

Lessons Learned: The VA Experience with Cognitive-Communication Interventions for TBI

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Introductory Comments:

- Thank you for inviting me to your conference
- What is discussed in this presentation and ultimately recommended as viable approaches to the diagnosis and rehabilitation of individuals with cognitive-communication due to brain injury has the potential of:
 - Improving the quality of life of these individuals
 - Moving the field of speech language pathology forward
 - Impacting the broader healthcare system to recognize and financially support rehabilitation services for individuals with brain dysfunction.

Plan of this presentation

- Discuss the blast etiology of TBI and try to determine similarities and difference with non-blast TBI
- Review the cognitive-communication deficits associated with TBI
- Describe the challenges of diagnosing cognitive-communication impairments in TBI and propose an approach to assessment that involves the client in the therapeutic process
- Propose models of cognitive-communication interventions that have a reasonable chance of helping individuals with brain dysfunction

TBI—"Signature Injury" of Current Combat Operations

What we know

- Brain injury occurs with high frequency (~10-20% of combat duty soldiers)
- Brain injuries result from BOTH blast & other trauma
- Cognitive effects from TBI co-occur with other psychological conditions—depression, interpersonal conflicts, PTSD
- Cognitive effects may also be a direct result of other mental health conditions

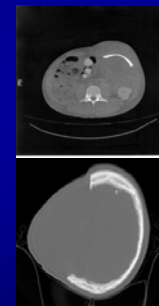
What we don't know

- How to parse out which cognitive effects are due to direct trauma and which are due to other mental health conditions
- Whether the therapies found to be efficacious for TBI will have the same effects for TBI from blast injuries

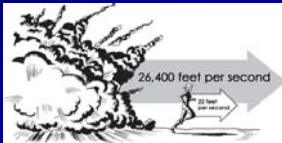
BLAST TBI

Modern War – Blast Related Brain Injuries

- Concussion/closed (barotrauma)
- Penetration (fragments)
- Blunt/crush (acceleration/deceleration)
- Systemic injury effects on the brain



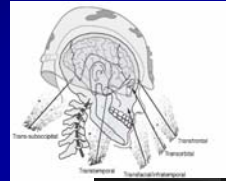
Barotrauma – Blast Concussion



- Blast wave through brain (blood)
- Tissue damage (not understood)
- Metabolic and neuro-endocrine changes (animal models)

Fragmentation Injuries - Penetrating TBI

- Flying debris
- Bomb fragments
- Fragments may be contaminated
- Not concussions



Blunt Trauma - Crush Injuries

- Displacement of the body
- Acceleration/ deceleration
- Diffuse axonal injury
- Subdural hematoma
- Most frequent serious injury



Systemic Injuries Affect the Brain

- Hypotension
- Hypoxia
- Increased intracranial pressure
- Impaired cerebral vascular reactivity and blood flow
- Asphyxia



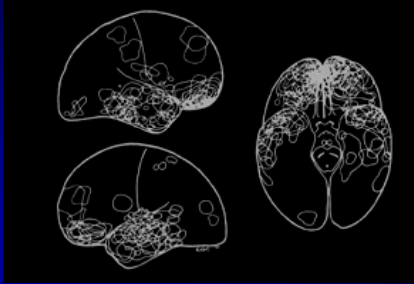
Dewitt, Prough: J Neurotrauma 2008

Is Blast-TBI Different from Other Mechanisms of Injury for TBI?

