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Physical Rehabilitation following Traumatic Brain Injury (TBI)

Jill Seale, PT, PhD, NCS

Objectives

- Describe at least three common clinical presentations across the TBI spectrum from concussion/mild to severe TBI.
- Identify the roles of Occupational and Physical Therapy in the rehabilitation of persons with traumatic brain injury.
- Outline at least three evidence-based rehabilitation interventions for the most common impairments and activity/participation limitations across the continuum of TBI rehabilitation.
- Differentiate the levels of care and appropriate referral across the continuum of care for persons with acute TBI.

4

Mechanisms of Injury

- Direct Impact
- Severe acceleration/deceleration
- Blast injury
- Penetrating object

5

Primary v Secondary Damage

- Primary
  - Contusions
  - Hematomas
  - Diffuse axonal injuries
  - Penetrating injuries
  - Blast injuries
- Secondary
  - Increased intracranial pressure (ICP)
  - Hypoxia or ischemia
  - Seizures
  - Intracranial hemorrhage (ICH)
  - Electrolyte and acid-base imbalance

Neurological Rehabilitation, 2013

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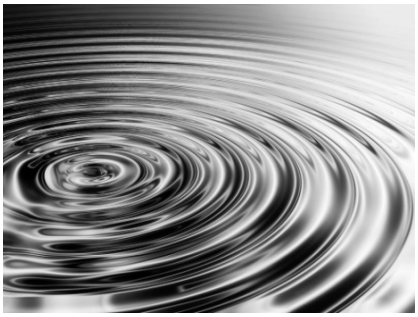
TBI as a Chronic Condition

- Chronic disease issues possible after TBI
  - Seizures
  - Endocrine issues
  - Sleep disorders
  - Incontinence
- Post TBI Syndrome
  - Set up symptoms persons may experience long term or up to a lifetime after TBI

The Effects of TBI

- Neuromuscular/somatosensory
- Autonomic dysfunction
- Cognitive
- Psychological
- Behavioral
- Communication
- Visual/Perceptual
- Dysphagia
- Vision/Vestibular
- Cardiovascular



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Neuromuscular/Somatosensory

- Paralysis/paresis
- Altered muscle tone and/or abnormal reflexes
- Poor coordination/ataxia
- Cranial nerve dysfunction
- Impaired balance
- Poor selective motor control
- Bowel and bladder dysfunction
- Dysphagia
- Loss of sensory function or hypersensitivity

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Autonomic Dysfunction

- Temperature elevations/Excessive sweating
- Hypertension
- Tachycardia/Tachypnea
- Pupillary dilation
- Extensor posturing
- Paroxysmal Autonomic Instability with Dystonia (PAID) and Paroxysmal Sympathetic Hyperactivity
- Management of symptoms pharmacologically
  - Meyer KS. *Surg Neurol Int*. 2014

10

Application to OT/PT

- Monitor patients response to PT intervention
- Temperature regulation
- Vigilant monitoring of vitals
- Identification/avoidance of triggers
- Maintain patient's safety

11

Neuropsych

- Memory impairment
  - PTA
  - Short term memory
- Emotional changes
  - Behavior ranging from obtundity to hyperactivity
- Communication
  - Aphasias
  - Dysarthria
- Cognitive impairment
  - Attention/concentration deficits
  - Executive function loss
  - Loss of reasoning and/or abstract thinking
  - Poor problem solving

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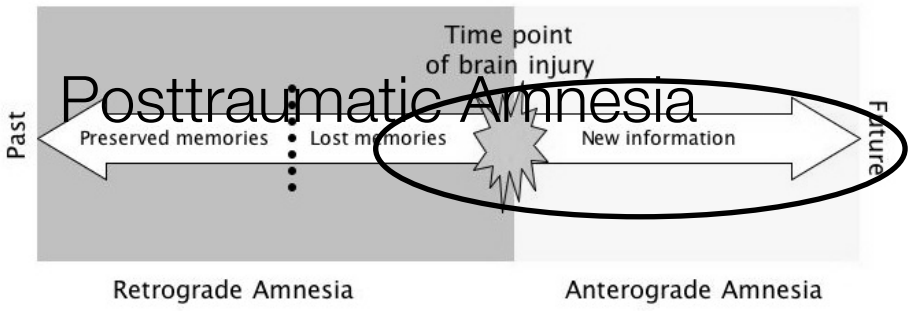

