Brain Injury in Children and Youth

A Manual for Educators

COLORADO

Department of Education

Revised 2018

ACKNOWLEDGMENTS

In 2001, the Traumatic Brain injury (TBI) Manual was written as a joint effort between the Colorado Department of Education, the New Start Project within the Center for Community Participation at Colorado State University in Fort Collins, Colorado, and the Children's Hospital Colorado. Since 2001, brain injury research and practice has changed significantly. In 2012, the Colorado Brain Injury Steering Committee, led by Karen McAvoy and Judy Dettmer, was instrumental in updating the TBI Manual and creating the stand alone special education eligibility category and criteria for TBI, which was formally adopted into the Colorado Rules for the Exceptional Children's Educational Act (ECEA).

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Thanks to all contributors over past years who have made this a valuable resource for parents and educators.

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Introduction

You might be wondering why you as an educator or school staff member should be interested in brain injury. Many people do not realize how common it is for children to sustain a brain injury. Traumatic Brain Injury (TBI) is a leading cause of death and disability among children ages 1 to 19 years in the United States (Faul, Xu, Wald, & Coronado, 2010). Each year, approximately 40 percent of TBIs in the United States occur in the pediatric population (ages 0 to 19 years) (Faul et al., 2010). The Centers for Disease Control (CDC) estimates that more than 60,000 children and adolescents are hospitalized annually in the United States after sustaining moderate to severe brain injuries from motor vehicle crashes, falls, sports and physical abuse with an additional 631,146 seen in hospital emergency rooms and released (Faul et al., 2010). In all, nearly 145,000 children aged 0 to 19 years are currently living with long-lasting, significant alterations in social, behavioral, physical and cognitive functioning following a TBI (Zaloshnja, Miller, Langlois, & Selassie, 2008).

The Colorado Department of Public Health and Environment (CDPHE) reported the rate of Traumatic Brain Injury was twice as high for Colorado boys and young males ages 0 to 20 years (71.7 TBIs per 100,000 population) than the rate for Colorado girls and young females of the same age (36 per 100,000). The leading causes of non-fatal TBI among Colorado children and youth were motor vehicle-related events in traffic or on public roads and falls. Two additional causes more common among children and youth than adults were those involving other transportation (including motor vehicles not in use on public roads, off-road vehicles, trains, airplanes and water transport) and being struck by/against a person or object such as in recreational and sporting events.

Although TBI is a high-incidence medical event, the U.S. Department of Education and most state departments of education consider TBI a “low-incidence” educational disability. A significant discrepancy between the incidence of TBI and the identification of children with TBI for special education services continues to exist. Although approximately 145,000 children live with persistent disability following TBI (Zaloshnja et al., 2008), the total number of students receiving special education services under the TBI category is only 27,000 (U.S. Department of Education, 2015-16). Given that 60,000 children are hospitalized each year for TBI it is likely that many of them are not receiving the services they need (Faul et al., 2010). Rates of special education identification are higher for some students with TBI, including those with severe TBI, problem behavior, poor academic performance, and socio-economic disadvantage (Donders, 1994; Ewing-Cobbs, Fletcher, Levin, Iovino, & Miner, 1998; Max et al., 1998; Miller & Donders, 2003; Taylor et al., 2003). This discrepancy exists across all states, including Colorado.

Since 2014, in Colorado, over 500 students have been identified with a brain injury as their primary disability category for special education. Comparing this to data from the CDPHE which says approximately 2,000 youth ages 0 to 20 years are discharged from the hospital with TBI each year, there may be a significant number of students who are either receiving services under an inappropriate disability category or are not receiving special education services at all. While it is difficult to determine how many youth who sustain TBI will experience any long-term educational impact requiring special education support, the Pediatric Registry suggests approximately 19 percent of moderate-to-severe brain injury will result in on-going, life-long impairment. This data would suggest that we are **grossly under-identifying students with brain injury** that may benefit from special education services. Additionally, this data only reflects injuries that were of a significant enough medical nature to require hospitalization. Therefore, those with medically “mild” TBI (concussion) who were treated and released from the hospital or who perhaps never sought medical care are not included in these numbers. Schools and districts specifically wanting more information on concussion identification and management and state concussion legislation (Senate Bill 11-040) should refer to the Colorado Department of Education Health and Wellness Brain Injury web page.

School personnel MUST know how to look for subtle and longer-term effects on any and all students who sustain either a traumatic or non-traumatic brain injury. However, there are many reasons why staff may not realize a student in their classroom has sustained a brain injury:

- If the injury occurred in infancy or before they reached school age, parents may not realize there could be a connection with learning/behavioral problems and the injury. Parents are often told by health care providers that there will not be any long-term effects of the injury and they don't report the history when their child starts school.
- The information about the injury may not follow the child through his/her educational career. This happens particularly when the child moves from school-to-school, and/or grade-level to grade-level (such as from elementary school to middle school).
- Both parents and school personnel may miss how a seemingly "mild" brain injury may impact school performance and learning ability.
- A parent may not want to tell the school about injuries that have occurred during domestic violence/child abuse incidents or injuries that reflect poorly on their supervision and care.
- Parents may not know of their child's participation in "problem" activities, such as "huffing" or playing asphyxiation games, which can cause a non-traumatic (acquired) brain injury.
- Lastly, neither a parent, doctor nor school professional can determine the long-term impact of the injury at the time it occurs.

Types of Brain Injury

There are different types of brain injury.

Congenital Brain Impact: This takes place **BEFORE** birth, in utero. Congenital brain injury can result from a lack of blood flow or oxygen, exposure to substances (drugs – prescription, legal or illicit or alcohol), or other insults to the developing brain before birth.

Acquired Brain Injury (ABI): Any insult to the brain POST birth is considered an "acquired" brain injury (ABI). The child is born with a normally developed brain but an incident happens after birth that compromises the brain's future growth and potential.

There are two types of acquired brain injuries:

Traumatic Brain Injuries (TBI): Caused by a bump, blow or jolt to the head or a penetrating head injury that disrupts the normal function of the brain. The severity of a TBI may range from mild (causing a brief change in mental status, including concussion) to severe (long term changes in brain function).

Non-Traumatic Brain Injury (nTBI): Caused by an internal event such as a brain tumor, infection, lack of oxygen or blood flow, or introduction of a toxin that causes damage (e.g., lead, inhalant), etc.

While there are different mechanisms that cause BI, the consequences of brain injury may be similar and interventions may be the same. Regarding special education identification (assessment) and intervention, the U.S. Department of Education recognizes TBI, not the broader ABI, under the disability category of Traumatic Brain Injury. The Colorado Department of Education aligns with the federal definition of TBI and implemented this category as of January 2013. While students with a non-traumatic brain injury are not eligible for the IDEA TBI category, they can still be eligible for special education services under Other Health Impairment (OHI) or other special education category. For the purposes of this manual, all of the techniques, strategies and assessment tools can be applied to all types of brain injury. Chapter 5 of this Manual outlines the details of 504 Plans, IDEA/Special Education Criteria.

Mild-Moderate-Severe:

In the medical field, doctors have tried to quantify brain injury by assigning the classifications "mild," "moderate," and "severe". Using the Glasgow Coma Scale (GCS), medical professionals observe a patient throughout the first 48 hours in which the injury has occurred and assign levels of responsiveness in three areas: eye opening; motor response; and verbal response.

The severity of TBI according to the GCS score (within 48 hours) is as follows:

- Severe TBI = 3-8
- Moderate TBI = 9-12
- Mild TBI = 13-15

(Reference: http://emedicine.medscape.com/article/326510-overview)

School personnel are warned to not simply rely on classifications such as mild, moderate and severe. This classification implies a predictive course of recovery. Brain injury does not lend itself to a predictive course of recovery regardless of classification applied by medical professionals. Many students with a moderate-to-severe brain injury will be discharged from a hospital setting with distinct physical, medical and educational needs – such as a wheelchair, feeding assistance and special education programming. However, just because they are classified moderate-to-severe does not mean that they will inevitably require special education services.

Even more misleading is the child/adolescent with a "mild" brain injury, often called a "concussion" or a "ding" to the head. This injury could be the result of a fall as a toddler, or a sports injury as an adolescent. Many of these "invisible" injuries, while perhaps not significantly impactful at the time, could have serious physical, learning, behavioral or social consequences later. Because the injury was classified as "mild" at one point, there is a risk of adults not making the connection between the injury and the serious problems that may occur later. The seriousness of a brain injury can only be classified by the level of burden it later poses to the child/adolescent in the areas of physical health, learning, behavior and social development. School serves as a place to watch these children for years and decades. It is the responsibility of the school to:

- Be aware of the brain injury (once disclosed by the parent or medical professional).
- Watch for changes in learning, behavior or social skill development.
- Be able to screen for and monitor any report of lifetime history of brain injury.
- Be able to assess and identify appropriate educational options individualized for the student.

School personnel have to consider the possibility that a child's learning problems could be stemming from a brain injury. The student with a brain injury may have issues in school that look the same as children with other disabilities, such as Attention-Deficit Disorder, Oppositional Defiant Disorder, or Emotional/Behavioral Disability. The student may be identified as having one of these conditions and may even be on an Individualized Education Program (IEP). You may wonder then, if the child who has sustained a brain injury is identified and receiving special education services, why is it important that he/she be identified with a TBI? It is important because the student's learning and behavior problems come from a different root source and interventions that work for other disorders may be ineffective for a child with a brain injury. A teacher will be more effective if he/she understands the true cause of the problem. This manual is designed to assist school personnel in understanding how the brain injury can best be recognized and served.

Chapter Overview

Chapter 1 provides an overview of basic neuroanatomy and neurophysiology. It is helpful to understand how complex the brain is and how disruption to any part of its hard or soft wiring can result in lifelong challenges.

Chapter 2 provides an understanding of the tasks being mastered during normal development so the reader will understand how a brain injury can disrupt development at any point.

Chapter 3 examines the **Building Blocks of Brain Development** - the building blocks refer to the domains (or skills) most commonly disrupted following a brain injury. Organized in ascending order from the most fundamental building blocks to the highest order of cognitive thought, a brain injury at any age can forever alter the course of neurocognitive development. This chapter also provides an in-depth look at the social/emotional competency building block; one of the most difficult areas disrupted following a brain injury. As many of the questions from parents and teachers revolve around the student's "ability and intent" or "skill vs. will" with regard to behavior and social skills. Additionally, this chapter provides factors for consideration, specific to brain injury, that may affect any or numerous building blocks.

Chapter 4 explains the federal definition of TBI and its implications on formalized services such as 504 Plans and IDEA (a.k.a. special education). Prior to 2013, students in Colorado with TBI were provided services under the Physical Disability designation. Colorado now has a stand-alone category for TBI and is in alignment with the Federal definition. This chapter provides the guidelines and criteria for assessment and eligibility for a student with either a medically documented TBI or an educational identification of TBI.

Educational and Community Resources

Infrastructure Development, Case Management and Education Consultation Supports

Colorado is extremely fortunate to have a funding mechanism to support an infrastructure for children with brain injury. With funding from MINDSOURCE Brain-Injury Network within the Colorado Department of Human Services (CDHS) and the Colorado Department of Education (CDE), a partnership was developed between CDE, CDHS, Brain Injury Alliance of Colorado (BIAC) and school districts throughout the state. By working together, these organizations have developed a system of care to support Colorado children from the time of injury through adulthood.

These goals are achieved through a multi-pronged approach:

Services For Children/Youth

BIAC offers multiple support programs for children/youth with a brain injury and their family. These services include Resource Navigation, Education Consultation, and Classes & Workshops. All services are free of charge. More information about these programs can be found at https://BIAColorado.org

Education Consultation

BIAC is able to provide education consultation for children/youth experiencing difficulties in school. Education consultation is provided by a trained school professional with expertise in brain injury. The Youth Education Liaison works collaboratively with the child/youth, family, brain injury case manager, and school team to identify educational support (both informal and formal) with the goal of improving school outcomes for the child/youth.

