



Mild Traumatic Brain Injury

The Impact of Concussions Among Servicemen and Women

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Mild Traumatic Brain Injury

- mTBI = concussion
- International Multidisciplinary Conference 2012 - "Concussion is a brain injury and is defined as a complex pathophysiological process affecting the brain, induced by traumatic biomechanical forces."
- May or may not involve loss of consciousness
- Results from sudden impact to the head, change in direction (i.e. whiplash), and pressure blasts



Mild Traumatic Brain Injury

Every 23 seconds, someone incurs a brain injury.

Methods in Injury





Defense and Veterans Brain Injury Center



DoD Numbers for Traumatic Brain Injury Worldwide – Totals

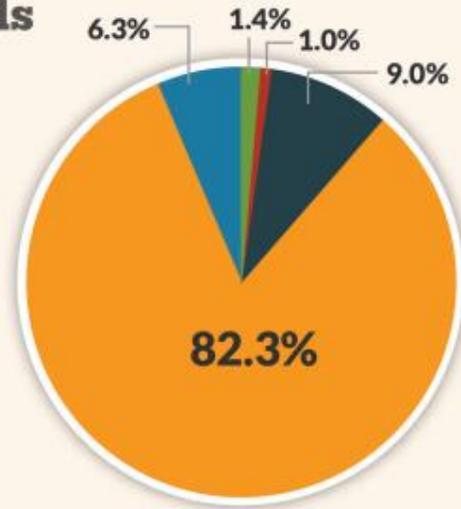
2000-2016 Q1

Penetrating	5,000
Severe	3,653
Moderate	31,202
Mild	286,255
Not Classifiable	21,852

Total - All Severities 347,962

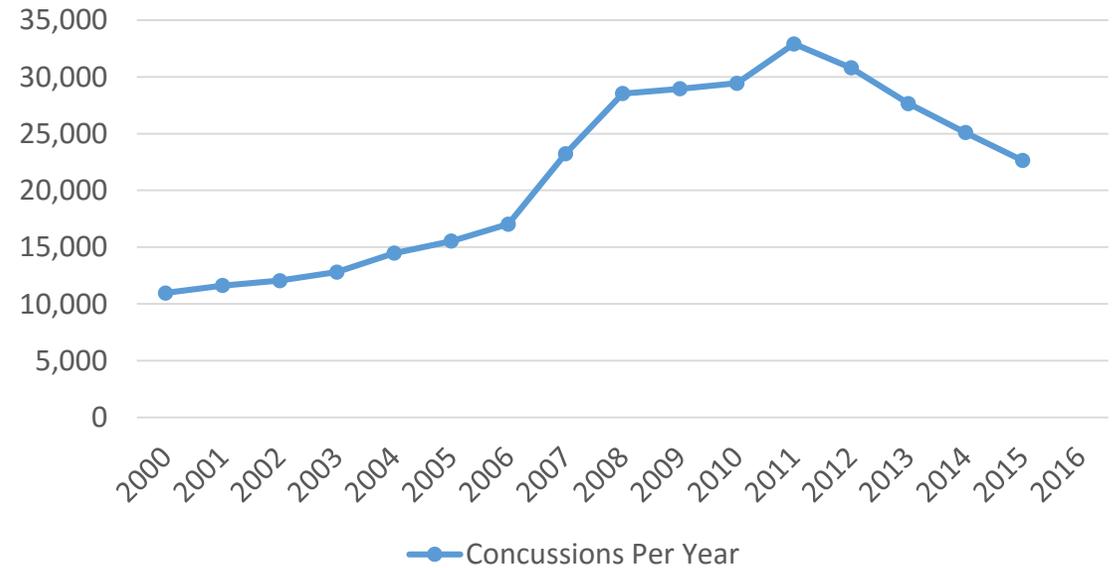
Source: Defense Medical Surveillance System (DMSS), Theater Medical Data Store (TMDS) provided by the Armed Forces Health Surveillance Branch (AFHSB)

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2000-2016 Q1, as of May 16, 2016

Concussions Per Year



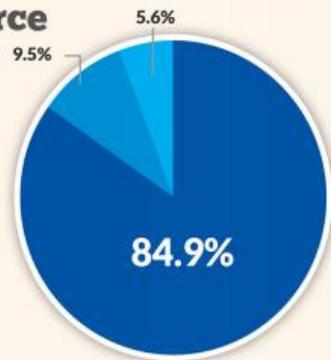


DoD Numbers for Traumatic Brain Injury Worldwide – Air Force

2000-2016 Q1

Active	40,362
Guard	4,528
Reserve	2,655

Total - Air Force 47,545



Source: Defense Medical Surveillance System (DMSS), Theater Medical Data Store (TMDS) provided by the Armed Forces Health Surveillance Branch (AFHSB)

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2000-2016 Q1, as of May 16, 2016

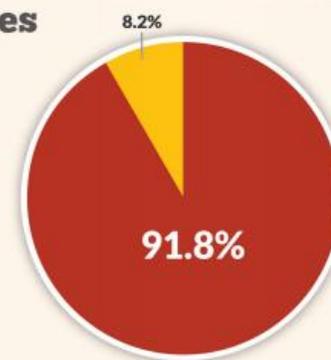


DoD Numbers for Traumatic Brain Injury Worldwide – Marines

2000-2016 Q1

Active	45,731
Reserve	4,112

Total - Marines 49,843



Source: Defense Medical Surveillance System (DMSS), Theater Medical Data Store (TMDS) provided by the Armed Forces Health Surveillance Branch (AFHSB)

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2000-2016 Q1, as of May 16, 2016



DoD Numbers for Traumatic Brain Injury Worldwide – Navy

2000-2016 Q1

Active	43,591
Reserve	3,606

Total - Navy 47,197



Source: Defense Medical Surveillance System (DMSS), Theater Medical Data Store (TMDS) provided by the Armed Forces Health Surveillance Branch (AFHSB)

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2000-2016 Q1, as of May 16, 2016

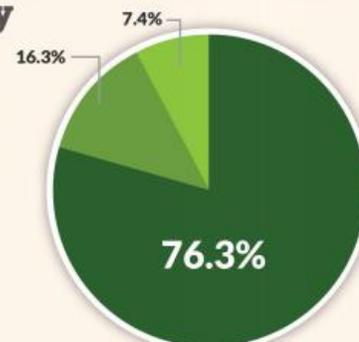


DoD Numbers for Traumatic Brain Injury Worldwide – Army

2000-2016 Q1

Active	155,186
Guard	33,088
Reserve	15,103

Total - Army 203,377



Source: Defense Medical Surveillance System (DMSS), Theater Medical Data Store (TMDS) provided by the Armed Forces Health Surveillance Branch (AFHSB)

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2000-2016 Q1, as of May 16, 2016

Dual Diagnosis



The screenshot shows the DVBIC website with a navigation menu and a research publication page. The navigation menu includes links for 'About DVBIC', 'About Traumatic Brain Injury', 'Education', 'Research', and 'DVBIC Locations'. Below the navigation menu, there are three tabs: 'Service Members & Veterans', 'Family & Caregivers', and 'Medical Providers'. The main content area displays the title 'Overlap of mild TBI and mental health conditions in returning OIF/OEF service members and veterans' under the 'DVBIC Publications' category. The page also includes the research type, citation, journal, publication date, and URL.

