



# WELCOME

**The Battle Within:  
Traumatic Brain Injury,  
Posttraumatic Stress Disorder,  
and Violence Risk**

**Cynthia Boyd, Ph.D.**



# Continuing Education



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- **1.5 Nursing Contact Hours**
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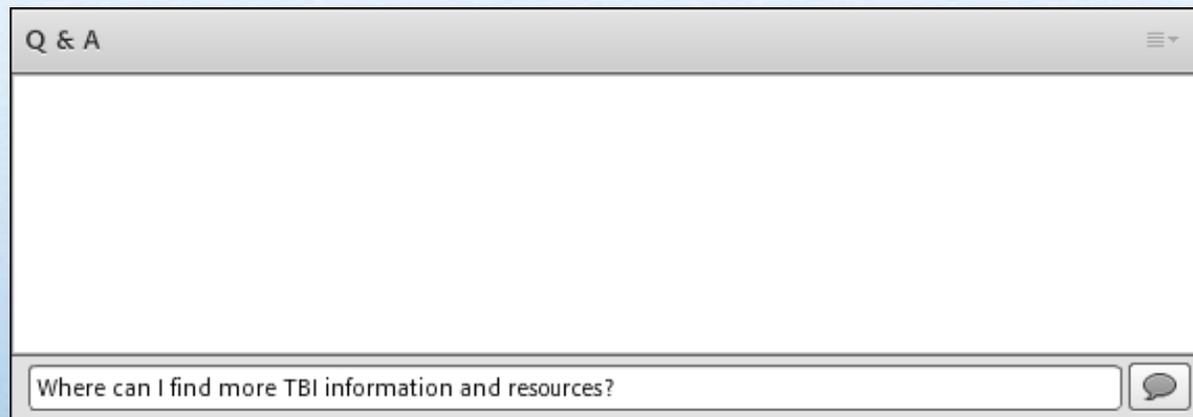
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# Additional Webinar Details



Today's webinar will include a **question-and-answer session** following the presentation. You will be provided an opportunity to submit your questions in a Q&A box located on your screen at the end of the presentation. Please hold all questions until the end.



Following the question-and-answer session, instructions on **how to complete the online CE evaluation and how to download your certificate** will be provided.



# Webinar Overview



- Many service members returning from Operations Enduring, Iraqi Freedom (OEF/OIF) and New Dawn continue to fight a battle within.
- Multiple deployments have increased the risk for blast exposure and combat-related psychological trauma, resulting in the signature wound of these conflicts: traumatic brain injury (TBI) and posttraumatic stress disorder (PTSD).
- This presentation will examine the physiological changes that occur after TBI, and with PTSD, which increase service members' risk for aggressive and violent behavior.





# The Battle Within: Traumatic Brain Injury, Posttraumatic Stress Disorder and Violence Risk

Cynthia Boyd, Ph.D.  
Co-Senior Scientific Director  
Neuropsychologist  
Defense and Veterans Brain Injury Center  
Naval Medical Center San Diego





# Disclaimer

The views expressed in this presentation are those of the authors and do not reflect the official policy of the Department of the Navy, Department of the Army, Department of Defense, or the U.S. Government.

There are no relevant financial relationships to disclose.



# Points to Be Covered



- Aggression & violence associated with TBI
- Physiological effects of PTSD
- Aggression and violence associated with PTSD
- Case examples
- Comorbid factors that lower the threshold of impulse control
- Recent research examining aggression and violence in the military population
- Future concerns



# Veterans in State & Federal Prison 2004

U.S. Department of Justice (May 2007)



- In 2004: male veterans had lower incarceration rates than nonveterans due in part to age differences
- 65% of male veterans in 2004 were at least 55 years old
- More than half of veterans in state prisons were serving for a violent offense
- More likely to have had recent mental health problems



# Veterans in State & Federal Prison 2004

## U.S. Department of Justice

Noonan, M.E & Mumola, C. J. (2007)



- Vietnam-era largest group of wartime veterans
- Honorable Discharge = 62%
- Shorter criminal histories than nonveterans
- State prison veterans: 1 in 4 sex offenders
- 71% knew their victims
  - Relative, friend/acquaintance
- 71% did not use a weapon





# Veterans in State & Federal Prison 2004

U.S. Department of Justice

Noonan, M.E & Mumola, C. J. (2007)

	State prison (2004)	Federal (2004)
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Combat Exposure	19.9%	25.7%
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No Combat	80.1%	74.3%
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# The New York Times (2008)



121 cases were found in which veterans of Iraq and Afghanistan committed a killing in this country, or were charged with one, after their return from war.