Posttraumatic Amnesia

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Application to OT/PT

- Learning/re-learning with memory deficit
  - Capitalizing on implicit memory/learning
  - Task specific and contextual
- Managing emotional/behavior issues
  - Flexibility and options in interventions
- Managing communication deficits
  - Consistency
  - Keep it simple

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Application to OT/PT

- Managing cognitive deficits
  - Altering environment
  - Encouraging self-reflection/self-management
  - Use of motor learning strategies

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Motor Learning Strategies

- Practice
- Feedback
- Autonomy
- Enhanced Expectancies
- External focus of attention

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Visual, Perceptual, Vestibular

- Cranial nerve impairment that affects vision
- Visual field changes
- Visuospatial abnormalities
- Vestibular: peripheral or central
- Vestibulo-ocular: dizziness, vertigo, blurred/unstable vision, nausea, difficulty with busy environments
- Agnosia
- Apraxia

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Applications to OT/PT

- Huge impact of ADL and mobility activities
- Need accurate differential diagnosis between visual, perceptual, and vestibular dysfunctions
  - May need compensation
- Vestibular dysfunction is common and often overlooked
  - Diagnosis of TBI warrants at least vestibular screening
  - Make sure history includes questions about dizziness, disequilibrium, etc…

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Cardiovascular

- Severe deconditioning
- VO2 Peak significantly decreased in all neuro dx
- NO RESERVE
- Most with neuro dx don't have the VO2 peak to meet demands for daily living of older adult
- Growth hormone insufficiency

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ORIGINAL ARTICLE

Aerobic Capacity After Traumatic Brain Injury: Comparison With a Nondisabled Cohort

Kurt A. Mossberg, PhD, PT, Danielle Ayala, MPT, Tracey Baker, MPT, Justin Heard, MPT, Brent Masel, MD

ABSTRACT. Mossberg KA, Ayala D, Baker T, Heard J, Masel B. Aerobic capacity after traumatic brain injury: comparison with a nondisabled cohort. Arch Phys Med Rehabil 2007;88:315-20.

Objective: To compare aerobic capacity of people recovering from traumatic brain injury (TBI) with an age- and sex-matched group of nondisabled sedentary people.

Design: Descriptive comparative study of peak and submaximal physiologic responses.

Setting: Residential postacute treatment center.

Participants: Convenience sample of 13 people with TBI and 13 age- and sex-matched nondisabled subjects. All subjects could walk 5.3kph (3.3mph), follow 2-step commands, and comply with testing using the gas collection apparatus.

Interventions: Not applicable.

Main Outcome Measures: Subjects performed a graded maximal treadmill test during which heart rate, minute ventilation ($\dot{V}_E$), oxygen consumption ($\dot{V}O_2$), carbon dioxide production, and respiratory exchange ratio (RER) were measured every minute until exhaustion. Ventilatory equivalents for oxygen ($\dot{V}_E/\dot{V}O_2$) and oxygen pulse were calculated.

Results: Subjects recovering from TBI had significantly lower peak responses for heart rate, $\dot{V}O_2$, $\dot{V}_E$, and oxygen pulse TBI ($P<.01$). Peak RER and $\dot{V}_E/\dot{V}O_2$ were similar. There were significant differences in submaximal responses for $\dot{V}_E/\dot{V}O_2$ and oxygen pulse.

Conclusions: Patients with TBI were significantly more deconditioned than a comparable group of sedentary people without disability. Participation in cardiorespiratory fitness programs after TBI should be encouraged to prevent secondary disability.

brain injuries that result in few or no physical impairments. Because they are young, they can expect to live for many years with the potential of developing age-related chronic disabilities. Many such disabilities are associated with physical inactivity and a sedentary lifestyle.[2] Some negative results of inactivity are poor stamina, reduced muscle strength, and limited flexibility.[3] It is well established that generally, people who live sedentary lifestyles are at greater risk for coronary heart disease, hypertension, thromboses, osteoporosis, obesity, certain cancers, and non-insulin-dependent diabetes mellitus.[4]

Presumably the same risks faced by the general population exist for people recovering from TBI. The combination of living with a disability and being sedentary increases the risk of developing secondary conditions.[5] Unfortunately, longitudinal studies that describe chronic disease development and its relation to physical activity levels in TBI patients have not been reported. The effects of these health problems are confounded in people with disabilities. Jankowski and Sullivan[6] provided data that strongly suggest that peak aerobic capacity is related to employment productivity in people recovering from TBI; they have a diminished tolerance for continuous physical activity and chronic fatigue is a common complaint, even years after injury.[7,8] For these reasons, it is crucial that they become as active as is feasible.

