

2.2  
TRAUMATIC BRAIN INJURY (TBI)  
DOMAINS OF FUNCTIONING DATA AGGREGATION Guide

DOMAINS OF FUNCTIONING OBSERVATION FRAMEWORK Description  
FOR INDIVIDUALS WITH TRAUMATIC BRAIN INJURY (TBI)

INTRODUCTION

The following Domains of Functioning Observation Framework Description can be used to summarize deficits and non affected areas which are typically observable following a Traumatic Brain Injury. Identified areas are not mutually exclusive, but are categorized in this format so that areas of concern and implications for programming can be identified. The Framework's underpinnings have been taken from many researchers and disciplines. The bibliography of this book is provided for further reading.

Many domains can be partially assessed using various measures in the standard batteries of school psychologists or other members of assessment and medical evaluation teams. Frequently medical and therapy records, parent, teacher and self-reports will yield observations which can be systematically recorded in the blank framework document. This framework can also be helpful to structure interviews or guide observation periods, aiding the examiner in conceptualizing the observed deficits to determine intervention needs.

No two brain injuries are exactly alike and individuals at different developmental stages at the time of the traumatic injury will have differing outcomes. No one individual is likely to manifest all behaviors listed, yet all behaviors cited are commonly observed following head trauma. Some understanding of brain behavior relationships and the effects of both coup and contra-coup injury and axonal shearing will be helpful. The observer can then look for behaviors in domains most likely to be affected as a result of a specific injury.

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**Guide to Aggregating Data**

**Nature of TBI:** *Nature of TBE can be determined from medical reports, coup & contra-coup information (i.e. impact site and region opposite of impact site), and various medical tests documenting damage*

**I. MEMORY**

Length of Coma *how long until awake, how long until other persons are recognized (often different)*  
 Length of Retrograde Amnesia *period prior to accident where first memory is now recalled*  
 Length of Antegrade Amnesia *how long after accident before new memories are present*

| Domain/Description and Examples  | DESCRIPTION   | EXAMPLES/COMMENTS  |
|--|---|--|
| Long Term Memory<br>(previous facts/concepts)  | Memory for former skills, prior goals, interests & hobbies are usually ok and mislead the individual.   | <i>Memory gaps, confusion, confabulations result as short-term memory is poor and long-term relatively intact.</i>   |
| Short Term Memory<br>(acquiring new information)   | After injury new learning is usually impaired, individual needs prompts & overlearning.   |  |
| Figural Memory<br>(geometric designs, shapes figures, facial features, directional orientation)  | Recall of information presented through visual channel. Requires spatial perception of data.  | <i>Deficits in memory for geometric designs, shapers &amp; figures (Bender Memory, WRAML) facial features, directional orientation.</i>  |
| Lexical Memory<br>(names, word lists, story details, oral directions)  | Encoding of language information usually presented orally.  | <i>There may be a bias toward retention of figural vs. semantic memory or vice versa. Right hemisphere damage often leads to figural deficits, left hemisphere damage often leads to semantic deficits.</i>  |
| Concept/Semantic Memory  |   |  |
| Context/Episodic Memory<br>(e.g. what ate for breakfast yesterday; who against Bush in 1988)   | Knowing time & space location of learned information: remembering sources and context of facts one knows.   | <i>Individual can sound dogmatic, can't remember who said what, or the significance, but might remember the fact itself. Trouble remembering recent events in context, or getting the whole picture is often difficult.</i>                        |
| Perseverations   | According to some research perseverations are actually interference of old material in present working memory.  | <i>Answering previous questions in current settings, not shifting off of topics when appropriate.</i>  |
| Encoding Deficits  | Poor recollection of present moment.  | <i>Trouble acquiring new information after TBI.</i>  |
| Storage Deficits<br>(retaining information)  | It is important to distinguish whether memory problems are composed of storage or retrieval deficits, or both.  | <i>Forgetting well mastered information after instruction constant review required.</i>  |
| Retrieval Functions<br>(if recall is poor, or does prompting or providing a list of optional answers improve performance – recognition answer retrieval) | If storage & encoding are relatively intact, it is important to assess what retrieval aids increase success.  | <i>WRAML story recognition subtest. If individual sees an answer in a group of three, is it recognized? If so, this has implication for testing (multiple choice over essay). Memory notebooks aids to assist in daily living are recommended.</i> |
| Procedural Memory<br>(Motor and Cognitive)   | Procedural memory entails how to perform a function. Student may not know he/she knows how to do a task, but he/she can do the task despite the denial. | <i>Such as: reading music, long division, multiplication. The student may learn and remember, but not acknowledge learning took place.</i>   |
| Personally Relevant Memory<br>(Events in Life)   | Usually the student remembers personally relevant material best.  | <i>Make learning activities specific to student, explain why he/she will need the information, and infuse with examples from the student's life.</i>   |

**SUMMARY: MEMORY**

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**LEVEL OF CONCERN:** *Extremely important for program planning.* **IMPLICATION:** *Memory strengths & weaknesses are important to delineate for program planning purposes.*