# The New York Times (2008)



- Branch of Military
  - Army: 76
  - Marines: 37
  - Other: 8
- Where they Served\*
  - Iraq: 108
  - Afghanistan: 13

\*Two Iraq war veterans also served in Afghanistan



# The New York Times (2008)



- The victims
    - Family members or girlfriends\*: 41
    - Service members: 32
    - Others: 59
  - Charges
    - Murder: 79
    - Manslaughter: 12
    - Homicide: 16
    - No charges (suicide, killed by police): 14
- \*In four cases, the victim was also in the military.



# Aggression Following Deployment

## Active Duty & National Guard

(Thomas, et al. 2010)



	<u>3mons</u>	<u>12mons</u>
<u>Angry: kicked, smashed, punched something</u>	41%	40%
<u>Threatened another with physical violence</u>	40%	35%
<u>Got into fight hit someone</u>	17%	18%



# Factors Associated with Physical Aggression Among U.S. Army Soldiers

Gallaway, et al. (2012)



Surveys collected six months post-deployment measuring overt aggressive behavior

Aggressive behavior associated with:

- highest level of combat intensity
- misuse of alcohol
- diagnosis of PTSD
- diagnosis of TBI
- prior altercation w/significant other
- Lower rank (E1-E4)



# Traumatic Brain Injury



- Signature wound of Operations Enduring and Iraqi Freedom (OEF/OIF)
- “Invisible Wound”
- 80% of TBIs are rated as “mild” in severity
- mTBI = concussion
  - Brief Loss of Consciousness or Alteration of Consciousness
  - Brief, if any, period of amnesia
  - Expectation of rapid and full recovery



# Physical Symptoms Reported Following Concussion/mTBI



- Dizziness
- Fatigue
- Headaches
- Impaired hearing
- Impaired vision
- Problems with balance
- Sensitivity to light
- Sensitivity to noise



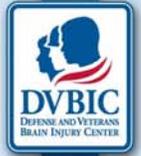
# Cognitive Symptoms Reported Following Concussion/mTBI



- Impaired memory
- Trouble concentrating
- Difficulty finding words
- Slowed overall processing
- Impaired organizational and problem-solving skills



# Behavioral Symptoms Reported Following Concussion/mTBI



- Difficulty being around people
- Personality changes
- Irritability, frustration, “short-fuse”
- May result in “acting out” behavior



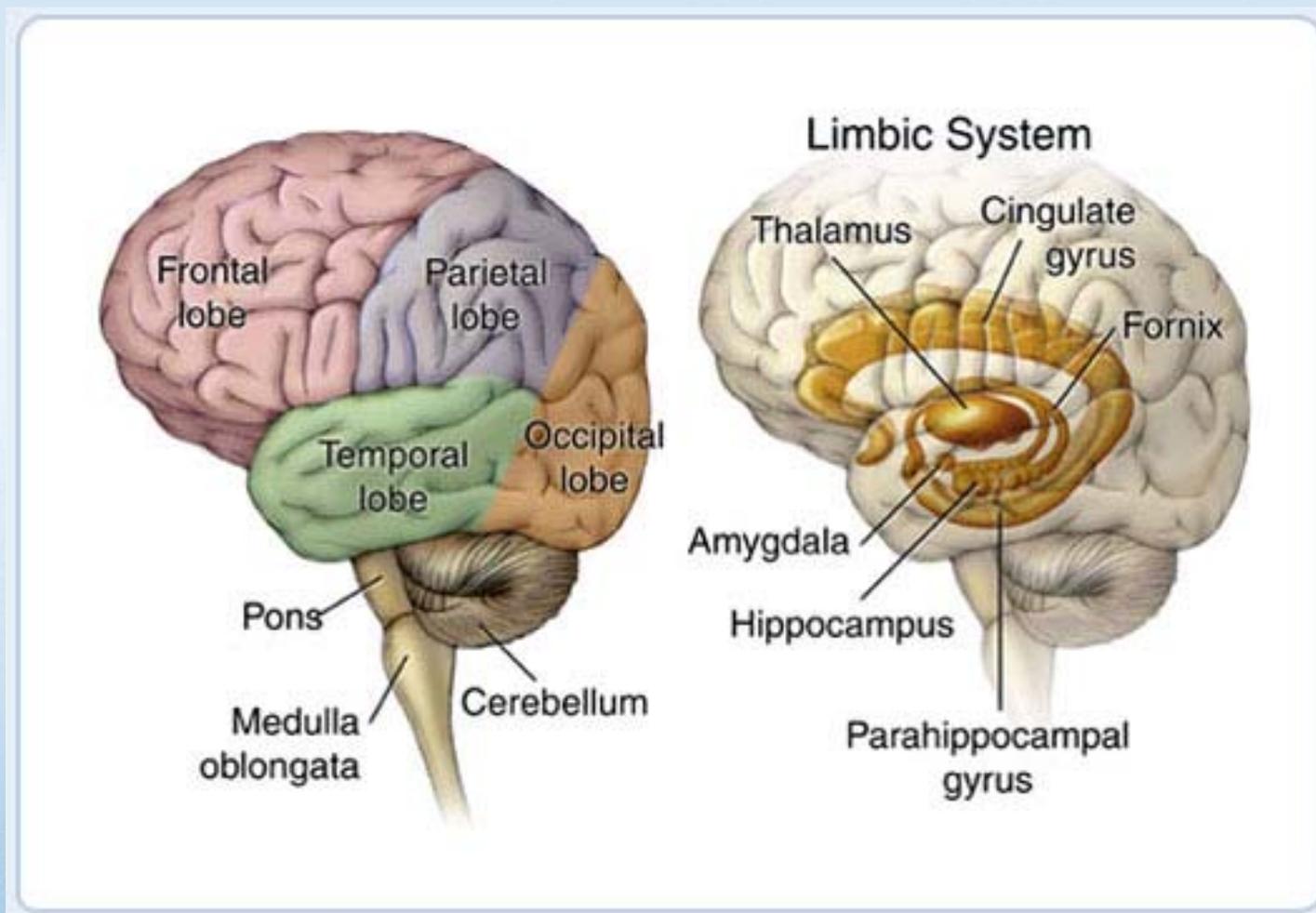
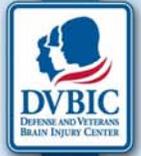