Resource Navigation

Resource Navigation is BIAC's foundational support program for survivors, family members, and caregivers. It is intended to be quick and easy to access. Whether it's over the phone, email, text, or in-person, BIAC has staff ready to provide support. No application is necessary – just give us a call to get started with one of our phone-based Resource Navigators.

All ages can access this free support.

Examples of support:

- Finding medical providers
- Understanding brain injury
- Filling out paperwork
- Connecting to community-based resources
- Problem-solving

Enrollment Process

To enroll in services individuals need to contact The BIAC at 1-888-331-3311 or by visiting the Brain Injury Alliance of Colorado referral web page.

Systems Support

Colorado Department of Education

MINDSOURCE Brain-Injury Network has an Inter-agency Agreement (IA) with the CDE to support schools and school districts in effectively managing concussion and children/youth with on-going educational needs resulting from their injury. This agreement supports a full time Brain Injury Consultant in the Health and Wellness Unit at CDE. A second Brain Injury Consultant is in the Exceptional Student Services Unit and supported by CDE. These Brain Injury Consultants work collaboratively to provide training and education to increase skills and knowledge of the systems and people that serve children with brain injury. In addition to training and technical assistance, the Brain Injury Consultants are developing a comprehensive network of district-wide BrainSTEPS CO consulting teams and school-specific Concussion Management Teams.

BrainSTEPS CO - Brain Injury Consulting Teams

CDE supported Brain Injury Resource Teams for many years and formally adopted the BrainSTEPS model in 2016 from Pennsylvania Department of Health. BrainSTEPS CO teams are BOCES/District-based teams comprised of multidisciplinary school professionals assembled to assist local school staff with:

- Education and awareness of brain injury for school professionals.
- Hospital-to-school re-entry planning.
- Understanding the Building Blocks of Brain Development Framework.
- Assessment and development of IEP and 504 Plan.
- Academic interventions.
- Educational programming.
- Monitoring of students until graduation.
- Brain injury trainings for school personnel and families.

The BrainSTEPS CO Team is intended to compliment, existing school teams or processes for identifying either informal or formal supports for students with brain injury.

If your district is interested in learning more about establishing its own BrainSTEPS CO Team, please visit the Colorado Department of Education BrainSTEPS website.

Concussion Management Teams

Return to Learn Concussion Management Teams (CMTs) support students returning to the demands of school while promoting recovery. The CMT focuses on the student's academics during recovery from concussion. CMTs monitor both student athletes and non-athletes. The CMT regularly communicates with the athletic department for student athletes. CMTs are modeled after Pennsylvania's BrainSTEPS program that originated the CMT model and has trained more than 1,100 Return to Learn CMTs in state schools as of March 2017. The Colorado Department of Education is partnering with Pennsylvania BrainSTEPS to bring CMT training to Colorado educators.

CMT Training is:

1. based on current research and best practices,
2. available on-line and takes approximately 5 hours to complete, and
3. covers the educational impacts of concussion and specific CMT roles.

The Concussion Management Team

Building-level CMTs must identify two persons:

- Academic Monitor: monitors the student's academics using a one-page tool/one time per week.
- Symptom Monitor: monitors the student's symptoms using a student self-reporting tool several days per week.

In addition to monitoring the student's academics and symptoms, the CMT assists teachers with implementation of academic adjustments until recovery. If at the end of six weeks a student's learning is still being impacted by concussion symptoms, the CMT will then refer the student to the district's BrainSTEPS Team. If a BrainSTEPS Team is not available, the case will be referred to the district's student assistance team for further evaluation and monitoring.

Online Support

Colorado Kids with Brian Injury www.cokidswithbraininjury.com

This site is designed to provide educators and parents with practical information that can be used to identify and provide appropriate supports and services to children with brain injury. Additionally, the site provides parents with information on services that are available for their child and how to access support. State and national resources that provide an overview on brain injury, treatment and advocacy can also be located on this site.

The following information is provided on this website:

- **The Brain Injury in Children and Youth: A Manual for Educators**: includes information on neuroanatomy, developmental stages, assessing functional behavior, learning implications and intervention strategies as they relate to youth with a brain injury.
- **The Building Blocks of Brain Development:** a user-friendly framework, developed by CDE and the Colorado Brain Injury Steering Committee, applies the most current research on brain function, neuroanatomy and assessment of the various brain processes. This framework aligns the:
  - areas of processing/learning most commonly affected by a brain injury,
  - eligibility criteria for the special education category of Traumatic Brain Injury (TBI), as defined by IDEA,
  - definitions of the typical cognitive and behavioral impacts of brain injury,
  - formal and informal neuroeducational assessments that can be used in the school setting, and
  - strategies and interventions to address the unique needs of students with brain injury.
- **TBI Identification Protocol:** Information and documents related to how to screen for lifetime history of brain injury and assess for learning and behavioral differences to identify a student with a traumatic brain injury requiring educational supports.
- **Concussion Info:** Provides information on Colorado legislation, resources and the Concussion Management Guidelines Manual.
- **Resources:** A list of brain injury resources within the state and nation.
- Colorado and contact **information for assistance** in developing support services, community partnerships and obtaining training.

CHAPTER 1

THE BRAIN: BASIC NEUROANATOMY/ NEUROPHYSIOLOGY AND DEVELOPMENTAL STAGES

This Chapter allows the reader to:

- Become familiar with several primary brain functions that are responsible for cognition, emotion and behavior.
- Understand the consequences of TBI when a specific brain area is damaged.

Introduction: The Brain

Without doubt, the human brain is by far the most complex organ known to exist. The brain has no equal in terms of its remarkably sophisticated processes and functions. The brain is directly responsible for all human behavior, emotions and cognition. Despite the popular comparison between the brain and the amazing feats of supercomputers, one must recognize that it is the human brain that created such supercomputers or any other extraordinary work of engineering, art or scientific invention.

For all of the brain's complexity and limitless capacity to create wondrous marvels, it is also a fragile human organ and prone to permanent damage. Although the brain has the ability to heal itself after physical or psychological trauma, there are real limits to the self-healing process due to the brain's complexity. Consider this example: The human foot and ankle, which are commonly injured body parts, have 26 bones. Now, think about the human brain. It has more than 80 billion neurons (a low estimate), which means the brain has countless ways it can be damaged.

Brain injury in the pediatric population is especially serious (CDC, 2010). Several decades ago, the standard convention held that children who sustained a brain injury would heal quicker and more completely than adults who had sustained similar injuries. This previous belief, called the Kennard Principle (circa 1942), was not an empirically supported theory (Savage, 2009). Medical experts now caution that a developing brain must be protected from damage during sensitive periods of neurological growth. In short, if the brain is the center of "who we are," it is prudent and essential for us to keep it safeguarded. For a comprehensive overview of pediatric brain development, access the following websites:

Harvard University, Center on the Developing Child, Brain Architecture

Brainline.org article on Pediatric Traumatic Brain Injury: Where Do We Go From Here?

Basic Neuroanatomy

Although it is not necessary for educational specialists or parents to know the intricate details involving the neurological structures and processes of the brain, it is beneficial and recommended that the reader have a grasp of basic brain functions. This section will illustrate the brain by describing basic neuroanatomy in an ascending order **(See Figure 1.1)**. The most basic fundamental level involves the cellular aspects of the brain. Moving from the basic level, the more evolved complex brain structures and functions reside. At this point, it is critical to emphasize that, while the brain has specialized areas associated with specific processes, the brain operates mostly as an integrated unit. Several regions of the brain must work in concert to produce a viable function such as hearing, seeing, memory, learning and behavior. Much like a large orchestra is made up of several different instruments that play different notes to create music, the brain needs its discrete areas working in harmony to produce effective functions.

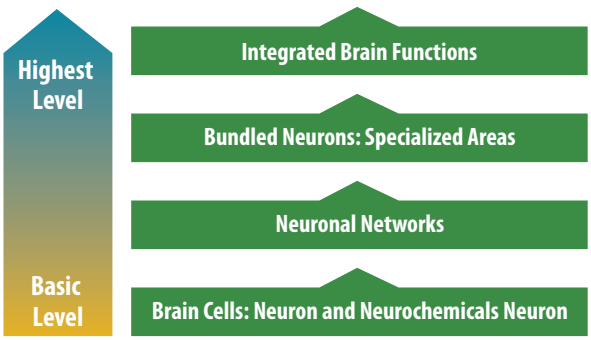


FIGURE 1.1 BASIC NEUROANATOMY (CARTER, 2009; SWEENEY, 2009) MILLER, HALSTEAD-REITAN

The Basic Level: The Neuron and Neurochemicals

Neurons are specialized nerve cells at the basic physiological level of the brain. Neurons are like the "electrical wires" of the brain that help it communicate with itself and to the rest of the human body. These neuronal wires transmit information and electrical impulses that produce all human

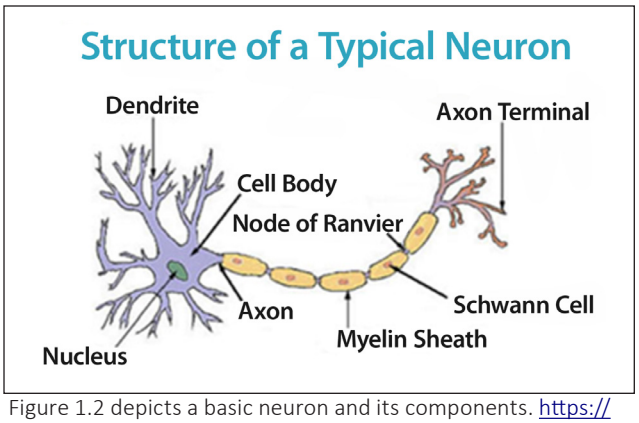


Figure 1.2 depicts a basic neuron and its components. https://en.wikipedia.org/wiki/Neuron

thoughts, emotions and behavior.

When neurons are jolted, shaken, stretched, or damaged after a blow to the head or body, the brain can have significant difficulty functioning because its wires cannot send vital messages to other areas. In other words, when neurons cannot talk to other neurons, the communication breakdown causes such brain dysfunction as slowed processing speed (Mathias and Wheaton, 2007). At this basic physiological level, the two areas that are typically damaged during an injury are the neuron's insulation (a fatty substance that wraps around the cell called myelin) and its power supply (neurochemicals). Myelin coats the neuron allowing it to transmit an electrical signal efficiently and directly down the cell body so the other neurons can receive the message. If the insulation is damaged by twisting, stretching or tearing, the signal is much less efficient and the electrical impulses are broadcasted in different directions. When a neuron's insulation is degraded, the message is garbled and the other neurons cannot hear or understand the signal.

After the brain is injured, the neurons may have difficulty making and transmitting messages because its power supply and process is disrupted. The brain produces neuro-electrical impulses by the use of neurochemicals (called neurotransmitters). These neurotransmitters are secreted and absorbed in extremely small amounts between neurons. Jolts to the brain upset the tight chemical balances and tolerances necessary for proper brain function. Many times, a blow to the brain causes vital neurochemicals to either flood or drain the spaces between and within neurons. An imbalance of neurotransmitters causes a disruption in how the brain controls itself and how it regulates the rest of the body (LEARNet, 2006; http://www.projectlearnet.org).

Neuronal Networks and Specialized Brain Areas

Billions of neurons are connected to each other throughout the entire brain to create a network. The network of neurons is connected to tightly bundled specialized cells (called nuclei). These neuronal bundles are found in localized areas of the brain that perform particular functions (Carter, 2009; Sweeney, 2009). Specific brain regions and their primary functions are illustrated in Figure 1.3.