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[Current DVBIC Studies](#)
DVBIC Publications
[Concussion Literature](#)
[Research Reviews](#)
[Study Manuals](#)

Overlap of mild TBI and mental health conditions in returning OIF/OEF service members and veterans

Research Type: DVBIC Publications

Citation: Lew HL, Vanderploeg RD, Moore DF, Schwab K, Friedman L, Yesavage J, Keane TM, Warden DL and Sigford BJ. 2008. Overlap of mild TBI and mental health conditions in returning OIF/OEF service members and veterans. *J Rehabil Res Dev* 45(3):xi-xvi.

Journal: Journal of Rehabilitation Research and Development

Publication Date: 2008

URL: <http://www.ncbi.nlm.nih.gov/pubmed/18629743>



Dual Diagnosis

- “Most of the patients screening positive on the TBI clinical reminder present with multiple post-concussion symptoms, many of which overlap with symptoms of PTSD, other anxiety disorders, and depression. Common accompanying symptoms include various **musculoskeletal pain complaints.**”
- “Approximately 300,000 service members who have returned from Iraq and Afghanistan are currently experiencing from PTSD or major depression and about 320,000 may have experienced at least a mild TBI during deployment.”
- *Lew HL, Vanderploeg RD, Moore DF, Schwab K, Friedman L, Yesavage J, Keane TM, Warden DL and Sigford BJ. 2008. Overlap of mild TBI and mental health conditions in returning OIF/OEF service members and veterans. J Rehabil Res Dev 45(3):xi-xvi*

Dual Diagnosis

The screenshot shows the DVBIC website with a navigation menu and a research article. The navigation menu includes: About DVBIC, About Traumatic Brain Injury, Education, Research, DVBIC Locations, Service Members & Veterans, Family & Caregivers, and Medical Providers. The research article is titled "Loss of consciousness, depression, posttraumatic stress disorder, and suicide risk among deployed military personnel with mild traumatic brain injury" and is categorized under "Concussion Literature".

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Loss of consciousness, depression, posttraumatic stress disorder, and suicide risk among deployed military personnel with mild traumatic brain injury

Research Type: Concussion Literature

Summary: In an outpatient TBI clinic on a US military base in Iraq, 135 SMs who had the diagnosis of mTBI received Suicidal Behaviors Questionnaire-Revised, Depression subscale of the Behavioral Health Measure-20, Posttraumatic Stress Disorder Checklist-Military Version, Insomnia Severity Index, self-report questionnaire, and clinical interview addressing TBI-related symptoms. Compared with a group that did not have mTBI, in patients with mTBI increased suicidality was significantly associated with depression and the interaction of depression with posttraumatic stress disorder symptoms. Longer duration of loss of consciousness was associated with



mTBI and Psychiatric Disorders in Vets

- “Individuals with TBI have been found to be at increased risk for the full range of suicidality including suicide ideation, suicide attempts, and death by suicide. One potential explanation for this increased risk is the higher rates of psychiatric illness associated with TBI, including **anxiety disorders, major depression, dysthymic disorder, substance abuse or dependence, and PTSD**, each of which serves as an independent risk factor for suicide.”
- *Bryan, CJ, Clemans, TA, Hernandez, AM and Rudd, MD. 2013. Loss of consciousness, depression, posttraumatic stress disorder, and suicide risk among deployed military personnel with mild traumatic brain injury. J Head Trauma Rehabil 28(1):13-20.*
- Average onset of psychiatric symptoms is 3-6 months post mTBI with a possible delay up to 54 months and are indistinguishable from actual psychiatric conditions.
- *Schwarzbold M, Diaz A, Martins ET, et al. Psychiatric disorders and traumatic brain injury. Neuropsychiatric Disease and Treatment. 2008;4(4):797-816.*



Signs and Symptoms

Short Term (0-9 Days)

- Lightheadedness
- Headaches
- Cognitive and Memory Dysfunction
- Difficulty Concentrating
- Personality Changes
- Sleep Disturbances
- Emotional Disturbances
- Seizures

Long Term Effects (Months-Years)

- Personality Change (abrupt, argumentative, stubborn, opinionated, or suspicious)
- Irritability, Anxiety, and Depression
- Intolerant of Noise, Emotional Excitement and Crowds
- Cognitive Decline
- Impaired Memory and Concentration
- Fatigue and Disruption of Sleep Patterns
- 15-20% of those injured develop symptoms meeting criteria for psychiatric disease (PTSD, anxiety, panic disorder, and depression).



Current Treatment

- Current treatment guidelines for mild traumatic brain injury (mTBI) center on limiting physical and cognitive activity while limiting exposure to symptom-aggravating stimuli until it is deemed that the patient has returned to normal function
- Pharmacotherapy for psychiatric and neuromuscular symptoms (Anti-epileptics, anti-depressants, anti-psychotics, pain medication)
- While this treatment is helping in some aspects is there an underlying pathology that is not being addressed?



Medical Treatment for Concussion

Drug	Condition Treated	Side Effect
Lamictal	Seizures	Insomnia, drowsiness, fatigue, dizziness, anxiety, pain, irritability, suicidal ideation, abnormal dreams, abnormality in thinking, agitation, amnesia, depression, emotional lability, hypoesthesia, migraine, confusion
Amitriptyline	Headaches, depression, fatigue, insomnia	Sedation, impaired memory, delirium, hallucinations, convulsions, coma, cardiotoxicity
Propranolol	Migraines,	Agitation, fatigue, dizziness
Sertraline	Antidepressant & PTSD	Insomnia, headache, dizziness, fatigue



Medical Treatment for Concussion

Drug	Condition	Side effect
Citalopram	Depression, anxiety, PTSD, panic and social anxiety	Drowsiness, insomnia
SSRI's	Depression, PTSD,	Insomnia, headache, dizziness, fatigue, SIADH
SNRI's	PTSD, Depression	Elevated blood pressure, stimulant, agitation, neuromuscular activity
Antipsychotics	Mood disorders, PTSD	Gynecomastia, dyskinesia, sedation, hypotension
Carbamazepine	Mood stabilizer	Agranulocytosis, diplopia, ataxia

