumatic event(s) that lead the individual to blame himself/herself or others.
4. Persistent negative emotional state (e.g., fear, horror, anger, guilt, or shame).
5. Markedly diminished interest or participation in significant activities.
6. Feelings of detachment or estrangement from others.
7. Persistent inability to experience positive emotions
PTSD Diagnosis

The ABCDE’s

D. NOTE  Negative alterations in cognitions and mood associated with the traumatic event(s), beginning or worsening after the traumatic event(s) occurred, as evidenced by two (or more) of the following:

Note the similarity and easy confusion with

Major Depression

PTSD Diagnosis

The ABCDE’s

E. Marked alterations in arousal and reactivity associated with the traumatic event(s), beginning or worsening after the traumatic event(s) occurred, as evidenced by two (or more) of the following:

1. Irritable behavior and angry outbursts (with little or no provocation) typically expressed as verbal or physical aggression toward people or objects.
2. Reckless or self-destructive behavior.
3. Hypervigilance.
4. Exaggerated startle response.
5. Problems with concentration.
6. Sleep disturbance (e.g., difficulty falling or staying asleep or restless sleep).
PTSD Diagnosis

The ABCDE’s

Summary Mnemonic

A. A particular trauma  
B. Bothered by memories  
C. Cannot go to many places  
D. Depressive thoughts  
E. Easily frightened

PTSD Diagnosis

What it is NOT

Without Criteria A – the DSM defined trauma there can be no PTSD --Regardless of subsequent symptoms

This is not just a technical point of exclusion, but rather goes to the biology and psychology of the diagnosis of PTSD and the nature of its symptoms.

Thus, far from being a vague result of adversity, PTSD is a specific neuropsychiatric disorder that occurs after a traumatic event distorts the functioning of our fear learning processes in a particular way.
PTSD Diagnosis

What it is NOT

Note that each of the symptoms clusters represent “symptoms” -- That is abnormal behaviors or experiences

Fear or behavioral avoidance in the absence of a current justification

Avoiding restaurants frequented by former colleagues after an embarrassing dismissal is a normal reaction to present shame – not a symptom

Constantly thinking about how you will start a new company and show the old boss what a loss it was to loose you, does not constitute intrusive thoughts

These are normal, if ill advised “planning’ thoughts

They may even become abnormal obsessions – still not the intrusive thoughts of PTSD

PTSD Diagnosis

Why it is Misunderstood

The modern DSM system - starting with DSM-III - was in reaction to Freudianism, which contained many unproven etiological propositions

The DSM system was therefore very purposely Theory Free

The most startling exception was PTSD – for which a cause was not only postulated but required

With the DSM-5 PTSD is taken out of the Anxiety Disorders Section and is given its own chapter…..

With other Diagnoses that also have this exceptional etiological characteristic
PTSD Diagnosis

Why it is Misunderstood and Misdiagnosed

Trauma- and Stressor-Related Disorders

Reactive Attachment Disorder

Disinhibited Social Engagement Disorder

*Posttraumatic Stress Disorder*

Acute Stress Disorder

Adjustment Disorders

Other Specified Trauma- and Stressor-Related Disorder

Unspecified Trauma- and Stressor-Related Disorder

This unique etiological characteristic has had specific consequences for how PTSD is viewed by clients by opposing counsel and by the culture leading to BOTH under and over diagnoses.

1. Low stigma compared to other diagnoses, as its source is external. Nothing wrong with my mind, I was traumatized, is more comfortable

2. **Post hoc ergo propter hoc.** There is a mistaken notion that all trauma leads to PTSD
   A. The mean prevalence of PTSD at three months was 17.0%.
   B. But it is lower for non-intentional traumas
   C. Higher for the intentional trauma category with estimates from 23% - 37%.

3. The mistaken notion that all bad occurrences are “traumatic” in the psychiatric sense, as well as the notion that only the most horrific mass disaster can cause PTSD. Not car accidents.
PTSD Diagnosis
Why it is Misunderstood and Misdiagnosed

Continued

4. Persons who have had a trauma see the diagnosis as validation of their traumatic experience.

5. The new popularity of victimhood identity

6. The association with first responder and military heroism,

7. The confusion with Traumatic Brain Injury.

8. In addition the word “trauma” has seen a huge expansion of uses and meanings across different discourses and across professional, academic, artistic, and advocacy cultures.

