Associations of PTSD, TBI, and Neurocognitive Performance Over Time

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Longitudinal Associations among Posttraumatic Stress Disorder Symptoms, Traumatic Brain Injury, and Neurocognitive Functioning in Army Soldiers Deployed to the Iraq War

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Prior data collection: DoD and VA CSR & D

Poll Question #1

- Do you work in any of the following clinical or clinical research setting(s) (select all that apply)?
  - Rehab (including polytrauma)
  - PTSD specialty care
  - Other mental health
  - Neurology/neurosurgery
  - Neuropsychology

Background

PTSD-related Neuropsychological Deficits: Meta-analytic findings

- ✓ Speed of information processing
- ✓ Attention/working memory
- ✓ Verbal learning
- Verbal memory
- Executive functioning

Cobb-Scott et al. (2015; Psych Bull)

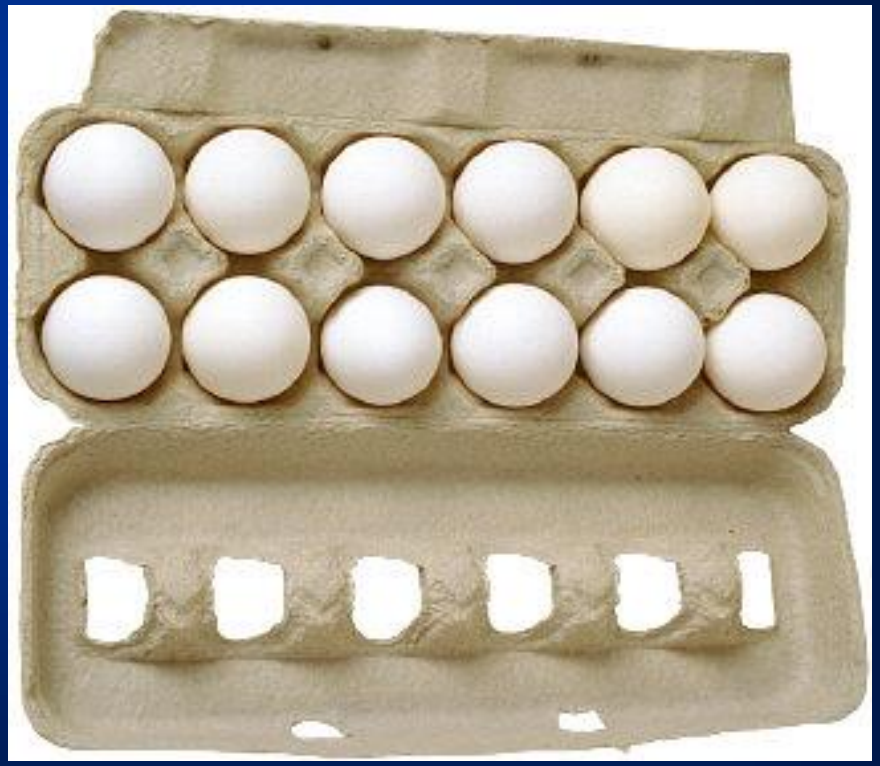
PTSD-related Neuropsychological Deficits: Growing Evidence

Visual learning/memory

Inhibition/gating

(e.g., Aase et al., 2017; Psychiatry Res; DeGutis et al., 2015: J Int Neuropsych Soc)