*MEMORY DEFICITS ARE PROBABLY THE MOST COMMON CHARACTERISTIC OF STUDENTS WITH AN ACQUIRED BRAIN INJURY. THE PRIMARY DIFFICULTY AFTER A TRAUMATIC BRAIN INJURY IS SHORT-TERM MEMORY CONSOLIDATION PROBLEMS, WHICH INHIBITS NEW LEARNING.*

### II. ATTENTION CONTROL SYSTEM

| Domain/Description and Examples                                 | DESCRIPTION  | EXAMPLES/COMMENTS   |
|---|--|---|
| Mood Control<br>(too happy/too sad/too angry)                   | Lack of inhibition of moods, modulation deficit.                             | <i>Described on III Psychosocial Domain. Rapid cycling, resembles Bipolar Disorder.</i>   |
| Behavior Control<br>(think before doing)                        | Poor selectivity, failure to see the end-point of behavior.                  | <i>Characteristically, impulsive acts that alienate, annoy, frustrate others. Reaction from others comes as a surprise, often totally unanticipated.</i>  |
| Motor/Verbal Control<br>(not wasting movement and talking)      | Inability to determine salience or importance of competing stimuli.          | <i>Attention to task without wasted movement on unnecessary talking is very difficult for most TBI individuals.</i>   |
| Social Control<br>(tuning out other people when needed)         | Inability to inhibit stimuli from peers in class.                            | <i>The individual can feel compelled to inspect, provoke and experiment on peers. Disruptive behavior &amp; alienation can result. Misreading social cues is common.</i>                        |
| Appetite Control<br>(spread of desires and delay gratification) | Insatiability – “distraction by appetite,” lingering feelings of need.       | <i>Characterized by: orientation to future, anticipatory excitement, hunger for intense experiences. Attempts at satisfaction often stimulate desire further. Provocative behaviors result.</i> |
| Sensory Filtration<br>(sight and sound)                         | Poorly sustained focus on salient features.                                  | <i>Characterized by: frequent scanning behavior, confusion over visual foreground/background interactions, focus on trivial sights and sounds.</i>  |
| Internal Free Flight<br>(daydream)                              | Inability to limit the spread of activation of triggered associations.       | <i>Free flight excursions with tune-out of environment for long periods occur due to the richness of mental associations with no self-monitoring.</i>   |
| Consistency Through Tasks                                       | Results from erratic focus.  | <i>A tendency to allocate wrong amount of time to tasks (too much or too little) is common. Impersistence and perseverations result.</i>  |
| Tempo Control<br>(speed through the task)                       | Reduced agility, reduced ability to scan & readjust perspective.             | <i>Erratic focus, tuned-in and then tuned-out, is accommodated by rushing to complete the task. This leads to poor academic performance.</i>  |
| Motivation Control<br>(for unexciting tasks)                    | Attention to non-personally relevant can be most affected.                   | <i>A TRI individual can have a difficult time completing mundane tasks.</i>   |
| Arousal Control<br>(staying awake while working or listening)   | Sleep arousal imbalance.   | <i>Trouble falling asleep or unusual erratic, disruptive or frenetic sleep is common. Alternating between under and over arousal is often present.</i>  |
| Selective Focus<br>(tuned into most important things)           | Tendency to gather data & learn from periphery rather than the center focus. | <i>This is seen on measures such as the Cognitive Control Battery. Constantly noticing things they're not supposed to notice is a frequent behavior pattern.</i>                                |

### SUMMARY: ATTENTION CONTROL

**LEVEL OF CONCERN:** *Needs accommodation.* **IMPLICATION:** *Coupled with memory deficits, the TBI individual needs tremendous structuring to learn new material*

*Deficits in attention and control are frequent outcomes of TBI. TBI may result in: (1) Reduced ability to attend and (2) Deficits in forethought and planning. Thus, The “EXECUTIVE FUNCTIONS” and “ATTENTIONAL CONTROL SYSTEM” are closely linked. The frontal lobes and basal ganglia areas (front and back of head) have multiple pathways that can be disrupted. The full extent of the impact from a TBI may not be manifested until the student is over the age 13 OR 14 when frontal lobe functioning becomes fully activated. Frontal lobe damage may result in impulsivity, poor judgment and planning, ADHD behaviors.*

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SOME EVIDENCE EXISTS TO SUGGEST PRE-FRONTAL ATTENTION DEFICIT IS PRIMARILY A DEFICIT OF DIRECT ATTENTION OR CONTROL OVER ATTENTIONAL PROCESSES. OTHER CENTERS (E.G., RETICULAR ACTIVATING SYSTEM IN BASAL GANGLIA/BRAIN STEM WHICH IS OFTEN DAMAGED IN TBI) ARE RESPONSIBLE FOR AROUSAL AND ALERTNESS; OTHER CENTERS MAY BE ALSO INVOLVED IN CONTROL FUNCTIONS. REGARDLESS OF THE SPECIFIC BRAIN AREA RESPONSIBLE FOR THE BEHAVIORS, DEFICITS ARE MANIFESTED IN FIVE AREAS (1) DIFFICULTY MAINTAINING ATTENTION OVER TIME; (2) DIFFICULTY FILTERING OUT DISTRACTIONS; (3) DIFFICULTY ORGANIZING INFORMATION INTO USABLE CHUNKS; (4) DIFFICULTY SHIFTING ATTENTION (PERSEVERATION); AND (5) DIFFICULTY DIVIDING ATTENTION.