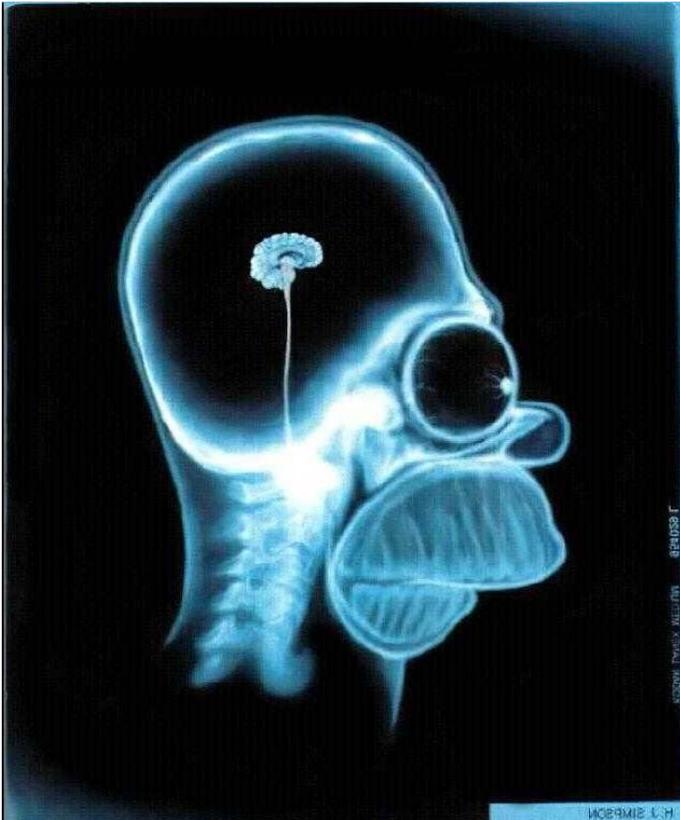


Neurovascular Coupling: The Root Cause

- To function, the brain must distribute and regulate blood flow to different regions for optimal performance – we call this Neurovascular Coupling (NVC).
- Concussions can alter the efficiency of NVC and limit cerebral function by changing neuron metabolism through hyper- or hypo-activation.
- Neurovascular Uncoupling (NVU), caused by trauma, alters distribution and regulation of blood flow that results in impaired neuronal metabolism.
- To restore η NVC, the brain must be retrained to optimize and allocate the appropriate blood flow to different cerebral areas.

Structural MRI vs. Functional NCI

Structural MRI reveals brain anatomy.

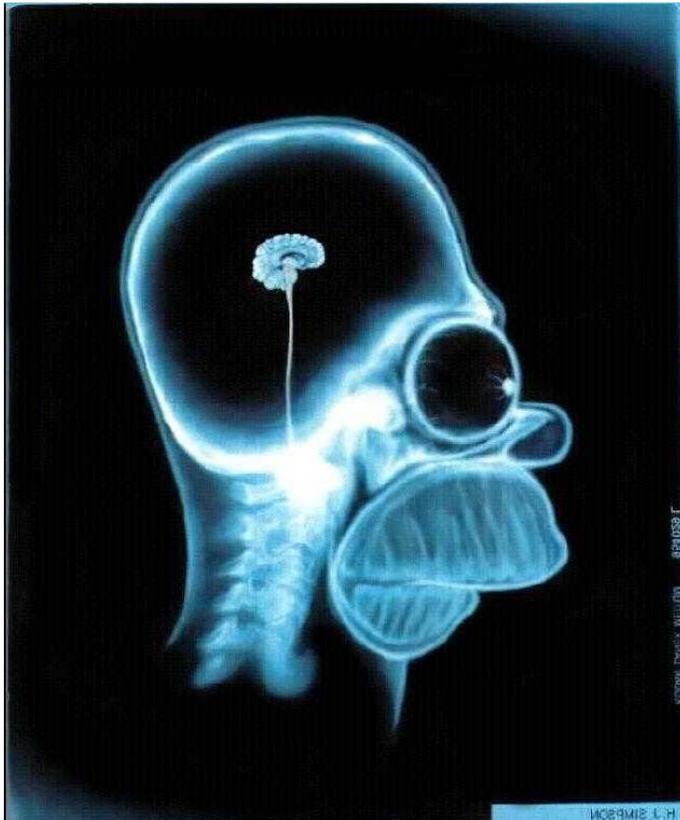


Functional NCI (fNCI) reveals brain function.

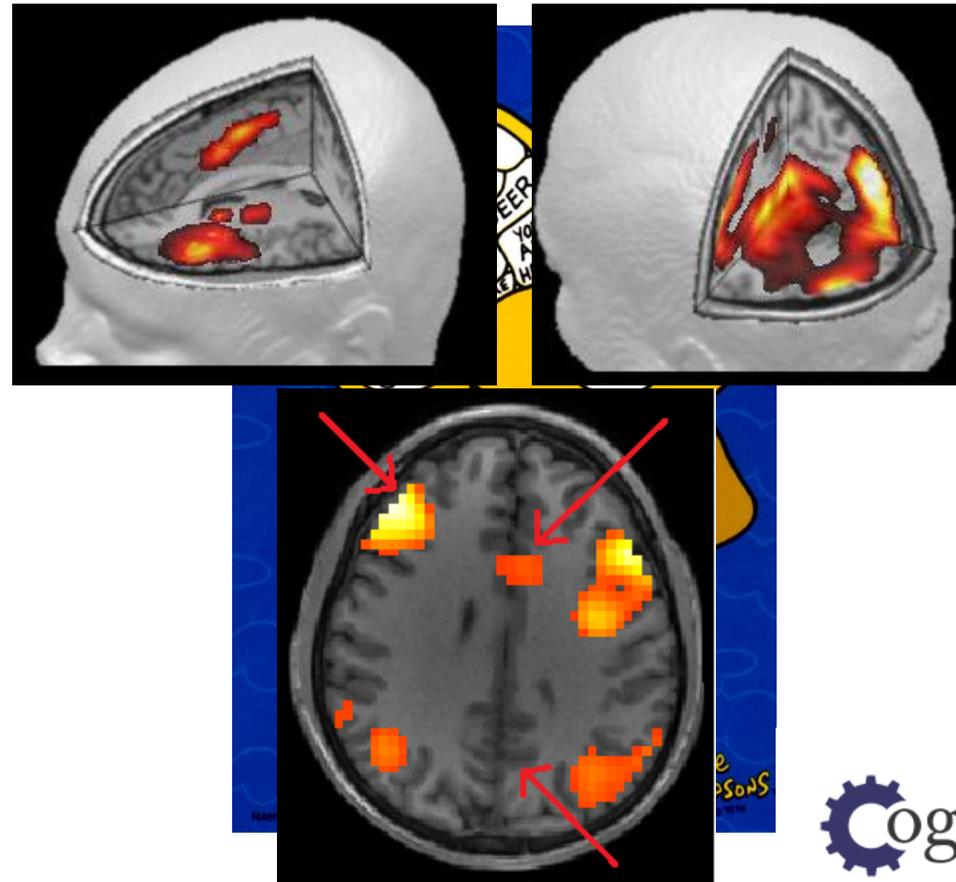


Structural MRI vs. Functional NCI

Structural MRI reveals brain anatomy.