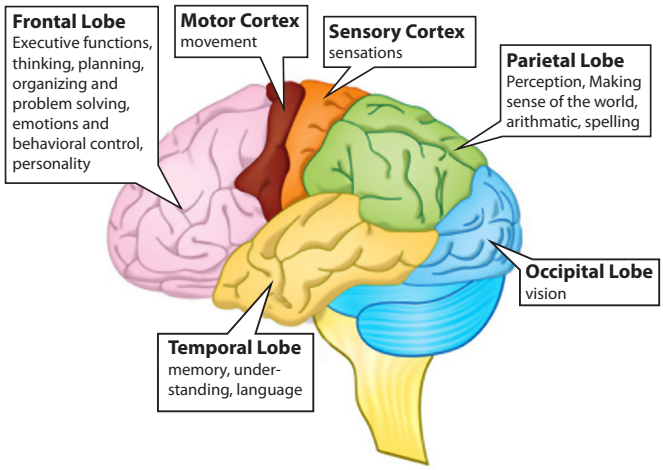


Figure 1.3. Specific Functions of Brain Areas
https://askabiologist.asu.edu/what-your-brain-doing

Scientists have various ways to organize the brain and its functions. One way to conceptualize brain processes is to organize its function starting from how the brain develops physiologically. The first areas of the brain to develop are the regions located at the base of the brain. Basal brain areas are generally related to basic physiological functions. For example, two important basal sections are the brainstem and cerebellum. The brainstem and cerebellum control voluntary and involuntary functions such as breathing, heart rate, gross motor movement and arousal. Injuries to these basal areas are extremely serious as they can be fatal.

Key Concepts:

The primary brain cell is called a neuron. Damage to a neuron's structure typically degrades its insulation (myelin sheath) and neurochemicals. Damage to the neuron's insulation may cause processing speed difficulties. When several neurons are injured, it may produce both specific and generalized difficulties.

Another basic area of the brain is called the limbic system. The limbic system is a very deep brain structure that is highly associated to emotions and memory formation. When parts of the limbic system are damaged, typically from significant blows to the brain or oxygen deprivation, the negative results are emotional difficulties and memory problems.

The remaining regions of the brain are associated with complex functions commonly associated with sensory processes, information processing, and behavior. These highly evolved brain areas, collectively called the cortex, influence verbal communication, fine motor movement, vision, rational

thought, comprehension, and reasoning.

When a person sustains an injury to a specific area of the brain, the primary function typically associated with that particular area is usually impacted. For example, damage to the front of the brain generally produces difficulties with problem solving and emotional regulation. Moreover, when one area of the brain is injured, other neurological networks may become disturbed. It is not uncommon for blows to specific areas to also cause general functional problems because the energy from a trauma travels throughout the entire brain producing both localized and broad (diffused axonal) damage.

Integrated Functions: Back vs. Front and Right vs. Left Functions

An oversimplified but sometimes useful model of how the brain works is based on the functions divided between two broad neurological areas. Generally speaking, the back (posterior) of the brain is primarily responsible for processing, understanding and storing incoming information. The front (anterior) parts of the brain are largely involved with the regulation of processes and output (behavior). It is widely believed that the anterior area (frontal cortex) acts as the brain's "manager" being richly connected to several other neurological areas. The frontal and prefrontal cortex generally directs action, concentration and emotional regulation. Logically, damage to the back of the brain will cause processing difficulties, while frontal damage is correlated to behavioral and emotional difficulties (Fiorello and Hale, 2004).

Another commonly held (but simplified) belief of brain function is that the right hemisphere is associated with creativity, holistic thinking, novel information processing and visual-spatial processes, while the left hemisphere is concerned with language, verbal information, sequences, and factual (learned or familiar) information. Currently, a refinement of the "right vs. left" model involves an emphasis on "new vs. routine" information processing. Some experts believe the right half of the brain is responsible for processing novel and divergent information. Once the novel information is processed and understood it is transferred to the left side of the brain where it becomes part of the person's knowledge base. The left side stores routine, familiar and factual information. This previously learned information is later retrieved and utilized when a person engages in routines or responds to the environment (Fiorello and Hale, 2004).

Damage to the right or left side of the brain can produce impairments specifically linked to each hemisphere. For example, injury to the left hemisphere of the brain may decrease a person's ability to speak, understand spoken language or remember facts. Damage to the right side of the brain is especially significant since this region is associated with new learning. Children with right hemisphere brain injury commonly have problems learning in school. However, it should be emphasized that the brain works as an integrated functional unit, so damage to one area of the brain will likely impact other areas as well.

New research has shown that similar to a physical injury, prolonged or constant stress to the brain can also have negative effects on brain function. Known as "toxic stress," this type of strain can weaken the architecture of the developing brain, resulting in learning problems, behavior challenges and other mental health issues. Stress can be an important part of life, but living in constant flight or fight can cause structural changes to areas of the brain. Harvard University, Center on the Developing Child, Toxic Stress web page discusses this further. Another excellent article on this topic is Post-traumatic stress disorder: the neurobiological impact of psychological trauma from the National Center for Biotechnology Information.

The brain can be both resilient and fragile. Researchers know the brain can heal itself and can compensate for damage. However, there are several factors that play into the post-injury recovery outcome. Brain injury recovery depends on the person's age, the nature of the injury, the developmental stage of the person, previous injuries, risk factors, environmental issues, and a host of other considerations. In short, brain injury recovery is a highly individualized situation. At the time of the injury, it is difficult to predict what, if any, long-term effects will manifest. Longer term deficits may include problems with attention, memory, processing and behavioral changes. See the article Pediatric Traumatic Brain Injury: Where Do We Go From Here? from Brainline.org for more information.

Key Concepts:

Blows to the brain typically produce both specific and general difficulties. The brain works as an integrated functional unit so damage to one area of the brain may impact other areas as well.

Chapter Summary Points:

The human brain is a remarkably complex organ that is responsible for all thought, feelings and actions. When a brain injury occurs, the disruption can take place at the very basic neurochemical level (functional), or at a larger structural level. Structural damage entails several neurons being physically altered to the point that these brain cells do not function well. The brain works as an integrated functional unit making it difficult to predict how damage to one area of the brain will impact other areas.

CHAPTER 2

DEVELOPMENTAL STAGES AND THE EFFECTS OF AN ACQUIRED BRAIN INJURY

In Memoriam

Jeanne Dise-Lewis, PhD.

Dr. Dise-Lewis was an original contributor to the 2001 version of the Brain Injury Manual for Educators. When the BI Manual was updated in 2013, Dr. Dise-Lewis generously shared her expertise on Development and Brain Injury as the sole contributor to Chapter 2. Sadly, Dr. Dise-Lewis passed away in the Fall of 2014. In 2017, with the 3rd revision of the Brain Injury Manual, it was decided that there will be no updates to Chapter 2. Dr. Dise-Lewis' words and work will live on in Chapter 2 as she wrote them.

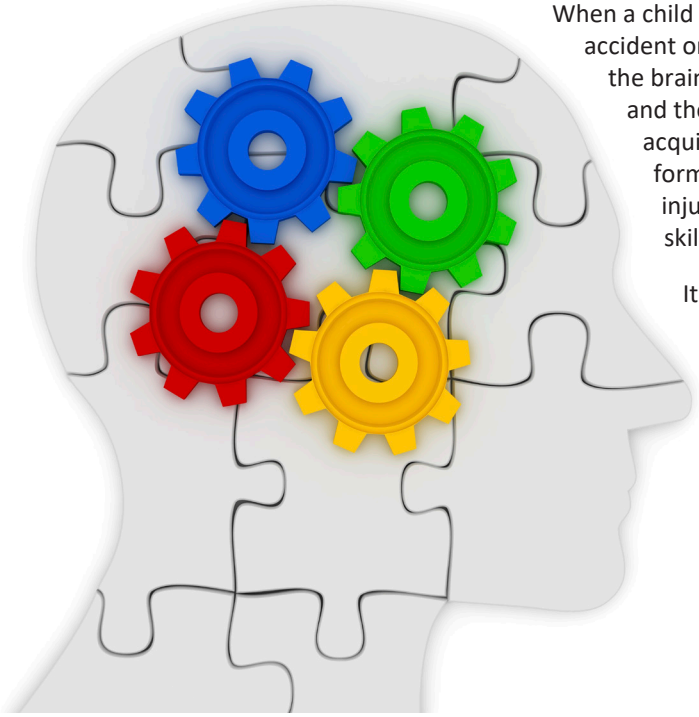
The state of Colorado, and the nation, mourn the loss of Dr. Dise-Lewis, an icon in the field of pediatric brain injury. Her spirit lives on in her many publications, in the numerous students she trained and in the children and families she served.

This Chapter Allows the Reader to:

- Understand the major stages of brain development from birth through late adolescence
- Learn the personal, emotional, and social changes typical of each stage.
- Recognize the main effects of a brain injury acquired at each stage of development on behavior and learning

From birth through young adulthood, children's brains are in a continuous process of change and development. As the brain grows in size and weight, adding an enormous number of cells, parts of the brain organize into centers to perform certain functions more efficiently. These changes in the brain allow the child to grow, learn, control himself, and become "mature." The child learns to walk and talk, to play soccer and write term papers. He learns to recognize his mother, to experience different feelings, to control temper, and to work cooperatively with others.

The child moves from discovering his hands to building block structures, and mastering mathematical formulas. This process of maturation and development, and the resultant abilities of the child, is set into motion by the changes taking place in the child's brain. The brain's development is regular and predictable. The abilities and skills accomplished at one stage of development provide the foundation for the development of the later stages.



When a child sustains a brain injury, whether as the result of an accident or illness, the injury affects the process of development in the brain. Abilities that are just developing are very vulnerable, and therefore, these are most likely to be disrupted by an acquired brain injury. Because skills developed at one stage form the foundation for later-developing abilities, a brain injury sustained early in life can disrupt the appearance of skills at later periods of life.

It is important to know when a student experienced the brain injury, so that adults working with the child can better understand the developmental abilities that were most likely to have been disrupted. These areas of difficulty and inability underly the learning and behavior problems seen in the classroom after a child has sustained a brain injury.

Infancy Stage: Birth-3

Normal Developmental Milestones

Newborns and young babies do not understand that they have an existence apart from others. Things happen to them "out of the blue," unconnected with other events. The baby is a jumble of feelings and impressions and receives information from all of his senses—the baby can feel pleasure and pain, and can make basic movements and sounds--- but does not know that these sensations have names such as smelling, feeling or moving. The infant is not self-aware and cannot differentiate various experiences. The infant simply experiences a wide variety of states, and responds, with quiet alertness and comfort, or with flailing, crying agitation.

As the infant grows, he develops a sense of self as a separate being. Impressions begin to separate into distinct experiences, and begin to be integrated with each other. The baby learns that when mother's footsteps are heard in the hall, mother will soon appear.

The baby also learns that he can make certain events happen: if mother does not appear, the baby will cry to make her come. In this way, the baby begins to understand cause-and-effect relationships. This development forms the foundation for understanding all cause-and- effect relationships in the future.

Emotions and emotional regulation are affected in a significant way by the brain development during this period. From a jumble of unrelated feelings, separate emotions begin to emerge and become clearly distinct experiences.

The child begins to express feelings through clearly different behaviors and can even label basic feelings (happy, sad, mad, scared) by the end of this stage.

Once there is an understanding that certain events are routinely paired together, the infant is capable of self-regulation. He can cry for his mother and wait for brief periods without becoming despondent. The sleep-wake cycle begins to be regulated, and by the end of the second year of life, the child's sleep patterns are very close to what they will remain throughout the life span.

Developmental Characteristics: Birth to 3 years:

- Language acquisition
- Refinements in sensory and motor systems
- Regulation of sleep-wake patterns
- Begin to understand cause-effect relationships
- Emotionally egocentric
- Symbiotic relationships with caregivers

Effects of Brain Injury: Birth to 3 years

When a child sustains a brain injury between birth and age three, the developmental milestones described above are disrupted.