Illustration provided courtesy of Alzheimer's Disease Research, a program of the American Health Assistance Foundation. © 2012

<http://www.ahaf.org/alzheimers/about/understanding/anatomy-of-the-brain.html>

# Frontal Lobe Functions



- Abstraction, judgment, planning, sustained motivation & self-regulation
- Have an inhibitory effect on other areas of the brain
  - Can restrain behavior
- Serves as a filter
- Last area of the brain to fully develop



# Frontal Lobe Impairment



- Aggression
  - Brain's loss of ability to maintain emotional control (loss of the “filter”)
  - Because of lack of planning ability, unable to anticipate the impact of their behavior and consequences
  - Can lead to exaggerated response and action far exceeding the normal reaction
  - Rarely understand their own role in conflicts



# Behavioral Aspects of TBI



Changes in  
cognitive  
abilities

Poor  
impulse  
control

Acting out  
behavior



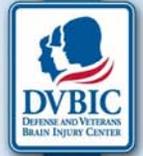
# Violence Associated with TBI



- TBI related cognitive and behavioral problems can result in aggressive behavior
  - Diminished coping abilities
  - Impulse control problems
  - Increased irritability, even with concussion
  - Lack of insight and judgment



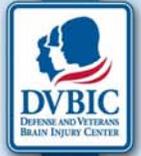
# Violence as a Consequence of TBI



- Not all brain-injured individuals are violent or aggressive
- Age of injury plays a role
- History of aggression
- Use of alcohol or drugs increases likelihood of aggressive acts
- Presence of a mental disorder increases likelihood of aggression



# Case Example: Violence Following Severe TBI



- Male, early 60s
- History of childhood physical abuse
- History of alcohol abuse (DUI over 10 yrs ago)
- No violent criminal history
- Married 4 times
- Self-inflicted gunshot wound to head
- Open skull fracture, Glasgow Coma Scale of 3
- ER: respiratory failure, post-cardiac arrest



# Case Example: Violence Following Severe TBI



- Required a craniotomy to remove bony fragments in the left frontal lobe
- Conditioned worsened with brain hemorrhage
- Second craniotomy: “previously made craniotomy incision was open and liquefied brains are coming through the wound”
- CT scan revealed: multiple metallic bullet fragments remained in his frontal lobes



# Case Example: Violence Following Severe TBI



- Hospitalized for 6 weeks
- Behavior was described as: “combative, impulsive, angry, disinhibited, confused, disoriented, and argumentative”
- His teeth bled from trying to get out of restraints
- Released from hospital without follow-up care
- Began drinking one month later



# Case Example: Violence Following Severe TBI



- Two months after hospital discharge
- 14 weeks status post injury
- Killed his estranged wife (mother of his two small children) and her mother