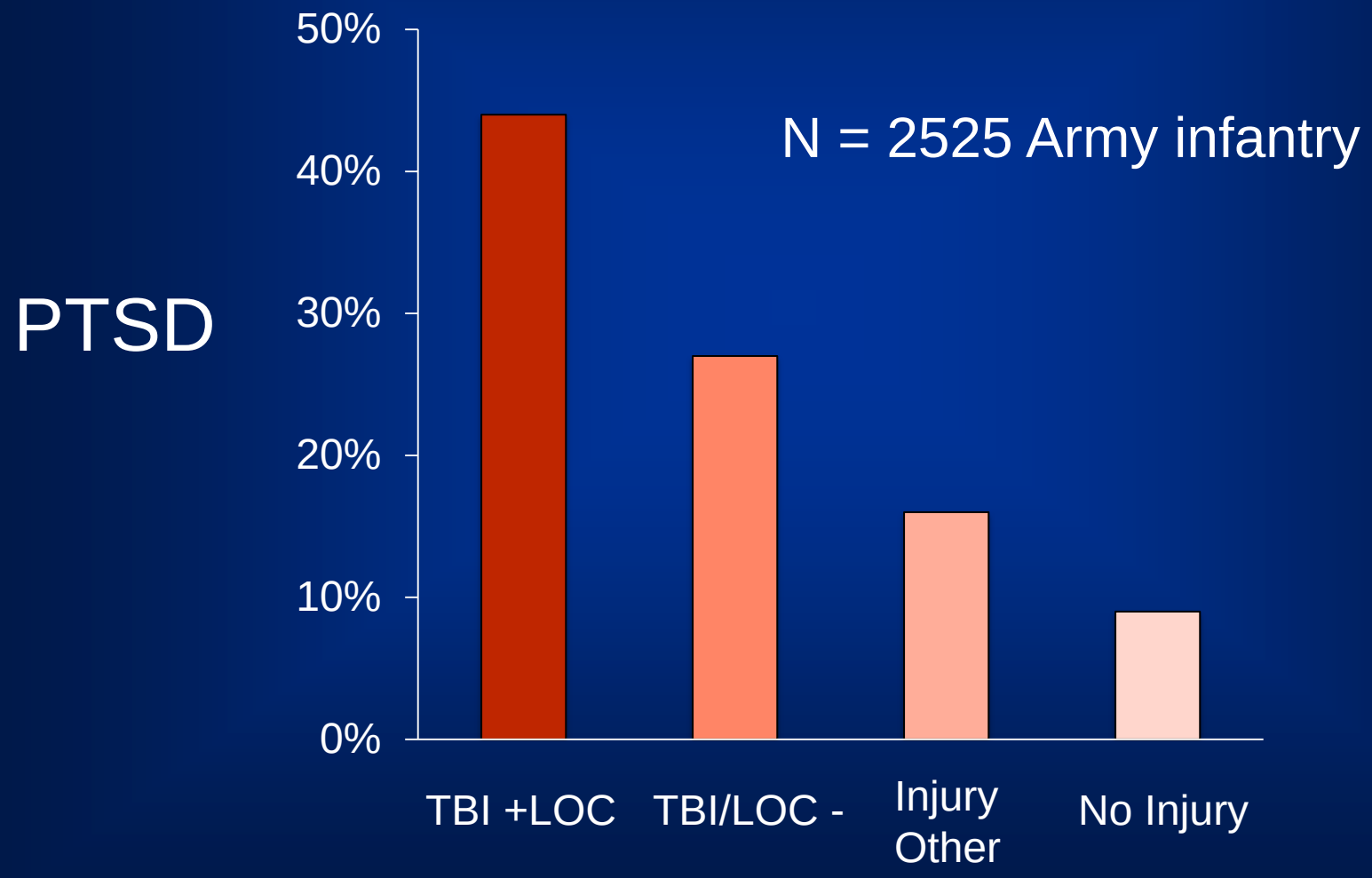
Most research cross-sectional



Objective 1:

To examine longitudinal associations between neuropsychological performance and PTSD symptoms

Hoge et al. (2008; *N Eng J Med*)



Mild TBI Increases Risk of PTSD

- Bryant et al. (2010; Am J Psych)

n = 1084 civilians with traumatic injuries

At 12 mos., mild TBI patients ~2x more likely to develop new:

	Adj OR	CI
PTSD	1.92	1.08, 3.40
Panic	2.10	1.03, 4.14
Social Phobia	2.07	1.03, 4.16
Agoraphobia	1.94	1.13, 3.39

Functional impairment related to psychiatric status.

6-year Follow-up

- O'Donnell et al. (2016; J Clin Psychiatry)

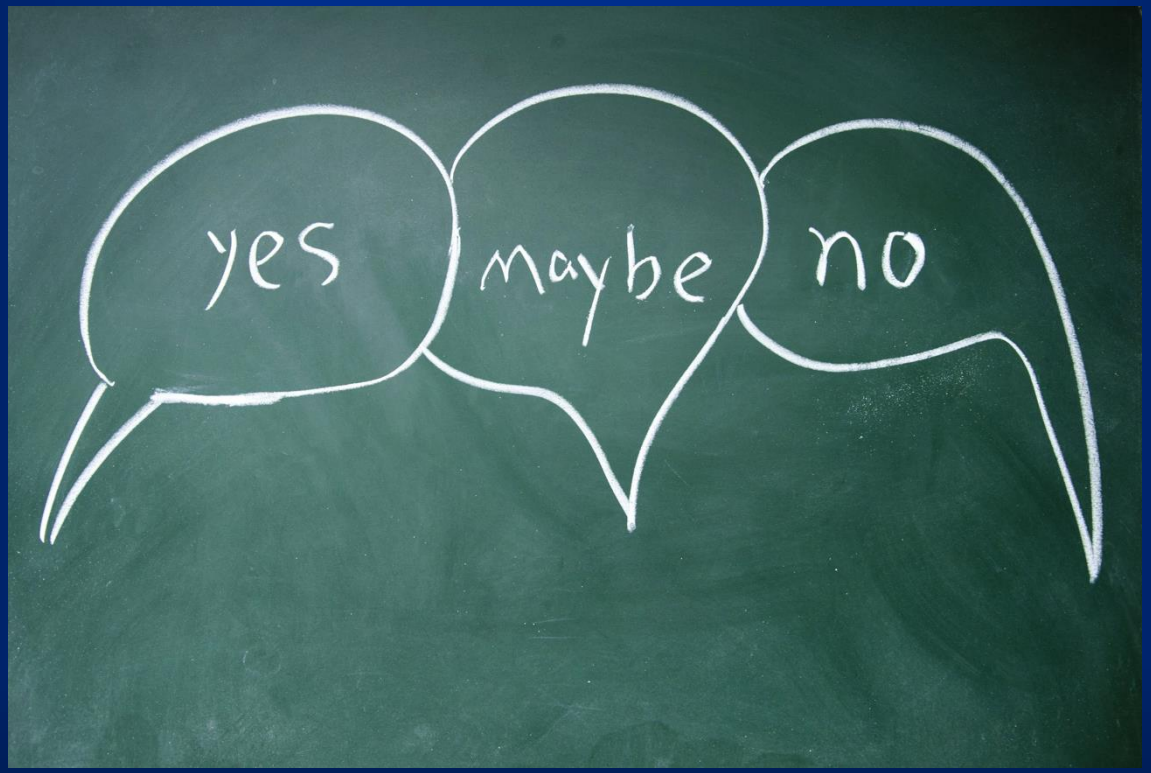
At 72 mos., mild TBI patients still ~2x more likely to have PTSD.