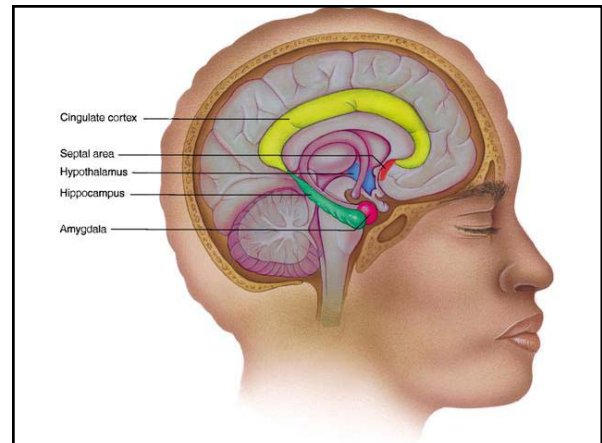
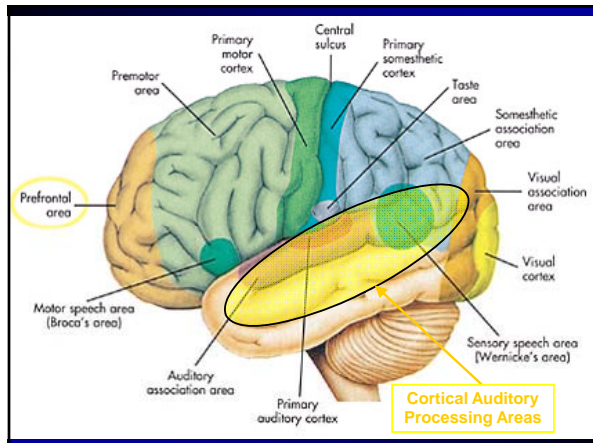
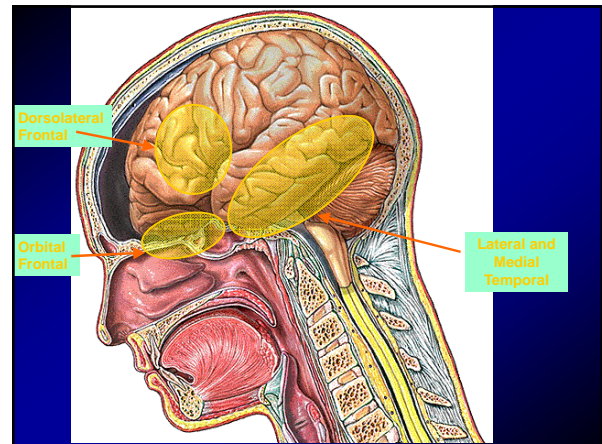
Definition of TBI

- A traumatically induced structural injury and/or physiological disruption of brain function occurring as a result of an external force
- New onset of at least one of the clinical signs:
 1. Any period of loss or decreased level of consciousness;
 2. Any loss of memory for events immediately before or after the injury;
 3. Any alteration in mental state at the time of the injury (e.g., confusion, disorientation, slowed thinking);
 4. Neurological deficits (e.g., weakness, balance disturbance, praxis, paresis/plegia, change in vision, other sensory alterations, aphasia.) that may or may not be transient;
 5. Intracranial abnormalities (e.g. contusions, diffuse axonal injury, hemorrhages, aneurysms).

Localization of TBI



from Courville, 1941



Criteria for Severity of TBI

Mild	Moderate	Severe
LOC 0-30 min	LOC > 30 min and < 24 hrs.	LOC > 24 hrs.
Normal structural imaging	Normal or abnormal structural imaging	Abnormal structural imaging
GCS 13-15	GCS 9-12	GCS < 9
PTA ≤ 24 hrs.	PTA ≤ 7 days	PTA > 7 days

Is Blast-TBI Different from Other Injury Mechanisms for TBI?

Different cognitive profile?

NO

Blast vs. Non-Blast TBI Neuropsychological Findings

- Belanger et al, 2009
 - 102 participants – tested at VA Centers in Tampa, Richmond, Salisbury, and Durham
 - Sustained blast or non-blast TBI
 - Stratified by level of severity
 - Nearly 2 years post injury
- Findings
 - Cognitive sequelae following TBI are determined more by severity of injury than by mechanism of injury
- Similar findings in Vanderploeg, 2009 (presentation)
 - 387 participants tested at WRAMC

Is Blast-TBI Different from Other Injury Mechanisms for TBI?

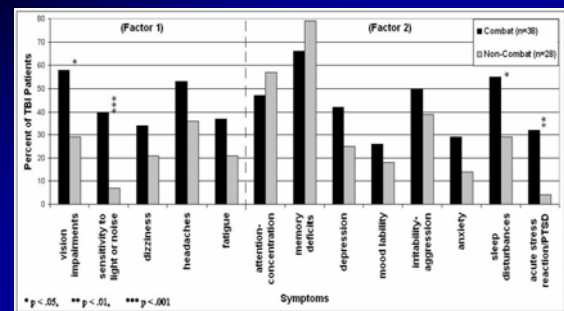
Are there different symptom profiles?

