Optimizing Interdisciplinary Rehab for Individuals with Dual Injury SCI & ABI

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Objectives

- Appreciate the collective impact of biopsychosocial factors on a patient’s ability to move toward functional independence.
- Gain exposure to the various methods of assessing cognitive, emotional, and behavioral variables that often represent functional barriers during the process of acute rehabilitation.
- Understand the projected functional outcomes following comorbid spinal cord injury and acquired brain injury and the various factors influencing these outcomes.
- Familiarize yourself with the advantages of a collaborative rehabilitation approach to management of the dual diagnosis patient and the role of various team members with regard to implementation.

No Financial Relationships or Conflicts of Interest to Disclose

American Congress of Rehabilitation Medicine (ACRM) Definition of Traumatic Brain Injury

"Traumatic brain injury is defined as:

[A] an alteration in brain function,

[B] or other evidence of brain pathology,

[C] caused by an external force."

American Congress of Rehabilitation Medicine (ACRM) Definition of Traumatic Brain Injury

- *[A] Alteration in brain function*
- Any period of loss of, or a decreased level of consciousness
- Any loss of memory for events immediately before (retrograde amnesia) or after the injury (anterograde amnesia)
- Neurologic deficits (weakness, loss of balance, change in vision, dyspraxia, paresis/plegia [paralysis], sensory loss, aphasia, etc.)
- Any alteration in mental state at the time of the injury (confusion, disorientation, slowed thinking, etc.)

American Congress of Rehabilitation Medicine (ACRM) Definition of Traumatic Brain Injury

[B] or other evidence of brain pathology

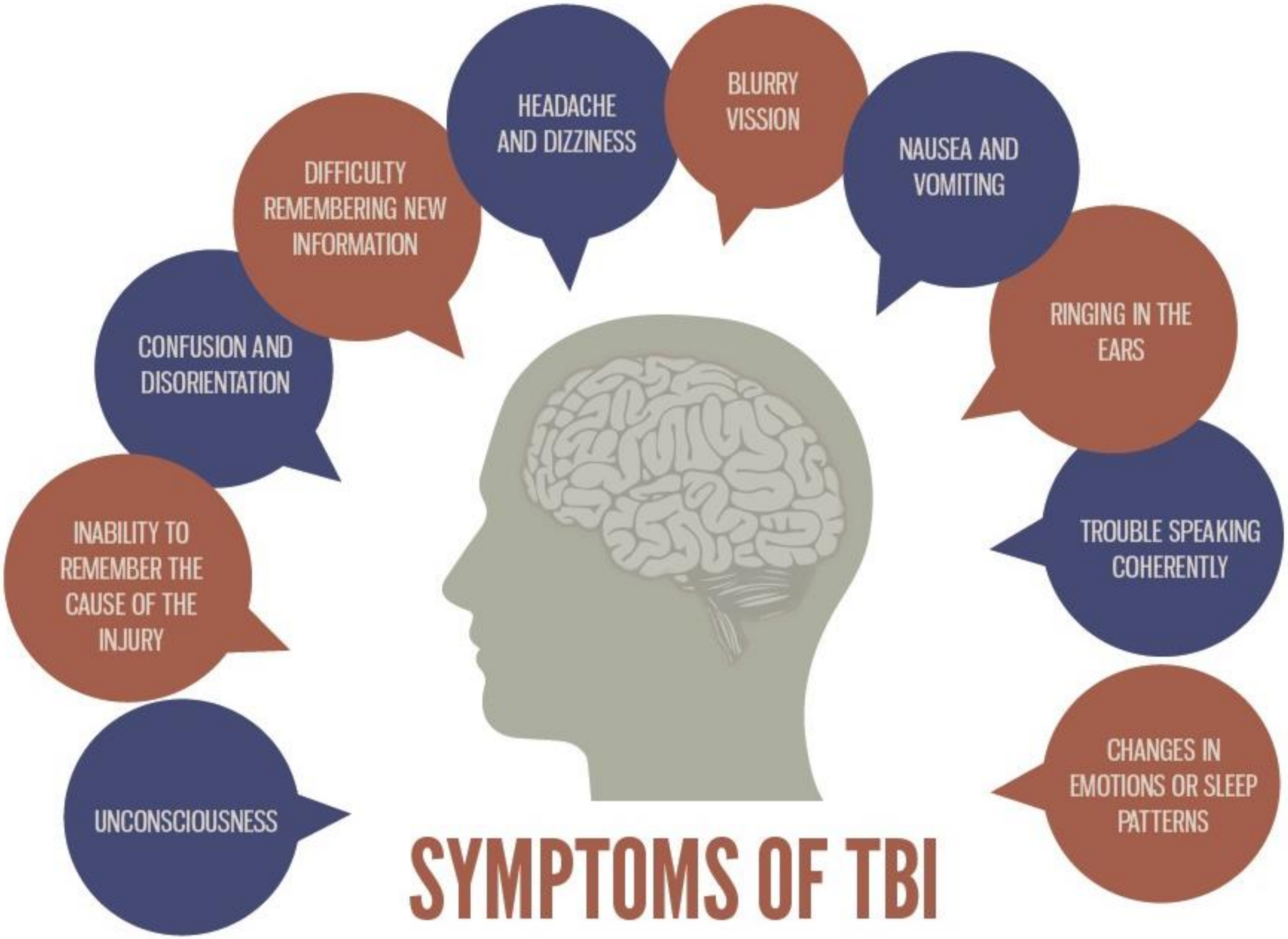
- Such evidence may include visual, neuroradiologic, or laboratory confirmation of damage to the brain.

American Congress of Rehabilitation Medicine (ACRM) Definition of Traumatic Brain Injury

[C] caused by an external force

- The head being struck by an object
- The head striking an object
- The brain undergoing an acceleration/deceleration movement without direct external trauma to the head
- A foreign body penetrating the brain
- Forces generated from events such as a blast or explosion
- Or other force yet to be defined

Early Symptoms of Traumatic Brain Injury



Effects of Traumatic Brain Injury

PHYSICAL

- Headaches
- Difficulty speaking
- Blurry eyesight
- Trouble hearing
- Loss of energy
- Change in sense of taste or smell
- Dizziness or trouble with balance

COGNITIVE

- Difficulty concentrating
- Trouble with attention
- Forgetfulness
- Difficulty making decisions
- Repeating things

BEHAVIORAL

- Becoming angry easily
- Getting frustrated easily
- Acting without thinking

Rates of Comorbid Traumatic Brain Injury in the Spinal Cord Injury Population

- Retrospective studies demonstrate TBI incidence ranges from 25% to 70%
- Macciocchi, et al., 2008 determined 60% incidence based on initial GCS score, duration of PTA and positive neuroimaging findings (n=118)
    - Mild = 34%
    - Complicated Mild = 10%
    - Moderate = 6%
    - Severe = 10%
- Cervical-level SCI associated with greater rates of TBI
- Cervical-level SCI was *not* associated with increased severity of TBI

How Do We Assess for the Presence of Traumatic Brain Injury?