The degree of aerobic or endurance capacity limitation in recovering TBI patients is not well documented. It has been estimated that their peak aerobic capacities are from 65% to 74% of normative values.[6,9,10] The certainty of these estimates is questionable for several reasons. First, many patients with TBI have physical impairments. Becker et al[11] did a direct comparison of nondisabled sedentary subjects and patients with

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More issues

- For most with neuro dx, VO2 requirements increase secondary to gross motor insufficiencies
- Low level of fitness associated with increased mortality
- Decrease in available motor units → decrease in metabolically active tissue → decrease in oxidative potential

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Application to OT/PT

- Deconditioning is common and will impact capacity for daily activity, not just cardiovascular "exercise"
- Cardiovascular fitness interventions should be standard for ALL persons with TBI
- How does this work?
  - Selection of target zone (either HR or RPE)
  - Monitoring during exercise
  - Often need supervision to achieve "real" cardio workout

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Exercise and TBI

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Benefits above Improved Fitness

- Improved fitness (duh!)
- Impact on cognition
- Impact on mood/behavior
- Impact on recovery

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Exercise and Depressive Symptoms

- Increased prevalence of depression in persons with neurological disorders
- Exercise improves depression
  - Needed to be exercise that met PAGs
  - Moderate to vigorous intensity
  - 3-5 days per week
    - Adamson BC, Ensari I, Motl RW, Arch Phys Med Rehabil, 2015.

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Exercise Maintenance after TBI

- Decreased score on BDI
  - Maintained improvement over time
- Increased physical activity
  - 48% with increased activity level at 6 months post
- Exercise greater than 90 minutes per week resulted in lower BDI and higher perceived QOL and mental health
- 52% of subjects were exercising greater than 90 minutes per week at 6 months
  - Wise EK et al, *Arch Phys Med Rehabil*, 2012

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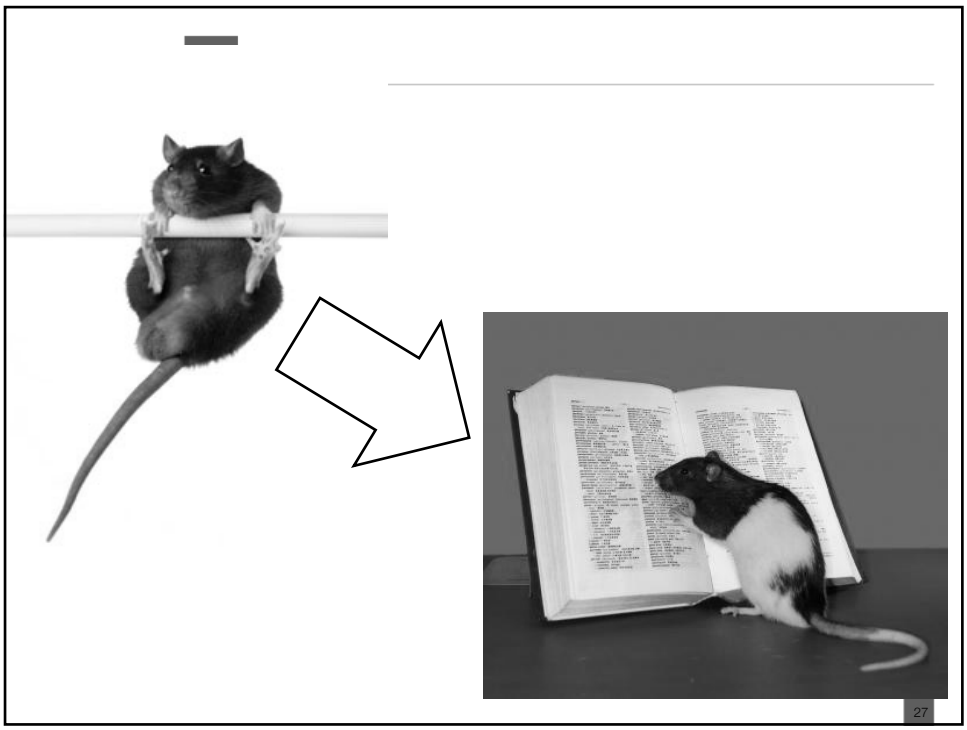

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CONTINUED

Cognition and Aerobic Exercise

- > 50% of TBI survivors still experiencing cognitive problems several years post TBI
- Vigorous training: 3 times/wk x 30 minutes on treadmill x 12 wks
  - supervised
- Improved cognitive function with aerobic training in TBI
  - Processing speed, executive function, overall cognition
- Aerobic exercises associated with physical adaptations and positive cortical functions like angiogenesis and neurogenesis
  - Chin LM et al, *Arch Phys Med Rehabil*, 2015

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PM R. 2009 Jun;1(6):560-75.