MAYBE

Blast vs. Non-Blast TBI Symptom Profile

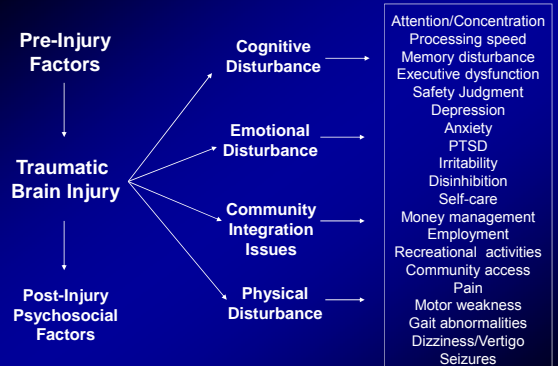
- Mean symptom severity tends to be higher in all blast injuries
 - Vanderploeg, 2009; Lew 2007
- Higher number of emotional symptoms (anxiety, depression, frustration)
 - Vanderploeg, 2009
- Higher endorsement of PTSD symptoms
 - Belanger, 2009; Vanderploeg, 2009; Rand Corp., 2008; Lew, 2007.

Symptom Frequency: Higher in Combat-Injured TBI



Cognitive-Communication Impairments of TBI

Neurobehavioral sequelae of TBI



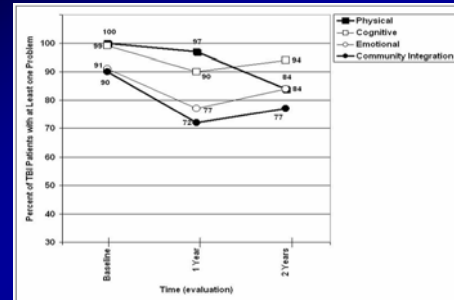
Physical and Cognitive Impairments

- Physical impairments may be prominent early
- Cognitive/behavioral impairments are more persistent and make greater contribution to long-term disability^{1,2}

¹Brooks, et al., (1986). The five year outcome of severe blunt head injury: A relative's view. J Neurol Neurosurg Psychiatry 49, 764-770.

²Jennett et al. (1981). Disability after severe head injury: Observations on the use of the Glasgow Outcome Scale. J Neurol Neurosurg Psychiatry, 44, 285-293.

TBI Sequelae at One and Two Years Post Injury (Lew, 2006)



Common Cognitive Sequelae

- Attention Impairments
- Executive Function Impairments
- Memory Impairments

Neuroanatomic Model of Attention (Posner's Model)

Three separate underlying networks

Alerting: Maintain an alert state (modulated by norepinephrine systems/frontal and parietal cortex)

Orienting: Focus our senses on target information (modulated by acetylcholine/superior colliculus, pulvinar, temporal parietal junction)

Executive attention: controls emotions and other processes (modulated by dopamine/anterior cingulate, lateral prefrontal basal ganglia)

Clinical Models of Attention

- | | |
|------------------------------|---------------------------|
| • Capacity | • Sustained Attention |
| • Resistance to interference | • Selective Attention |
| • Deployment of attention | • Focused Attention |
| • Mental manipulation | • Alternating Attention |
| (Mateer & Mapou, 1996) | • Divided Attention |
| | (Sohlberg & Mateer, 2000) |

Dorsolateral aspects of the frontal lobes are involved in controlling and allocating attentional resources

Clinical Symptoms of Attention Problems...

Common functional complaints related to attention problems

- Difficulty completing tasks, reading longer materials, or following the plot line of a movie – sustained attention
- Distractibility or poor concentration when other activities are going on in the immediate environment - selective attention
- Decreased ability to shift from task to task –alternating attention;
- Difficulty responding to two tasks occurring simultaneously – divided attention

Executive Functions

- Executive functions are those capacities, most commonly linked to the frontal cortex, that guide complex behavior over time through planning, decision-making and response control.
- Miller & Cohen's (2001) model:
 - Pre-frontal cortex serves a specific function in cognitive control: the active maintenance of patterns of activity that represent goals and the means to achieve them. It provides bias signals throughout much of the rest of the brain, affecting not only visual processes but also other sensory modalities, as well as systems responsible for response execution, memory retrieval, emotional evaluation, etc.