- ✓ Plausible Mechanism of Injury
- ✓ Acute Signs of Closed Head Injury
- ✓ Symptoms of Traumatic Brain Injury
- ✓ Positive Neuropsych Findings
- ✓ Positive Neuroimaging Studies

Factors Complicating Accurate Diagnosis

- Variable classification criteria
- Medication effects (e.g. benzodiazepines, anti-spasmodics, opioids, beta-blockers, statins, anti-seizure)
- Pain
- Fatigue
- Psychiatric Comorbidity
- Recreational Substances (alcohol, cannabis, amphetamines)
- Hearing and Visual Impairments
- Language and Cultural Factors

Other Forms of Acquired Brain Injury

- Excludes genetic, congenital, perinatal, or neurodegenerative disease
- Stroke
- Neoplasms
- Infection
- Toxic/Metabolic
- Substance-Related
- Hypoxic-Ischemic

Dual Injury (SCIP) Team

- Spinal Cord Injury Plus (SCIP)
- Specialized expertise in evaluating and treating both SCI and TBI
- Close collaboration and consultation
- Weekly rounds
- Case plans
- Behavior plans
- Interdisciplinary co-treatments

Functional Mobility Prognosis

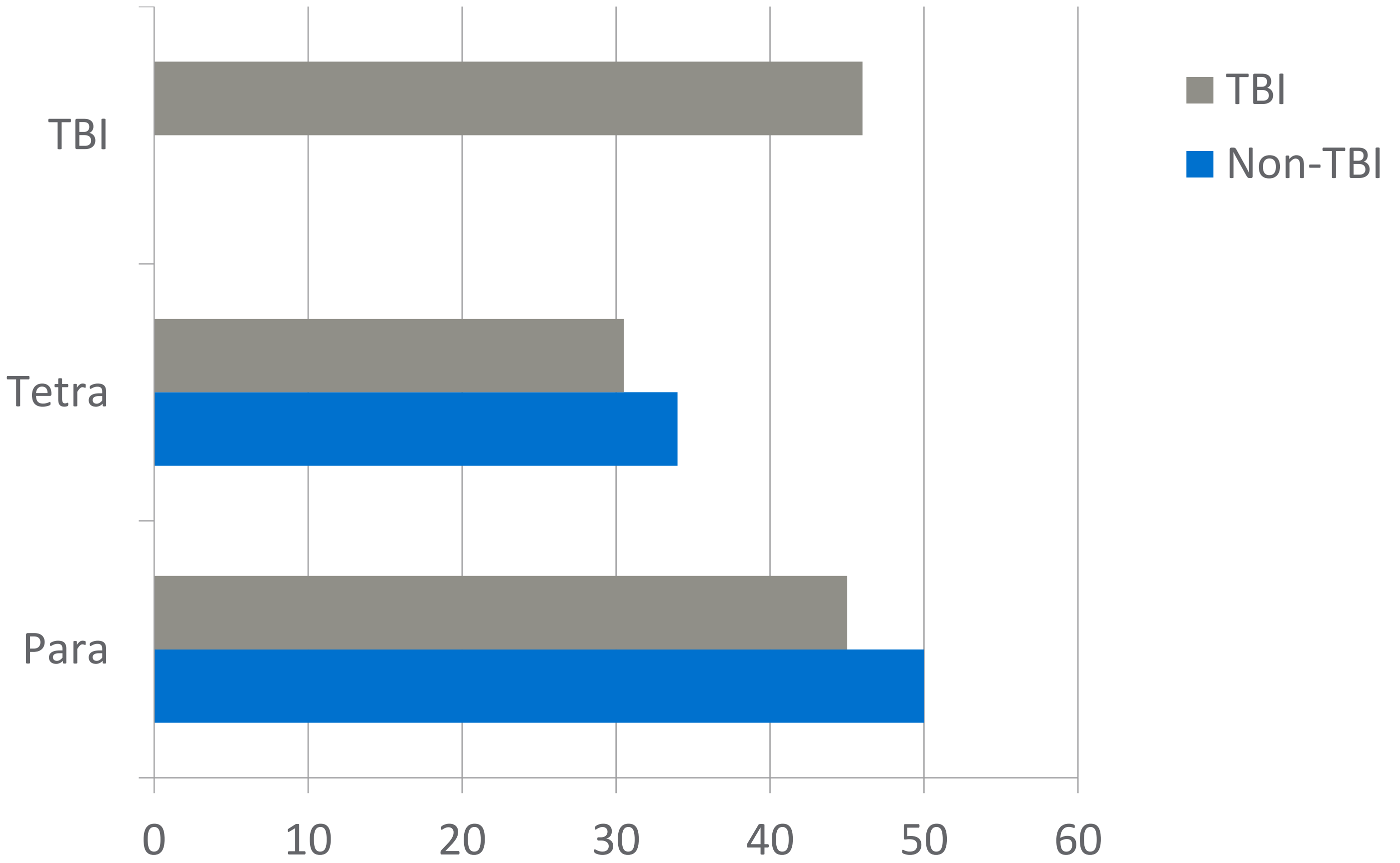
TABLE 2

Admission and discharge FIM™ scores of the spinal cord injury (SCI) only group and the SCI and traumatic brain injury (dual diagnosis [DDS]) group