| III. PSYCHOSOCIAL/BEHAVIORAL  |   |  |
|---|---|--|
| Domain/Description and Examples   | DESCRIPTION   | EXAMPLES/COMMENTS  |
| Depression/Withdrawal   | Depression and withdrawal result from grief and a sense of loss are common reactions from both the victim and the family.   | <i>Student loses ability to return to previous lifestyle (e.g., settings, social relationships.) Withdrawal isolation result. Rejection may occur.</i>   |
| Mental Flexibility Decline<br>(Empathy decrease; Feed-back rejection;<br>Dogmatic Single-minded personality;<br>Responsibility not accepted; Blame projections) | Stress when confronted with change in activities and abilities leads to an "inflexible" style as a psychological accommodation. This can also be the result of tissue damage. | <i>The TBI individual gives the appearance of self-focus and egocentricity; Difficulty perceiving and accepting alternative viewpoints and general lack of empathy, may be present. Blaming everyone else may be a behavior style. Poor problem solving results.</i> |
| Denial of:<br>(Personality differences; Physical disabilities;<br>Cognitive deficits; Emotional differences; Social inadequacies)                               | Denial is a useful coping technique in the initial stage of recovery to avoid depression.   | <i>Continual denial that a problem exists makes it difficult for the TBI individual to get motivated to do anything about the problems. This must be overcome if rehabilitation is to be successful.</i>   |
| Frustration Tolerance/Anger<br>(Overt actions-verbal or physical aggressive;<br>Patience in taxing situation; Passive-aggressive responses)                     | Inability to cope patiently without becoming emotionally upset is common.   | <i>Overt, aggressive actions, verbal tirades, physical assaults, work refusals, pouting and lack of motivation are present because a task once easy is now found to be difficult.</i>  |
| Irritability/Restlessness<br>(Hopeless/helpless statements;<br>Negativity/pessimism statements; Sleep deficits, pacing)   | Agitation is often present. The victim is never satisfied with self or accomplishments.   | <i>Difficulty sleeping, pacing, motor over-activity, distractibility, feelings of being over-protected, or having lack of autonomy are often reported or observed.</i>   |
| Anxiety<br>(Obsessive orderliness; Fear of social situations;<br>Fear of unknown)   | Anxiety often manifests as a fear of the unknown, stress over performance problems or feeling overwhelmed.  | <i>Pervasive anxiety disorder can develop post-TBI. Stress over on-going problems and feeling overwhelmed in large groups or social settings is common.</i>  |
| Lability<br>(abrupt mood changes; rapid and frequent)   | The individual is often unable to manage or predict mood swings. This can be a result of tissue damage or environmental stressors.  | <i>The lability vary from positive to depressive and inactive. This can resemble a Bipolar Disorder, but with very short cycles.</i>   |
| Impulsivity Social Judgment<br>Disinhibitions<br>(Social norm, law violations; Lack of consequence recognition)   | Acting or verbalize without thinking is a frequent sequelae.  | <i>Both inability to recognize consequences and inability to control urges. Frequent embarrassment to families.</i>  |
| Sexual Dysfunction<br>(Hyper [interest & actions]; Hypo [interest & actions])   | An individual's reaction to TBI can be to become fearful or frigid or impotent, or the opposite reaction which is to become promiscuous.                                      | <i>Only some TBI individuals experience problems in this area. Social isolation or restriction impairs ability to express or explore feelings.</i>   |
| Euphoria<br>(Laugh, giddy; Inappropriate comments;<br>Bantering)  | The personality can change so that taking something serious is impaired and a continual high flat affect results.   | <i>Common results would be: nonchalant reactions in dangerous situations, misjudging social situations, difficulty in emotionally laden settings.</i>  |
| Apathy<br>(Implementing actions once goal established)  | There often is difficulty in getting "going," even when a goal and required action is known.  | <i>A lack of initiation or lack of "getting involved" is often present.</i>  |

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| Decreased Hygiene<br>(Lack of awareness; Lack of concern) | Overall cognitive and emotional problems can lead to decreased hygiene. |  |
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| <b>SUMMARY: PSYCHOSOCIAL/BEHAVIOR</b>   |
| <b>LEVEL OF CONCERN:</b> <i>Critical for future.</i> <b>IMPLICATION:</b> <i>This is a critical assessment area to observe to determine the need for a behavioral plan, outside services, or training.</i> |