Physical exercise and cognitive recovery in acquired brain injury: a review of the literature.

Devine JM, Zafonte RD.

Department of Physical Medicine & Rehabilitation, Spaulding Rehabilitation Hospital, Harvard Medical School, Boston, MA, USA.

Abstract

OBJECTIVE: Physical exercise has been shown to play an ever-broadening role in the maintenance of overall health and has been implicated in the preservation of cognitive function in both healthy elderly and demented populations. Animal and human studies of acquired brain injury (ABI) from trauma or vascular causes also suggest a possible role for physical exercise in enhancing cognitive recovery. DATA SOURCES: A review of the literature was conducted to explore the current understanding of how physical exercise impacts the molecular, functional, and neuroanatomic status of both intact and brain-injured animals and humans. STUDY SELECTION: Searches of the MEDLINE, CINHAL, and PsychInfo databases yielded an extensive collection of animal studies of physical exercise in ABI. Animal studies strongly tie physical exercise to the upregulation of multiple neural growth factor pathways in brain-injured animals, resulting in both hippocampal neurogenesis and functional improvements in memory. DATA EXTRACTION: A search of the same databases for publications involving physical exercise in human subjects with ABI yielded 24 prospective and retrospective studies. DATA SYNTHESIS: Four of these evaluated cognitive outcomes in persons with ABI who were involved in physical exercise. Three studies cited a positive association between exercise and improvements in cognitive function, whereas one observed no effect. Human exercise interventions varied greatly in duration, intensity, and level of subject supervision, and tools for assessing neurocognitive changes were inconsistent. CONCLUSIONS: There is strong evidence in animal ABI models that physical exercise facilitates neurocognitive recovery. Physical exercise interventions are safe in the subacute and rehabilitative phases of recovery for humans with ABI. In light of strong evidence of positive effects in animal studies, more controlled, prospective human interventions are warranted to better explore the neurocognitive effects of physical exercise on persons with ABI.

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Dev Neurorehabil. 2008 Jul;11(3):236-40.

Exercise is brain food: the effects of physical activity on cognitive function.

Ploughman M.

Clinical Research, Rehabilitation Program, Eastern Health Authority, St John's, Newfoundland and Labrador, Canada. mploughm@mun.ca

Abstract

This commentary reviews selected biomedical and clinical research examining the relationship between physical exercise and cognitive function especially in youth with disability. Youth with physical disability may not benefit from the effects of exercise on cardiovascular fitness and brain health since they are less active than their non-disabled peers. In animal models, physical activity enhances memory and learning, promotes neurogenesis and protects the nervous system from injury and neurodegenerative disease. Neurotrophins, endogenous proteins that support brain plasticity likely mediate the beneficial effects of exercise on the brain. In clinical studies, exercise increases brain volume in areas implicated in executive processing, improves cognition in children with cerebral palsy and enhances phonemic skill in school children with reading difficulty. Studies examining the intensity of exercise required to optimize neurotrophins suggest that moderation is important. Sustained increases in neurotrophin levels occur with prolonged low intensity exercise, while higher intensity exercise, in a rat model of brain injury, elevates the stress hormone, corticosterone. Clearly, moderate physical activity is important for youth whose brains are highly plastic and perhaps even more critical for young people with physical disability.