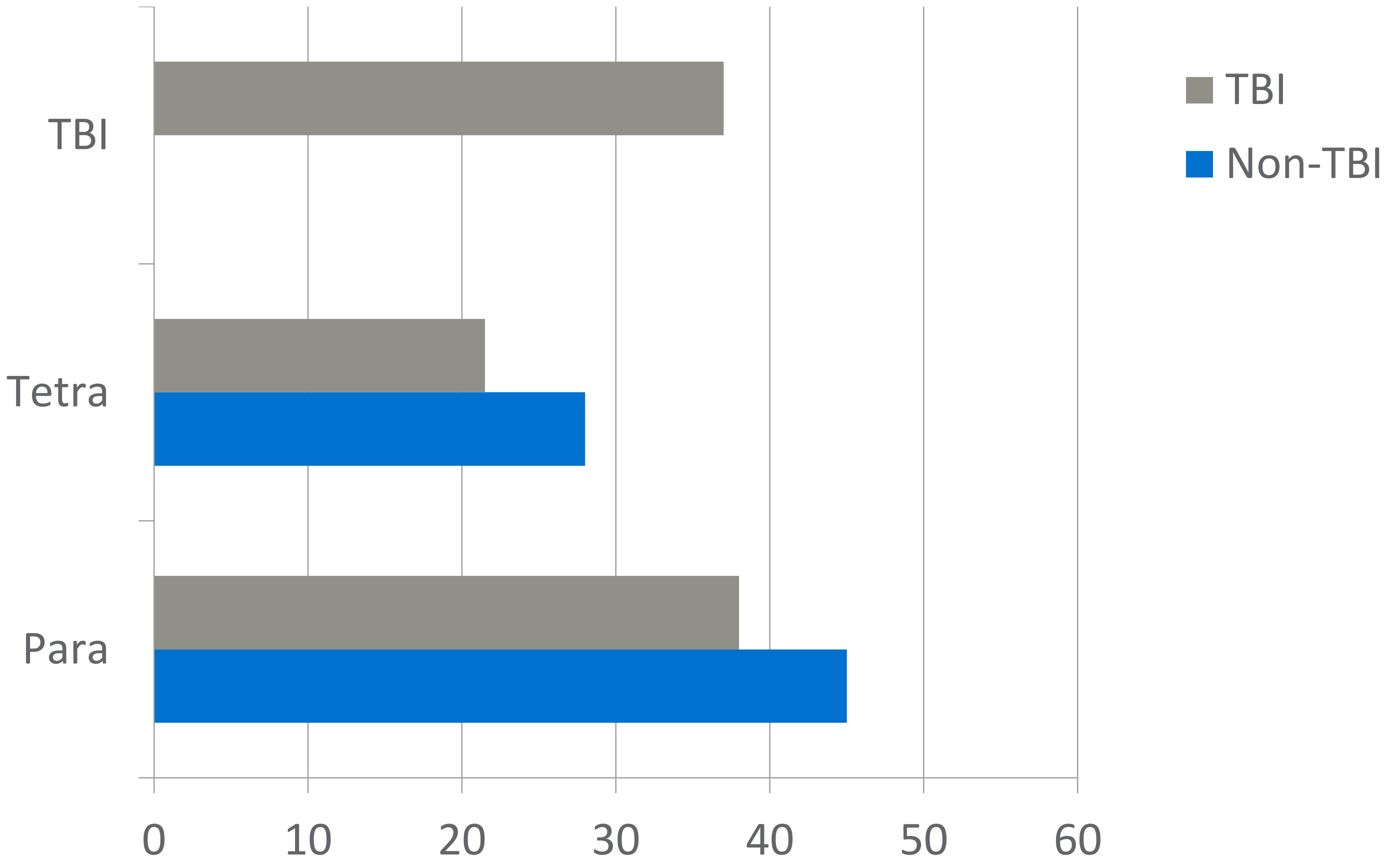
Variable	SCI, $n = 41$ Mean (SD)	DDS, $n = 41$ Mean (SD)	t ($df = 80$)
Admission Motor FIM score	23.2 (11.7)	25.1 (11.6)	0.65, $P < 0.51$
Discharge Motor FIM score	51.2 (22.8)	44.8 (23.3)	1.25, $P < 0.21$
Motor FIM change	28.0 (17.7)	19.9 (15.9)	2.17 $P < 0.03$
Admission Cognitive FIM score	28.6 (6.4)	24.3 (8.0)	2.68, $P < 0.009$
Discharge Cognitive FIM score	32.3 (4.3)	28.8 (8.2)	2.88, $P < 0.005$
Cognitive FIM change	3.6 (4.4)	4.4 (5.3)	−0.74, $P < 0.46$
Length of stay, days	43.0 (23.6)	43.6 (24.9)	1.09, $P < 0.91$
Rehabilitation charges, per $1,000	68.05 (34.2)	65.33 (36.3)	0.349, $P < 0.72$