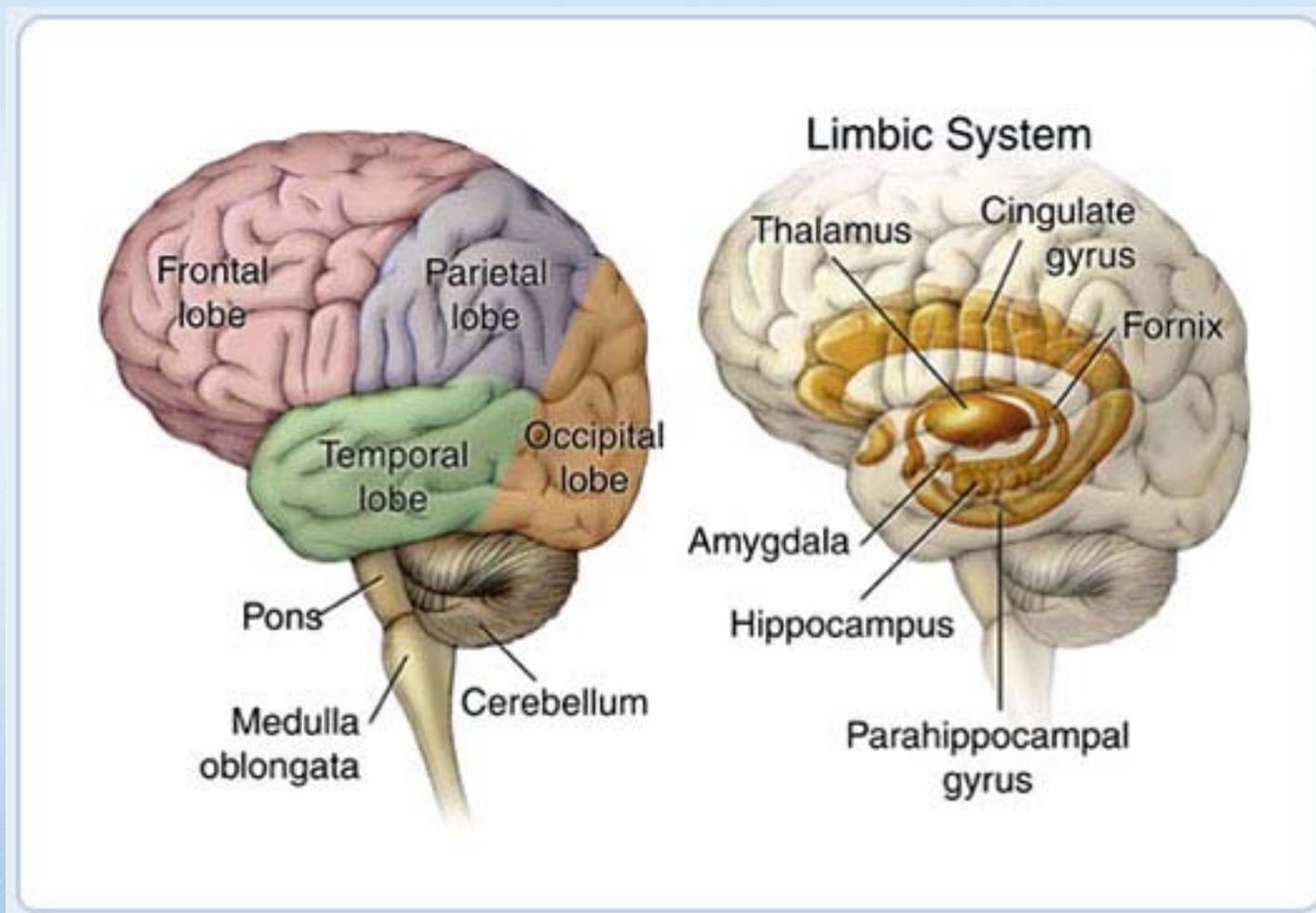


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<http://www.ahaf.org/alzheimers/about/understanding/anatomy-of-the-brain.html>

# Temporal Lobe Functions



- Interpreting and processing auditory information
- Memory
- Language comprehension
- Limbic System (“emotional brain”)
- Plays a role in emotion and learning



# Temporal Lobe Impairment



- Makes its appearance as a true learning disorder
  - Problems learning and memory
- Limbic System (“emotional brain”)
  - Hippocampus
  - Amygdala (fear memory)
- Auditory or visual hallucinations
- May have episodes of unprovoked or exaggerated anger



# Temporal Lobe Impairment



- Aggression following temporal lobe damage involves a loss of behavioral control
  - Unpatterned
  - Not confined to particular situations, times or individuals
  - Occurs with minimal provocation
  - Without premeditation

Golden, et al. (1996)



# Case Example: Temporal Lobe Rage



- Marine with 7 years of active duty, excellent service record
- Seizures
- Temporal lobe tumor resection
- Unpatterned rage



# Does TBI Predispose One to Crime?



- From civilian literature: a number of studies have found a greater history of head injury in a variety of offender populations (Raine, 1993)
- Violent offenders on death row studied by Lewis et al. (1986) had a history of *severe* head injury
- McKinlay, et al. (1981) found aggression and irritability to follow *serious* head injury in 70% of cases



# Does TBI Predispose One to Crime?



- It is likely that brain injury precipitates violence in those individuals who are already predisposed to violence through other biological or social risks
- Theorized the TBI diminishes coping skills, judgment, and restraint, thus the injury may provoke violence in those who already have deficits in these areas (Miller, 1990)



# Posttraumatic Stress Disorder

## Definition and History

*Invisible wound*



- An anxiety disorder
- PTSD is unique among psychiatric disorders in that the symptoms are directly linked to a traumatic event
- 5<sup>th</sup> most common psychiatric disorder (5% of Americans)
- 20 years after Vietnam, 15% of combat veterans still have PTSD (National Vietnam Veteran Readjustment Study, 1990)



