

**ASSISTING STUDENTS WITH
TRAUMATIC BRAIN INJURY
IN THE CLASSROOM:**

A Guide for School Personnel

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Introduction

As a result of improved medical care, many people are surviving traumatic brain injury (TBI). The majority of all persons who sustain a TBI are adolescents and young adults. Therefore, it is likely that they will be returning to an educational setting. Advocates and public policy have clearly indicated a need for providing the best possible educational services for students with TBI. As more and more educational personnel are faced with teaching students with TBI, so increases their need for information on how this can be done. The level of postinjury educational and remedial support needed to complete school is an important consideration. The major reason for writing this guide is to provide a basic resource and problem-solving guide for front line school personnel who serve students with TBI in either the normal or special education classroom.

Objectives

Upon Completion of this guide the reader will be able to:

- Describe traumatic brain injury (TBI) including information related to incidence and prevalence.
- Become familiar with some of the common physical, cognitive, social and behavioral changes that a student may experience as a result of a TBI.
- Understand some of the various types of teaching strategies and accommodations that promote a successful education for students with TBI.

What is a traumatic brain injury?

According to the Federal Register (Vol. 57, No. 189) TBI means: an acquired injury to the brain caused by an external physical force, resulting in total or partial functional disability or psychosocial impairment, or both, that adversely affects performance." Trauma is the most common way brain injury occurs.

The brain is a complex organ that is responsible for controlling all body functioning like movements, heart rate, emotions, and learning. Under normal circumstances the soft brain, which has a jelly-like consistency, floats in a bath of cerebral spinal fluid and surrounded by the protective bone and membrane of the skull. The skull is rough and bony on the inside but smooth on the outside. It is hard and unyielding but may bend. If the brain is violently disturbed, as when it is struck by an object, or when it hits a windshield there is an unnatural movement of the brain inside the skull.

The soft brain moves around inside the skull and get bruised all over. This is called a closed injury. This can lead to diffuse brain damage due to the stretching and tearing of the nerve fibers. This damage is most severe when a person is moving at a high rate of speed (ie-, traveling in a car) and suddenly stops (striking the steering wheel or dashboard with the head). Rotational forces cause pulling and stretching of the brain. As the brain collides with the sharp bony protrusions in the skull, more damage is done. Brain damage may also result if the skull bends in and bruises the brain beneath it.

Two parts of the brain that are frequently injured in a motor vehicle accident are the frontal lobes which control executive functioning (ability to plan and carry out events, make decisions and solve problems) and the temporal lobes which control memory.

An open head injury occurs when one object, like a bullet, goes through the scalp and skull and into the brain. Oftentimes this type of damage is localized to a specific area of the brain. Additional brain damage or secondary injury may result from the following: Hemorrhage: bleeding in the brain Hematoma: a localized mass of blood or a blood clot puts pressure on the brain tissue Anoxia: an increase in pressure on the brain from a hematoma can restrict blood flow and oxygen to other parts of the brain and result in more damage to the brain Edema: accumulation of fluid in the brain tissue leads to swelling of the brain which causes damage since the skull is not flexible.

Medication, medical procedures and/or surgery may be needed to stop the bleeding and/or relieve pressure and swelling. Secondary damage is usually associated with more severe injuries.

The severity of an injury is usually associated with the length of post-traumatic amnesia (forgetting events before and leading up to the traumatic event) or loss of consciousness. Mild, moderate and severe injuries are usually classified using the criteria that follow:

Mild Injury

- Post traumatic amnesia of less than one hour
- Brief loss of consciousness

Moderate Injury

- Post traumatic amnesia between 1 to 24 hours
- Loss of consciousness between 1 to 24 hours

Severe Injury

- Post traumatic amnesia of greater than 24 hours
- Loss of consciousness of greater than 24 hours

Damage to the brain may be mild and temporary or serious and long lasting. A concussion or temporary loss of consciousness is usually associated with a mild brain injury while a coma or prolonged period of unconsciousness is associated with a severe injury.