The child:

1) has trouble understanding or explaining about what is happening to him,

2) tends to get overwhelmed by experiences, and

3) situations that are most likely interesting to others of his age often are overstimulating. The child appears unpredictable in emotional reactions, seesawing from happy to sad, content to angry, without any apparent cause. Behavior is just as hard to predict, because it does not follow logically from his emotional state.

Being unable to distinguish perceptions and emotions clearly, the young child does not develop a solid understanding of cause-and-effect relationships. Because there is a weak connection between what the child has done and the consequences that occur as the result of the behavior(s) the child does not respond to standard punishments or discipline strategies as expected.

While young children do not demonstrate self-control or self-regulation, the persistence of these problems as the child matures presents serious difficulty for parents and teachers. Throughout life, the child who sustained a brain injury in infancy will probably need to rely on others to provide structure, support and supervision much more than what is considered appropriate for that age.

Behavioral Characteristics After Brain Injury: Birth to 3 Years

- Quick shifts from one emotion or state to another
- Impulsivity
- Use of primitive behaviors (biting, hitting, etc.)
- Lack of self-awareness
- Inability to self-regulate behaviors
- Lack of responsiveness to others

Preschool Stage: Ages 3 to 6 Years

Normal Developmental Milestones

The preschool years bring important progress in the child's physical, personal, social and emotional development. By age three, a child's sensory systems—sight, hearing, touch, smell and taste—are well developed and differentiated. Motor skills—movement, dexterity and agility—are also progressing.

In addition, during the preschool years, the child begins to coordinate these systems with each other. The child is focused on learning about the concrete properties of things: how they can be moved, shaped, stacked, and created, and learns that certain things are best suited for certain activities (wheels to roll, markers to decorate, and cookies to eat).

There is a fascination with how things work, and much time is spent gaining experience with the physical properties of the world around the child.

The preschooler distills these specific experiences into sets of concepts. Concepts are general principles that describe the physical world. The first concepts relate to size (big and little), amount (all, some and none), speed (fast and slow), and personal conduct (nice and mean).

These concepts allow the child to extend control over the world and give a sense of importance to the child. The child tirelessly categorizes experiences and enjoys learning new concepts.

Developmental Characteristics: 3 to 6 Years

- Very basic understanding of cause and effect relationships
- Developing ability to think before acting
- Focuses on one aspect of the situation at a time
- Emotional focus is on control and mastery
- Concrete and rigid thinking

The limitation cognitively is that only one concept or dimension can be handled at a time. The preschooler's views about the world and the concepts that are developed are completely dependent on personal experiences. Someone is either nice or mean, depending on how that person just acted. The preschooler's thinking is thus very rigid: there are no middle- ground, no shades of gray, and no extenuating circumstances.

By the end of the preschool stage (age 6), the child is capable of thinking before acting. Actions become more and more "appropriate," not only in general tone, but also in degree. This accomplishment reflects the ability to integrate the thinking, emotion and behavior systems.

The child can make fine distinctions among feelings, thoughts and behaviors and can smoothly interrelate these thoughts, feelings and actions. By the end of this stage, the child is usually able to think before acting, and is cognitively ready to begin to learn academic material in school.

Effects of Brain Injury: 3 to 6 Years

A brain injury acquired between the ages of 3 and 6 may affect the child's ability to organize and manage behaviors and emotions. Because the connections among the thinking, emotion and behavior systems do not develop well, the child seems to feel things more forcefully and more immediately. When experiencing a feeling (such as tired), the child may react on that feeling by having a temper tantrum. Attempts to appeal to the child's rational side will fail, because the "rational side" has not developed. Often, emotions overwhelm

the child and the child will often act in a manner that seems aggressive, out-of- control and dangerous to others.

A child who acquires a brain injury between ages 3 and 6 does not learn preschool concepts well. These concepts include: same/different; quantity (some/all), shapes, size (big/little), and time (yesterday, next week). Mistakes in using these concepts will not pose serious problems for the child as a preschooler. Because these concepts provide the foundation for the basic academic skills of reading, writing, and arithmetic the lack of understanding is likely to become a greater handicap as the child progresses through school.

Behavioral Characteristics after Brain Injury: 3 to 6 Years

- temper tantrums
- high emotionality
- impulsivity
- primitive behaviors (biting, hitting, etc.)
- lack of concern for danger and safety
- resistance to influence or direction from parents

A child injured at this stage also has difficulty with executive functions, such as making decisions, judging situations, and planning stages of an activity. There is often difficulty starting or initiating activities, determining how close he is to reaching a goal, changing a plan, and knowing when a task is finished. There is likely to be more difficulty separating from parents and handling transitions or change.

Self-monitoring of behavior or figuring out how to behave in situations that are over-stimulating, unfamiliar, or unclear (in the grocery store, at sports events, and at school recess or lunch) is often extremely difficult for the child to do.

Developmental Disruptions Following Brain Injury: 3 to 6 Years

- Disruption in the connections among thinking-emotion-behavior systems
- Emotional and behavioral extremism
- “Executive function” difficulties
- Poor organization of behavior
- Immediate expression of feelings
- Temper tantrums and rigid behavior
- Poor acquisition of preschool concepts: same/different; quantity (some/all); size (big/little); shapes; time concepts (yesterday/next week)
- Dependence on structure and organization provided by adults

Elementary School Stage: 6 To 12 Years

Normal Developmental Milestones

Children at this stage of development can consider several aspects of a situation at once. They can take another person's point of view. They understand that life is more complicated than the simple set of cause-and-effect relationships they recognized just a year ago. They now think it is "babyish" to throw a tantrum in response to a disappointment. They are capable of listening to reason and responding with understanding. No wonder this stage starts with the "sunny sixes!"

At this age, the child thinks that the intention of acts is important. There is awareness that things do not always turn out as expected or hoped-for and that the motivation or intent is what counts. The ability to pay attention to several things at once and to understand another person's point of view makes it possible for children of this age to work together on teams in school and in sports. Children are truly ready for school.

Their sensory and motor systems are refined and integrated to the point that they are able to sit in desks with "quiet" bodies. Cognitively, the child has matured to the point of being able to understand symbolic information. This development makes it possible to learn to read, spell and do math.

Developmental Characteristics: 6 to 12 years

- Robust understanding of cause-and-effect relationships
- Ready to learn academic skills
- Focus on effort as important
- Recognize intention of acts as important

Effects of Brain Injury: 6 -12 Years

Children who experience a brain injury during the elementary school years typically have difficulty learning new concepts. They may be able to memorize information, but fail to grasp the basic principles required for a true understanding of reading, spelling and math. Children usually end up with a poor performance despite hard work.

Because they rely on memorization and rote learning so much, they have difficulty holding on to what they have learned and using it in new situations. They may be able to memorize a list of spelling words for a test but will not be able to spell them in written compositions.

The child who acquires a brain injury during the early elementary school years often has trouble applying rote-learned skills to creative projects. Although they may be able to read, their comprehension of long paragraphs may be reduced.

They may have a hard time making inferences, organizing new information so they can remember and use it later, and knowing how to act in spontaneous social situations. Any areas of learning weakness or disability that may have been compensated for previously will be more pronounced following a brain injury at this stage.

Developmental Disruptions Following Brain Injury: 6 to 12 Years

- Disruption in reading, spelling, math skills
- Poor performance despite hard work
- School failure/avoidance
- Behavior problems during unstructured times
- Depression, social isolation or withdrawal from peers
- Sleep disturbance
- Fatigue

The child is unable to organize incoming information independently. These organizational problems make it even more difficult to hold on to new information so that it can be retrieved and used later. These basic challenges make the classroom a highly stressful environment. The child is working hard yet receives poor grades and the recommendation to "try harder."

Particularly in the early elementary grades, when children are highly focused on reading levels, spelling test grades, and mastering math facts, the child with a head injury can feel like a failure. Because mastery and accomplishment in school is the primary arena for self-esteem at this stage, school failure can have far-reaching effects.

Children who already have mastered the basic skills of reading, spelling and math before the brain injury may have an uneven learning profile of strengths and weaknesses afterward. For the child, unevenness among abilities creates mental fatigue and frustration. Time spent learning yields fewer rewards.

Often, the child's speed of mental processing is very reduced, resulting in slower learning and spotty learning of new material. Even though the child is working hard, he finds it impossible to finish class work. Children, whose learning problems are misunderstood, develop the feeling that they are just not good at school and thus begin to avoid school.

When the brain injury occurs during this stage, a child's behavior in school and during familiar activities is usually quite good. Behavior problems are more likely to occur during unstructured times. They may make poor judgment; get "carried away" during play, and easily misinterpret others' cues.

They may react to peers in an irritable or aggressive way. The child may get in trouble for fighting during recess or be teased because of their difficulties and become socially isolated or withdrawn from peers because of this.

Early Adolescence: 12 To 16 Years

Normal Developmental Milestones

Beginning in early adolescence, children enter the last stage of major brain change and reorganization. They become able to think of the world abstractly and they are able to organize many sources of information into projects or essays that reflect their own thinking. They are able to analyze information, think logically, and present a convincing argument for a position. At this stage of life, children become capable of organizing, planning, and carrying out complicated, long-term projects. The school system recognizes these changes by requiring children to produce papers, essays and projects rather than simply telling back information they have memorized.

Young people of this age are developing judgment, the ability to plan, and the ability to reason independently. As a society, we recognize this maturity by allowing them to stay by themselves at home, babysit others, and do jobs in the neighborhood for pay. Their parents have learned to count on them to step into these roles. Teenagers are eager to assume the responsibility and monetary rewards that come their way.

Emotionally, the young teenager is entering a period of great change and growth. This means that he is often quite unstable emotionally and will often experience swings of emotion. Self-control will sometimes be good and sometimes poor.

The ability to think in an abstract way means that the adolescent is not as impressed with concrete reality so much anymore. Rather, he can become obsessed with what he imagines could happen. The ability to think of infinite possibilities is highly exciting but also can create anxiety and extremism. The pimple appearing on his face the week before the social event not only prevents the young teen from asking someone to go with him, but also can set off a chain of catastrophic thinking – he probably will never get a date and will end up loveless and unsuccessful forever.

Psychologically, young teenagers are starting to develop a clear and solid sense of identity. They tend to do this at first by being clearer about who they aren't rather than who they are. They may reject things associated with growing up, home and parents as being conventional and "not-me." They try on different styles of dress, hair, and identity and experiment with the effect on others.

This age group already has established personalities, they have responsible roles in the family, and they are largely responsible for their own self-care, schoolwork and plans.

Effects of Brain Injury: 12 to 16 Years

A brain injury sustained in early adolescence affects the adolescent's ability to continue with all of these areas of growth. The big brother who may have babysat siblings, ran errands on his bike, and managed his own school and personal responsibilities is now in the position of requiring the care and supervision of others.

The youngster may not be able to return to sports, particularly team sports that require quick decision-making and organization skills. This causes a double loss for the child: the loss of a primary stress-reducing activity and the loss of a shared activity with friends.

Friends also respond to the changes in the child's "personality." Cognitive problems caused by the injury often result in being quieter, less tolerant, less spontaneous, more easily fatigued, and/or more irritable than before.

In school, adolescents with sustained brain injury often have difficulty learning new information. Usually, they are able to remember and use what was learned before the injury, but

Developmental Characteristics: 12 to 16 Years

- Considers three or more dimensions simultaneously
- Abstract reasoning
- Extremism
- Increasing autonomy
- Beginning identity development
- Social stereotyping
- Responsibility: able to care for self, babysit, perform jobs for pay

acquiring new skills becomes harder. Mental processing speed is usually reduced considerably, even in children who have had a mild brain injury. This makes it hard to learn new information, especially in a lecture-type class where the teacher may be talking rapidly and expecting the student to take notes at the same time.