*THE MOST DEVASTATING EFFECT OF THE BRAIN INJURIES CAN BE IN THIS AREA. FREQUENTLY THE PARENTS AND PEERS ARE CLAMORING TO TELL ABOUT THE CHANGES OBSERVED. INSIGHT FROM THE STUDENT IS UNLIKELY IN THE FIRST TWO YEARS AS THE STUDENT TENDS TO HAVE INSIGHT FROM THE PREVIOUS TEMPERAMENT AND PERSONALITY AND VERY LITTLE FROM THIS NEW PERSON HE/SHE HAS BECOME. FAMILY COUNSELING CAN BE CRITICAL. REFERRAL TO REHABILITATION SERVICES CAN BE CRITICAL. FUTURE EMPLOYABILITY IS GREATLY IMPACTED BY DYSUNCTION IN THIS AREA.*

| IV. COMMUNICATION  |  |   |
|--|--|---|
| Domain/Description and Examples  | DESCRIPTION  | EXAMPLES/COMMENTS   |
| <b>Content:</b>  |  |   |
| Listening  | <i>What people talk about and what they understand of what other people say.</i>                                   | <i>Student may appear that they are unable to focus and listen; it may be they are not able to process what is said to them?</i>  |
| Understanding/ Interpretation of Verbal/Non-Verbal Communication           | <i>Difficulty with rapidly spoken language; difficulty with extended language.</i>                                 | <i>Does not appear to comprehend what others are telling he or she verbally? Does the student ask for frequent clarifications or say "I don't get it"?</i>  |
| Semantics (words & word relationships)                                     | <i>Difficulty comprehending written language, especially under time pressure; difficulty detecting main ideas.</i> | <i>Student can answer recall level questions when others explain things to them or they may not be able to retell a story or demonstrate understanding of the "main idea. It is important to allow student to demonstrate learning in multiple ways.</i>            |
| Inferences   | <i>Imprecise use of words.</i>   | <i>Does the student understand "hints" or inferred language?</i>  |
| <b>Form:</b>   | <i>Difficulty understanding abstract language; including indirect and implied meaning.</i>                         |   |
| Speaking   | <i>Articulation, syntax, morphology (grammar), voice quality, rate, and expressiveness.</i>                        | <i>Speech may be characterized by words that are slurred together. Student may only be able to speak one word utterances</i>  |
| Production of Verbal Communication<br>-Word Finding                        | <i>Disorganized narratives, difficulty with manuscript writing, spelling.</i>                                      | <i>Student may have trouble telling the sequence of events for an activity that has happened recently or from the past. Student may have thoughts that he or she is unable to articulate – may have word retrieval difficulties – may appear like "stuttering".</i> |
| Production of Non-Verbal Communication<br>-Facial Expressions<br>-Gestures | <i>Generally present. Decreased use of facial expressions and gestures for communication.</i>                      | <i>Student may use inappropriate facial expressions for the setting or conversation or lack facial expressions.</i>   |
| Grammar (syntax and morphology)  | <i>Frequently present. Word order may be confused and the structure of words may be incorrect.</i>                 | <i>Characterized by the word order of spoken or written sentences being mixed up or out of proper order – may impair understanding of the listener or reader.</i>   |
| Phonology/Articulation   | <i>Can be intact or impaired, depending on site of damage.</i>   | <i>Student may have difficulty producing sounds of speech correctly. Their speech may be unintelligible.</i>  |

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| <b>Use:</b>                            | <i>Articulatory imprecision; motor speech disorders (apraxia, dysarthria).</i>   | <i>Characterized by spoken messages (expressive or receptive) being</i>   |
| Turn Taking                            | <i>Hypervocal, sparse or restricted output, lack of initiation.</i>  | <i>The student does not allow others a chance to share input; student may dominate the topic of focus or is unable to initiate input from peers/</i>            |
| Topic Elaboration (topic Maintenance)  | <i>Normal "ebb and flow" of conversation impaired. Restricted; associations may be unusual or tangential.</i>          | <i>Characterized by student switching from one topic to another or perseverating on one topic when the topic is changed.</i>                                    |
| Disinhibition                          | <i>Language may seem offensive or not appropriate for the setting. Student does not speak before he or she thinks.</i> | <i>Student may make comments in a social setting that are inappropriate to the setting or offensive to others.</i>  |
| Proximity                              | <i>Misjudges social space; generally stands too close</i>  | <i>Student stands at a close distance to another when speaking or being spoken to. Generally makes the listener uncomfortable.</i>                              |
| Output Message Matching Output Affect: | <i>Language used does not align to the affect of the user.</i>   | <i>Student may make comments in a social setting that does not match the affect.</i>  |
| Opening Interactions                   | <i>Restricted or absent. Characterized by difficulty starting a conversation</i>                                       | <i>Student may not use gestures or body to communicate intent to start a conversation. Student may not be able to start conversations with peers or adults.</i> |
| Closing Interactions                   | <i>Restricted or absent. Characterized by difficulty changing topics or ending a conversation</i>                      | <i>Student may have difficulty with turn taking or responding appropriately in sequence.</i>  |

### SUMMARY: COMMUNICATION

**LEVEL OF CONCERN:** Usually impacted in one or more areas. **IMPLICATION:** Many TBIs result in paralinguistic (non-language) deficits, this is, difficulty in the use/interpretation of language versus difficulty with interaction. Communication rooted in the concrete.