Additionally, the person may have associated physical injuries from the trauma. This could include fractures, organ damage, and spinal cord injury. Also, depending on the severity and characteristics of the injury an individual may acquire post-traumatic epilepsy or seizure activity.

What is the scope of TBI in the United States?

To get a better understanding, consider the following:

- In the United States someone sustains a TBI every 15 seconds. As result, today it is estimated that 5.3 million Americans or 25 of the population have a TBI.
- Vehicle crashes are the leading (50%) cause of injury. Common causes of brain injury among infants and toddlers are abuse, accidental droppings and being a passenger in an automobile accident; for preschoolers are falls and motor vehicle accidents; for school aged children are sports related accidents and motor vehicle accidents and for adolescence assaults and motor vehicle accidents. Falls are the leading cause for those aged 65 or older.
- Males between the ages of 15 and 24 are at the highest risk of injury and are twice as likely than females to sustain an injury

- The chance of recurrent brain injury significantly increases with repeated insults to the brain. After the first injury risk of another injury is 3 times greater and after the second injury the risk of another injury is 8 times greater. j
- The incidence of Traumatic Brain Injury is 40 times greater than Muscular Dystrophy, ten times greater than Spinal Cord Injury and three times greater than Multiple Sclerosis.

Costs associated with TBI are estimated to be around 48.3 billion dollars a year. Collective loss of work productivity is estimated to be greater than 30,000 years of work. **What types of changes does a student experience after a TBI?** School personnel should be aware of some of the common changes resulting from a traumatic brain injury. Typically, the most significant amount of recovery will occur within the first 18 to 24 months post-injury. Changes may be related physical, sensory, cognitive, social and/or behavioral functioning. Examples of some of the Physical Changes that may result from a TBI include the following:

- Movement, Coordination, Balance and Walking: the ability to perform skilled movements may be effected, movements of upper or lower extremities may not be coordinated and may be jerky, abnormal muscle tone can limit motion or produce abnormal movement patterns; the person may have problems walking without assistance or lose the ability to walk.
- Endurance and Energy: chronic fatigue and a lack of stamina and energy may be present.

Vision and Perceptual: may have blurred or double vision, visual field cuts, difficulty with judging depths and distances, trouble identifying the foreground from background and difficulty understanding the positions of objects relative to each other and self Language and Speech: may have problems with language (how words are put together in to meaningful patterns) or speech the physical ability to produce language. Examples of some of the Cognitive Changes that may result from a TBI include the following: Memory: short term memory problems may result in difficulties remembering new information or what just happened, or if long term memory is effected the person may not remember earlier happenings or life events Attention and Concentration: this results in problems with attending or focusing on the task at hand and the person may be easily distracted.

Information Processing Speed: the persons speed of thought may be effected and result in a slowed comprehension and speech Executive Functioning: problems may be seen when the person is required to plan, organize and carry out and action; problem solving skills may also be adversely effected.

Examples of some of the Social or Behavioral Changes that be seen after a TBI include the following: Personality: changes may be slight or extreme, the person may become very self centered which can lead to isolation Social Behavior: behaviors that are not socially acceptable may be displayed, person may not be able to read social cues, and have difficulties with interpersonal relations _easily upset, may lash out at others

- Apathetic: appears not to care, and seems unhappy, may have problems expressing emotions and forming relationships.
- Self Awareness: may not appreciate or recognize difficulties stemming from TBI

A TBI will result in a unique combination of changes for each person. Most individuals will have some residual skills and areas of strengths. This can mislead others into thinking that a student can easily perform at areas both below and beyond that level. How well a student does after a TBI depends upon a number of factors like the following:

- residual (pre-injury) abilities
- age at injury
- severity of injury
- medical treatment and rehabilitation
- emotional and social adjustment
- support at home, school and in the community.

What is a Neuropsychological Evaluation?