Functional NCI (fNCI) reveals brain function.



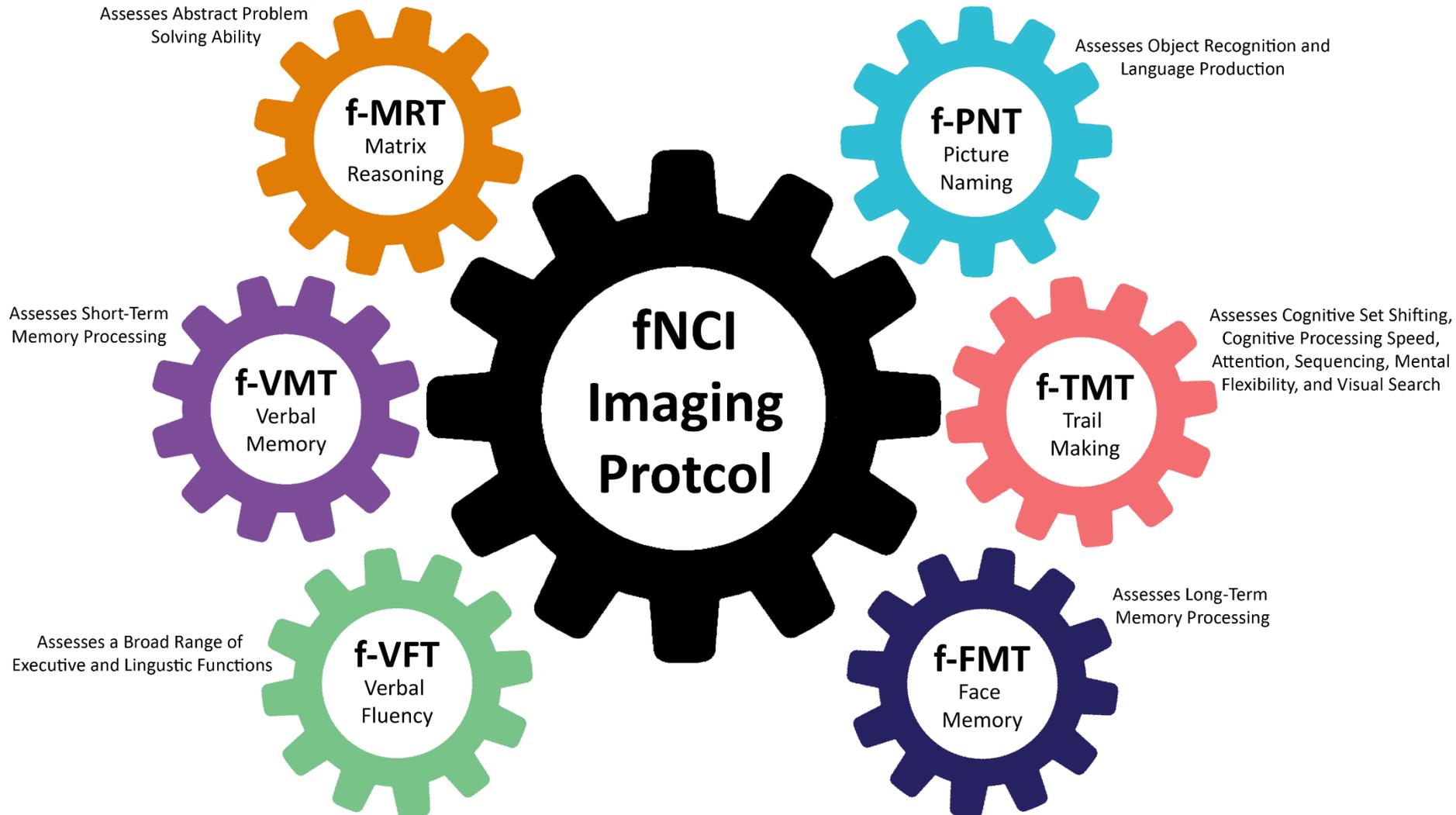


The CFX difference

CognitiveFX



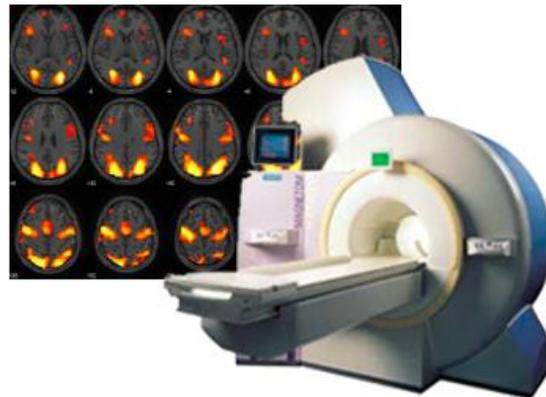
fNCI Assessment



fNCI Guides Treatment

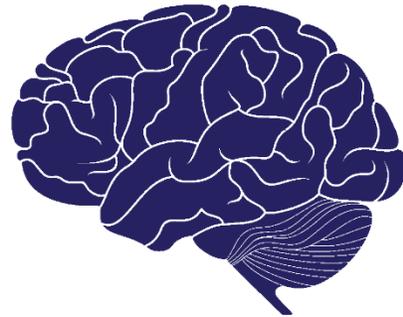
Symptoms alone do not reveal areas of damage

- fNCI measures current brain activity by detecting changes in blood flow.
- Visualizes NVU, even if there is no structural brain damage, as is typically the case for mTBI.
- Images are made by looking at blood flow changes (NVU) that occur during the performance of standardized tasks, and can be used to localize brain regions associated with task accomplishment.