When injured at this stage they may have difficulty organizing complex tasks over time; they may do well on homework due the next day and studying for tests, but they fail to complete long-range projects. Typically, they have an uneven pattern of academic strengths and weaknesses. This kind of behavior is difficult for teachers to understand and causes a lot of fatigue and stress for the student. Fatigue and school failure often cause frustration.

Adolescents are capable

The adolescent's natural tendency to exaggerate and catastrophize often results in feelings of depression and hopelessness about ever being able to succeed again. Loss of friends, difficulty with school performance, changed status in family roles, loss of sports and other social coping strategies, and inadequate information about specific learning profile cause emotional pain for the young adolescent.

Usually, the adolescent is acutely aware of these changes, adding to his despair. It is essential to have a comprehensive evaluation of the child's pattern of cognitive strengths and weaknesses after a sustained brain injury, to educate him about his abilities, make the accommodations/modifications necessary for school success, and prevent these serious emotional problems.

Developmental Disruptions following Brain Injury: 12 to 16 Years

- Unevenness in cognitive profile
- New learning deficits
- Slower rate of mental processing
- Difficulty organizing complex tasks over time
- Judgment and reasoning difficulties
- Increased "frustration" response
- Depression
- Fatigue

Key Concepts:

It is essential to have a comprehensive evaluation of the child's pattern of cognitive strengths and weaknesses after a brain injury.

Late Adolescence: 16 To 19 Years

Normal Developmental Milestones

By the end of adolescence, children are able to plan, organize, think about things in a complex way, show good judgment, respond to changes in plans with flexibility, and solve problems in a sophisticated way. They have a relatively solid sense of who they are, what they like to do, and what they are good at.

Older adolescents link their identity to these positive attributes; they have "grown out of" the reactionary views of the younger teenager. At this stage, teens are able to learn on their own, and most schoolwork involves self-directed study.

Developmental Characteristics: 16 to 19 Years

- Complex reasoning and judgment
- Ability to plan and execute complex projects over time
- Solid sense of own identity based on positive identifications
- Social sophistication
- Capacity for altruism

Adolescents are capable of true friendships, which are grounded in shared values, rather than superficial appearances. The primary emotional and psychological task of this period is to establish independent identity related to the major roles of adulthood: love and work. By the end of this stage, the young adult has a clear sense of his sexual identity, vocational plans, and social roles.

Older adolescents typically are employed, at least during the summer months; they transport themselves to and from appointments; and they usually have developed goals and plans for the future, at least in terms of whether they are headed to college or not.

Typically, they are becoming more calm and reflective; they have been gaining experience with abstract reasoning and so are much less prone to over-reacting and extremism in their thinking.

Effects of Brain Injury: 16 to 19 Years

When an older adolescent sustains a brain injury, cognitive changes usually involve subtle connections and "higher-order" abilities. Abstract concept formation, organization, initiation, the ability to keep track of several things at once, reasoning, and judgment abilities are usually affected. These changes in thinking abilities are felt in subtle changes in personality, responsibility, and social behavior. The youngster may be quieter, more "to himself," more irritable with his parents, peers, or family members, and avoidant of social situations.

Usually, the older teenager is aware that his thinking is not as sharp as it was previously. He does not think well "on his feet;" he makes errors, feels vulnerable, and is afraid of making more mistakes in front of peers. He feels unsure of his ability to function independently, and when people correct or try to help, he feels humiliated and despondent.

A brain injury can seriously interfere with social judgment and personal development and this can have ramifications for dating and the development of sexual identity. Adolescents with brain injury are prone to misinterpret the subtle cues sent out by others.

The safest course, he may feel, is to withdraw from everyone, concentrate on schoolwork, and avoid social settings.

They may require more supervision and protection than is normally felt appropriate for youngsters of this age. They often put themselves in dangerous situations; for example, a young woman may accept a date with a male she does not know, without hesitating to think about the potential risks. Others may withdraw and avoid the dating scene entirely, putting off intimate relationships until later in adulthood.

In school, academic problems typically come from slow rates of mental processing. Even mild brain injuries drastically reduce the speed of mental processing. For bright teenagers, who are used to functioning at a very fast and efficient pace, this aspect of brain injury is devastating. Interestingly, adolescents rarely realize that their thinking is slower than before; rather, their experience is that they are confused, or having a hard time understanding things as well as before.

They fall behind in lecture-type classes, feel overwhelmed and confused, become easily fatigued, and frustrated. Slow mental processing can lead to the child spending a huge amount of time on homework and trying to complete unfinished class work.

They do not have the reserve energy to think about working on projects or to involve themselves in extra-curricular activities, because they are exhausted from their efforts on the basics of schoolwork.

Older adolescents have a solid store of learning and experiences, from which to draw following a brain injury. They also have a solid sense of who they are, their likes and dislikes, their goals and aspirations. They have a history of friendships, relationships, and involvement with others through sports, hobbies, and school-related activities.

The need to plan deliberately, the inability to resume job and schoolwork immediately with success, and concern about the meaning of this injury on the rest of their lives, creates added stress and frustration.

They are often unable to keep up with the pace of former activities, and that of peers. Often the adolescent is aware of the difference between abilities before the accident and current status. For this reason, the adolescent with a sustained injury is at risk for serious depression, hopelessness and suicidal thinking.

Developmental Disruptions Following Brain Injury: 16 to 19 Years

- New learning deficits (e.g., memory for numbers)
- Mental processing speed deficits
- Inability to organize complex tasks
- Conflict between specific challenges and career goals
- Interference in developmental drive toward independence/separation
- Social awkwardness
- Fatigue
- Defensiveness regarding emotional/cognitive problems
- Depression
- Body image/social image

Chapter Summary Points:

A child's brain is not fully formed at birth. In contrast to adults', children's brains undergo active development, growth and reorganization from birth through young adulthood.

- These developmental changes result in qualitative changes in thinking, emotional maturity, social understanding and behavior.
- Development takes place in stages, which proceed in a generally universal order, and which build upon each other. Abilities developed at one stage form the foundation for more complex skills developed at later stages.

The impact of a brain injury on cognitive, emotional and social abilities depends largely on the stage of development at which the injury occurs.

- Abilities, which are in the process of development, are the most likely to be disrupted by a brain injury.
- The earlier in development a brain injury is sustained, the more it will affect the basic developmental processes.
- Sometimes the major impact of a brain injury is not obvious until a later stage of development.

CHAPTER 3

BUILDING BLOCKS OF BRAIN DEVELOPMENT

This Chapter Allows the Reader to:

- Understand the framework of "The Building Blocks of Brain Development."
- Use additional web-based resources to assess each of the Building Blocks.
- Identify strategies to support students in the home and school settings.
- Understand factors that may affect students such as unevenness, fatigue, and transitions.
- Understand the higher order Building Blocks of Social/Emotional competency & Executive Function

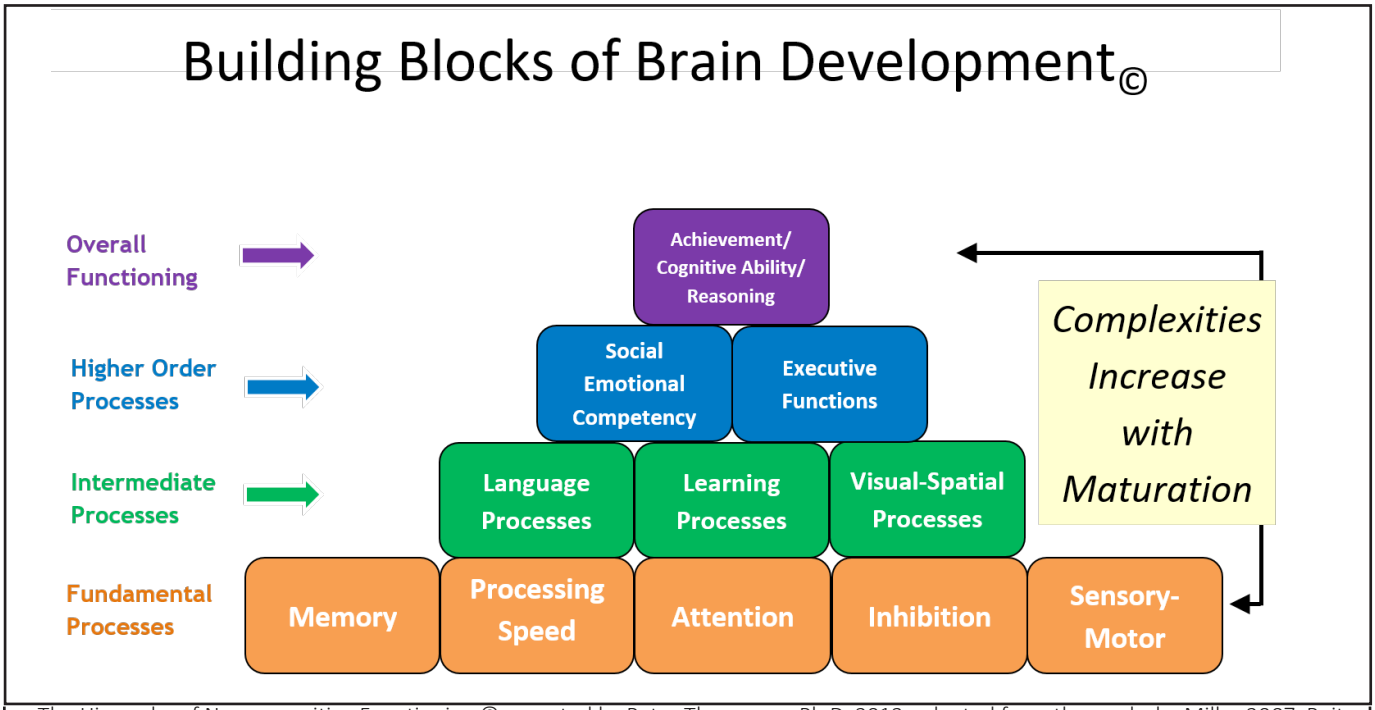
"The Building Blocks of Brain Development" is a framework we created to explore the brain processes most commonly impacted following a brain injury. This chapter will discuss all of these "building blocks" this chapter also provides an in-depth look at the social/emotional competency building block; one of the most difficult areas disrupted following a brain injury. As many of the questions from parents and teachers revolve around the student's "ability and intent" or "skill vs. will" with regard to behavior and social skills.

When considering the many neurocognitive domains a person develops over time it is important to understand the hierarchy of functions in their development. This is to say that each process or function precedes, at least in part, the development of another and the subsequent domains and processes are cumulative and compounding.

As we review the neurocognitive domains – or building blocks most commonly affected by brain injury – we will highlight their developmental progression. The Building Blocks of Brain Development explains the interaction between the more basic, fundamental skills and the higher-order cognitive skills.

It is important to note that the Colorado Department of Education (CDE) model represents one of several possible conceptualizations of how neurocognitive domains are organized. Despite the simplicity of the building blocks framework, the model describes the deep complexity of neurological functions and their interrelation. Although current debate, there is no optimal model of neurocognitive development upon which the majority of researchers agree. Readers should understand that parts of the CDE model can be challenged in theory.