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Mild TBI or Concussion

- Injury to head from blunt trauma or acceleration/deceleration forces
- Results in 1 or more of the following:
  - Confusion, disorientation, or impaired consciousness
  - Dysfunction of memory around time of injury
  - LOC < 30 minutes
  - Onset of observed signs or symptoms of neurological or neuropsychological dysfunction
    - CDC

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Thinking/ Remembering	Physical	Emotional/ Mood	Sleep
Difficulty thinking clearly	Headache	Irritability	Sleeping more than usual
	Fuzzy or blurry vision		
Feeling slowed down	Nausea or vomiting (early on)	Sadness	Sleep less than usual
	Dizziness		
Difficulty concentrating	Sensitivity to noise or light	More emotional	Trouble falling asleep
	Balance problems		
Difficulty remembering new information	Feeling tired, having no energy	Nervousness or anxiety	

CDC

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Concussion and Exercise

- Rest versus exercise debate
- Neurometabolic cascade following mild TBI results in neurologic energy deficit
- Period of vulnerability to additional injury
- Led to extreme of absolute rest until all symptoms have resolved
- But is that the best strategy???
  - Wells EM, Godkin HP, Griesbach GS, *J Child Neurol*, 2016

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Concussion Treatment and Recovery

- Physical Rest
  - Metabolic dysfunction post concussion
  - Risk of second injury
  - Unrestricted activity may worsen symptoms/delay recovery
  - But is complete rest best?
  - Unrestricted exercise in immediate acute phase may increase risk of subsequent injury and/or delay recovery
  - Some level of exercise may be beneficial once beyond acute injury stage
    - Broglio SP, Collins MW, Williams RM, Mucha A, Kontos A. *Clin Sports Med*. 2015

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Concussion Treatment and Recovery

- Cognitive Rest
  - increased cognitive activities post concussion increase symptom recovery time and prolong recovery
  - Reduction in brain stimulating activity
  - "prolonged cognitive rest and reduction of school events have the potential to exacerbate symptoms or cause negative mental health issues"
  - Key is during acute phase; symptoms are guide
    - Broglio SP, Collins MW, Williams RM, Mucha A, Kontos A. Clin Sports Med. 2015

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Concussion Treatment and Recovery

- Vestibular and Oculomotor Impairment
  - Occurs in approx 60% of athletes
  - Vestibular: peripheral or central
  - Vestibular issues: benign paroxysmal positional vertigo (BPPV), vestibulo-ocular reflex (VOR) impairment, visual motion sensitivity, balance dysfunction, cervicogenic dizziness, and exercise-induced dizziness.
  - Vestibulo-ocular: dizziness, vertigo, blurred/unstable vision, nausea, difficulty with busy environments
  - Vision Therapy
  - Pharmacological interventions
- May predict prolonged recovery
  - Broglio SP, Collins MW, Williams RM, Mucha A, Kontos A. Clin Sports Med. 2015

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CONTINUED

Practice Recommendations for Service Members with Mild TBI

- Specific recommendations for PT assessment and intervention are made in the following areas:
  - patient/client education
  - activity intolerance
  - vestibular dysfunction
  - high-level balance dysfunction
  - post traumatic headache
  - temporomandibular disorder (TMD)
  - attention and dual-task performance deficits
  - participation in exercise
    - Weightman et al, *J Head Trauma Rehabil*, 2010

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CONTINUED

Acute Management of TBI

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Acute OT/PT Treatment

- Prevention of anticipated problems
- Patient/family education
- ONGOING Evaluation
- Early mobilization
- Appropriate environment
- Systems based approach

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Start with Mental Status

- Increasing arousal and awareness
- Memory: orientation, implementation of memory strategies
- Cognition, speech, language: increased time for processing, cognitive rest, consistent approach to speech/language; graded cognitive exercise

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Neuromuscular Interventions

- Increasing upright tolerance
  - Tilt table therapy
    - Krewer C, Luther M, Koenig E, Muller F., 2015
- Activities to maintain flexibility
- Management of altered tone
- Emphasize automatic tasks/movements
- Normalizing sensory input

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Cardiovascular/Respiratory

- Increasing upright tolerance
  - Managing orthostatic hypotension
- Endurance training
- DVT prevention
- Positioning to optimize pulmonary function
- Activities to improve respiratory function

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Integumentary System

- Thorough and ongoing examination
- Positioning to prevent pressure
- Pressure relieving beds and w/c systems
- Bowel and bladder management
- Protection against agitation/restlessness
- Family education

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Evidence for Early Mobilization

- Schweickert et al. effect of early physiotherapy and occupational therapy while interrupting the sedation
  - better functional outcome when released from the ICU, shorter amount of time spent in delirium, and shorter periods of mechanical ventilation.
- Morris et al. initiating a mobility protocol within the first 48 hours following mechanical ventilation for patients with acute respiratory failure decreased both the duration of stay in the ICU and the total stay in the hospital.
- Hellweg S, *Crit Care Res Prac*, 2012

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Subacute and Chronic Management

45

Relationship between Intensity and Outcomes

- Age predicted the intensity of both psychologic and total therapy services.
- Therapy intensity was predictive of motor functioning at discharge
- However, therapy intensity did not predict cognitive gain
- Lack dosing guidelines, and intensity often determined by factors like insurance rather than evidence
  - Cifu DX et al, *Arch Phys Med Rehabil*, 2003.