### V. SPEED OF INFORMATION PROCESSING

| Domain/Description and Examples | DESCRIPTION   | EXAMPLES/COMMENTS  |
|---------------------------------|---|--|
| Reaction Time                   | Information processing slows due to axonal lesions. Degree of accuracy may not be impaired. However slow in processing and responding to data, the student may be capable of good output. | <i>Observe speed of processing in discussions, in games, in testing. Testing: DAS, WRAML, BENDER, WISC V, etc. are opportunities for observations.</i> |
| Speed of Response               |   |  |
| Data Integration Speed          |   |  |
| Output Quality                  |   |  |

### SUMMARY: SPEED OF INFORMATION PROCESSING

**LEVEL OF CONCERN:** Important to accommodate. **IMPLICATION:** Determine need for additional processing time: Does it improve outcome?

OBSERVATIONS ACROSS ALL TESTING SESSIONS CAN YIELD QUALITATIVE INFORMATION IN THIS AREA.

### VI. SPATIAL REASONING

| Domain/Description and Examples | DESCRIPTION  | EXAMPLES/COMMENTS  |
|---------------------------------|--|--|
| Judging Distances               | Spatial reasoning requires ability to interpret, coordinate and manipulate information related to object, space and constructional relationships. These are all associated with right hemisphere | <i>Characterized by: recognizing shape of objects (stereognosis tests), judging distances accurately, and navigating across campus without getting lost, and reading maps. There may</i> |
| Navigating in Environment       |  |  |

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| Map Reading   | functioning. Spatial reasoning skills entail forming a whole from parts, understanding design shape and color. | <i>be visualization deficits. Deficits here may require visually or spatially oriented instructional programs or materials. Some LEAs use Orientation and Mobility specialists for services if deficits are found.</i> |
| Visualizing Images                                      |  |  |
| Mechanical Thinking Skills<br>(how things fit together) |  |  |
| Shape Recognition                                       |  |  |

### SUMMARY: SPATIAL REASONING

**LEVEL OF CONCERN:** *Can be problematic.* **IMPLICATION:** *Spatial reasoning skills may be critical in community access and other adaptive behaviors.*

*INTERVIEWS OF STUDENT AND SIGNIFICANT OTHERS CAN PIN-POINT DEFICITS IN THIS AREA.*

### VII. CONCEPTUALIZATION

| Domain/Description and Examples            | DESCRIPTION  | EXAMPLES/COMMENTS  |
|--|--|--|
| Categorize                                 | Thinking may be concrete and stimulus bound, disallowing generalization. The person then appears rigid and conversation becomes stilted. | <i>Pieces of a puzzle may be identified, but putting them together may be difficult; recognition of important vs. minor details may be impaired. Understanding inferences, recognizing sequences within written assignments, prioritizing one's work and weight of various ideas can be impaired. This can result in a presenting affect that resembles an intellectually disabled individual when overall retardation is not present.</i> |
| Sequence                                   |  |  |
| Abstract                                   |  |  |
| Prioritize                                 |  |  |
| Difficulty Going From Part to Whole        |  |  |
| Problem Solving: <u>Abstract Reasoning</u> |  |  |

### SUMMARY: CONCEPTUALIZATION

**LEVEL OF CONCERN:** *Important for academic planning.* **IMPLICATION:** *Generalization of new learning may be impaired and require a curriculum shift to functional skills rather than a core curriculum approach to learning.*

### VIII. MOTOR/SENSORY PHYSICAL

| Domain/Description and Examples                          | DESCRIPTION   | EXAMPLES/COMMENTS  |
|--|---|--|
| <u>Movement</u>  | With damage to nerve cells or fiber tracts, a primitive pattern called "spasticity" can be released. Tremors, uncontrollable rhythmic movements, can be present. Damage to one or the other hemisphere can cause movement difficulties varying from paralysis to subtle body side usage problems. Gait can be affected. Apraxias from cortical damage affects motor planning. With apraxia, fluidity of movement will appear reduced. | <i>Observation during all testing, walking, talking, and PE class can yield qualitative information. The person may use a wall as a guide when left/right damage occurs. Look for gait problems. Does the person use both hands normally during testing? APE assessment as part of multidisciplinary assessment is suggested. If contractures are present, which limit full range of movement in arm or leg, neck or trunk, tightness and discomfort will occur. Physical therapy may be needed.</i> |
| <i>Increased Muscle Tone</i>                             |   |  |
| <i>Tremors/Overflow Movements</i>                        |   |  |
| <i>Reflexes Limiting Voluntary Movement</i>              |   |  |
| <i>Apraxia</i> (perform organized sequential motor acts) |   |  |
| <i>Decreased Cross mid-line/Bilateral Coordination</i>   |   |  |
| <i>Decreased Strength</i>                                |   |  |