Treatment Focus



EPIC Treatment Focuses on the Primary Cause - Concussion

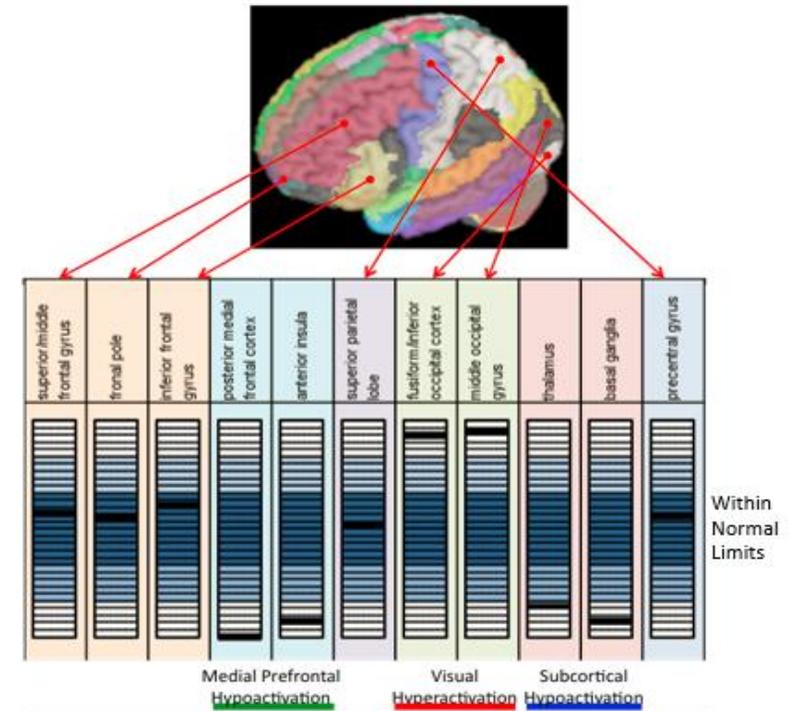
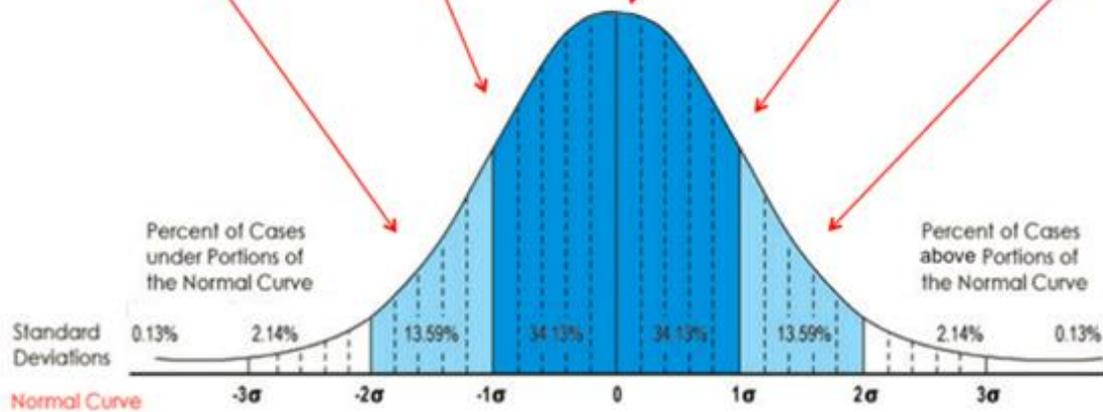
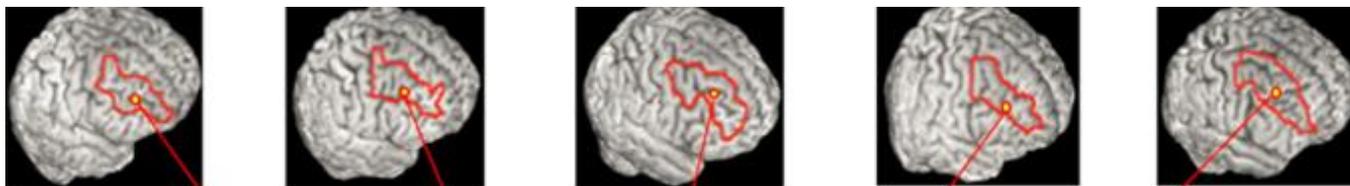
Thereby Reducing Secondary Symptoms

- > Sleep
- > Cognitive Impairment
- > Headaches & Chronic Pain
- > Anxiety
- > Depression

**EPIC Treatment Gives Individuals the
Ability to Regain Control & Rise to the Challenges of Life**

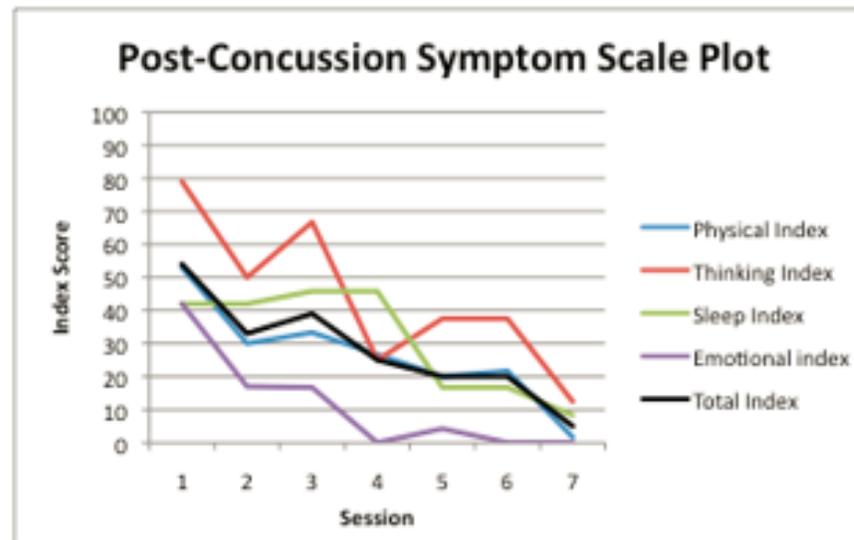
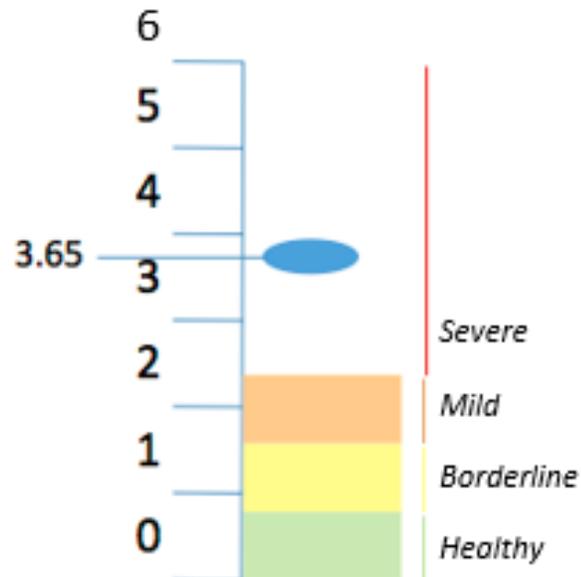
Analysis

- Collectively, healthy control data formed a normative atlas, or three-dimensional standard distribution of activation across all healthy control subjects. Patient brain activation is compared to this normative atlas to determine where brain function is impaired.