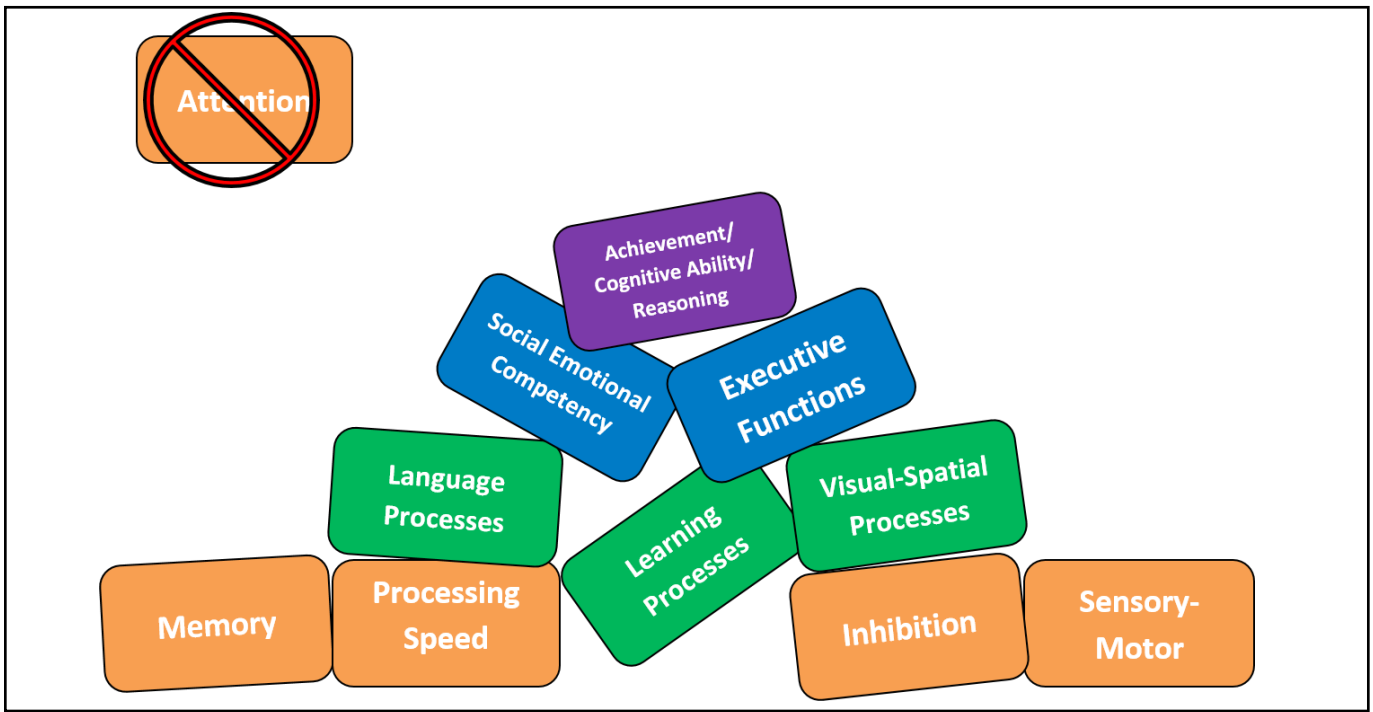
The Building Blocks of Brain Development graphic below represents the hierarchy of brain development and functioning. Essentially, the domain areas are building blocks by which the neurological growth or maturation of the brain follows. The model proceeds from simple processes (indicated in orange) to more complex functions (indicated in green, blue and purple).



The Hierarchy of Neurocognitive Functioning © - created by Peter Thompson, Ph.D. 2013, adapted from the works by Miller 2007; Reitan and Wolfson 2004; Hale and Fiorello 2004.
The Building Blocks of Brain Development © - further adapted by the CO Brain Injury Steering Committee, 2016.

At the base of the chart are the fundamental blocks critical to all learning and behavior. The processes at this level are also the most sensitive to being impacted by a brain injury. The processes at the intermediate level (as seen in green) depend on the fundamental building blocks in order to develop and become more complex. The higher-order thinking skills (as seen in blue) rely on the lower levels in order to solidify, fully develop, and be available for later use. And finally our top domain of overall achievement (as seen in purple) is the peak of functioning. The processes at this level allow us to operate in our varied environments, be productive citizens, and are wholly dependent on the three preceding levels. In order to produce our desired outcome of reasoning and overall healthy brain function, these levels must be intact and working in harmony.

A brain injury may cause disruption or gaps in one or more building blocks that can impact our behavior, ability to learn, and ultimately our overall achievement. Due to the interconnected nature of our brains, the dysfunction of just one building block can affect all of the others, as described below. It is important to note that this framework is not an exhaustive list of processes or building blocks, but those that have been found to be impacted most frequently. Our brains may develop each process/ building block in a progressive manner, but each continue to mature and become more complex over time.



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Regardless of how a brain injury is medically classified (mild, moderate or severe) it is likely the student will experience some degree of change, even if temporarily, in several of the areas described in this chapter. Children's awareness of these changes and their perception of the need for compensatory strategies will vary from student to student. "Compensatory strategies are techniques or modifications to our behavior or environment that are used to compensate for a deficit, weakness, injury, or perceived inadequacy in a specific area or skill. They help us cope with what we think of as personal weaknesses." (http://study.com/academy/lesson/compensatory-strategies-definition-examples.html). As a parent or teacher, you will need to evaluate the child's ability to work independently with compensatory strategies. Younger students and those injured at early developmental stages must be explicitly taught compensatory strategies and supported in order to ultimately implement techniques on their own.

In order to help students identify what works best for them, they will require repeated opportunities to learn these strategies with feedback from others concerning their successfulness. Even if self-awareness is reduced, there is benefit to helping the student understand ways to make learning easier by identifying tasks that are easy and hard or liked and disliked.

Building this awareness and implementing approved interventions (as found later in this chapter) will assist the student in generalizing these strategies and applying them to other areas of their life. Learning self-advocacy and maximizing independence are essential to a student's life success following brain injury.

Communication and collaboration are essential in order to effectively provide support in all settings. This includes the school team, student, parents, rehabilitation team and other individuals or agencies that may be involved. The way the student presents him/herself and the accommodations or interventions needed may vary between home and school, as well as from classroom to classroom. This does not mean that one environment or person is better able to provide support for the child, but rather that environments can have different cognitive demands, expectations, or strengths upon which to build. In order to discover the most effective strategies, teachers and parents can experiment by introducing interventions gradually and allowing considerable time to assess effectiveness. Because situations and demands change overtime, strategies will need to be evaluated periodically and fine-tuned or altered throughout the student's school and adult life.

As a general rule, interventions used with children who have brain injuries should not be punitive. Depending on the area(s) of the brain affected by the injury, traditional consequence-based interventions (e.g., punishment) may not always be successful. For example, if a student with a brain injury is behind on their work, keeping them inside for recess or taking up their free time is not an appropriate alternative. Other interventions and accommodations should be put into place to address the work completion and/or work overload issues. Removing recess or lunch time only punishes the student for having a brain injury and places more cognitive strain on their ability to learn and perform in the classroom. This type of punishment eliminates the time that they have to rebuild their social skills, as well as needed time away from the cognitive demands of academics.

To set the stage for success and to optimize consistency of performance on a daily basis, students need to have a regular routine both at home and school. As part of this routine, students need to get plenty of sleep, eat a well-balanced diet, stay hydrated and regularly participate in medically-approved exercise activities. Depending on the needs of the student, parents might want to consider consulting with a healthcare professional who has knowledge of brain injury concerning medications and/or alternative treatment options. These approaches have been successful for some students who have attention, sleep, and behavior issues related to their injury.

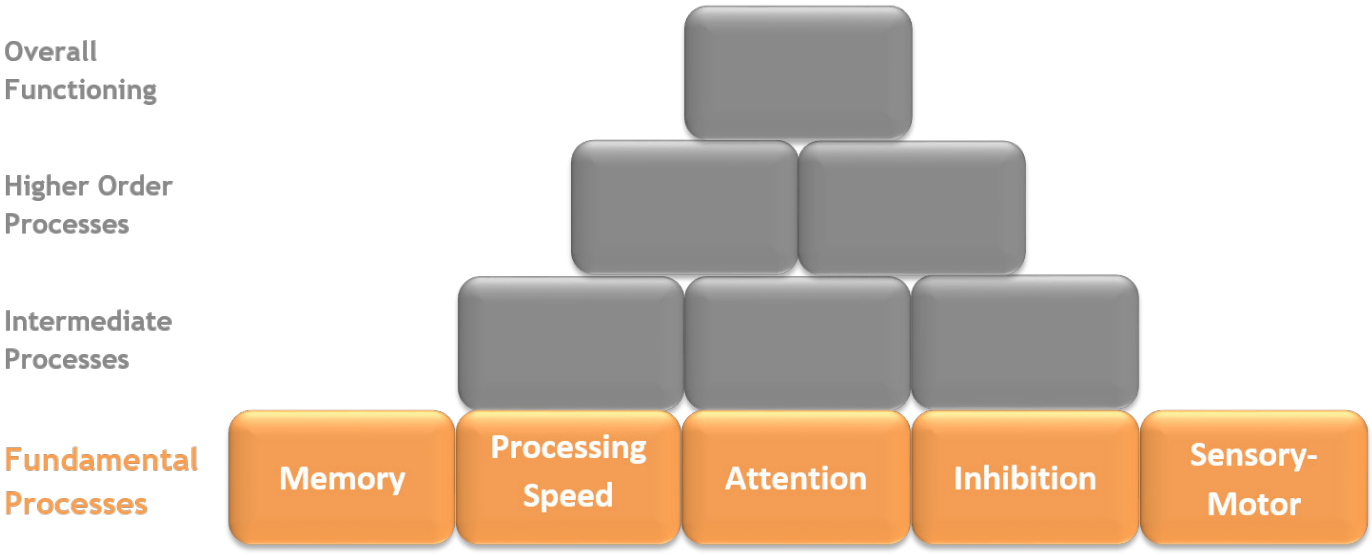
If the student is still struggling, a more in-depth cognitive evaluation, including standardized tests and informal observations, may clarify how a student is functioning and which strategies would be most effective. This neuroeducational evaluation can help identify cognitive strengths and weaknesses while determining how much support the student will need. With partners such as the MINDSOURCE Brain Injury Network, CDE has published a website that outlines these building blocks (or most common neurocognitive effects of a brain injury) and provides tools to assist school district personnel in conducting school-based neuroeducational assessments in addition to identifying interventions for each building block (Colorado Kids Brain Injury). By using this website, school professionals can learn how to provide functional school-based neuroeducational assessments detailing the effects of the brain injury.

Finally, before we delve into the building blocks and intervention strategies for students with long-term impacts from multiple mild TBIs (a.k.a. concussions), as well as those with moderate or severe injuries, it is important to note that support for implementing concussion identification and management within your school or district is available in the CDE Concussion Guidelines located on the CDE Health and Wellness Brain Injury web page. Because concussion is defined as a short-term, temporary TBI that rarely produces long-term effects, little is written in this manual regarding its management. Even though concussion is a TBI, the short-lived and positive outcomes associated with proper care means that concussion will infrequently progress to a special education evaluation and/or will likely not require an intensive level of academic support. The CDE Concussion Guidelines contain additional information about the management of concussions, if needed.

THE BUILDING BLOCKS OF BRAIN DEVELOPMENT

Fundamental Processes

This section will cover the changes that may be observed and the strategies for intervention that address fundamental skills to brain development. These fundamental building blocks are Memory, Processing Speed, Attention, Inhibition and Sensory-Motor.



Fundamental Processes: Attention and Concentration

Attention and concentration involve retaining information such as events, words, and visuals in one's awareness. It is the ability to focus on the necessary material to learn and complete a task. Students must pay attention in order to perform higher-level cognitive processing and store incoming information into memory. Following an injury, the brain is generally not as alert and is less able to sustain focus or filter out sensory data. Combined with the mental effort of using injured pathways and the now challenging task of shifting external focus from one thing to another, many students have problems with attention and concentration. Difficulties with attention may also indicate problems with processing speed, organization, memory, language abilities, emotional issues or fatigue.