A neuropsychological evaluation is a formal testing tool that can provide insight into a person's current strengths and abilities. Referral questions are used to help direct the evaluation, and the report can be useful when the right ones are asked of the examiner. Some examples of questions that may be relevant to school personnel include:

- What types of accommodations would be beneficial?
- What is the student's level of self-awareness?
- In what areas has the student improved, declined or remained the same since a) injury or b) last evaluation?
- What teaching strategies would be most effective in promoting memory and learning?

What learning modality does the student use?

It is very important to note that a neuropsychological evaluation is simply a snap shot in time of how the person is performing and should not be used to predict future success. Instead, it should be used to help develop strategies to help the student succeed in the classroom. If the report is inadequate, unclear or highly technical then a meeting with the examiner may be necessary. In many instances questions may be able to be answered without this formal evaluation and resources can be better used for other services.

A glossary listing some terms associated with TBI that may be seen in medical reports or evaluations is located under Appendix A at the end of the guide.

What can be done in and out of the classroom to enhance the student's success?

Educational supports must be individualized to maximize the student's potential. Sometimes a number of approaches or accommodations will need to be tried, tested and modified before locating the ones that best meet the student's needs. In addition, the student should be involved in the process to promote ownership and use.

Some examples of classroom strategies are offered below: Note: The following information has been re-printed with permission from *Supported Employment Services for Individuals with Traumatic Brain Injury*: Virginia Commonwealth University, Rehabilitation Research and Training Center on Supported Employment.

Attention/Concentration: Be sure you have the individual's attention before giving instructions. When off-task, redirect to task at hand. Decrease visual and auditory distractions by moving the individual to a distraction-free area or adapting the environment (e.g., earplugs, room divider, etc.).

Confusion: Clarify instructions. Explain tasks to be done in a clear and simple manner. Repeat instructions and ask the individual to paraphrase. Identify and isolate the source of confusion.

Memory: Verbally explain how to perform a task and demonstrate what is to be done. When teaching a new skill, pair it with a familiar concept and examples. Explain why the task is being performed. Be consistent when providing step-by-step instruction. Ask the individual to write down and verbalize what is to be remembered. Establish cuing systems that serve as memory aids. Develop and implement compensatory strategies that can be used to instruct on what to do and how to do it.

Initiation: Implement cuing systems that signal changes in tasks. Use naturally occurring cues whenever possible. Develop compensatory strategies (e.g., checklist which indicates when and what to do.) Use reinforcement for proceeding from one step to the next, rather than completion of the previous step. Establish time frames to begin a task. Provide a rationale for performing each step within a task and ask the individual to verbalize.

Judgment and Problem Solving: Have the individual participate in the planning and organization of tasks. Demonstrate and/or write instructions to promote understanding. Use verbal and visual cues when leading the consumer through the steps of the task analysis.

Impulsiveness/Lack of Inhibition: Teach the individual and increase his/her belief that he/she can control behavior. Establish a key word such as "chill out" to be repeated when he/she feels that he/she is losing control of a situation. Investigate prescribed medication effectiveness and compliance. Investigate the use of alcohol and other drugs that lower inhibition. Provide immediate feedback on how behavior affects others, i.e., role play. Provide a one word command that signals the individual to recognize the behavior.

Agitation/Irritability: Model calm. behavior; keep nonverbal cues relaxed. Acknowledge the individual's feelings and frustrations and provide a time for further discussion at break or after work. Reinforce the individual's regaining self-control after an outburst. Comment on the behavior and not the person. Provide structure in the environment to minimize frustration. Eliminate environmental calm and redirect. Teach relaxation techniques. Investigate medication compliance and effectiveness.

Some students may not be able to acknowledge that a problem exists and is unlikely to accept accommodations or other supports. Allowing the student to experience "failure with support" may lead him or her to recognize that help is needed.