Measurements

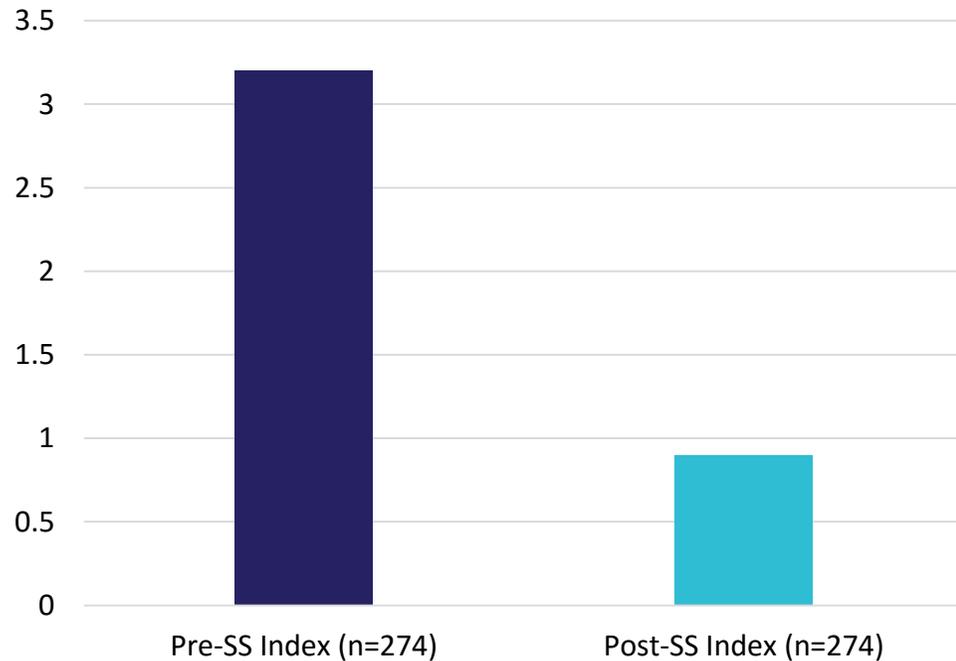
- Patient recovery is measured in two ways: Severity Index Scores and Post-Concussion Symptom Scale Scores
 - **Objective** - Severity Index Scores (SS) are calculated by brain activations recorded in fNCl.
 - **Subjective** - Post-Concussion Symptom Scale Scores (PCSS) are pain and symptom
- Self-reports completed by patients upon arrival and departure of the clinic each day of their treatment.



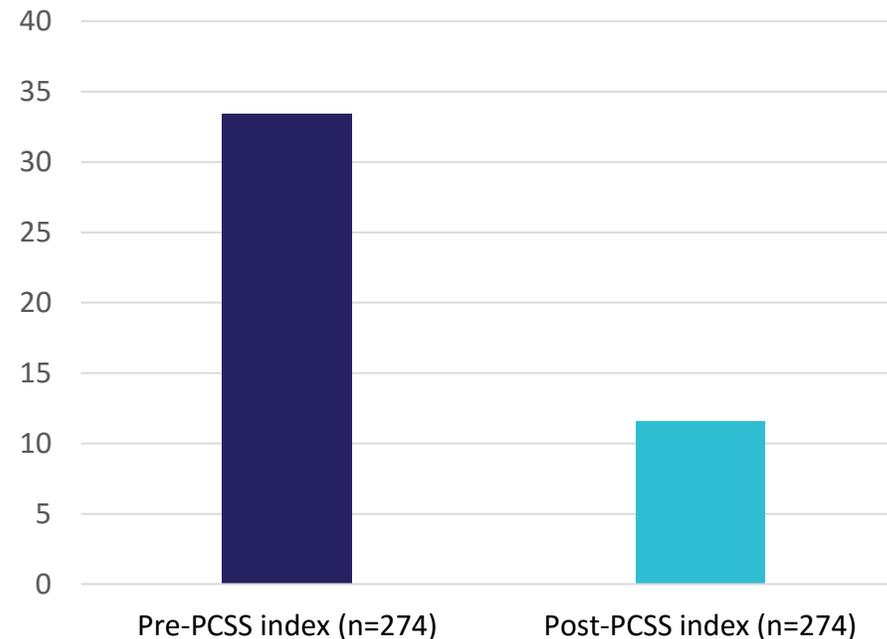
Outcomes

- Significant Severity Index Score Improvement in 97% of Patients
- Greater than 90% of patients report significant symptom improvement in the first few days of treatment.