---

PTSD Diagnosis
How to Sort out the Authentic from the Inauthentic

The key, in all cases, is to have a thorough psychiatric/psychological assessment.

This includes validated assessment tools to help rule in PTSD

Neuro-imaging and neuropsychiatric testing to rule out other disorders, where appropriate

These latter cannot make the diagnoses of PTSD but can indicate if TBI or other brain pathology is mistakenly presenting as PTSD or is comorbid with PTSD.
9/11 Trauma and Toxicity in Childhood: Longitudinal Health and Behavioral Outcomes

(U01 OH 011308, PI: Hoven)
aka Stress & Well-Being Follow-Up (S&W2)

The S&W Baseline Study: The Impact of 9/11 on Youth: Mental Health, Substance Use & Other Risk Behaviors

- Sept. 11, 2001
  - Child WTC Exposure

  • Life Changes
    - Family Economic Hardship
    - School/Residence Relocation
    - Safety Procedures

  • Childhood Mental Disorders

  • Possible Moderators
    • Parent WTC Exposure
      • Gender, Age, Race/Ethnicity, Decision Making, Other Exposure to Trauma

- Youth Behaviors
  - SubSTANCE USE/Abuse
    • Other High Risk Behaviors:
      - Sexual Risk Behaviors
      - Injury (intended and unintended)

- Adolescents and emerging adults (ages 12+)

Stress and Well-Being Study-Baseline
Preliminary Findings (N=1,500)

Highly Exposed* compared to Controls (Evaluated 12-14 years after 9/11):

- Psychiatric Conditions- **More** likely to have:
  - Separation Anxiety: AOR=2.19 (p=0.0279)
  - Panic Disorder: AOR=2.40 (p=0.0101)
  - Marijuana abuse: AOR=2.09 (p=0.0158)
  - Any Anxiety Disorder AOR=1.43 (p=0.0461)
  - Any Internalizing Disorder AOR=1.39 (p=0.0405)
  - Having At Least One Drink OR=1.63 (p= 0.0541)

- Functional Impairment -- **Less** likely to be:
  - Living with a spouse/partner AOR=0.59 (p=0.0126)
  - Living Independently AOR=0.60 (p=0.0021)

*Highly-exposed: on 9/11 attended school below Canal Street and saw the planes crash or towers collapse with own eyes. Adjusted for gender and age.

Respecting Individual Experience and Narrative

Even when excluding PTSD as a diagnosis, it is important to respect the client’s history of having had a very painful experience, and explore other ways this may be affecting them.

For persons who have had a trauma often see the diagnosis as validation of their traumatic experience.

Often individuals may have another psychiatric diagnosis after a trauma

In our research on 1,000 kids exposed to 9/11 they have Seperation anxiety and Panic fifteen years later

Or even in the absence of a trauma, individuals may have a diagnoses they think is PTSD eg Complicated Grief
Future Directions

We can expect advances in the Diagnosis and treatment of PTSD
Biomarkers and neuroimaging for diagnoses
New medications and new forms of psychotherapy for treatment
Some of these will be based on advances in the molecular neurobiology of memory as well as the cognitive science of fear learning

Thank You!
Malingering and brain imaging

Monte S. Buchsbaum, M.D.
Distinguished Professor Emeritus of Psychiatry
University of California

Malingering and poor performance

- Deliberate planned feigning
- Psychosis and disturbed attention and function
- Frontal lobe damage in attentional and executive centers causing variable performance
- Low motivation due to damage of emotional and cognitive centers
- Pseudodementia of depression or mood center damage
- Inept feigning due to cortical damage
- Adolescents?
PET fluorodeoxyglucose

- Uptake of artificial radiolabeled sugar (FDG) over 30 minutes
- FDG trapped in brain in proportion to brain activity
- Move to scanner after uptake to image brain activity
FDG-PET method

| FDG uptake Memory task | PET image acquisition |

30 min 45 min
FDG metabolic trapping

Orientation of PET scans
FDG uptake increased with novelty

Regional activation with task
Head injury after birth or at age 17 just a poor school dropout exaggerating problems?
Statistical probability map

Normal group mean = 1.20
standard deviation = .10
lower limit of normal = 1.00

Patient value = 0.90

Statistical probability map
Automobile head injury malingering because can drive car and shop for spaghetti sauce?