Final Thoughts

As medical interventions and rehabilitation services continue to improve our educational systems can expect to see more students with TBI. Our aim has been to help the system become more adequately prepared to serve students with TBI both academically and socially by bringing to light the unique needs and problems associated with this lifelong disability. For additional information contact: Pam Targett TBI Model Systems at 804-828-2325 or email at psherron@atlas.vcu.edu.

For Additional Reading:

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Other Resources:

National Brain Injury Association 105 North Alfred Street Alexandria, VA (703)838-8777 Family Help Line: 1-800-444-6443 www.biausa.org

Brain Injury Association of VA 3212 Cutshaw Avenue, Suite 315 Richmond, VA 23230 (804)355-5748/800-334-8443 www.bia.pmr.vcu.edu/biav@visi.net

TBI Model System of Care Virginia Commonwealth University Medical College of Virginia Department of Physical Medicine & Rehabilitation VCU Box 980542 Richmond, VA 23298-0542 804-828-3704 (Voice) 804-828-2378 (Fax) www.neuro.pmr.vcu.edu

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APPENDIX A GLOSSARY

Abstraction: The degree to which a concept is removed from a single concrete instance.

Agnosia: Inability to recognize a sensory stimulus. May occur in any sensory modality.

Ambidextrous: The left or right hand can perform a task, as opposed to being "right handed" or "left handed".

Amnesia: Lack of memory for periods of time. Several varieties are relevant:

Anterograde Amnesia - Inability to remember events beginning with the onset of the injury; essentially, severely decreased ability to learn.

Retrograde Amnesia - Loss of memory for events preceding the injury.

Post-Traumatic Amnesia (PTA) - The period of anterograde amnesia following a head injury. Patient is unable to store new information.

Anomia: Inability to find the correct word.

Anoxia: Lack of oxygen supply; resulting from poor blood flow to the brain or low oxygen in the blood.

Aphasia: Impairment of some aspect of language not due to defects in speech or hearing organs, but due to brain impairment.

Aphasia, Expressive - Difficulty primarily in producing speech; the ability to read and understand language is relatively better preserved.

Aphasia, Receptive - Difficulty primarily with understanding written or spoken language; the ability to speak is better preserved.

Aphasia, Global - Severe difficulty speaking and understanding language.

Apraxia: Inability to plan and execute a learned voluntary movement smoothly not due to muscle weakness or failure to understand directions.

Assistance, Dependent Maximum: A persons must completely rely on the help of another for specific task(s).

Assistance, Moderate: A person requires some help from another to perform a specific task.

Assistance, Minimum: A person requires very little help from another to perform a specific task.

Ataxia: Inability to coordinate. muscular movements.

Attention: The capacity for selective perception, for choosing which stimuli to perceive.

Attention Span: The ability to concentrate for a given amount of time.

Body Awareness And Laterality: Refer to awareness of left-right, over-under, etc. within one's own body, and the ability to distinguish between movement on the left and right sides of the body. Awareness of his own body, its parts, and how they work, prepare the person for dealing with his environment. Only after developing the ability to make spatial judgments in relation to his own body is the person able to apply spatial concepts to external objects. **Directionality** refers to the ability to discriminate left-right, up-down, etc. in external space.

Brainstem: The lower extension of the brain connected to the spinal cord. Its functions include those necessary for survival, arousal, and alertness.

Cerebellum: The portion of the brain that helps coordinate movement. Damage may result in ataxia.

Cerebral Infarct - Lack of blood flow to the brain causing the death of tissue in the affected area.

Cerebrospinal Fluid (CSF): Fluid that circulates around the brain and spinal canal.

Closed Head Injury: Trauma to the head that does not penetrate the skull but damages the brain.

Cognition: The thinking process; the person's ability to process information. Knowing or understanding; information processing and thinking skills, including concept formation, reasoning, and problem solving. (Gianutsos, 1980)

Reasoning ...

Drawing logical conclusions with analysis and support of given facts. Includes drawing inferences; recognizing cause/effect; understanding relevancies and relationships.