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| <i>Decreased Endurance</i>                               |  |  |
| <i>Dynamic Balance</i>                                   |  |  |
| <i>Static Balance</i>                                    |  |  |
| <u>Visual Impairment</u>                                 |  |  |
| <i>Cortical Visual Impairment</i> (i.e., black-outs)     | Pathways from eye to back of brain are susceptible to damage.                            | <i>Black-outs can be visual or seizure origin or pressure. Requires medical intervention.</i>  |
| <i>Hemianopsia</i> (field loss in both eyes)             | Loss to ½ of visual fields each eye.   | <i>Requires training in scanning, VH &amp; O &amp; M services usually needed. Safety compromised.</i>  |
| <i>Visual Neglect of One Side</i>                        | Suggests damage in a specific hemisphere.  | <i>Retraining for neglect can be helpful, observable in task completion.</i>   |
| <i>Visual Perception Decrease</i>                        | Recognizing same and different.  | <i>On standardized tests, difficulties not present before accident</i>   |
| <i>Oculomotor Control</i>                                | Established by medical exam.   | <i>Jerky eye movements, affects visual fatigue, and processing information.</i>  |
| <i>Visual Motor Integration Deficits</i>                 | Esp. hand-eye coordination.  | <i>On standardized tests, difficulties not present before TBI.</i>   |
| <u>Hearing Impairment</u>                                |  |  |
| <i>Equilibrium Vertigo Changes</i>                       | Extensive pathways, from ear to auditory cortex, are susceptible to damage.              | <i>Dizziness, sensation of falling.</i>  |
| <i>Auditory Imperceptions</i>                            | Difficulty prominent in noisy places.  | <i>Mis-hearing words, difficulty foreground/background discrimination.</i>   |
| <i>Auditory Loss</i>                                     | Reduced hearing.   | <i>Audiological exam important, if loss suspected.</i>   |
| <u>Tactile Impairment/Loss</u>                           |  |  |
| <i>Light Touch</i>                                       |  |  |
| <i>Deep Pressure Touch</i>                               | Frequently the person may perceive light touch as irritating, deep pressure as soothing. | <i>Difficulty with soaps, shaving cream, shampoo, tooth brush, sand, etc. A program utilizing sensory desensitization can be helpful. OT consult may be helpful.</i> |
| <i>Two-point Discrimination</i>                          | Where did I touch you? Do you feel one or two points?                                    | <i>Inability to accurately process and localize incoming stimuli.</i>  |
| <i>Temperature</i>                                       | Feeling hot or cold overall, or on different body parts.                                 | <i>The person may wear heavier or lighter clothing than expected.</i>  |
| <i>Pain/Sensitivity</i> (sharp/dull)                     | Over or under sensitivities.   | <i>The person over-reacts or under-reacts to mild sensations, can be dangerous if pain sensation is reduced.</i>   |
| <i>Body Position Awareness</i>                           | Inability to locate self in space.   | <i>Not knowing where body or parts are in a space, movements lack fluidity.</i>  |
| <u>Taste/Smell Impairment</u>                            | Can be over or under responsive  | <i>Complains food doesn't smell or taste as good or is better than ever.</i>   |
| <u>Evidence of Hypersensitivity To Sensory Stimuli</u>   | Easily irritated by sensory experiences.   | <i>Many sounds, touch, smells are over reacted to-causes discomfort and irritability.</i>  |
| <u>Evidence of Hyporesponsiveness To Sensory Stimuli</u> | Lack of zest, appears unresponsive.  | <i>Person not as perceptive, requires more intensity to achieve arousal.</i>   |
| <u>Other Physical</u>                                    |  |  |
| <i>Bowel</i>   | Difficulties not present pre TBI.  | <i>Sensation problems, constipation, urgency.</i>  |
| <i>Bladder</i>   | Difficulties not present pre TBI.  | <i>Sensation problems, enuresis, urgency.</i>  |
| <i>Regulate Appetite/Thirst</i>                          | Lack of satiation feelings or fullness sensations.                                       | <i>Very rapid weight gain frequently seen, may be on-going.</i>  |
| <i>Respiratory Complications</i>                         | Complaints about breathing.  | <i>Chest pressure complaints, shortness of breath, etc.</i>  |
| <i>Yawning</i>   | Unrelated to amount of sleep.  | <i>Frequently seen in first year as a TBI sequelae.</i>  |

**SUMMARY: MOTOR/ PHYSICAL/SENSORY**

## 2.2 TRAUMATIC BRAIN INJURY (TBI) DOMAINS OF FUNCTIONING DATA AGGREGATION Guide

**LEVEL OF CONCERN:** *Thorough assessment is important.* **IMPLICATION:** *May lead to need for medical treatment, therapies, or accommodations.*

*FINDINGS IN THIS AREA MAY RESULT IN SERVICE PROVISION FOR: OCCUPATIONAL OR PHYSICAL THERAPY, OPHTHALMOLOGY, VISUAL HANDICAPPED ININERANT SERVICES, AND APE SERVICES. MULTI-DISCIPLINARY ASSESSMENT AND GOOD COMMUNICATION BETWEEN PHYSICIANS AND SCHOOL IS CRITICAL.*

### IX. EXECUTIVE FUNCTIONS

| Domain/Description and Examples | DESCRIPTION  | EXAMPLES/COMMENTS  |
|---------------------------------|--|--|
| Goal Setting                    | Executive functions includes self-regulatory or control functions that direct and organize all behavior. True extent of executive functioning damage may not be known for years if injury occurs early. Executive functions are thought to involve pre-frontal lobes, a commonly injured area as the brain slams forward and slides backward over bony ridges. | <i>Difficulty suppressing interference (reduces memory efficiency), difficulty organizing information for easy storage and retrieval, difficulty predicting success, monitoring and evaluating performance in relation to task goals. Pre-frontal injuries (esp. right) lead to difficulties learning from social feedback. Deficits in problem solving are often not revealed in structured testing, but show-up in real-world problem identification and solving tasks. Reports from caretakers are important to review.</i> |
| Planning                        |  |  |
| Flexibility                     |  |  |
| Recognition of Conclusion       |  |  |
| Recognition of Problem To Solve |  |  |
| Organizational Skills           |  |  |