Typical adult brain injury patient speaks only Portuguese no testing
The TOMM is a 50-item recognition test designed for adults to discriminate between true memory-impaired patients and malingerers. Subjects were shown 50 drawings for 3 s each, at 1-s intervals. Subsequently, they were given 50 recognition panels, with two pictures per slide, each panel containing the target picture and a new picture. The subject was asked to indicate the picture previously viewed. A screen stating correct or incorrect was presented on the screen for 1 s immediately following this response, to provide feedback. If the subject did not respond within 15 s, the task would automatically advance (no subject data timeout). Scores had the potential range from 0 to 50 for each trial. A score lower than 45 indicated the possibility of malingering (Tombaugh & Tombaugh, 1996).
Subjects who activated right superior frontal gyrus the most in TOMM also had the least amount of correct responses during feigning condition. This finding suggests that falsified memory performance requires greater activation of cognitive control networks to determine a correct selection.

Feigning vs answering correctly digit forced choice task
Feigning cognitive deficits requires greater brain activation

- Browndyke et al. 2008
- Liang et al. 2012
- Abe, 2011
- Larsen et al 2010
- Lee et al 2005
- Kosheleva, Strigo, Buchsbaum and Simmons, Neuropsychology, 30:377, 2016

TOMM test in 31 veterans with brain injury not in litigation and results confidential

Fig. 1. Greater ventral anterior cingulate cortex 15O-H2O binding potential in Good TOMM versus Poor TOMM (Asial slice: x = -6) in 45 subjects controlling for PTSD and mTBI. TOMM = Test of Memory Malingering.

Neural correlates of malingering in mild traumatic brain injury: A positron emission tomography study

Andrea D. Spadoni, Elena Kosheleva, Monte S. Buchsbaum, Alan N. Simmons

Competency real or feignned?

Normal elderly man Vincent Gigante

FDG-PET and Alzheimer’s disease

Competency to stand trial and participate in defense?
Competency to form intent and appreciate outcome of actions?

Fluorodeoxy-glucose PET

Perrin et al. Nature 2009
Alzheimer’s dementia

Gigante statistical contrast

Patient and areas in lowest 5% of elderly

33 patients with AD statistically contrasted with 33 normal elderly
FDG decrease in ADNI Alzheimer patients

FDG-PET Vincent Gigante

Significantly lower in Patient than In healthy volunteers
Vincent Giagante contrasts

vs. healthy

vs. early mild cognitive impairment

vs. late MCI

vs. Alzheimer’s disease

Screening Tool: The Mini-Mental State Examination (MMSE)

<table>
<thead>
<tr>
<th>Item</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orientation</td>
<td>3</td>
</tr>
<tr>
<td>Registration</td>
<td>3</td>
</tr>
<tr>
<td>Attention and Calculation</td>
<td>3</td>
</tr>
<tr>
<td>Recall</td>
<td>3</td>
</tr>
<tr>
<td>Language</td>
<td>2</td>
</tr>
<tr>
<td>Total Score</td>
<td></td>
</tr>
</tbody>
</table>
Quality of intent

- Continuous or dichotomous?
- IQ continuous or dichotomous (IQ 69 defective and IQ 70 normal?)
Continuum of intent
What is the nature and quality of the act?

Carefully considered  product of mental disease  no intent or brain disease

Wannsee Conference – Berlin 1942
Chair: Heydrich
14 high government officials, 5 with doctors degrees
Minutes kept and fancy refreshments served

Ted Kaczynski
Ph.D in Mathematics

Hypofrontality in schizophrenia
TOMM test and malingering in adolescents

- Standardized for adults
- Development of understanding of faking bad for monetary gain may be in adolescence or young adulthood
- Simulation of faking bad by children little studied
- Only 64% of subjects in pediatric neurological clinic with no litigation ages 6-18 passed the TOMM test (Perna et al. 2013).