# Posttraumatic Stress Disorder



Diagnostic Criteria:

D. Persistent symptoms of increased arousal  
(2) Irritability or outbursts of anger

(DSM-IV, 2000)



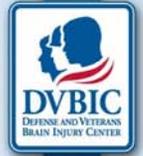
# Violence Associated with PTSD



- Hyperarousal = “fight or flight”
  - Amped-up limbic system
  - Hypervigilance: causes paranoia and misperceptions
  - Increased startle response: “ready to respond”
  - Road rage
  - Sleep violence



# PTSD and Anger



- Among Vietnam veterans, research has shown levels of anger greater in veterans with PTSD compared to veterans without PTSD
  - after accounting for combat exposure, substance abuse and other mental health disorders

(Beckham, et al., 1997, Castillo, et al., 2001, Novaco & Chemtob 2002)



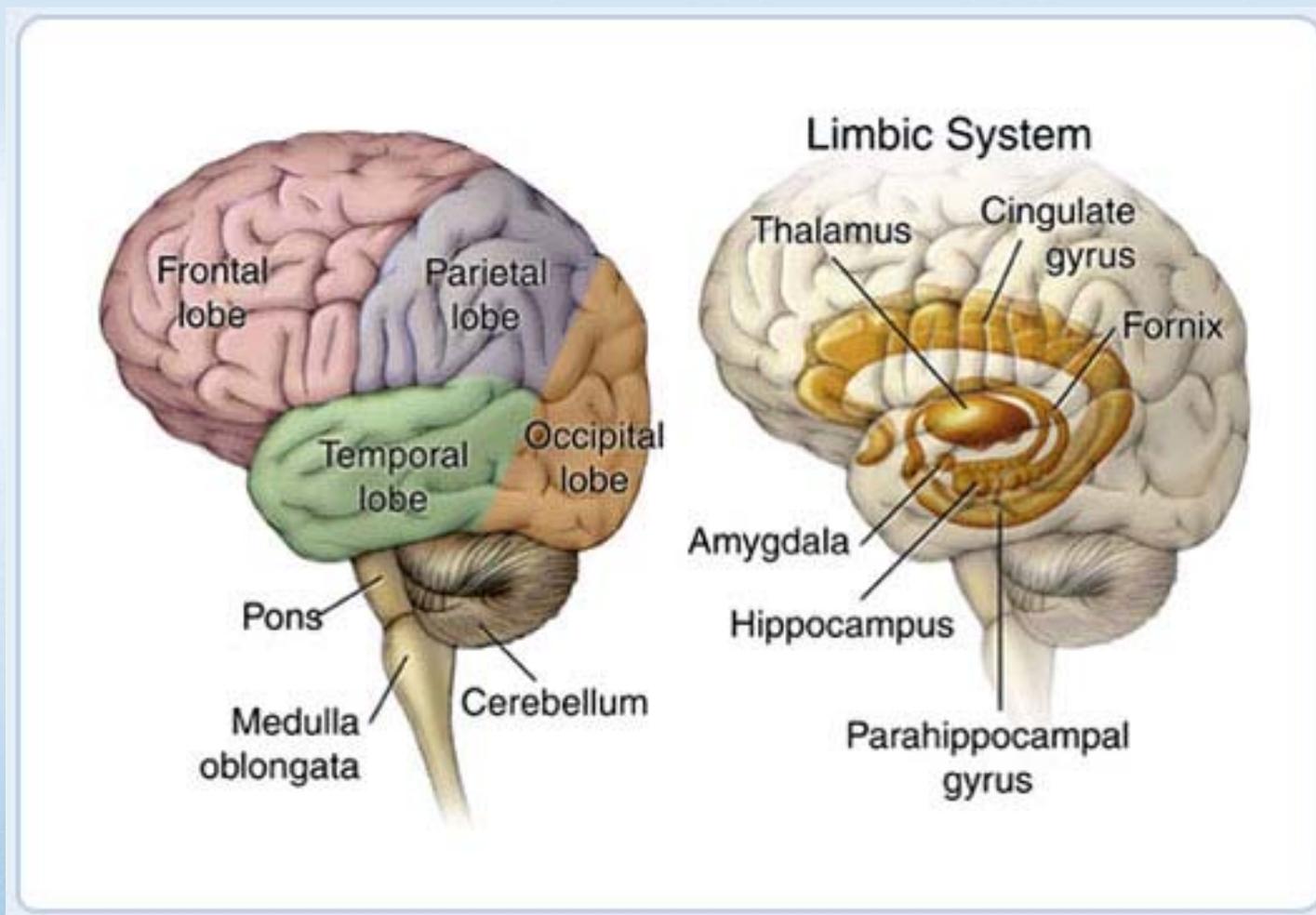


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<http://www.ahaf.org/alzheimers/about/understanding/anatomy-of-the-brain.html>