	Adj OR	CI
PTSD (DSM-IV)	2.32	1.11, 4.84
PTSD (DSM-5)	1.92	0.89, 4.14

PTSD dx, >12x more likely to report high disability.

mTBI → disability only with psychiatric co-morbidity.

Mild TBI and persistent neuropsychological deficits?



Poll Question #2

- Are most Veterans that you care for with both PTSD and history of TBI (pick one answer):
  - More comfortable with a mental health etiology for cognitive deficits
  - More comfortable with TBI as an etiology for cognitive deficits
  - Equally comfortable/uncomfortable with either etiology

Objective 2:

To examine longitudinal associations of TBI with both PTSD symptoms and neuropsychological performance

Gaps in knowledge regarding long-term OEF/OIF deployment mental health outcomes.

Objective 3:

To examine longitudinal associations both in the short-term and long-term

Methods

Iraq Deployment

12 mo

M = 7.9 years

Pre 2003-05

Post 2004-06

Follow-up 2009-14

VA CSP 566

Eligibility for CSP 566

Iraq deployment

Prior permission for contact for future research

Pre and post neuropsych assessment

Valid neuropsychological performances

No physical condition precluding testing

Living in US

Measures

Demographics	Written survey
Military history	Written survey/DMDC records
Combat exposure	DRRI Combat Exp Scale

PTSD severity	PTSD Checklist (PCL-C)*
TBI	Structured interview

*Highly correlated with CAPS (PTSD gold standard interview) summary score at long-term follow-up

Neuropsychological Measures

Effort/Engagement	TOMM, Trial 1
Verbal learning	WMS-III Verbal Paired Assoc I
Verbal memory	WMS-III Verbal Paired Assoc II
Visual learning	WMS Visual Reproductions IR
Visual memory	WMS Visual Reproductions DR
Simple reaction time	ANAM Simple Reaction Time
Sustained attention	NES Continuous Perf Test

VA CSP 566 (Long-term Follow-Up) Procedures

- Phone interview (CAPS, TBI interview)

- Mailed questionnaires

- In-person neurocognitive tests

	Pre-deployment	Long-term follow-up
Age, mean (SD), years	26.1 (6.1)	35.3 (6.1)
% women	5.9	5.9
% racial/ethic minority	28.8	28.8
Education		
% high school/GED	66.9	21.3
% > high school	33.1	78.7
Duty status		
% regular active duty	84.6	31.3
% reservist	15.4	17.7
% military veteran	0	51.1
Cumulative OEF/OIF deployments		
0	98.5	0
1	1.5	39.3
>1	0	61.7
% PTSD cases	4.8	19.9

TBI Characteristics

Pre- to post-deployment (n = 73 reporting TBI)	**%**
> 1 TBI	37.0
Mild TBI (most serious event)	89.0
Time, most recent event to post-deployment	
<1 month	0
1 – 3 months	1.4
>3 months – 1 year	79.4
> 1 year	19.2
Post-depl. to long-term follow-up (n = 60 reporting TBI)	**%**
> 1 TBI	43.3
Mild TBI (most serious event)	83.3
Time, most recent event to long-term follow-up	
<1 month	0
1 – 3 months	1.7
>3 months – 1 year	3.3
> 1 year	95.0