Emotion recognition and fMRI

Vetter et al. Social cognitive and affective neuroscience 2013
Dorsolateral prefrontal and temporal cortex used to recognize emotion

Entire group emotion recognition>physical characteristics

Adults use dorsal medial prefrontal and adolescents ventromedial

Percent signal change in dmPFC and vmPFC

On in adolescents

Off in adults
Potential future of imaging for Neuroscience and the Law

- Contribution in traumatic brain injury patients to identifying psychobiology of poor performance including motivation and impulsivity
- Contribution to feigning incompetency
- Contribution of imaging to defense based on psychiatric illness assessing feigning and severity...schizophrenia, PTSD
- Contribution to setting age limits for statues relating adolescent age

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MALINGERING & ASSESSMENT

Avraham Schweiger, Ph.D.

The Future of Neuroscience and Law
February 21, 2018

MALINGERING

The intentional production of false or grossly exaggerated physical or psychological symptoms, motivated by external incentives.
Examples of Incentives

• avoiding work
• obtaining financial compensation
• avoiding military duty
• evading criminal prosecution
• obtaining drugs
• *may be adaptive (POW)*
Malingering vs Other

What differentiates malingering from Conversion Disorder and other Somatoform Disorders is the *intentional* production of symptoms.

Suspect Malingering if:

- Medicolegal context (referred by an attorney)
- Marked discrepancy between the person’s claimed stress or disability and the objective findings
- Lack of cooperation during the diagnostic evaluation and in complying with the prescribed treatment
- The presence of Antisocial PD
Tests of Effort
or
Performance Validity Testing

Tests of Performance Validity

- Most commonly, focus on suspect memory-test performance
- Rely on known facts about memory functions/performance patterns
- Seek significantly atypical performance; infer suspect effort from that
- Are *never* 100% valid and reliable
- Multiple assessment methods preferred
Tests of Effort

• Word Memory Test

• Rey’s Fifteen Item Test

• Test of Memory Malingering
TOMM Validity Studies

• In one study with 475 normal subjects, average number correct in 2nd ‘learning’ trial and ‘recall’ trial was 49.9, s.d.=.5
• Less than 3% had score less than 49
• Age and educational level explained less than 2% of total variance
TOMM – Face Validity

• Tests of memory malingering require that the subject *perceive* the test to be harder than it is
• Most TOMM studies asked control subjects and ‘malingers’ to rate their subjective perception of their performance after the first ‘learning’ trial
• In general, they rated their performance lower than it actually was

Symptom Validity Test:

• Another form of an effort test in several version. Based on the same principle as above.

• A sequence of digits appear, followed after a short delay by to sequences, and the subject is asked to identify which one was the same as the previous sequence.
Traumatic Brain Injury and Law

Mehrdad Golzad, M.D.

Outline

1. Traumatic injury to Selected Cranial Nerves:
   1A: Cranial Nerve 1: Anosmia
   1B: CN ii, iii, iv, vi: Optic & OculoMotor nerves
   1C: CN viii: Vestibular nerve:

2. Genetic susceptibility to traumatic brain injury
Definition

• The cranial nerves are a set of 12 paired nerves that arise directly from the brain and control the motor, sensory & perceptual systems of the head, face and neck.

First Description of Cranial Nerves

• About 900 A.D. By Zakaria Razhes or Razi

Injury to the First Cranial Nerve: Anosmia and much more ...!

Anosmia: Loss of Sense of Smell

Anosmia is a common sequela of TBI: The blow to the head shears off the nerve fibers that travel from the nose through the cribriform plate to the brain.

Most Drs., even “ENT specialists” never test it!
Mechanism of Injury

Widespread repercussions

- Olfactory pathways have **extensive connections** with multiple regions in the brain including: The orbito-frontal cortex, Thalamus, Pyriformis Cortex, Insula, &

The limbic system which consists of:

1) the limbic lobe,
2) the hippocampal formation and fornix,
3) the amygdala,
4) the septal area,
5) the mammillary bodies & hypothalamus
6) the anterior nuclei of the thalamus
Other Causes of Anosmia

Consequences of CN1 injury

- Anosmia.
- Impaired sense of taste.
- Impaired memory & recall.
- Depression, Anhedonia, Social Isolation.
- Decreased Libido.
- Disability.
### Disability!