Critical Thinking Skills in Problem-Solving ... (Watson, Glaser, 1964) 1. Ability to define a problem. 2. Selecting pertinent information in solving it. 3. Recognizing stated and unstated assumptions. 4. Formulating and selecting relevant hypotheses. 5. Drawing valid conclusions and judging validity of inferences.

Insight ...

Understanding and integrating facts of a situation. A patient may not understand the limitations of his deficits, show unrealistic future planning and poor decision making.

Cognitive Flexibility: The ability to shift one's cognitive or perceptual set.

Coma: A state of unconsciousness.

Comprehension: Processing language of varying complexity, relating that information to past experiences, acting upon it appropriately. Comprehension is determined by the patient's behavior.

Concrete Thinking: Thinking in a logical and coherent manner about what can be seen (e.g., balancing a check book).

Concussion: A blow to the head causing brief unconsciousness.

Confabulation: Fabrication of ideas which is partially, or completely based, on false information or misinterpretations of information. A patient with memory deficits may often confabulate about a situation which actually occurred, exaggerating and distorting the facts. It often coincides with confusion, and the patient may make a "verbal collage" of past bits of information with no logical sequence or organization.

Constructional Apraxia: Inability to assemble, build, draw, or copy accurately, not due to apraxia of single movements.

Contracture: Reduction in movement of a joint.

Contralateral: Opposite side.

Coping Pattern: Mechanisms to adapt to or overcome a stressful situation.

Denial: Patient will not admit or realize existence or severity of problems. Shows unrealistic attitude with comments such as, "I can do this with no problems." Another common remark may be, "I never could do this anyway," when finding a therapy task difficult. The patient may do much excuse-making for his problems.

Diffuse Axonal Injury: Brain damage that is spread out to many areas of the brain.

Diplopia: Double vision.

Discrimination: The ability to discern fine differences among stimuli, whether visual, auditory, tactile, etc.

Distractibility: Inability to separate figure from ground visually or auditorily. All stimuli are equally important, and the person is unable to determine the most essential information. This may be internal, such as a pain, or external, such as an outside noise.

Dysarthria: Inability to control the muscles involved in the speech process, resulting in poorly articulated speech.

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Dyscalculia: Impaired ability to do arithmetic computation. May relate to a variety of more basic disorders, such as confusion or deficits in perception, spatial skills, sequencing, etc. Sometimes referred to as acalculia, which is technically a total inability to do arithmetic.

Dysgraphia: Impaired ability to write, not due to motor impairment. Also referred to as agraphia, which is technically a total inability to write.

Dyslexia: Impaired ability to read.

Dysphagia: Difficulty in chewing and/or swallowing.

Edema: Swelling.

Embolus: A blood clot that travels from one part of the bloodstream to another blood vessel.

Epilepsy: Seizure disorder.

Equilibrium: Maintaining balance and posture.

Evoked Potentials: Electrical activity in response to a stimulus.

Executive Functions: Planning, prioritizing, sequencing, self-monitoring, self-correcting, inhibiting, initiating, controlling, or altering behavior.

Extension: Straightening.

Eye-Hand Coordination Or Visual-Motor Integration: The use of the eyes and hands together in unified actions, in which visual information guides the motor response of the hand. Eye-hand coordination is involved in many activities, such as writing, cutting, catching, and throwing a ball, tying shoelaces, etc.

Figure-Ground: Distinguishing between foreground and the background.

Finger Agnosia: Inability to determine which finger is being stimulated by touch alone.

Flexion: Bending.

Frontal Lobe: Lobe of the cerebral hemisphere associated with the execution of smooth coordinated movements, sense of smell, and thinking skills.

Gait: Walking pattern.

Hematoma: Blood clot.

Hemianopsia: Blindness in the right or left field of vision.

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Hemiplegia, Hemiparesis: Loss of function or weakness of half of the body resulting from an injury in the brain on the opposite side.

Hemisphere: Half of the cerebral cortex.