### SUMMARY: EXECUTIVE FUNCTIONS

**LEVEL OF CONCERN:** *May be elusive to measure – critical for recovery.* **IMPLICATION:** *Substantial social disability can occur with pre-frontal damage – Requires real-world assessment.*

*EFFECTIVE EXECUTIVE SELF-REGULATION IS CRITICAL FOR SOCIAL SUCCESS, ACADEMIC SUCCESS, VOCATIONAL SUCCESS, AND INDEPENDENT LIVING. PRE-FRONTAL INJURY DOES NOT IN GENERAL DIRECTLY AFFECT SPECIFIC COGNITIVE OR LINGUISTIC PROCESSES. RATHER, IT AFFECTS THEIR REGULATION AND EFFECTIVE USE. IT IS IN THE APPLICATION OF COGNITIVE AND COMMUNICATIVE PROCESSES AND SKILLS WITHIN EVERYDAY SITUATIONS THAT EXECUTIVE FUNCTIONS ARE REQUIRED. PARENT/TEACHER BEHAVIOR QUESTIONNAIRES AND DIRECT OBSERVATION ARE MORE HELPFUL IN IDENTIFYING EXECUTIVE FUNCTION DEFICITS THAN SPECIFIC NEUROPSYCHOLOGICAL MEASURES USED WITH CHILDREN.*

**PRE (OFTEN ESTIMATED) AND POST GLOBAL MEASURES OF FUNCTIONING:** *Frequently differences in pre-TBI and post-TBI cognitive ability measures are not great and do not reflect the extensive change in processing and function skills.*

### X. HEALTH/ MEDICAL

| Domain/Description and Examples   | DESCRIPTION  | EXAMPLES/COMMENTS   |
|---|--|---|
| Fatigue<br>(Physical endurance; Listlessness; Need for nap; Faintness; Cognitive endurance) | After a TBI the brain is in a healing state. Endurance and perseverance difficulty are usually present, especially in the initial recover period. A student with TBI may require frequent rests or naps breaks between cognitively demanding tasks. Sometimes this ends in the first year and in some cases it persists for years. | <i>This can be a serious social and vocational impediment. Fatigue can be physical or mental. Complaints of depletion of energy after mildly fatiguing tasks are common. For example, a student may experience extreme fatigue after performing math calculations or reading a passage.</i> |
| Seizures  | All seizure types can occur. General: Grand Mal (generalized tonic-clonic, absence, myoclonic, tonic, clonic, atonic or Partial: simple, complex, partial with secondary generalization.   |   |

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|                    |  |   |
|--------------------|--|---|
| Headaches          | Headache is one of the most common medical symptoms after TBI. Headaches after TBI can be long-lasting, and may come and go even past one year out.  | Headaches can make it hard for students to carry out daily activities or can cause them to have more difficulty thinking and remembering things. They can impact cognition – resulting in low academic performance.   |
| Other Chronic Pain | After TBI neuropathic pain, back pain due to spasticity, etc. is common. Changes in brain functioning after TBI are thought to possibly impact perception of pain stimuli. Psychological and social factors can contribute to states of pain in TBI survivors. | Pain may be acute or chronic. Pain may be musculoskeletal, neuropathic (“nerve pain”), or secondary to medical complications. <i>A student may develop pain in the neck, shoulder or back. Chronic pain can impact the ability to concentrate, focus and complete academic tasks.</i> |
| Other              |  |   |

### SUMMARY: HEALTH/MEDICAL

**LEVEL OF CONCERN:** There are high rates of post TBI pain reported. Researchers estimate that the rate of posttraumatic headaches approaches 90% early on or 44% within six months after injury. Unlike what is seen objectively on medical scans, pain is never clearly understood because the suffering is subjective. Post-TBI or seizures are a serious concern as they can have a significant impact on learning and cognition. 35-65% of TBI survivors manifest some form of seizures. **IMPLICATION:** Education professionals need to recognize possible manifestations of pain in students with TBI and ensure that appropriate accommodations or therapies are provided if needed to ensure academic success. 98% of TBI survivors will manifest some sort of fatigue the first year out from the injury. Post-TBI seizures over time can lower cognition and lead to serious health concerns or death.