- There are several different types of attentional abilities. It is important to determine which type of attention has been impacted to gain an understanding of the student's difficulties and provide targeted interventions and support.
- Arousal and alertness involves being awake and alert to incoming information.
- Sustained attention is the ability to maintain attention throughout a period of time. Students with difficulty in this area may only be able to maintain attention on an activity for a few minutes or even seconds.
- Selective attention is the ability to focus on what is important while ignoring competing stimulus and information in the environment. Students with difficulties in this area are easily distracted by the noises, sights, sounds and activities occurring around them. They may also be distracted by their own thoughts occurring inside their minds.
- Shifting attention is the ability to maintain focus while changing from one activity to another. Difficulties in this area can lead to challenges with switching activities or continuing on the same task as the cognitive demands change.
- Divided attention involves being able to focus on more than one task at a time. An example of this is listening to the teacher while simultaneously taking notes. A child with a brain injury may have to focus complete attention on learning or completing just one task and therefore is unable to provide divided attention. Divided attention becomes particularly difficult when the task is new and not an automatic process.

Neuroimaging studies suggest many areas of the brain are involved in different types of attention. Despite the variability of brain regions that assist one's ability to pay attention, most studies appear to implicate the frontal lobe of the brain and a deeper structure called the cingulate gyrus. Regulating the environment and modifying its content and pace of assignments will be particularly important in addressing challenges in this area. In extreme cases, medication supervised by a physician specializing in brain injury may be effective.

Attention and Concentration: Changes that may be Observed

- Difficulties concentrating or focusing on one task. Easily distracted.
- Disorganized and loses things.
- Appears spacey and forgetful.
- Jumps from one activity to another without finishing.
- Has inconsistent performance at school.
- Can't keep up with the rest of the class.
- Gives up on tasks and hands in incomplete assignments or homework.
- Does not turn in assignments.
- Appears to have memory difficulties.
- Struggles with following instructions or comprehending lessons.
- Difficulties following multi-step instructions.
- Makes careless mistakes with schoolwork.

- Difficulties shifting attention from an earlier event or topic or transitioning from one activity to another.
- Takes poor notes.
- Does not follow classroom discussions/lectures.
- Makes comments that are off topic or not related to the situation.
- Difficulties staying in one place and sitting still.
- Talks excessively, blurts out or talks about inappropriate or irrelevant topics.
- Interrupts conversations.
- Difficulties with taking turns.
- Low frustration tolerance.
- Does not object to the teacher, staff or speaker.

Attention and Concentration: Strategies for Intervention

- Specifically teach and practice what it looks like to pay attention. What is our body language? What are our eyes doing? Our mouths?
- Provide clear expectations for what the student is expected to accomplish during the activity.
- Schedule most important work during times when the child has displayed the greatest concentration.
- Position student nearest to location of instruction and away from distractions (e.g. doors, windows, high traffic areas, and other off-task children).
- Seat next to positive peers with age-appropriate attention abilities to help with redirection and understanding of instructions.
- Clear desk and area of everything except for what is needed for task at hand.
- Reduce background noise by experimenting with ear plugs, ear muffs/headphones, or introducing background sound such as white noise or a music device with soft music.
- Eliminate interruptions as much as possible. Once students are focused on a task, it is very difficult to get them restarted if interrupted.
- Allow student to complete work or tests in alternate settings where there are fewer distractions.
- Make sure to gain the student's attention when giving directions or cue when information is particularly important. Prompt the student with statements such as "I am going to tell you something very important and when I am done you will repeat it back to me."
- Use verbal and visual cues to refocus student as well as frequent checks for understanding.
- Provide opportunities for the student to take breaks throughout the day.
- Alternate classroom activities to provide movement and hands-on learning opportunities after periods of sitting, listening and working at their desks. Increase interest with new, stimulating activities. Alternate preferred and non-preferred tasks.
- Connect new learning to prior knowledge or with areas of interest.
- Break assignments into smaller and shorter steps. Present information in short and concise segments.

- Limit the amount of information on worksheets, notes, etc.
- Remind and teach them how to check their work.
- To check for focus, have the student teach concepts that were just taught.
- Provide copies of guided classroom notes or outlines.
- Use written or picture organizers and check off progress.
- Experiment with using timers and a motivating reward for on-task behavior and work completion. Write start and stop times on the top of the assignment.
- Use an excited, loud voice to get the student's attention and a quieter voice to keep it.
- Assign tasks that do not require a lot of divided attention. For example, teach one concept (one letter, one number, one color, etc.) at a time until they have it mastered.
- Use visual system to support student staying on-task (e.g. stop light, stop sign, put a sticky note on their desk to cue them to refocus, etc.).
- Provide visual with pictures at their desk as to what it looks like for that student to be paying attention. Reinforce using the visual throughout the day.
- Teach self-monitoring and focusing strategies (self-talk to remind brain to stay focused, saying the steps out loud when doing a task, etc.).
- Make paying attention a game. Time how long it takes to complete a task. The teacher challenges the student to beat their own time for the next similar task.
- Use technology (e.g. Interval Minder or other variable timer app) to teach self-monitoring. Have student identify if they are on or off-task every time the application makes a beeping noise. Teachers can also provide whole classroom attention training by having all of the students mark if they were on or off-task when they hear the beep. Teachers can then "randomly" target students with issues and the student or entire class can earn privileges based on the number of times the teacher and student both agreed they were on task. Teachers will need to do training up front of what it looks like to display good attention.
- Provide brain breaks and/or crossing the midline activities.
- Teach/encourage mindfulness, meditation, relaxation techniques, yoga, etc.
- Play attention games such as Memory, Blink, Spot It!, Find It Tubes, etc. Use I Spy books (if the book is more complicated, draw out a small imaginary square on part of the page and work with them to focus on only that square to look for the item. Once found or decided item is not there, create the next imaginary square). Suggestions for other attention games: Harvard University's Center on the Developing Child website for their *Activities Guide: Enhancing and Practicing Executive Function Skills with Children from Infancy to Adolescence.*
- See Inhibition (page 28) building block for additional strategies.
- See Curriculum Resources (page 49) for available intervention programs/materials.
- See Social/Emotional Competency (page 50).

Fundamental Processes: Inhibition

Inhibition is the ability to control one's thoughts, impulses and behaviors by stopping and thinking before acting. Inhibition includes delaying responses and focusing on important information while ignoring the irrelevant. Researchers believe inhibition resides primarily in the prefrontal cortex and is necessary for self-discipline, emotional regulation, self-monitoring, and self-evaluating. Students who have experienced a brain injury can display difficulties with impulsivity (disinhibition) which impacts their ability to listen, follow directions and to learn. Students with impulsivity issues may also experience difficulties controlling their emotions and displaying behaviors that get them into trouble.

Inhibition: Changes that may be Observed

- Acts without thinking or on the first thing that pops into their mind.
- Jumps into an activity without waiting for or slowing down to process directions.
- Difficulties following multi step instructions.
- Unable to verbally, physically or mentally "put on the brakes."
- Completes assignments incorrectly.
- Difficulties with transitions (space to space or task to task).
- Shouts out or talks excessively.
- Interrupts others.
- Social difficulties.
- Physical touch with others may be too much. Disregard for boundaries.
- Constantly moving, fidgeting, or squirming.
- Difficulty standing still in lines or staying in seat.
- Wanders around the classroom disrupting others.
- Requires frequent redirection by the teacher.
- Irritating and annoying.
- Difficulties controlling emotions.
- Verbally or physically aggressive behaviors.
- Requires adult supervision and structure.
- Appears to be purposely breaking rules or oppositional.
- Engages in unsafe risk-taking or behaviors that land them in trouble.

Inhibition: Strategies for Intervention

- Provide structure and consistent expectations. Teach and practice routines.
- Fade prompts or external supports until student is able to complete the skills independently.
- Preferential seating away from visual and auditory stimulation.
- Seat next to a positive peer who does not have inhibition difficulties.
- Intentional adult movement throughout the room with frequent check-ins and proximity.
- Wait 10 to 15 seconds before allowing student to respond during large group instruction.
- Have student repeat questions before answering.
- Opportunities for physical and cognitive breaks throughout the day.
- Provide fidgets, wiggle seats, exercise balls, etc.
- Allow student to stand while working.
- Provide classroom jobs that allow movement (pass out papers, run errands, etc.).
- Obtain attention and eye contact (if appropriate) before providing directions.
- Provide step-by-step visual directions or a checklist at desk.
- Identify verbal or nonverbal cues between student and teacher.
- Use of stop sign or stoplight systems to help teach self-monitoring and as a visual reminder.
- Prepare to teach, model, and prompt appropriate behaviors during transitions.
- Teach stop, relax and think. Teach delayed gratification.
- Use games to build inhibition abilities. See Harvard University's Center on the Developing Child website for their *Activities Guide: Enhancing and Practicing Executive Function Skills with Children from Infancy to Adolescence.*
- Teach unexpected vs expected behaviors. Model appropriate expected behaviors immediately after the unexpected behavior has occurred.
- See Sensory (page 32), Attention (page 24), Mental Flexibility (page 47) and Reasoning (page 48) building blocks for additional strategies.
- See Curriculum Resources (page 49) for available intervention programs/materials.
- See Social/Emotional Competency (page 50).

Fundamental Processes: Processing Speed

Processing speed is the rate at which we receive, understand, integrate and respond to information. It is a mental function that is highly sensitive to brain injury. Even for children whose intellectual ability returns to average or above average following a brain injury, the processing speed index often tends to be lower than the other cluster scores. If the brain injury has been mild or if the student is an adolescent, slow processing speed may go unidentified in a standard school-based assessment. An adolescent will often adjust their behavior to "cover up" cognitive problems so it appears that they are "fine." Students often experience confusion or difficulty with comprehension following a brain injury and rarely recognize a decrease in their processing speed. Depending on the age of the student, slow processing speeds can be devastating to school performance. In the early grades, teachers tend to repeat directions in single-statement form with long pauses so the student has an opportunity to process the information given. However, starting around the fourth grade, teachers begin to both deliver larger amounts of information at once and reduce the frequency of repetition often needed for the student to listen and take notes. The student with slow processing speed may still be working on one piece of information while the teacher has moved on to the second, third or fourth. By the time the student catches up they have missed so much that the current information is out of context. They begin to develop a spotty information base and have a set of notes that is incomplete and hard to reconstruct afterwards.

Slowed information processing impacts a person's ability to think efficiently and may hinder the effectiveness of other abilities such as attention, memory, organization, language or executive functioning. One major reason for slowed processing speeds after an injury is that the "wires" of the brain (neurons) can no longer communicate efficiently with each other. Different areas of the brain not being able to communicate and share information with each other results in sluggish thinking and diminished cognitive abilities. The breakdown in communication is largely caused by damage to the neuron's insulation (myelin). Similar to the plastic lining of an electrical wire, if the myelin that helps protect the brain's signals is damaged the transmission loses energy. Another reason for slowed processing speed is that the brain may be diverting signals around the damaged area taking a longer time for the message to reach from one point to another.

Processing Speed: Changes that may be Observed

- Does not follow instructions or discussions.
- Delay in response and slow at completing work.
- Poor grades despite effort.
- Incomplete work.
- Spotty learning of new information or does not appear to remember information.
- Difficulty following lectures.
- Difficulty taking timed tests.
- Difficulty making transitions from one activity to another.
- Difficulty multitasking or doing more than one activity at a time.
- Difficulty remembering details from a conversation (the details were never learned in the first place).
- Difficulty integrating information from several sources.
- Poor task persistence.
- Confusion or student looks "blank."
- Irritability and poor frustration tolerance.
- Unwillingness to engage in conversation.
- Motivational or initiation deficits. May appear lazy or spacey.
- Appears inattentive.
- Resistant to trying novel tasks.
- Difficulty translating thoughts into flexible, responsive and appropriate behavior.
- Fatigues easily.