Executive Functions Symptoms (Dysexecutive Syndrome)

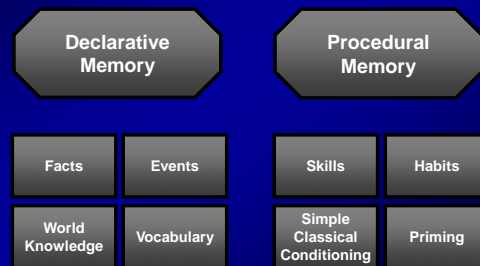
(Feeney, 2005)

- Impulsiveness
- Ineffective planning
- Ineffective problem solving
- Disorganization (in thinking, talking, and acting)
- Weak goal formulation
- Weak self-monitoring
- Difficulty responding to feedback/ consequences
- Poor social judgment
- Social disinhibition
- Egocentrism
- Difficulty interpreting the behavior of others
- Decreased flexibility/ shifting
- Concrete thinking
- Reduced initiation
- Dulled emotional responses

Neuroanatomic Model of Memory

- Hippocampus is the site for incoming information
- Has direct connections with emotional processing and long-term storage sites
- After encoding, the hippocampus initiates contact with storage sites
- The medial prefrontal cortex directs the information through a monodirectional pathway: hippocampus → entorhinal cortex → perirhinal cortex
- Neurotransmitters facilitate the transfer process: norepinephrine, acetylcholine, serotonin
- Retrieval of information is primarily mediated by the anterior frontal cortex

Types of Memory Content Dependent Forms



Clinical Symptoms of Memory Problems

- Difficulty following directions or passing on messages – working memory
- Difficulty retaining information about specific events that occur in the person's life since the injury – episodic memory
- Difficulty remembering to go to appointments or to complete household chores – prospective memory
- Decreased ability to judge one's own memory functioning (awareness, compensation, strategic behavior) - metamemory

What Makes Memories Last?

- Self-relevance
- Reactivation pattern
- Repetition pattern
- Distinctiveness
- Exposure duration
- Sensory diversity
- Cognitive significance
- Motivational significance
- Emotional significance
- Predictability

The Role of SLPs in Cognitive-Communication Rehabilitation

Specialized knowledge and skills in:

- Cognition and its relationship to language
- Clinical tools and methods for assessing CCDs
- Evidence-based intervention approaches
- Effects of pharmacology on cognition and communication
- Counseling, collaboration, education, and advocacy
- Cultural, social, and linguistic diversity
- Research principles

Assessment of Cognitive Communication Skills after TBI

Purposes of Assessment

(Ylvisaker & Gioia, 1998; Sohlberg & Mateer, 2001; Turkstra et al, 2005; Turkstra, Coelho, & Ylvisaker, 2005)

What are the concerns described by the patients?

- Support of medical or neurological diagnoses
- Establish baseline levels of function

Is there a cognitive-communication problem? Can it be captured by the evaluation instruments?

- Establish the nature and characteristics of the problem

What are the implications of the test results beyond the test session?

- Evaluating the ability to carry out functional everyday activities

Where should treatment begin or progress?

- Estimation of capacity to participate in rehabilitation services
- Determine the most effective means to facilitate learning
- Planning rehabilitation interventions
- Testing intervention hypotheses
- Measurement of recovery / treatment progress

ANCDS EBP Committee Recommendations (Turkstra et al, 2005)

- Use caution in using most published standardized, norm referenced tests for evaluation of persons with TBI
 - Lack of empirical data supporting the use of many tests for individuals with cognitive-communication disorders after TBI
 - Most tests were not developed for people with TBI
 - Many do not meet criteria for reliability and validity
 - **Predictive and ecological validity have not been demonstrated by any of the tests**

Predictive Validity of Testing

“...discordance between standardized tests – most of which are at the impairment level – and the needs of clients in life outside clinical settings.” Turkstra, Coelho, & Ylvisaker, 2005

“Our systems for classifying and describing (i.e. measuring) the behaviors related to brain injury do have predictive power for localizing an injury, but apparently less for understanding its effects on adaptive functioning.” Hart & Hayden, 1986

Effects of Decontextualized Testing

- Support from examiner
 - Initiates activity for patient
 - Inhibits irrelevant behavior
 - Monitors performance
- Clear orientation to tasks
- Elimination of distractions
- Short duration of most individual tests
- Single tasks that do not require integration of multiple sources of information or retention across days
- Individual cannot use strategies to improve performance

Overestimate Performance

Underestimate Performance

Formal testing: strengths & weaknesses

Strengths

- Measuring impairments in a decontextualized clinical setting
- Establishing diagnoses
- Establishing strengths & weaknesses at the impairment level
- Measuring recovery at the impairment level

Weaknesses

- Measuring needs, skills, and abilities outside of the clinical setting
- Evaluating ability to carry out functional everyday activities
- Establishing a prognosis for functional outcomes
- Planning rehabilitation
- Measuring recovery at activity & participation levels