All 40 patients with total anosmia following TBI, had major vocational problems during the 2 or more years after being medically cleared to return to work. None had major motor or sensory deficits, and the majority had above average intelligence & memory. However, most demonstrated psychosocial deficits of a type typically associated with damage to orbital frontal cortex. ½ of patients with partial anosmia manifest vocational problems.

*Source: [Study published in the journal of clinical Neuropsychology in 2008 by: Nils R. Varney]*

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### TBI induced Anosmia

- Usually it’s a serious and permanent loss of sense of smell.
- There is no available treatment.
- Often accompanied with neuropsychological abnormalities.
Associated NeuroPsychological Complications

• Poor empathy, poor judgment & absent-mindedness.
• Weakness of memory and recall

Loss of good smells & taste

• Loss of pleasure of sensing “good smells”
• Loss of sense of “Taste” Anything other than the taste of salt, sweet, sour and bitter is lost
• For those who work as chefs or sommeliers Anosmia makes it extremely difficult to continue their careers.
Metaphors used by patients to describe anosmia.

• My “smell is now ‘black & white’ and no longer ‘in color’ ”.
• Smelling without a sense of smell is like eating chick peas that you can feel but not taste when you eat them.
• It’s like being an almost blind person who still can recognize silhouettes.

Anosmia-induced Anhedonia

• The inability to experience pleasure from activities usually found enjoyable: I have a two year old daughter and I've never been able to smell her. I miss the smell of pickles, early September mornings, the ocean, gasoline, matches and garlic...
• I used to love the smell of the seaweed around the tide pools. The list is endless ....
Impaired sense of Taste

- The sense of smell allows us to appreciate different flavors.
- A patient with anosmia cannot tell the difference between the licorice candy, the orange or lime jelly beans. They all taste sweet! All wines will taste the same!
- Dangerous coping mechanism: e.g. Over-salt their food

What do they say about taste

- Patients compare their eating experience to eating sawdust, cardboard or paper with glue.
- Coffee and other hot beverages taste like hot water.
- Patients cannot distinguish cola from lemonade or cream soda, whiskey from rum, or coffee from tea.
- One patient reported that she noticed that she accidentally sprinkled paprika instead of cinnamon on her oatmeal only after she had finished eating.
Loss of “bad smells”

- Accidentally eating spoiled food is common.
- One patient reported that, while cleaning the bathroom with a strong solvent that was odorless to him, he exposed himself to the volatile chemical until he was coughing up blood.
- Several subjects reported that they have actually failed to detect a gas leak.
- The inability to detect fires has resulted in dangerous situations for many subjects.
- For firefighters, olfactory loss and the resulting inability to locate fires through smell is a particular challenge.

Odor management

- Without a sense of smell it is impossible to verify that one’s body, children, or home do smell acceptable.
- Some subjects reported that they could not perceive the foul smell of decay filling their house after an animal died underneath furniture.
- A young mother with anosmia stated that she couldn’t notice that her baby had a dirty diaper.
Smell loss-induced social isolation

- Many of the problems have to do with the responses by friends and family-members to the condition.
- This often leads to embarrassment, alienation, anger, and withdrawal on the side of the patient.
- Their condition makes them feel isolated & angry.

Late consequences of Anosmia

- Major psychological consequences: Depression
- Pharmaceutical Labs use olfactory bulbectomized rat as a model of depression. Chemical Imbalance: Alterations in the noradrenergic, serotonergic, cholinergic, γ-aminobutyric acid (GABA)ergic and glutamatergic neurotransmitter systems are also associated with olfactory bulbectomy: The entire communication system of the rat’s brain is impaired. Antidepressants partially restore the chemical balance.
Cognitive consequences of Anosmia

- Post Traumatic Amnesia is intimately related to olfactory problems following a TBI.
- **Poor olfactory scores** correlate with a longer amnesia period, but not with GCS Glasgow Coma Scale scores.