### XI. ACADEMIC FUNCTIONS

| Domain/Description and Examples | DESCRIPTION   | EXAMPLES/COMMENTS   |
|---------------------------------|---|---|
| Reading Decoding (basic) Skills | <i>Changes in word decoding skills</i>                                      | Student struggles to decode   |
| Reading Comprehension           | <i>Student struggles to understand previously understood text</i>           | <i>Multiple choice comprehension questions problems</i>                                   |
| Reading Fluency                 | <i>Lower scores in fluency measures</i>                                     | Student reads haltingly and slower than average grade level text decoding prior to injury |
| Written Expression              | Main idea and supporting details and conclusions can be difficult           | Look for omitted words, grammar errors and other errors atypical compared to baseline     |
| Mathematics Calculation         | Student struggles with math facts and calculations                          | Calculation errors occur with more frequency than baseline                                |
| Mathematics Reasoning           | Student has difficulty with multi-step reasoning and loses train of thought | Frustration and confusion in multi-step problems occur                                    |

### SUMMARY: ACADEMIC FUNCTIONS

**LEVEL OF CONCERN:** Important for academic success and obtaining a diploma. **IMPLICATION:** *Pre-and post-TBI standardized academic testing may yield similar findings, yet classroom performance may be affected (i.e. failing grades, inability to learn or retain new skills). Relative strengths compared to pre-injury may shift.*

**RECOMMENDED HEAD TRAUMA REFERRALS:** *THERE ARE MANY DIFFERENT SERVICES AVAILABLE THROUGH DIFFERENT AGENCIES FOR INDIVIDUALS WITH A HISTORY OF TRAUMATIC BRAIN INJURY. NEW LEGISLATION HAS BEEN PASSED TO EXPAND SERVICES FOR THESE INDIVIDUALS AND THE CONTINUED EXPANSION OF SERVICES THROUGH INTERAGENCY COLLABORATION IS CRUCIAL. IT IS IMPORTANT STUDENTS WITH TBI AND THEIR FAMILIES TO BE CONTINUALLY UPDATED ON AVAILABLE PROGRAMS TO ENHANCE ACCESS TO THE COMMUNITY, RECREATION OPPORTUNITIES AND TO PREVOCATIONAL/VOCATIONAL ACTIVITIES TO HELP PREPARE THE STUDENT FOR SUCCESSFUL ADULT TRANSITION. AS THE STUDENT TRANSITIONS TO THE WORLD OF WORK AND INDEPENDENT LIVING, ADDITIONAL NEEDED RESOURCES BECOME AVAILABLE. ONGOING INTERAGENCY COLLABORATION BETWEEN SCHOOLS AND OTHER AGENCIES ASSURES UP-TO-DATE KNOWLEDGE OF HOW TO ACCESS SERVICES AND THE CHANGES IN SERVICES AS THEY BECOME AVAILABLE. IT IS IMPORTANT TO RECOGNIZE THAT AGENCIES ARE NOT NECESSARILY AWARE OF WHAT SERVICES ARE AVAILABLE FROM OTHER AGENCIES. THEREFORE, GOOD CASE MANAGEMENT PRACTICE FOR STUDENTS WITH TBI REQUIRES INVOLVING AND PERIODICALLY CONTACTING ALL RELEVANT AGENCIES.*

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- A. *DEPARTMENT OF REHABILITATION (CONTACT LOCAL OFFICE FOR COACHING OPPORTUNITIES AND ELIGIBILITY)*
- B. *SOCIAL SECURITY ADMINISTRATION (CONTACT DIRECTLY OR ACCESS THROUGH HEAD INJURY FOUNDATION; FUNDS ARE AVAILABLE FOR SUPPORT AND TRAINING)*
- C. *BRAIN INJURY ASSOCIATION OF AMERICA – PROVIDES LATEST RESEARCH; RESOURCES AND LAWS & REGULATIONS RELATED TO BRAIN INJURY*
- D. *DEPARTMENT OF REHABILITATION OR VOCATIONAL REHABILITATION – EACH STATE HAS A “DEPARTMENT OF REHABILITATION” OF SOME SORT THAT WILL PROVIDE JOB TRAINING, FINANCIAL ASSISTANCE AND PLACEMENT IN A WORK SETTING WITH SOME LEVEL OF SUPPORT.*
- E. *BRAIN INJURY NETWORK - IS A NON-PROFIT ADVOCACY ORGANIZATION OPERATED FOR AND BY SURVIVORS OF ACQUIRED BRAIN INJURY (ABI).*
- F. *NATIONAL RESOURCE CENTER FOR TRAUMATIC BRAIN INJURY (NRCTBI) - PROVIDES RELEVANT, PRACTICAL INFORMATION FOR PROFESSIONALS, PERSONS WITH BRAIN INJURY, AND FAMILY MEMBERS.*
- G. *BRAINLINE.ORG – PROVIDES RESEARCH AND RESOURCES FOR TBI SURVIVORS*
- H. *BRAIN TRAUMA FOUNDATION - FOUNDED TO IMPROVE THE OUTCOME OF TRAUMATIC BRAIN INJURY (TBI) PATIENTS BY DEVELOPING BEST PRACTICE GUIDELINES, CONDUCTING CLINICAL RESEARCH, AND EDUCATING MEDICAL PERSONNEL.*
- I. *CENTER ON BRAIN INJURY RESEARCH AND TRAINING (CBIRT) - CONDUCTS RESEARCH AND TRAINING TO IMPROVE THE LIVES OF CHILDREN AND ADULTS WITH TRAUMATIC BRAIN INJURY (TBI)*
- J. *EPILEPSY FOUNDATION – PROVIDES BEST PRACTICES, TRAINING AND RESEARCH ON EPILEPSY*