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JRRD Volume 46, Number 6, 2009
Pages 697–702
Journal of Rehabilitation Research & Development

Prevalence of chronic pain, posttraumatic stress disorder, and persistent postconcussive symptoms in OIF/OEF veterans: Polytrauma clinical triad

Henry L. Lew, MD, PhD;[1–3]* John D. Otis, PhD;[4] Carlos Tun, MD;[1–2] Robert D. Kerns, PhD;[5] Michael E. Clark, PhD;[6] David X. Cifu, MD[7]

[1]Physical Medicine and Rehabilitation (PM&R) Service, Department of Veterans Affairs (VA) Boston Healthcare System, Boston, MA; [2]Harvard Medical School, Boston, MA; [3]Defense and Veterans Brain Injury Center (DVBIC) Site, Boston, MA; [4]Pain Research Program, VA Boston Healthcare System, Boston, MA; [5]PRIME Center, VA Connecticut Healthcare System, West Haven, CT; [6]Chronic Pain Rehabilitation Program, James A. Haley Veterans' Hospital, Tampa, FL; [7]PM&R Service, Richmond VA Medical Center, Richmond, VA

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Balance and Gait Re-Training

- Limited evidence on effectiveness
  - Does this mean interventions aren't effective?
  - More likely a matter of poor research
- One conclusion was that BWSTT was not superior to conventional gait training
- Moderate evidence supports Tai Chi improves individuals' self-description of coordination, flexibility and physical activity
- Balance and gait interventions in combination only share limited evidence of positive effects on balance and mobility outcomes; neither balance or gait intervention alone has emerged as more effective than the other.
  - Bland DC, Zampieri C, Damiano DL. *Brain Injury*. 2011

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J Head Trauma Rehabil
Vol. 20, No. 5, pp. 402–415

Body Weight-Supported Treadmill Training Versus Conventional Gait Training for People With Chronic Traumatic Brain Injury

Tracy H. Brown, PT; Julie Mount, PhD, PT; Bethany L. Rouland, PT; Katherine A. Kautz, MS, PT; Renee M. Barnes, PTA; Jihye Kim, MPT

Objectives: To compare body weight support treadmill training (BWSTT) to conventional overground gait training (COGT). **Design:** Randomized controlled trial. **Setting:** Residential rehabilitation center. **Participants:** Twenty subjects with chronic traumatic brain injury (TBI). **Intervention:** The BWSTT or COGT for 15 minutes plus 30 minutes of exercise 2 days per week, for 3 months. **Main Outcome Measures:** Functional Ambulation Category (FAC), Functional Reach (FR), Timed Up and Go; gait velocity, step width (BOS) and step length differential using instrumented gait mat. **Results:** Step width approached the norm without between-group differences. Step length differential improved significantly more for the COGT. **Conclusions:** Physical therapy can improve gait for patients more than 6 years post-TBI. The COGT is more effective than the BWSTT for improving gait symmetry during overground walking. **Key words:** *body weight support, gait training, head injury, physical therapy, rehabilitation, traumatic brain injury, treadmill*

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Trends and Patterns

- Impact of Income
- Mortality and outcomes improving?
  - Overall mortality rate in severe TBI not decreasing
  - Increased risk of death increased up to sevenfold
  - Increased risk for Alzheimer's disease
    - Roozenbeek B, Maas AIR, Menon D, Nat rev Neurol, 2013.
- TBI Model System Data at 5 yrs post injury
  - 21.7% dead
  - 32.3% need assistance
  - 29.1% dissatisfied with life
  - 55% unemployed
  - 57.8% with moderate to severe disability
  - 38.8% declined from earlier status to 5 yr outcome
    - Corrigan JD et al, 2014

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Motor Impairment after Severe TBI

- Improvement over time that levels off by 12 months
- > 1/3 had persistent impairment at 2 years
- Persistence of tandem gait impairment particularly common
  - Postural stability impairment
  - Significant concern for some return to work activities
  - Walker WC, Pickett TC, *J Rehabil Res Dev*, 2007