Macciochi, et al., 2004

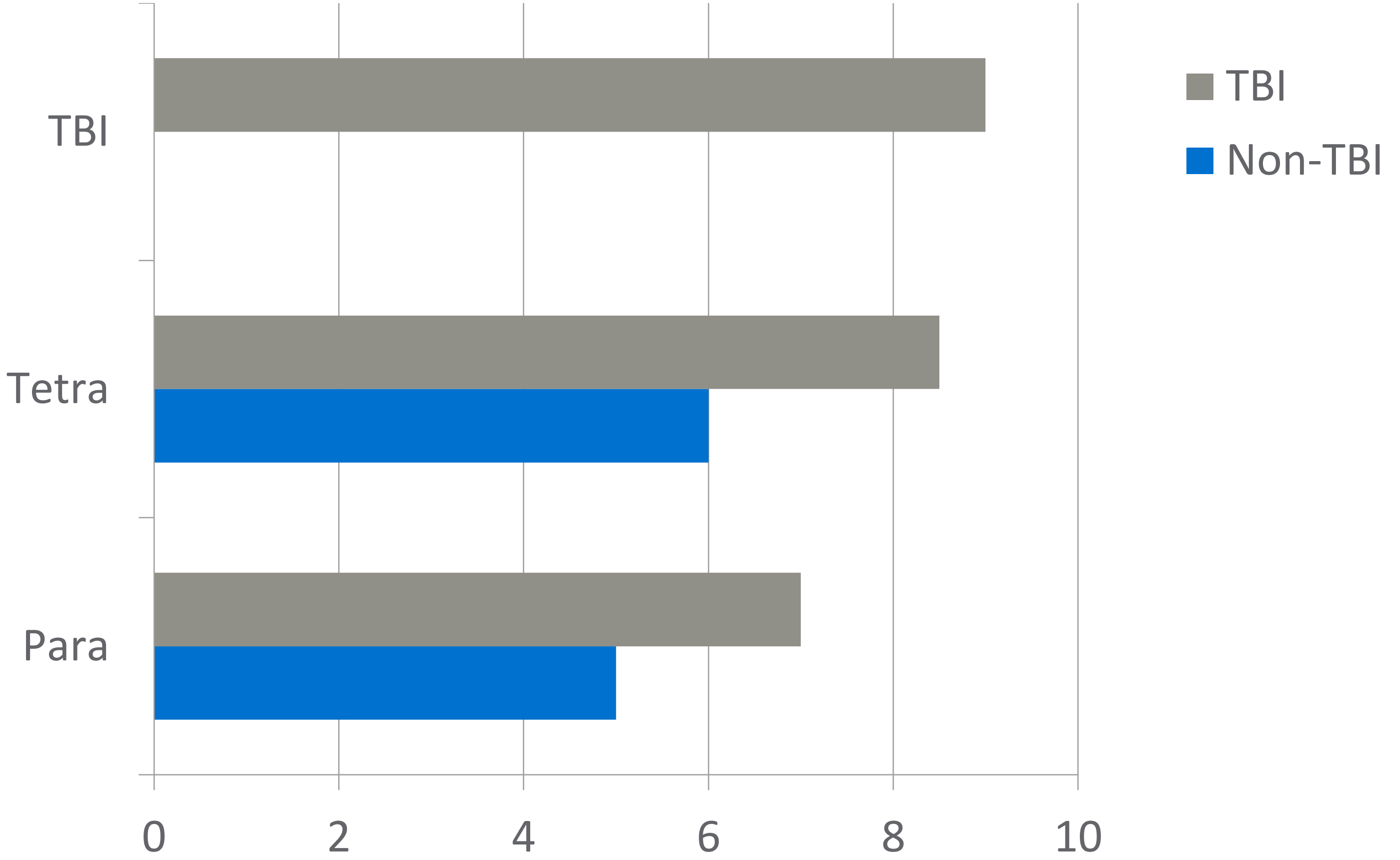
FIM Overall Change Based on Comorbidity



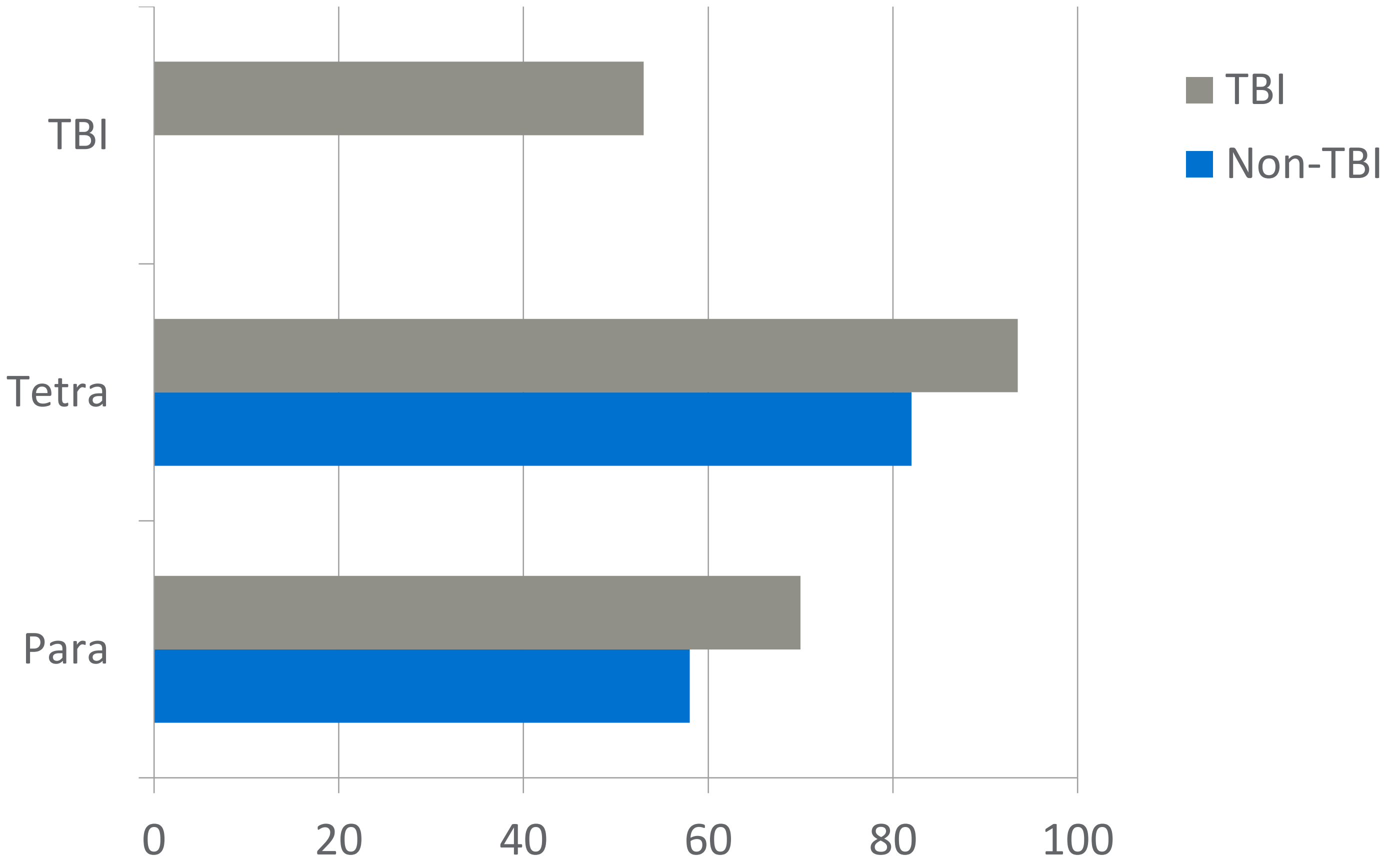
FIM Motor Change Based on Comorbidity



FIM Cognitive Change Based on Comorbidity



Length of Stay Based on Comorbidity



Functional Mobility Prognosis

More recently…

- Patients with paraplegia and severe TBI do not fair as well with those with a mild or moderate injury (Macciochi, et al., 2012)
  - Even with longer lengths of stay and insignificant FIM motor change scores admission to discharge
- At discharge, patients with dual injury and those with SCI alone have comparable FIM scores, TBI alone significantly better (Nott, et al., 2014)
- More specifically, there was no significant difference in FIM motor scores between those with dual injury and SCI (Nott et al., 2014)