# The Amygdala

- Extensively linked to the frontal lobe
- Primary role is in the acquisition and the physiological expression of conditioned fears
- It processes and stores memories of emotional events
  - Stores feelings and physiologic responses associated with the event (fear with increased HR)
- The stored memory can later be triggered

Phelps (2004)

# The Amygdala



- Flight and fear responses (“freezing”)
- Has a distinct difference from a *conscious* feeling of fear
- Defensive or aggressive reactions
- Has a sensory input system



# Neural Connections



Cortex



Amygdala



Whalen & Phelps (2009)



# 1980 PTSD as a Primary Legal Defense



- Veterans argued they had been rendered temporarily insane from flashbacks while committing their crimes
- PTSD defense met increasing resistance, just as the insanity defense did in many states
- Current war-era defendants use “combat trauma” not to escape culpability, but to explain state of mind  
“Were it not for their deployment...”



# Headlines

- 2009 Oregon: 1<sup>st</sup> Iraq veteran found not guilty of murder *by reason of insanity* due to PTSD
  - Sentenced to Oregon State Hospital for life
- “War Crimes” (Vanguard) July 8, 2010  
State of AZ v. Clark Fish

[http://current.com/shows/vanguard/92532800\\_war-crimes.htm](http://current.com/shows/vanguard/92532800_war-crimes.htm)

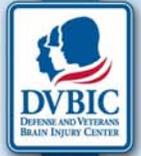
# Personal Email Correspondence



- Fall 2011: “Last month, my nephew who had served three tours in Iraq shot and killed my brother (his father) four or five times in the head as he slept. At the time he had not been taking his medication. He was diagnosed with PTSD and schizophrenia when he received a medical discharge from the Marine Corps.”
- Found not fit to stand trial and sent to a mental facility



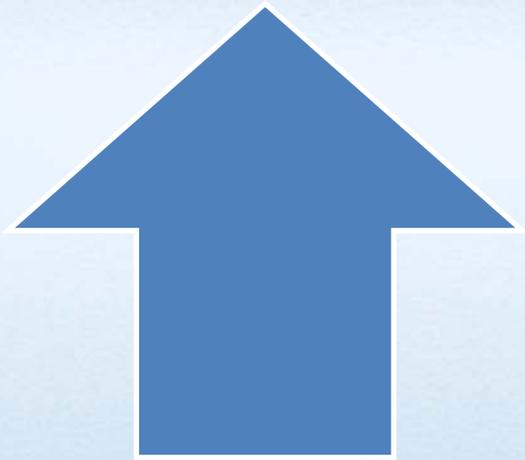
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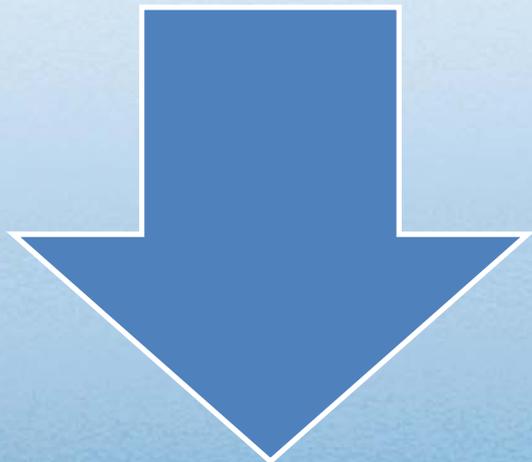
- Spring 2012: found *not guilty by reason of insanity*
- Committed to a state hospital



# Aggression and Violence Interaction: PTSD & TBI



Increased  
activation  
(limbic system)



Decreased  
Inhibition  
(frontal lobes)