Higher Cognitive Functions: Usually refers to judgment, abstraction, problem-solving, planning, etc.

Hydrocephalus: Commonly referred to as "water on the brain". Abnormal accumulation of cerebrospinal fluid in the brain causing swelling of the head.

Imperception/Inattention/Suppression/Extinction: All these terms refer to a failure to perceive stimulation on one side of the body when both sides are being stimulated simultaneously (double simultaneous stimulation). It is not due to a primary sensory deficit, such as deafness, blindness, or dysesthesia (numbness); it appears to be an attention deficit. It is less severe than neglect and may occur in a patient recovering from neglect.

Impulsivity: "Confidently attempting unfamiliar tasks beyond capabilities." (Norman, 1979) This can also include familiar activities. Patient may be impulsive in trying to answer a question before completely asked, or starting a task before fully explained.

Ipsilateral: Same side.

Ischemia: Reduced blood supply.

Judgment: The ability to make appropriate decisions based upon available information and expected consequences.

Lability: Inappropriate and/or exaggerated emotional expression of laughing or crying due to loss of emotional control.

Lack Of Initiation And Follow Through: Inability to start actions independently, continue and carry through to completion. The patient usually requires structure and supervision in tasks.

Lack Of Self-Correction: Inability or lack of sufficient "quality control" of verbalizations or actions. The patient may not recognize his or her own errors; or if error is pointed out, be able to identify steps for self-correction.

Language: Usually the ability to enter new information into long-term memory.

Latency of Response/Response Delay: Amount of time it takes to respond to a stimulus.

Memory: Recording of new information. Many types of memory are distinguished, depending on the person's theoretical orientation. Some of the more common are:

Registration - A very brief sensory/memory function by which information enters the memory system. It is then entered into short-term memory or decays and is lost. Very resistant to impairments.

Short-Term Memory - *Working* memory with a limited capacity. Its contents are in conscious awareness. Lasts 30 seconds to several minutes.

Long-Term Memory - More permanent storage of the memory trace.

Immediate Recall - *Immediate* repetition of information given by the examiner.

Delayed Recall - Recall of material after a delay, often with intervening material being introduced to prevent active rehearsal.

Verbal Memory - Memory for verbal information. Assumed to reflect functioning of the deep structures of the left temporal lobe.

Nonverbal Memory - Memory for figures, spatial relationships, etc. Assumed to be based in the deep structures of the right temporal lobe.

Episodic Memory - Memory for ongoing events in a person's life. More easily impaired than semantic memory, perhaps because rehearsal or repetition tends to be minimal.

Semantic Memory - Memory for facts, usually learned through repetition.

Neglect: Severe lack of awareness of the side of space contralateral to a brain lesion. May occur in any sensory modality. More pronounced than imperception.

Occipital Lobe: Lobe of the cerebral hemisphere responsible for vision.

Orientation: Reality-based information about the world, i.e., who one is, where one is, who one is talking to, what day it is, etc.

Orthoses: Splints and braces.

Parapnasias: Use of incorrect words or word combinations.

Perception: A combination of many primary skills - implies interpretation of information coming from eyes, ears, and other nerve endings throughout the body. Sight is not visual perception; hearing is not auditory perception. Sight and hearing are simply two of the systems through which we receive information. Perception involves the ability to organize that sensory information, receive meaning from it, and use it to make discriminations and judgments about the world. Perceptual ability is necessary to perform any task, from separating red from blue blocks to solving complex mathematical problems.

Perception Of Form And Form Discrimination - Involve the ability to distinguish among stimuli on the basis of essential details of shape. Form discrimination may involve interpretation of visual information and/or shape. Form discrimination may involve interpretation of visual information and/or information from the sense of touch. Visual perception of form is critical to the ability to discriminate letters and numerals in reading. It is involved in distinguishing between A and H. Ability to perceive structural detail of form helps the person recognize the difference between h, n, and in. It is through perception of form that a person organizes his perception of quantity or number.