Level of Independence

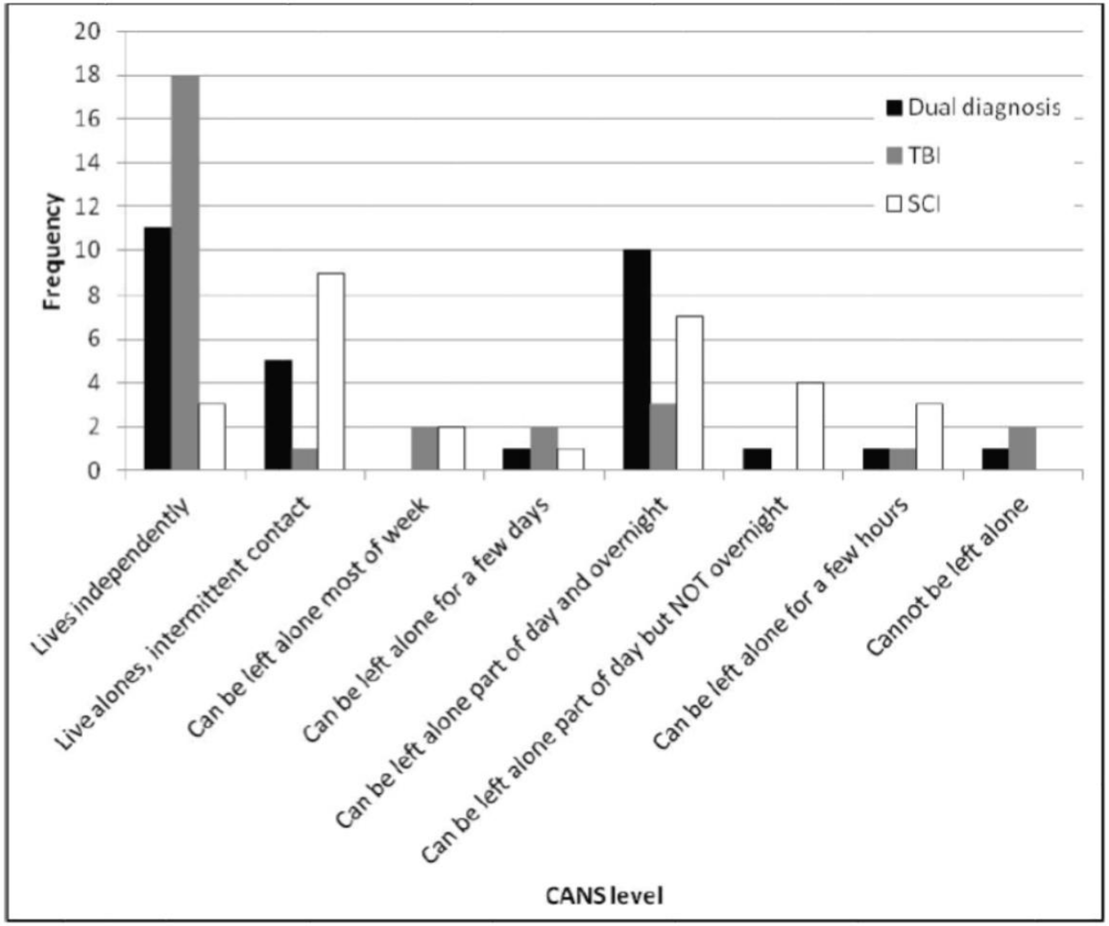


Figure 1. Comparison of Care and Needs Scale (CANS) scores between groups. SCI = spinal cord injury; TE = traumatic brain injury.

Nott et al., 2014

TBI Symptoms Affecting Physical Therapy Goals

- Information Processing
- Memory
- Motor Planning
- Initiation
- Psychological

Considerations When Assessing Functioning in Dual Injury

- Use of a motor-free battery
- Tailored and flexible based on neuroanatomy
- Brief screening battery (60 minutes)
- False positives due to shared physiological or neurological symptoms with known (or unknown) medical conditions
- Accommodations for language, vision and hearing impairments
- Premorbid personality functioning
- Psychosocial and financial stressors
- Coordination with other disciplines to prevent intrusions and redundancy

Neuropsychological Screening Protocol for Dual Injury (Non-Motor Based)

NAB:
Digits Forward (Auditory Attention)
Digits Backward (Auditory Working Memory)
Auditory Comprehension (Auditory Comprehension)
Naming (Language)
Shape Learning (Immediate & Delayed Visual Memory)
Story Learning (Immediate & Delayed Auditory Memory)
Visual Discrimination (Visuospatial Acuity)
Word Generation (Verbal Fluency)
Categories (Abstract Reasoning)

OTMT:
Part A (Speed of Processing)
Part B (Set-Shifting)

BSI- 18:
Somatization Index (Bodily Preoccupation)
Depression Index (Clinical Depression)
Anxiety Index (Clinical Anxiety)
General Severity Index (Overall Psychological Symptom Severity)

Impact on Essential Functional Mobility Tasks

Transfers

Patients with paraplegia and severe TBI struggle greater with toileting, dressing, and transfers when compared to those with less severe TBIs (Macciochi, et al., 2012)

What gets in the way?

- Coordination
- Motor planning
- Other impairments that you are used to treating in the SCI population, but have a cortical or subcortical origin

Clearly the same holds true for bed mobility, ambulation, etc.

John: T3 AIS A Paraplegia, Severe Traumatic Brain Injury

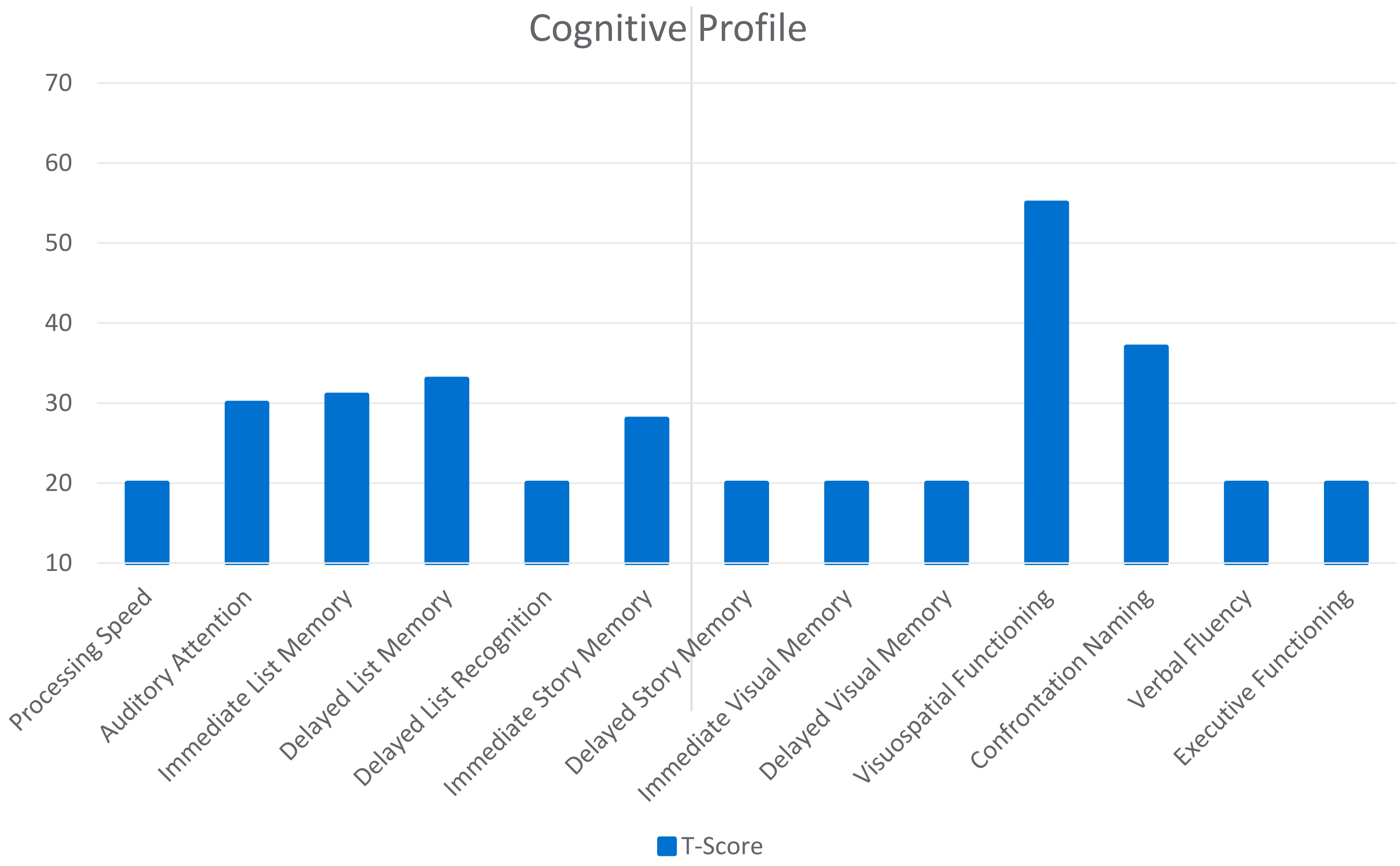
Information Processing Deficits and Sequelae