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TBI Outcome Measures

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CONTINUED

TBI EDGE

Students should learn to administer:

6 minute walk
10 meter walk
Action Research Arm Test
Agitated Behavior Scale
Berg Balance Scale
Clinical Test of Sensory Interaction & Balance
Coma Recovery Scale – Revised
Community Balance and Mobility Scale
Community Integration Questionnaire I
Dizziness Handicap Inventory
Dynamic Gait Index
Functional Gait Assessment
FIM
Functional Reach
Functional Status Examination
Glasgow Coma Scale
High-level Mobility Assessment
Modified Ashworth Scale
Moss Attention Rating Scale
Rancho Levels of Cognitive Functioning

Students should be familiar with:

2 minute walk
Activity Specific Balance Confidence Scale
Assessment of Life Habits
Balance Error Scoring System
Canadian Occupational Performance Measure
Craig Handicap Assessment and Reporting Technique (SF)
Craig Hospital Inventory of Environmental Factors
Disability Rating Scale
Disorders of Consciousness Scale
EuroQOL
Four Square Step Test
Functional Ambulation Category
Functional Assessment Measure
Glasgow Outcome Scale – Extended
Impact on Participation and Autonomy Questionnaire
Mayo Portland Adaptability Inventory – 4
MOS Short Form (SF-36)
Montreal Cognitive Assessment
Neurological Outcome Scale for TBI
NeuroQOL
O-Log
Patient Health Questionnaire
Quality of Life after Brain Injury
Satisfaction with Life Scale
Sensory Organization Test
Sydney Psychosocial Re-integration Questionnaire
Timed Up and Go
Timed Up and Go (cog)
Trunk Control Test
Trunk Impairment Scale
Walking While Talking
WHO QOL-BREF

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CONTINUED

Agitated Behavior Scale

1 = absent: the behavior is not present.
2 = present to a slight degree: the behavior is present but does not prevent the conduct of other, contextually appropriate behavior. (The individual may redirect spontaneously, or the continuation of the agitated behavior does not disrupt appropriate behavior.)
3 = present to a moderate degree: the individual needs to be redirected from an agitated to an appropriate behavior, but benefits from such cueing.
4 = present to an extreme degree: the individual is not able to engage in appropriate behavior due to the interference of the agitated behavior, even when external cueing or redirection is provided.

DO NOT LEAVE BLANKS.

_____ 1. Short attention span, easy distractibility, inability to concentrate.
_____ 2. Impulsive, impatient, low tolerance for pain or frustration.
_____ 3. Uncooperative, resistant to care, demanding.
_____ 4. Violent and or threatening violence toward people or property.
_____ 5. Explosive and/or unpredictable anger.
_____ 6. Rocking, rubbing, moaning or other self-stimulating behavior.
_____ 7. Pulling at tubes, restraints, etc.
_____ 8. Wandering from treatment areas.
_____ 9. Restlessness, pacing, excessive movement.
_____ 10. Repetitive behaviors, motor and/or verbal.
_____ 11. Rapid, loud or excessive talking.
_____ 12. Sudden changes of mood.
_____ 13. Easily initiated or excessive crying and/or laughter.
_____ 14. Self-abusiveness, physical and/or verbal.

_____ **Total Score**

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High-Level Mobility Assessment Tool (HiMAT)

ITEM	PERFORMANCE	SCORE 0	1	2	3	4	5
WALK	sec	X	> 6.6	5.4-6.6	4.3-5.3	< 4.3	X
WALK BACKWARD	sec		>13.3	8.1-13.3	5.8-8.0	< 5.8	X
WALK ON TOES	sec		> 8.9	7.0 - 8.9	5.4-6.9	< 5.4	X
WALK OVER OBSTACLE	sec		> 7.1	5.4-7.1	4.5-5.3	< 4.5	X
RUN	sec		> 2.7	2.0-2.7	1.7-1.9	< 1.7	X
SKIP	sec		> 4.0	3.5-4.0	3.0-3.4	< 3.0	X
HOP FORWARD (AFFECTED)	sec		> 7.0	5.3-7.0	4.1-5.2	< 4.1	X
BOUND (AFFECTED)	1) 2) 3) cm		< 80	80-103	104-132	> 132	X
BOUND (LESS-AFFECTED)	1) 2) 3) cm		< 82	82-105	106-129	> 129	X
UP STAIRS DEPENDENT (Rail **OR** not reciprocal: if not, score 5 and rate below)	sec		>22.8	14.6-22.8	12.3-14.5	<12.3	
UP STAIRS INDEPENDENT (No rail **AND** reciprocal: if not score 0 and rate above)	sec		> 9.1	7.6-9.1	6.8-7.5	< 6.8	X
DOWN STAIRS DEPENDENT (Rail **OR** not reciprocal: if not score 5 and rate below)	sec		>24.3	17.6-24.3	12.8-17.5	<12.8	
DOWN STAIRS INDEPENDENT (No rail **AND** reciprocal: if not score 0 and rate above)	sec		> 8.4	6.6-8.4	5.8-6.5	< 5.8	X
	SUBTOTAL						