Sexual Consequences of Anosmia

- Anosmia results in Decreased libido
- Ref.: Hidden consequences of olfactory dysfunction: a patient report series;
  Andreas Keller Email author and
  Dolores Malaspina  *BMC Ear, Nose and Throat Disorders 2013* 13:8
Diagnosis

- **UPSIT**: University of Pennsylvania Smell Identification Test (Expensive, time consuming test not reimbursed by insurance companies!)
- Accurate, Comprehensive 40-item test, with test-retest reliability of 94% (Easy to detect malingering through multiple tests)
- Provides an absolute indication of smell loss (anosmia; mild, moderate, or severe microsomia) as well as an index to detect malingering.
- Norms from nearly 4,000 men and women spanning the entire age range provide a basis for examinee percentile rank. Available in 28 languages.
Other diagnostic Tests

Olfactory Event Related Potential is the gold standard for anosmia evaluation;
High Resolution MRI may show abnormalities on the olfactory pathways.
Single-photon emission computed tomography (SPECT) shows substantial orbital frontal hypoperfusion in anosmic patients.

Optic & Oculomotor pathways

- Cranial Nerves ii, iii, iv, and vi
- Appropriate diagnostic tests show that all patients with significant brain injury have some type of visual and/or oculo-motor abnormalities.
  - Routine eye exam is usually normal!
  - Detailed visual field tests can show 60% w/ scattered VF defects (imagine a VF with many blind spots)
Eye, Visual Pathways & Ocular Movements

1,000,000 neurons in each optic nerve account for 70% of all sensory input fibers to the brain. (For perspective, the auditory nerve contains 30,000 neurons)

Oculomotor pathways directly, or indirectly connect to about 80% of all relay stations in the brain.

As a result almost all significant TBI cases have some type of visual and/or oculomotor abnormalities

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Effective Visual Deficits after TBI

<table>
<thead>
<tr>
<th>Deficit</th>
<th>Associated Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accomodation</td>
<td>Slower less accurate reading. Difficulty sustaining gaze, Shifting gaze, or tracking targets</td>
</tr>
<tr>
<td>Vergence Ocular motility</td>
<td>Constant intermittent eye strain, Diplopia eliminated with monocular occlusion</td>
</tr>
<tr>
<td>Visual-Vestibular Interaction</td>
<td>Disequilibrium exacerbated by movements or visually stimulating environments</td>
</tr>
<tr>
<td>Visual Processing</td>
<td>Slower speed / Impaired visual memory and visual processing</td>
</tr>
<tr>
<td>Visual Field Integrity</td>
<td>Missing a portion of Field of Vision</td>
</tr>
<tr>
<td>Light Dark Adaptation</td>
<td>Elevated Light Sensitivity</td>
</tr>
</tbody>
</table>
Genetic Susceptibility to TBI

• Several genes have been implicated as influencing the outcome following traumatic brain injury (TBI)

Type IV collagen (COL4A1) mutations results in intracerebral bleed following minor traumatic injury to the brain.
**APOE** adversely influences overall outcome, coma recovery, risk of posttraumatic seizures, as well as cognitive and behavioral functions following TBI.

Many **other genetic abnormalities** result in a significant vulnerability of the brain to traumatic injuries: Hereditary cerebral amyloid angiopathy, CADASIL (cerebral autosomal dominant arteriopathy with subcortical infarcts and leukoencephalopathy)
Factors in Predicting outcome after traumatic brain injury

• Severity of injury
• Age
• Abnormalities on neurological & Cognitive examination
• CT / MRI abnormalities
• Wild card: Genetic Factors

MRI report of a patient with superior cognitive scores on Neuropsychological tests

• Extensive right anterior Frontal lobe atrophy, cystic encephalomalacia and gliosis involving the inferolateral cortex. Similar parenchymal tissue loss are seen involving the right anterior Temporal tip and the left inferomedial Frontal cortex.
Conclusion

• A minor accident may result in significant brain injuries with permanent disability, while a major accident with initially marked brain injuries may result in a good recovery.