# Comorbid Factors Influencing Behavior



**Cognitive  
Impairment**

**Substance  
Abuse**

**Physical  
Injury /  
Chronic  
Pain**

**Emotional/  
Psychological**

**Medication**



# Increased Violence Potential (civilian literature)

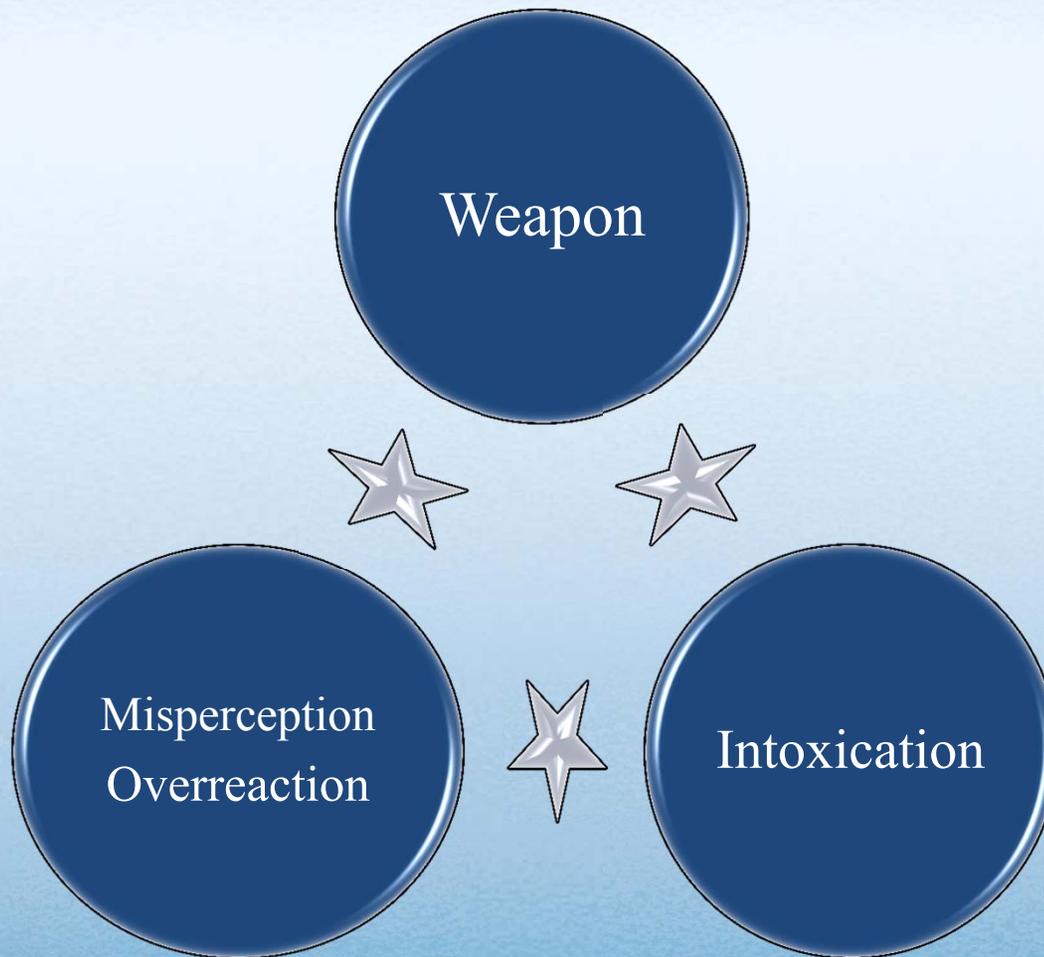


# Increased Violence Potential (OEF/OIF)



# Criminal Acts

## Forensic Practice



# Alcohol



- TBI
  - Alcohol has a stronger effect on the brain after injury
  - May interfere with prescription medication
  - May lower the seizure threshold, especially if combined with anti-seizure medication
- PTSD
  - Lowers inhibitions
  - When coupled with misperceived cues, may result in acting out behavior



# Psychobiological Origins of Violence



- Typology of Criminal Human Aggression
  - Predatory aggression
  - Defensive aggression
  - Irritable aggression

Levi, Nussbaum & Rich (2010)



# Typology of Criminal Human Aggression



- Predatory aggression: the behavior is for material gain, typically carried out with the absence of emotion, physiological arousal or empathy. The purpose is the attainment of a goal.

Levi, Nussbaum & Rich (2010)



# Typology of Criminal Human Aggression



- Defensive aggression: typically occurs in response to an actual attack or threat of attack. The goal is escape. Defensive aggression is associated with fear or anxiety as well as heightened arousal.

Levi, Nussbaum & Rich (2010)



# Typology of Criminal Human Aggression



- Irritable aggression: elicited by frustration or perceived insults, typically of a psychological nature. Described as impulsive or disinhibited and associated with intense anger, hostility and heightened arousal, well out of proportion to the eliciting event.

Levi, Nussbaum & Rich (2010)



# Can These Typologies Apply to the Physiological and Behavioral Effects of TBI and PTSD in an OEF/OIF Population?



- **Predatory aggression:**
  - Aggression is typically associated with a specific goal
  - Aggression is w/o physiological arousal. PTSD is associated with physiological arousal.
  - Not consistent with post deployment aggressive behavior



# Can These Typologies Apply to the Physiological and Behavioral Effects of TBI and PTSD in an OEF/OIF Population?



- **Defensive aggression:**
  - Associated with fear or anxiety as well as heightened arousal. Occurs in response to an actual (perceived) attack
  - Limbic system's overarousal produces PTSD symptoms
  - Consistent with post deployment aggressive behavior associated with PTSD



# Can These Typologies Apply to the Physiological and Behavioral Effects of TBI and PTSD in an OEF/OIF Population?



- **Irritable aggression:**
  - Elicited by frustration or perceived insults
  - Impulsive or disinhibited
  - Consistent with post deployment aggressive behavior with both TBI and PTSD