TOTAL HiMAT SCORE /54

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Moss Attention Rating Scale

Please don't leave any items blank. If you are not sure how to answer, just make your best guess

1 = Definitely false
2 = False, for the most part
3 = Sometimes true, sometimes false
4 = True, for the most part
5 = Definitely true

1. _____ Is restless or fidgety when unoccupied
2. _____ Sustains conversation without interjecting irrelevant or off-topic comments
3. _____ Persists at a task or conversation for several minutes without stopping or "drifting off"
4. _____ Stops performing a task when given something else to do or to think about
5. _____ Misses materials needed for tasks even though they are within sight and reach
6. _____ Performance is best early in the day or after a rest
7. _____ Initiates communication with others
8. _____ Fails to return to a task after an interruption unless prompted to do so
9. _____ Looks toward people approaching
10. _____ Persists with an activity or response after being told to stop
11. _____ Has no difficulty stopping one task or step in order to begin the next one
12. _____ Attends to nearby conversations rather than the current task or conversation
13. _____ Tends not to initiate tasks which are within his/her capabilities
14. _____ Speed or accuracy deteriorates over several minutes on a task, but improves after a break
15. _____ Performance of comparable activities is inconsistent from one day to the next
16. _____ Fails to notice situations affecting current performance, e.g., wheelchair hitting against table

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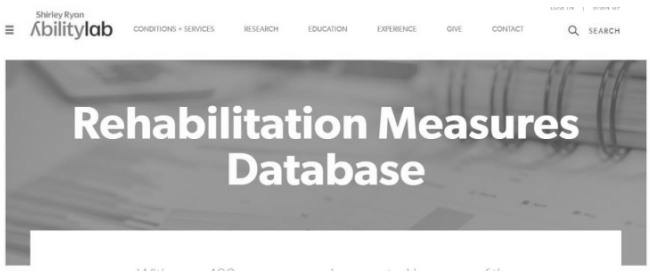
Additional Resource

- https://www.sralab.org/rehabilitation-measures



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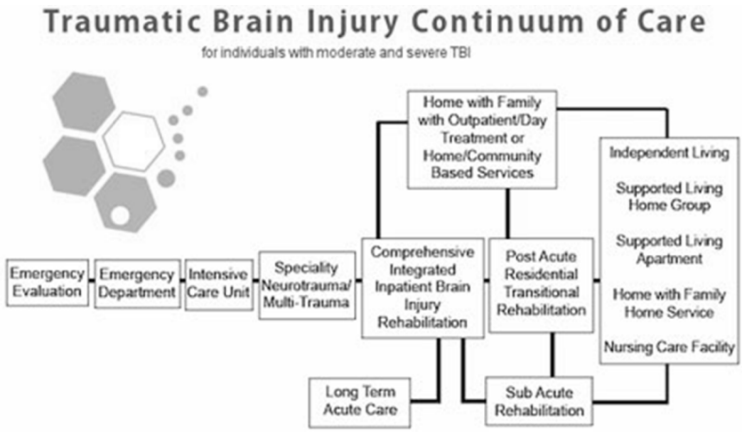
Roles of OT and PT

- Vary depending on intervention setting and level of patient function
- Acute: early mobilization, sensory stimulation, meaningful interaction with environment, assessment
- Sub-acute/rehab: ADLs, basic mobility, memory and cognition, return to independent living, assessment
- Post acute/OP rehab: return to independent living/work/school, increase productive time, assessment

Rehabilitation Continuum of Care



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TBI Continuum of Care

- Acute Care
  - ICU
  - Neuro unit
- Inpatient Rehabilitation
- Post Acute Brain Injury Rehabilitation
  - Residential
  - Day program
- Outpatient Therapy
- SNF
- Long term care

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CONTINUED

Questions?

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