Average Severity Score Improvement

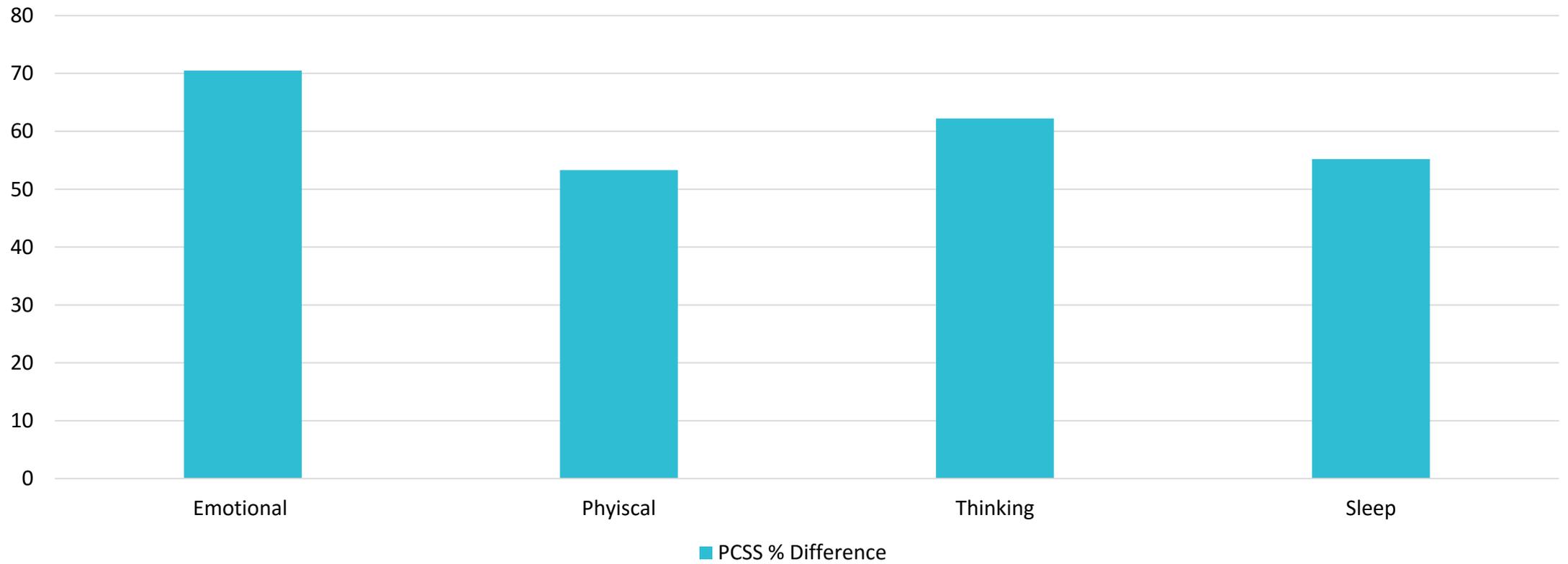


Average Concussion Symptom Improvement



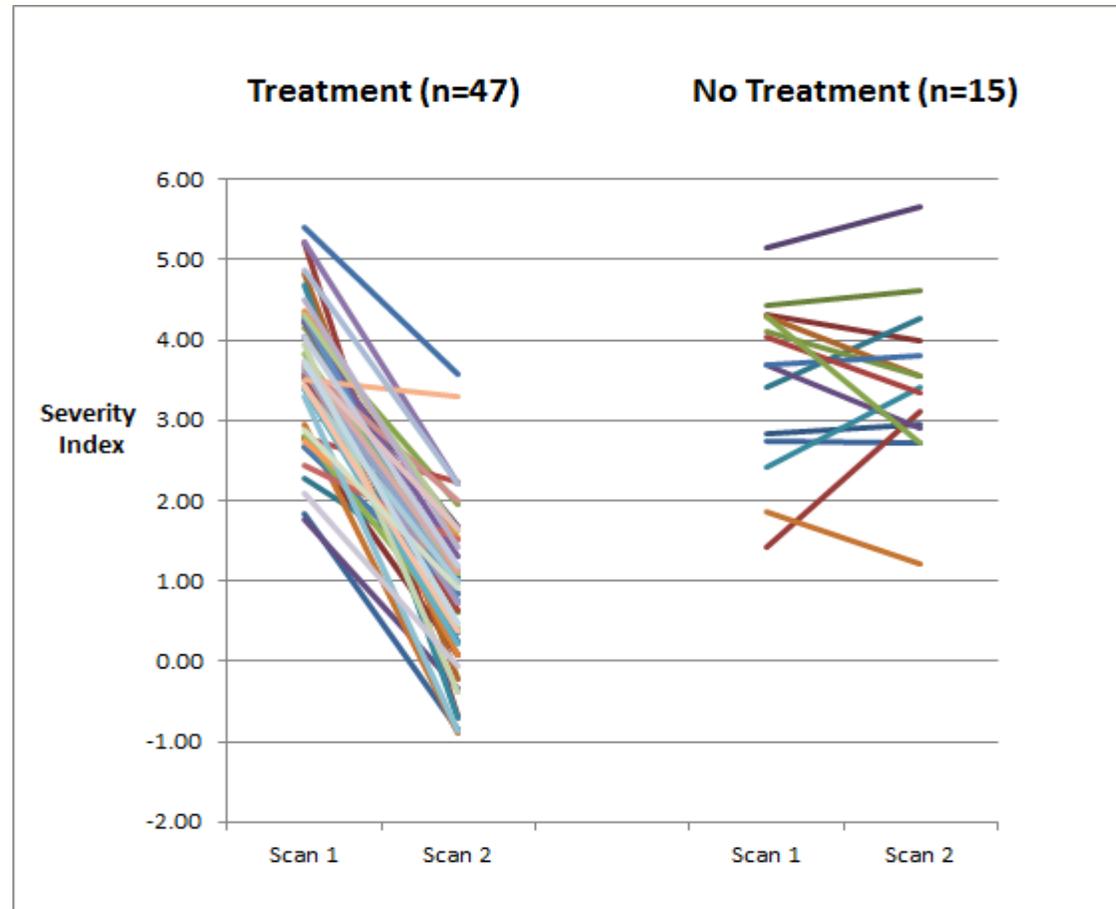


Percent Difference in PCSS (n=274)



The Difference

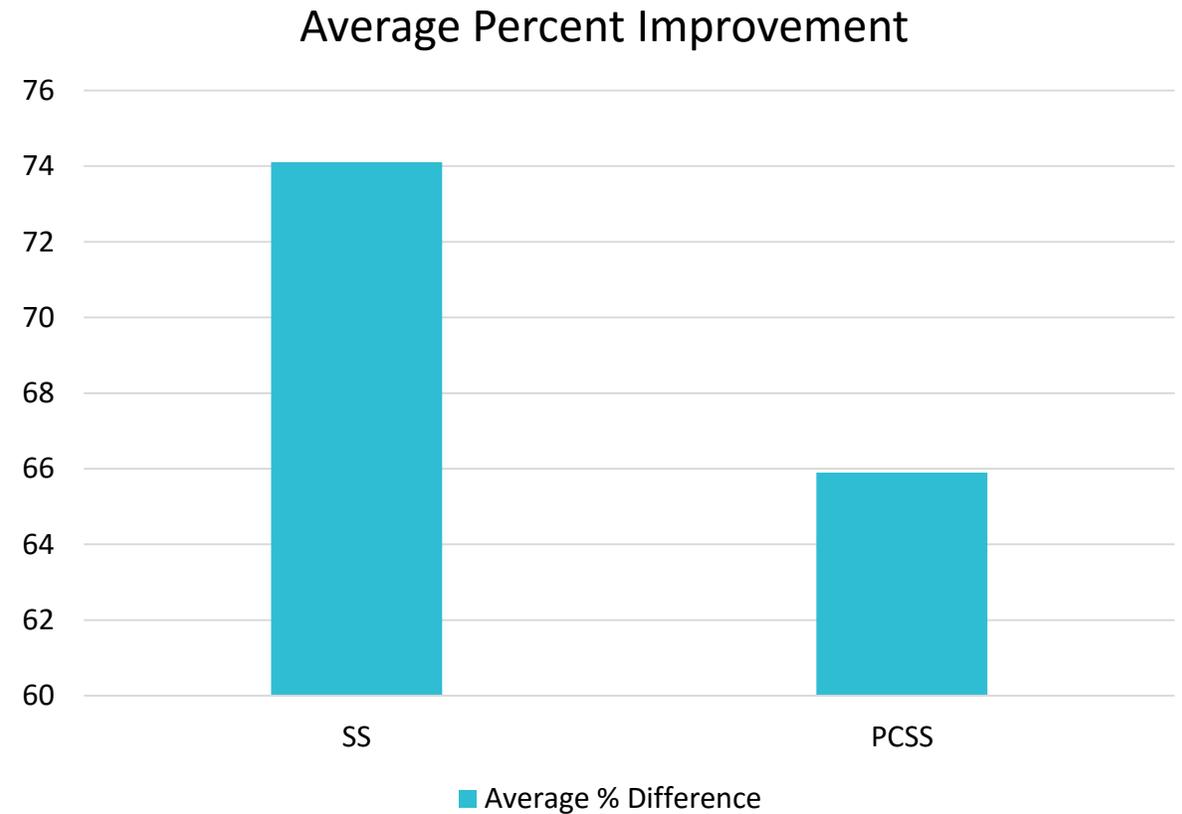
- EPIC Care Treatment has been proven to show improved results, whereas, for those who opt-out of treatment, the results are much less predictable.
- 38.1% of those who opt-out of treatment have been shown to worsen overtime, whereas, only 0.46% of those who undergo treatment worsen under their Severity Score Measurement.