Cognitive-Communication Assessment Domains

- Language
- Attention
- Speed of processing
- Memory
- Executive functions
- Self-awareness
- Social communication

Sample Cognitive-Communication Assessment Protocol (Carole Roth, 2009)

- Questionnaire of Cognitive-Linguistic Concerns
 - Sohlberg & Mateer, 1989
- Woodcock-Johnson (WJ-III)
 - Psycho-Educational Battery
 - Achievement Battery
- Attention Process Training Test (APT)
 - Sohlberg & Mateer, 1987, 1989, 2001
- Functional Assessment of Verbal Reasoning and Executive Skills (FAVRES)
 - MacDonald & Johnson, 2005
- Self-report measures and behavioral scales

Nonstandardized Assessment Procedures for Social Communication

- Discourse analysis
 - Monologic narratives
 - Analysis of productivity, efficiency, accuracy, organization, coherence, story grammar
- Conversational Discourse
 - Measures of initiation and manipulation of content
 - Measures of content and topic management
- Pragmatic Rating Scale
 - Measures of conversational acts (Grice's maxims)

Division Between Clinicians and Patients

(Cicerone, 2006)

- Therapists believed therapy was the most important factor in a patient's improvement
 - Poor motivation, resistance to treatment, or unrealistic expectations the primary reason for poor recovery
- Patients believed that their own motivation and support from families was the primary factor in improvement
 - Inadequate therapy was seen as the primary reason for poor recovery

Model for Collaborative Assessment

- Pretesting phase
 - a therapeutic alliance
- Testing phase
- Post-testing phase
 - Establishing collaborative agreement on strengths & weaknesses
 - Interdisciplinary collaborative goal setting
 - Interdisciplinary collaborative hypothesis testing to assess skills in everyday contexts
 - History establishing

MacLennan, 2009

Pretesting: History

- Medical Record
- Family
- Patient
- Medical History
- Educational History
- Vocational history
- Questionnaires/Interview
 - Communication history
 - Cognitive history

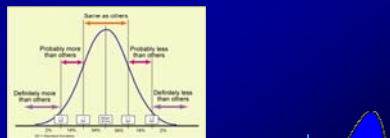
You just met me – how can you tell anything about me before my injury? (Lezak, 2004)

Pre-testing: Therapeutic Alliance

- Know the chart
- Questions go both ways
- Emphasize the nature of testing as to find BOTH strengths and weaknesses
- Frame the relationship as collaborative
 - Presidential advisor metaphor (Ylvisaker & Feeney, 1998)

Post-testing: Sharing results Explaining the concept of norms

- How can a test tell you anything about my strengths and weaknesses?
- Explain the concept of standardization
 - Percentile-referenced tests



- Cut-off referenced tests

Post-testing: Collaborative Development of an Inventory of Strengths and Weaknesses

Strengths	Weaknesses	Undetermined

(MacLennan, 2009)

Collaborative Goal Setting (MacLennan, 2009)

Goals	Barriers	Therapy
Return to college	<ul style="list-style-type: none"> • walking • driving • ↓ attention <ul style="list-style-type: none"> - speed/control - distractibility • ↓ memory <ul style="list-style-type: none"> - prospective memory - ? learning 	<ul style="list-style-type: none"> • PT / ? surgery • see #2 • attention therapy <ul style="list-style-type: none"> - attention drills - self talk • memory therapy <ul style="list-style-type: none"> - external cueing - college simulation
Return to driving	<ul style="list-style-type: none"> • ↓ attention <ul style="list-style-type: none"> - speed/control - distractibility • anxiety • adaptive controls 	<ul style="list-style-type: none"> • attention therapy <ul style="list-style-type: none"> - attention drills - self talk • relaxation exercises • OT / PT / Prosthetics
↑ Socializing	<ul style="list-style-type: none"> • ↓ attention <ul style="list-style-type: none"> - distractibility • anxiety 	<ul style="list-style-type: none"> • attention therapy <ul style="list-style-type: none"> - self talk • social anxiety therapy <ul style="list-style-type: none"> - relaxation exercises - social desensitization

Summary

“A combination of psychometric tests, structured observations in functional settings, and standardized ratings by the client, family, caregivers, and therapists is likely to yield the most accurate and complete information with regard to current functional capacity.”

Sohlberg & Mateer, 2001