Processing speed and capacity are impacted by diffuse damage to the myelinated axonal connections (white matter tracts) of the brain.

Tasks demanding simultaneous attention to multiple factors and/or quick reaction time will be most affected due to:

- Cognitive fatigue
- Inconsistent performance
- Inefficiency
- Sensitivity to environmental stimuli
- Distractibility

John: T3 AIS A Paraplegia, Severe Traumatic Brain Injury



Initiation Deficits and Sequelae

Often the result of Disorders of Diminished Motivation (DDM). DDMs result from trauma to the frontal and basal-ganglia regions of the brain or more diffuse disruptions of the mesolimbic and mesocortical dopamine systems. These occur along a continuum from ranging from less to more severe (apathy ➡ aboulia ➡ akinetic mutism).

Tasks will be slowed and effortful and those demanding rapid start-ups and stops will often be most affected:

- Difficulty in starting and sustaining purposeful movements
- Decreased spontaneous movement without cueing
- Reduced spontaneous speech
- Increased response-time to queries
- Passivity
- Reduced emotional responsiveness

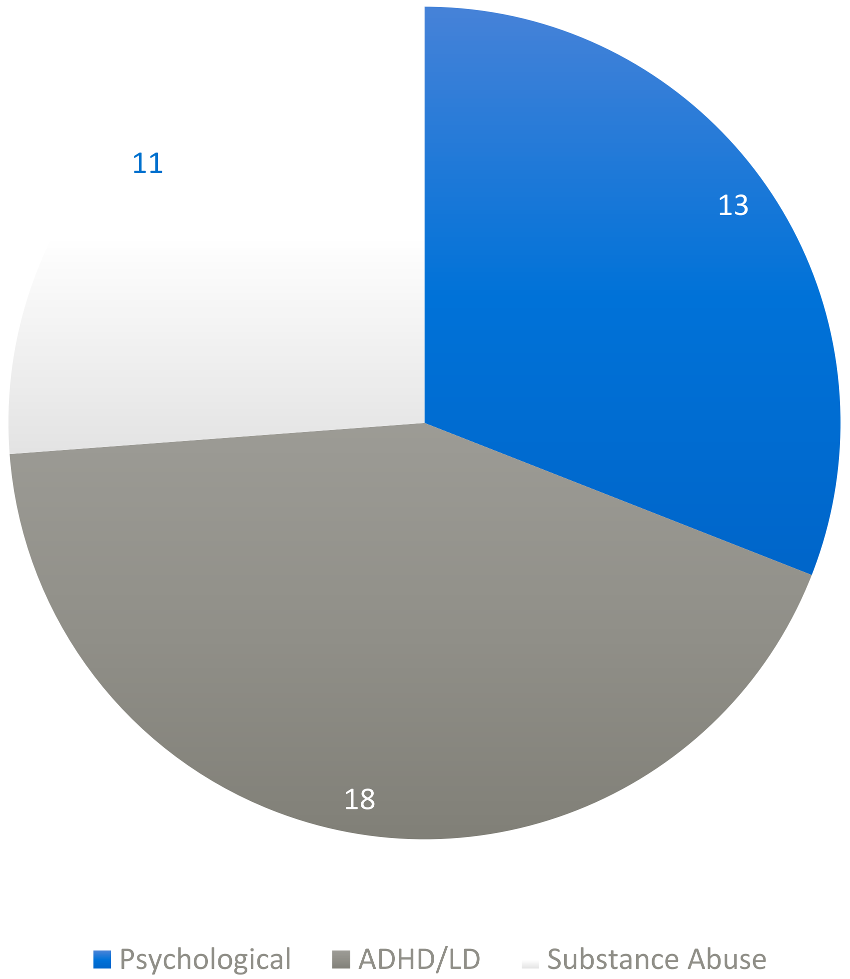
Psychological Deficits and Sequelae

Psychological symptoms predate or arise following TBI. The most common are anxiety, depression, impaired impulse control, aggression, lability and maladaptive coping.

Tasks will be affected in many different ways depending on the presenting symptom:

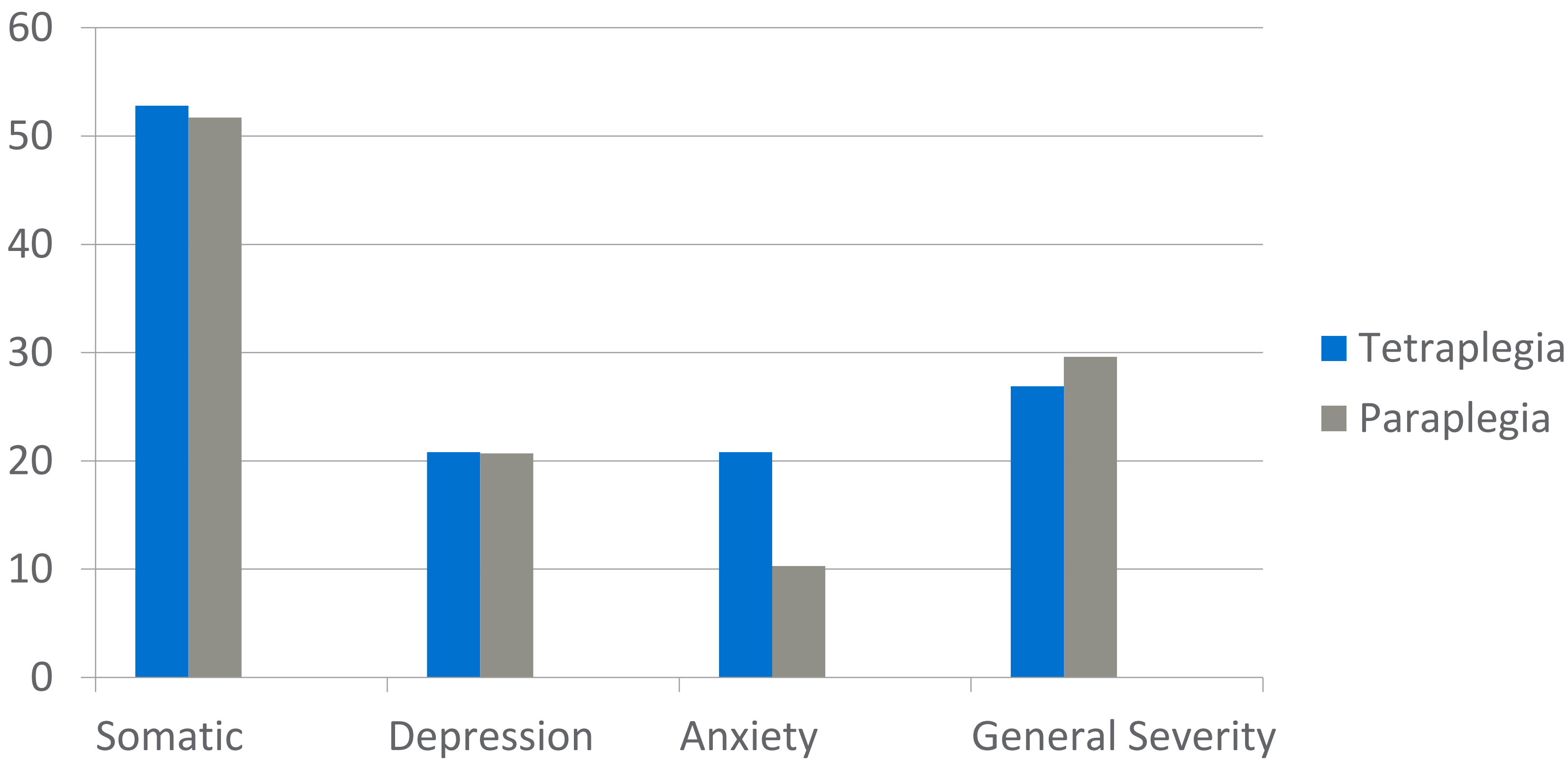
- Difficulty in engaging or participating due to psychogenic apathy
- Fearful responses to modalities or transfers
- Impulsive behavior creating risk for falls or other safety concerns
- Personality clashes with specific staff or “splitting” behavior
- Labile or expansive affect that is difficult to “reign in”
- Combative or abusive physical or verbal behavior

Percentage of Psychological Comorbidity at Craig



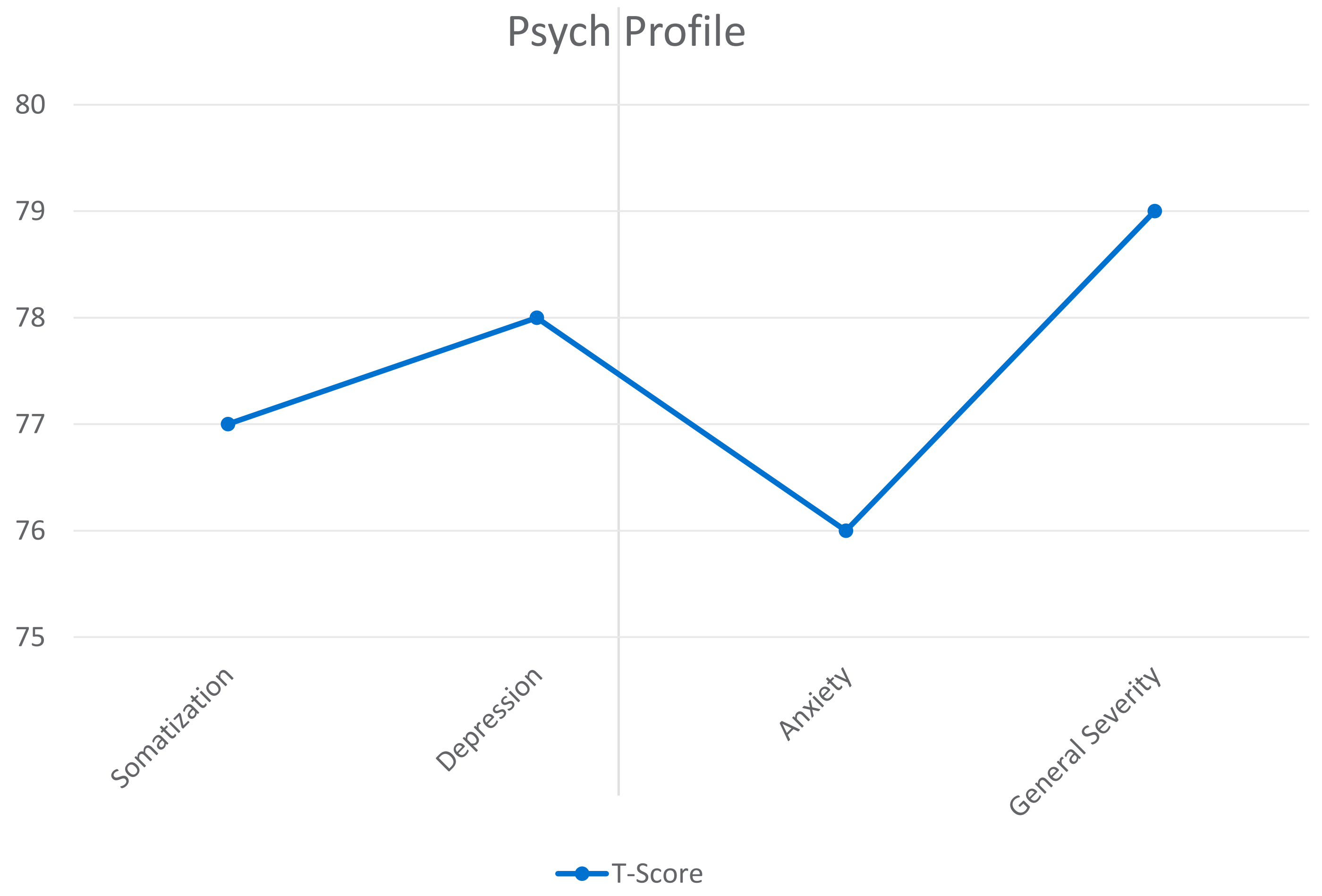
Gerber & Newman (2011)