# Schofield Soldier Admits Guilt in Slaying of Contractor in Iraq

*Honolulu Star Advertiser (4/15/11)*



- Army medic and three-time Iraq war veteran
- Pled guilty to killing a civilian contractor days before leaving Iraq
- Shooting took place in an SUV on base
- Also found guilty of assaulting three other contractors by pointing a loaded weapon at them and of fleeing apprehension
- In a standoff with authorities for 12 hours following the shooting



# Schofield Soldier Admits Guilt in Slaying of Contractor in Iraq

*Honolulu Star Advertiser (4/15/11)*



- FEB 2010: Army mental fitness board found he had likely experienced a “short psychotic episode”
- Army mental health board found him fit to stand trial
- An Army friend described him as “acting strangely several days before the shooting, thinking there were wanted posters with his face and name around the base”



# Early Intervention



# Interventions

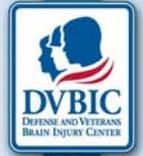


- Thoroughly assess for behavioral changes
- Educate patient on what behavioral changes are normal vs. of concern
- Assess for alcohol misuse
- Refer to mental health services for anger/aggression interventions



# Criminal Justice Involvement Iraq and Afghanistan War Veterans

Elbogen et al. (2012)

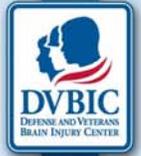


## Variables related to criminal justice involvement

- Young males
- Witnessed family violence
- Substance abuse
- Prior history of arrest
  - Consider non-military factors
  - Similar to civilian criminal factors (Meloy, 2000)



# TBI- and PTSD-Related Problems and Incarceration



- TBI
  - Slowed verbal and physical responses may be interpreted as uncooperative behavior
  - Memory deficits can make it difficult to understand and remember rules
- PTSD
  - Attention deficits may interfere with job duties or response to directions, and may be misinterpreted as deliberate defiance
- TBI and PTSD
  - Irritability and anger can lead to an incident



# Risk Factors for Violent Behavior



- Chronic pain effects mood
- Substance abuse
- Perceived disrespect (misperceptions)
- “Adrenaline letdown”
- Unresolved rage
- Irritability associated with both brain injury and PTSD can lead to aggression
  - Increases the probability of violent behavior



# More Risks...

## Sexual Violence



- *Newsweek* (April 2011)
- 2010: 50,000 male veterans screened positive for “military sexual trauma”
- “Women in the armed forces are now more likely to be assaulted by a fellow soldier, than killed in combat”



# Future Concerns

How to control for violence within this population

- Incorporate education
  - Patients, family members, providers
- Law enforcement training
- Look for signs of workplace violence

# Disgruntled Marine



- Engaged in Department of Veterans Affairs services in the Midwest
- Reached out to former Sergeant
- Withdrawal from prescription medication
- Perceived Sergeant as uncaring



# Veteran's Courts

## California Penal Code Section 1170.9



**1982**

Only applied to combat veterans who served in Vietnam.

Had to be convicted of a felony.

Had to suffer from substance abuse or psychological problems as a result of service.

**2006**

Problems had to stem from service in a combat theater in the U.S. military.

Had to be convicted of a criminal offense, misdemeanor or felony.

Applied to post-traumatic stress disorder, substance abuse or psychological problems.

**2011**

Applies to problems stemming from service in the U.S. military.

Has to be convicted of a criminal offense, misdemeanor or felony.

Has to suffer from sexual trauma, traumatic brain injury, post-traumatic stress disorder, substance abuse, or mental health problems as a result of service.



# Take Home Points

- Not all patients with a TBI or PTSD are aggressive or violent
- Alcohol misuse increases the probability of acting out behavior
- Patient, family and command education is critical for intervention
- Mental health services should be the first referral considered to address increased irritability and anger issues



# Questions?





Cynthia Boyd, Ph.D.

Co-Senior Scientific Director  
Neuropsychologist

Defense and Veterans Brain Injury Center  
Naval Medical Center San Diego

[info@dvbic.org](mailto:info@dvbic.org)





**This presentation with audio will be  
available online at**

**<http://www.dvbic.org/winter-webinar-series-hot-topics-traumatic-brain-injury>**

**starting**

**December 7, 2012**



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## **PRE-REGISTERED**

**ON or BEFORE November 26, 2012**

Visit <http://conf.swankhealth.com/dvbic> and complete the online evaluation in order to receive a continuing education certificate.

## **PRE-REGISTERED**

**AFTER November 26, 2012 (but before 1:15 p.m. EST today)**

The above website will be available starting December 3, 2012.

**If you did not pre-register, you will not be able to receive continuing education credit for this event.**

## **Website will close on December 19, 2012**



# Save the Date

**January 16**

“Alternate Approaches to Headache Management”

**February 20**

“Advanced Imaging Techniques”

**March 20**

“Intimacy: Sex, Drugs and TBI”