Results

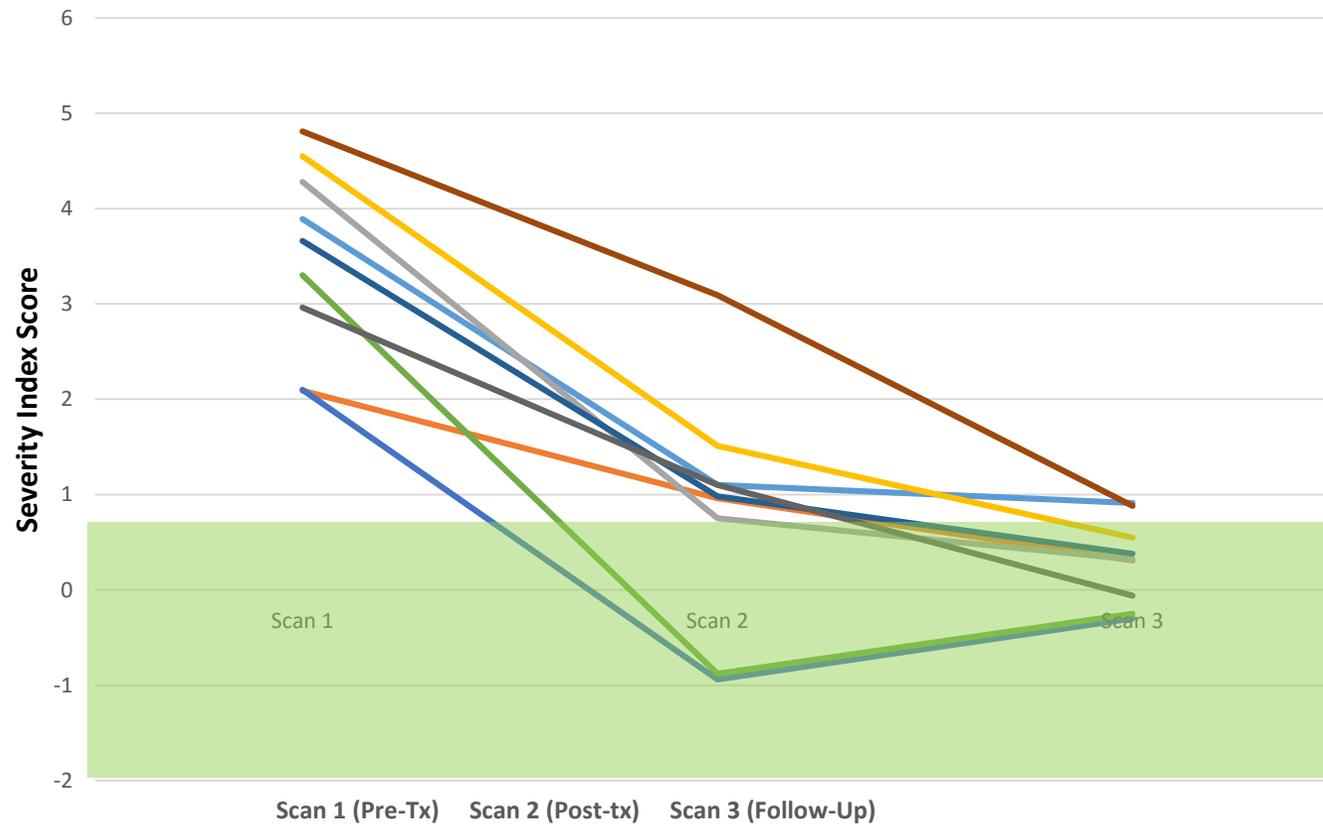
- Initial recovery gains report 75.3% improvement on Severity measurements and 67.2% improvement on Symptom measurements for patients within the first week. These individual progress measurements are reported as percent differences between Pre- and Post-Treatment scores.





Long Term Results – 9 -18 Months Post-Treatment

Longitudinal Post-Treatment Follow-Up



— Patient 1 — Patient 2 — Patient 3 — Patient 4 — Patient 5
— Patient 6 — Patient 7 — Patient 8 — Patient 9



Overall Benefits of fNCI and EPIC Treatment

- fNCI can detect injury and contour treatment.
- Targeted treatments accelerate recovery.
- Return to daily activity and service more quickly and with confidence.
- Active duty/veterans will feel less pressure to hide injury.
- Active duty/veterans can provide evidence of recovery.
- Patients will feel protected knowing their health and information is more in their control.
- CFX program gives active duty/veterans of any age the same opportunities for rehab and improvement.
- Patients can get baselines and track their own brain function over the course of their career and life.



BIAU Services Provided

- Resource Facilitation
 - An open-door approach is the guiding principle of our resource facilitation service. Calls, referrals, walk-ins - you will always be welcomed with compassion and empathy. We will help you navigate brain injury recovery by serving as a stepping stone to the people and places you need.
 - As Resource Facilitators, we provide community resources, a listening ear, and access to our TBI Fund to pay for neuropsychological evaluations for those who cannot afford them. This service is FREE!
 - Resource facilitation is a statewide service that provides individuals affected by brain injury with support transitioning back to their family life, work or school, and the community.





Contact



Brain Injury Alliance

U T A H

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**Brain Injury
Alliance**

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Questions