Percent Clinically Elevated by SCI Level (BSI-18)



Gerber & Newman (2011)

John: T3 AIS A Paraplegia, Severe Traumatic Brain Injury



Memory Deficits and Sequelae

Impaired memory (verbal or visual) is caused by damage to fronto-temporal regions with deficits in retrieval caused by damage to the frontal lobe and deficits in encoding (new learning) caused by damage or disruption to the medial temporal lobe (hippocampus)

Tasks demanding use of prospective memory (remembering to perform a planned action or recall a planned intention) will be most affected due to:

- Lack of adequate encoding of new information
- Incomplete retrieval of previously presented information
- Intrusion errors tainted by competing stimuli

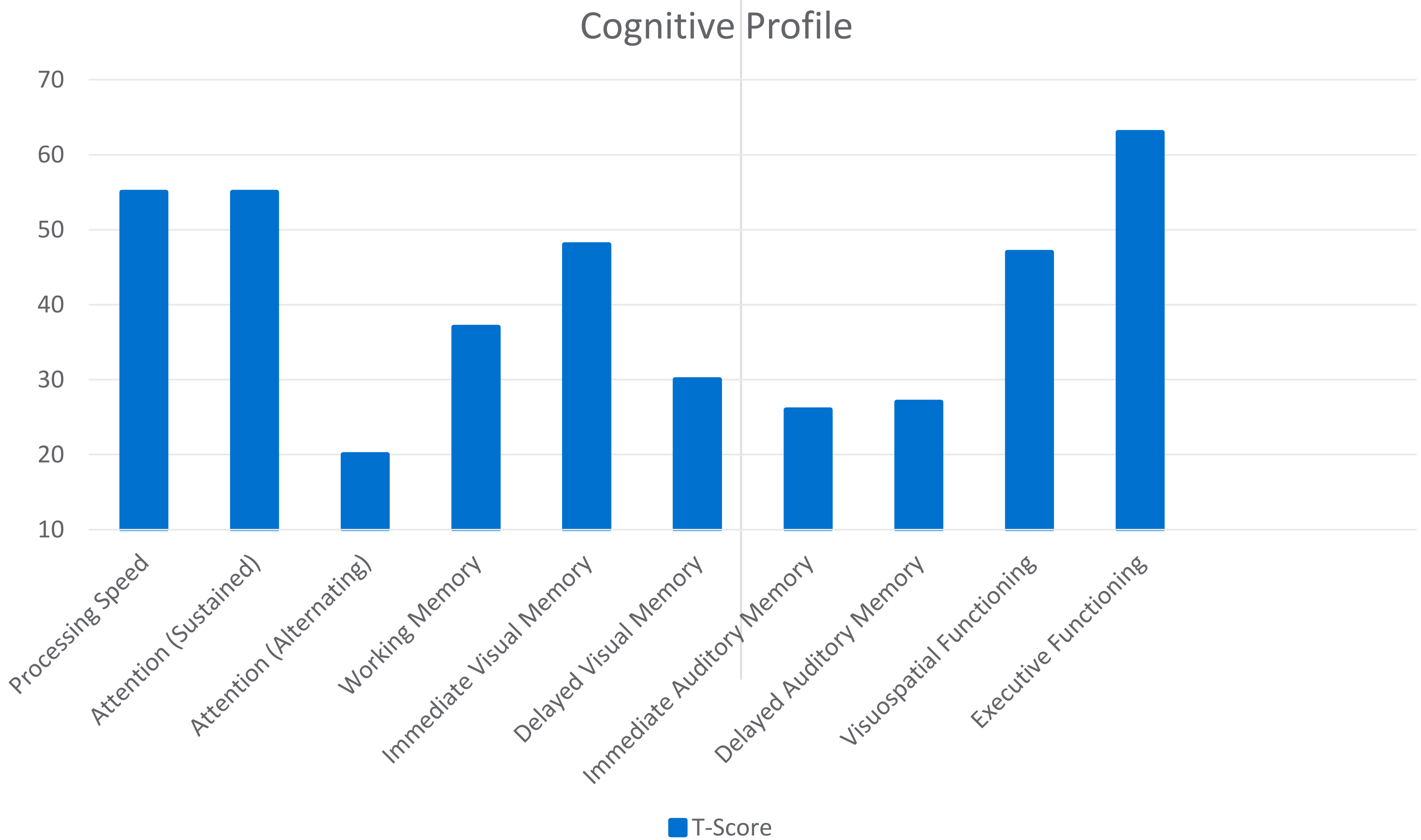
Motor Planning Deficits and Sequelae

Impaired motor planning (ideomotor apraxia) is often caused by damage to the fronto-parietal cortex in the dominant hemisphere of the brain or subcortical motor structures (i.e. basal ganglia).

Tasks demanding frequent shifting of set and sequencing are often most affected due to:

- Tendencies to get "stuck" in a loop
- Sequencing disruption
- Difficulty producing alternating movements

Albert: C5 AIS C Tetraplegia/Hypoxic-Ischemic Brain Injury



Interdisciplinary Approaches

Speech Therapy:

- Motor Learning Principles
  - Feedback Strategies (Errorless vs. Errorful Learning)
  - Improving explicit learning for retention of SCI education
  - Writing out transfer sequence

Interdisciplinary Approaches

Psychology:

- Values mapping
- Treatment ”buy-in”
- Family systems
- Psychopharmacology
- Psychotherapy
- Behavioral Modification
- Bereavement Counseling

Patient Engagement

ACE:

Acceptance

Collaborative

Evocative

Miller and Rollnick (2012)

Patient Engagement

OARS:

Open-ended questions

Affirm

Reflect

Summarize

Miller and Rollnick (2012)

CHANGE TALK!

- “engaging in helpful health behaviors”
- “working to be healthy”
- Invite your patients to make the arguments for change

Miller and Rollnick (2012)

Thank You!

- The Staff of Craig Hospital
- Meghan Joyce, PT, DPT, NCS
- Laura Wehrli, PT, DPT, NCS
- Don Gerber, M.Ed., Psy.D., ABPP
- Jody Newman, MA, CCC-SLP
- Our Patients and Families

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