Predicting PTSD Severity from Earlier Neuropsych and TBI

Variable	Post-deployment PCL	Long-term follow-up PCL
Earlier PCL-C score	(+) p < .001	(+) p < .001
Visual Reproductions, immed recall	p = .05	(-) p = .02
Visual Reproductions delayed recall	ns	(-) p = .01
Verbal Paired Assoc, I	ns	ns
Verbal Paired Assoc II	ns	ns
Simple Reaction Time throughput	ns	ns
CPT log-transformed omissions	ns	ns
TBI present	(+) p < .001	(+) p =..01
Combat severity (DRRI)	ns	(+) p<.001,<.002

Adjusted for age, race, education, marital status, duty status

Relationships of PTSD Symptom Change and TBI to Post-deployment Neuropsychological Performance

Variable	Neuropsychological outcomes					
	Visual Reprod		Verbal Pairs		Simple RT	CPT
	Immed	Delay	I	II	Throughput	Omissions*
Pre-deployment neuropsych value	(+) P<.001	(+) P<.001	(+) P<.001	(+) P<.001	(+) P<.001	(+) P<.001
PTSD severity increase (PCL-C)	ns	ns	ns	(-) P=.03	(-) P=.05	ns
TBI present during interval	ns	ns	ns	ns	ns	ns
Combat severity (DRRI)	ns	ns	ns	ns	ns	ns

Adjusted for age, race, education, marital status, duty status
*log-transformed

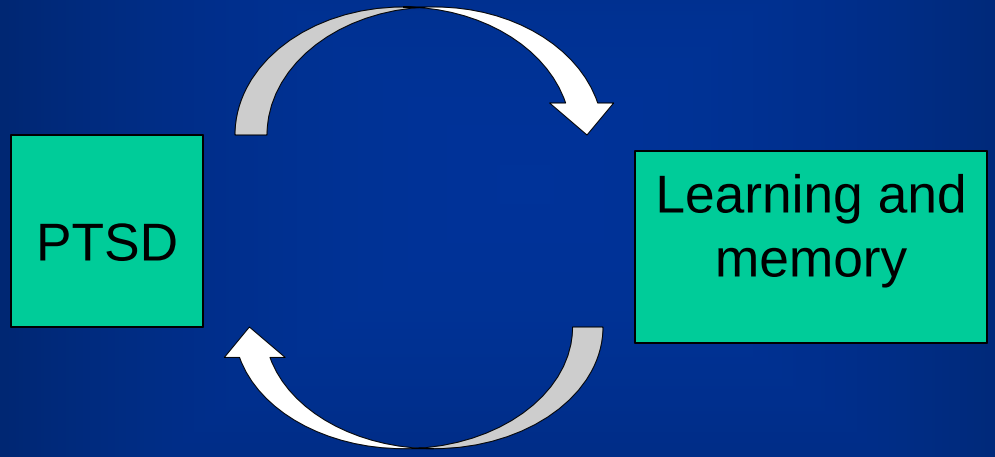
Relationships of PTSD Symptom Change and TBI to Long-term Neuropsychological Outcomes

Variable	Neuropsychological outcomes					
	Visual Reprod		Verbal Pairs		Simple RT	CPT
	Immed	Delay	I	II	Throughput	Omissions*
Post-deployment neuropsych value	(+) P<.001	(+) P<.001	(+) P<.001	(+) P<.001	(+) P<.001	(+) P =.02
PTSD severity increase (PCL-C)	(-) P = .03	(-) P =.001	ns	(-) P =.03	ns	ns
TBI present during interval	ns	ns	ns	ns	ns	ns
Combat severity (DRRI)	ns	ns	ns	ns	ns	ns

Adjusted for age, race, education, marital status, duty status
*log-transformed

Summary

- Better visual learning and memory predictive of less severe PTSD symptoms on subsequent assessments.



- Although cognitive performances were WNL, PTSD symptom increases associated with poorer learning and memory (both assessments).

Summary

- TBI not associated with neuropsychological deficits.
- In contrast, TBI associated with more severe PTSD symptoms at both post-deployment and long-term follow-up.
- Relationship of TBI with poorer PTSD outcomes not explained by combat severity

Limitations

- TBI screened retrospectively; most mild
- Limited range of neuropsychological functions assessed
- Common co-morbidities not assessed (e.g., chronic pain, depression)
- Too few women to examine gender

Conclusions

- Relationships among PTSD, TBI, and neuropsychological functioning may over time lead to sustained emotional and neurocognitive symptoms.
- Assessing for, and addressing, PTSD in Veterans presenting with TBI is important over both the short an long term.
- Augmentative strategies to enhance cognitive skills, and especially memory processes, may be helpful.

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QUESTIONS/COMMENTS?

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For more information about PTSD:

http://www.ptsd.va.gov

THANK YOU!