Perception of Spatial Relationships - Involves visual organization of points in space as they relate first to the self, then to each other. Perception of space affects the ability to move through space without bumping objects, or to move a glass of milk to the mouth without spilling. It affects the ability to organize work on paper, to find starting and stopping points, to reproduce symbols on paper. Inaccurate perception of spatial relationships may contribute to reversal problems (was/saw, on/no, 42/24). Many letter and number symbols require accurate perception of spatial directionality (6/9, b/d, p/q, u/n). All position concepts (over, under, in, behind, between, etc.) depend upon perception of spatial relationships.

Figure-Ground Discrimination - The ability to find and focus attention on a given stimulus while other stimuli remain dimly perceived background, and to shift attention appropriately. This skill is needed to focus on one word or symbol on a page and to maintain one's place on a page in reading. In the auditory area (called Focus-Field Discrimination) it involves the ability to focus attention on a relevant sound source (such as a teacher's voice) while ignoring sounds from irrelevant sources (hall noises, pencil sharpeners, etc.).

Perception of Sequence - The ability to understand the ordering of visual, verbal or manipulative materials in meaningful sequences. Sequence is involved in many vital areas. Spelling and reading require coordination of an auditory sequence of sounds with a visual sequence of symbols. In the English language, the relationship of ideas is expressed primarily through word order; if word order is changed, new meaning may result (That girl with Tom is mad; that girl is mad with Tom). Concepts for number and numerical progression are built upon perception of sequence.

Parts-To-Whole Relationships - the ability to integrate parts into meaningful wholes, or to analyze wholes into component parts. This skill is needed in spelling and reading; written words are made up of letter parts, spoken words are made up of sound units, and sentences are made up of words. In mathematics, perception of parts-to-whole relationships is basic to understanding the composition of number, number operations, and fractions. Ability to integrate elements into a total meaningful whole is involved in all abstract thought processes, concept formation, and generalization.

Perseveration: Persistent repetition of a verbal response or motor activity. The patient may be aware of this but finds it difficult to stop.

Prosody: The inflections and intonations of speech.

Rigidity: Inflexibility; difficulty to easily conform, change attitudes or actions. A patient may be compulsive about objects being in a certain position in his or her room. He or she may be rigid about schedules and become easily upset if changes need to be made.

Scanning: Active search of the environment for information.

Seizure: Sudden excitation of neurons associated with involuntary muscle contractions, unconsciousness, and/or poor bowel and bladder control.

Self-Monitoring: Awareness of one's behavior and the accuracy or appropriateness of one's performance. Usually automatic and ongoing.

Sensation: Sensory stimulation, passively received. Involves no processing or manipulation of sensory information.

Sequencing Skills: The ability to order elements correctly. May be motor (sequencing body movements smoothly) or linguistic (sequencing words appropriately into sentences) as well as keeping track of the correct order of stimuli.

Shunt: A surgically implanted tube that allows transfer of fluid from the ventricles to the abdomen, heart or veins of the neck.

Social Imperception: "Lack of usual emotional concern about surrounding stimuli or lack of regard to life's usual priorities, particularly in social situations." (Norman, 1979) The awareness of the actions of another person that reveal his attitudes, feelings, or intentions. This may be demonstrated by flat affect and inappropriate social interaction.

Spasticity: Increase in muscle tone and/or heightened reflexes which results in abnormal movement patterns.

Speech: Oral expression of language.

Spontaneous Recovery: Behavioral outcome of the natural healing process of the nervous system.

Temporal Lobe: Lobe of the cerebral hemisphere associated with verbal and nonverbal memory as well as balance, hearing, language processing, and emotional responses.

Unilateral: One side.

Ventricles: Cavities that store fluid inside the brain.

Verbosity: Inability to control amount of verbalization, usually disorganized in content. The patient continuously talks in rambling manner, sometimes speaking simultaneously with their listener. They experience difficulty in conciseness and reaching the point of discussion.

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