Processing Speed: Strategies for Intervention

- Have well established daily routines and classroom expectations/rules.
- Give instructions one at a time and focus on the essential or most important information (clear and concise).
- Give time between parts of a direction for the child to process and provide a response.
- If the child appears "blank" or is not doing what you have asked, repeat the main points. Do not elaborate or add details.
- Provide written directions and combine verbal information with visuals.
- Provide frequent checks for understanding.
- Reduce other distractions so the student does not have to screen them out or share his/her focus with anything but your words.
- Try not to pressure the student, urge them to "hurry up" or get exasperated. If you need something done quickly, it is better to not assign it to the student.
- Allow extra time for processing, providing responses, assessments and assignments, including standardized tests.
- Limit the number of tasks the student is required to complete at one time.
- Reduced workload- focus should be on whether student is learning the overall concepts not on whether they are completing all the required homework and classwork.
- Provide a copy of classroom notes or guided notes/outline.
- Provide or teach the use of graphic organizers and checklists.
- Teach the student how to highlight dense text material and use study hall time to highlight and outline lecture or text material with the student.
- Teach student to advocate for themselves and to ask others to slow down or repeat information.
- Address cognitive fatigue issues (page 61).

Fundamental Processes: Memory

Memory and learning involve the storage and organization of information for later use. Following a brain injury, memory of past information and events (long-term memory) is often retained. This may initially be perceived as a sign of little or no memory loss. However, the memory for new learning and experiences (short-term memory) is frequently affected after injury. Due to the impact on short-term memory, it is common for students to experience a loss of ability to organize new information in order to be effectively recalled. Working memory, which is the ability to use information in the memory systems for problem solving and/or task completion, can also be impacted. Working memory is typically short in duration and requires rehearsal and repetition in order to remember information for more than a few seconds. Associated with academic performance, working memory is a critical type of memory that helps a person solve multi step problems. Verbal learning, verbal memory and working memory all tend to be particularly impacted by brain injuries (Semrud-Clikeman, 2001). Memory skills can be further diminished by the presence of fatigue, pain, and stress.

The general memory process is complex and entails memory creation, storage of information, and retrieval. There are several types of memory, each having a different brain structure with which they are associated. For example, some primary types of memory are short-term, working, visual, auditory, procedural and declarative. Damage to any area of the brain that assists in the formation, storage or retrieval of information can degrade memory. There are multiple ways to damage the memory system. While a detailed neurological explanation of the types of memory is beyond the scope of this manual, a simplified account is provided below.

- Memories are created in very deep areas of the brain called the limbic system, specifically the hippocampus. The hippocampus is very sensitive to oxygen deprivation. For example, people who experience a near drowning event might develop difficulties with memory formation.
- Memory storage is located throughout the brain, but the medial left temporal lobe is an area of significant importance.
- The frontal lobe of the brain is a vital region for working and short-term memory processes while helping to retrieve stored memories.

Memory: Changes that may be Observed

- Student understands only parts of instructions or statements.
- Can't remember more than one thing at a time.
- Can't remember the details.
- Has difficulty following multi step directions.
- Does work incorrectly or incompletely.
- Forgets what homework is assigned.
- Does not turn in homework or turns it in incomplete.
- Has difficulty recalling information recently learned.
- Fails test in spite of studying.
- Repeatedly asks the same questions.
- Splintered learning and inconsistent performance.
- Doesn't recall participation in recent activity or events.
- Recalls pre-injury information or activities.
- Wanders or loses their way in school, home or community.
- Requires multiple repetition of instructions, information or activity.
- Appears disorganized.
- Appears spacey.
- Appears to be manipulative or have an "attitude" problem.
- Learned helplessness.

Memory: Strategies for Intervention

- Break instructions and assignments into manageable pieces. Limit amount of information given at one time.
- Focus on one concept or cognitive demand at a time (e.g. learn just one letter per week).
- Present information in several ways (verbal, written, visuals, modeling).
- Engage background knowledge and make connections with previous learning when teaching new concepts.
- Left hemispheric damage: Use visuals, graphic information, sticky notes and encourage students to form a mental visual picture of verbal information.
- Right hemispheric damage: Use verbal prompts and auditory modalities.
- Use who, what, when, where, why and how questions during reading and discussion.
- Use thematic learning across content areas when possible.
- Teach the concept and have student then teach you or others to activate numerous areas of the brain.

- Incorporate repetition/practice of new material. Allow rest breaks between repetitions.
- Provide copies of guided notes or overheads.
- Allow use of notes and books during assessments.
- Modify test format to multiple choice to reduce the need for total memory recall. Give recognition tests not recall tests.
- Teach note-taking techniques such as highlighting essential information or blacking out unnecessary information.
- Teach memory strategies: visual imagery, grouping information, mnemonics, connecting information to what the student already knows.
- Encourage student to develop a visual picture of information learned or read.
- Increase memory by making emotional connections and activating the limbic system.
- Competition games may activate emotional systems that enhance memory.
- Provide verbal or visual cues to help trigger and aid in memory recall. Use single keyword cues.
- Have student rehearse new information by reciting it out loud.
- Support student in practicing daily routines.
- Use errorless learning to teach concepts. See www.projectlearnet.org and www.brainline.org. Errorless learning discourages guessing so the student never has a chance to learn or remember incorrect information.
- Have student repeat or paraphrase what they learned to check their understanding.
- Identify peer helpers to assist with strategies and understanding of directions/content.
- During classroom discussions, call on student with brain injury first (if their hand is up) so they do not forget their responses and are able to then focus on the rest of the discussion.
- Encourage student to self-advocate having information repeated or presented in a different manner.
- Provide student/parents with upcoming topics, notes and materials so they can preview and reinforce concepts at home. Use classroom websites so student can access missing notes or assignments.
- Provide examples of homework problems/assignments to aid in memory when at home.
- Develop a folder specifically for homework.
- Designate a bag or pack in which to keep materials that go to and from school.
- Provide an extra set of textbooks for home.
- Teach the student to use picture schedules, daily planners or electronic organizers. Set alarms on phone or watch as a reminder when they need to complete a task.
- Develop checklists to help the student remember schedules, routines, etc.
- Use technology to set up automatic reminders. Use Google e-mail/calendars, computers and/or smart phone to send reminders.
- Depending on extent of memory concerns, student may need to use a memory book.
- Teach routines and expectations. Limit the number and frequency of changes in routine. Keep as consistent as possible.
- Use games to build memory abilities. See Harvard University's Center on the Developing Child website for their *Activities Guide: Enhancing and Practicing Executive Function Skills with Children from Infancy to Adolescence.*
- See New Learning (page 36) and Organization (page 45) building blocks for additional strategies.

Fundamental Processes: Sensory and Motor

Sensory-Motor is the perception and response to what is seen, heard, smelled, tasted, felt and touched, including balance (vestibular), internal perceptions (interoceptive) and "position sense" (proprioception). **Sensorimotor** skills involve the process of receiving messages (**sensory** input) and producing a response (**motor** output). We receive sensory information from our bodies and the environment through our sensory systems (vision, hearing, smell, taste, touch, vestibular, and proprioception). This sensory information then needs to be organized and processed to be able to produce an appropriate motor response to be successful in daily tasks at home or at school (North Shore Pediatric Therapy - Sensorimotor Skills).

Generally speaking, the parietal lobe of the brain processes most sensory information and integrates it to construct a picture of one's environment. The parietal cortex helps with attentional awareness and is involved in comprehending what objects are and where they are located in space. The parietal lobe is located at the top and back of the brain. Damage to the parietal lobe may interfere with body awareness, cause attention problems, and the accurate processing of auditory, olfactory, taste, tactile, and visual information.

In the motor area, children often have a hard time correctly grading their responses. This inability to grade their motion responses can sometimes cause an over- or under-response observable in their written work at school. For example, while sketching his letters a child may apply so much pressure that the paper tears. He may scribble or rework some letters so many times that they are dark and overdrawn. It may be impossible for the student to apply consistent pressure and smoothly grade the fine motor responses in order to produce a more acceptable product.

Motor movements involve a circuit between the frontal areas of the brain and a fist-sized structure at the lower rear called the cerebellum. The upper frontal and top regions of the brain (called the motor-strip) and deeper neurological areas (called subcortical areas) generally control fine motor movements. Fine motor movements include writing, playing a musical instrument, or picking up small objects. Injury to the motor-strip and/or the cerebellum (base of the brain) can cause motor difficulties such as jerky movements, poor posture, walking difficulties, and coordination problems. Disturbances in the sensory and motor systems, besides requiring intervention in their own right, also affect the child's energy and availability for higher order cognitive activity.

Sensory and Motor: Changes that may be Observed

Sensory: Over-stimulated

- Increased distraction during activities.
- Sensitivity to lights and sounds.
- May appear emotional, irritable or oppositional due to behaviors related to sensory overload. Experiences meltdowns.
- Appears overwhelmed or overly excited in stimulating or crowded environments (e.g. lunchroom, PE, assemblies, etc.).
- Fidgets.
- Clumsy and bumps into objects/people.
- Exhibits unusual behaviors (frequently out of seat, claps hands, stands up, makes noises, etc.) when overwhelmed.
- Doesn't like to be touched.
- Picky about clothing or clothes disheveled from tugging and sucking.
- Picky about food textures and tastes.
- Seeks out oral stimulation or physical feedback.
- Tunes out due to over-stimulation.
- Incomplete work.
- Messy papers, school work is not well-organized.
- Poor handwriting.
- Difficulty completing worksheets with too many items or visual information. Difficulty shifting from workbook/textbook to writing on answer sheet/paper.
- Difficulty with large group discussions and working with groups.
- Difficulty reading due to visual stimuli.
- Difficulty with seatwork.
- Excessive erasing, crossing out words.
- Struggles with transitions.

Sensory: Under-stimulated

- Seeks and requires increased sensation for stimulation.
- Overly excited in stimulating environments (e.g. lunchroom, PE, assemblies, etc.).
- Seeks out touch or being held.
- Frequently touching other people or things.
- Clumsy and bumps into objects/people.
- Difficulty registering pain or pressure.
- Always has something in mouth.
- Tugging or sucking on clothes.
- Loves swinging, climbing, running, and crashing into things.
- Picky eating due to seeking out particular tastes.

- Difficulty following directions.

Motor

- Poor coordination.
- Shaky hands/tremors.
- Poor handwriting or messy written work with several erasures or excessive reworking.
- Takes a long time to produce written work or avoids writing tasks.
- Difficulties cutting, drawing, dressing, feeding.
- Has awkward pencil grip.
- Difficulties shifting from workbook/textbook or board to writing answers on paper.
- Poor balance, clumsy, jerking movements, stumbling or bumping into things.
- Issues with posture. Slumping in their seat.
- Can't move easily from sitting to standing.
- Stands up to read or write.
- Leans heavily on desk or walls. Rubs hands along walls in hallways.
- Difficulty with or avoids recess and physical education class.

Sensory and Motor: Strategies for Intervention

Sensory and motor issues may both require consultation and/or services with an occupational therapist and/or physical therapist as well as an assistive technology evaluation.

Sensory

- Preferential seating away from visual and auditory stimulation.
- Limit visual (clutter) and auditory stimulation in the classroom. Consider the impact of lights, noise, movement, etc.
- Clear desk of everything except for what is needed for current task.
- Reduce amount of visual information and problems on a page/worksheet.
- Provide a quiet space/area for breaks or to allow the student to complete work.
- Provide student with the opportunity for physical and cognitive rest breaks during the day (lunch and recess are not rest breaks for a student with a brain injury).
- Monitor whether the student can handle the lunchroom or if a less stimulating area should be provided where they can eat with their friends.
- Permit use of headphones, earbuds or hoodies when over-stimulated/sensitive to auditory stimulation.
- Allow them to chew gum, hard candy or crunchy foods such as crackers or baby carrots.
- Use therapy balls, wiggle seats, inflatable chairs/cushions,

or wedges at their desks. Stretch bands on bottom of chairs.

- Deep joint pressure or weighted items (vests, blankets, animals).
- Provide squeeze ball and other objects/fidgets for hands.
- Allow student to wear comfortable clothing, remove tags.
- Allow use of sunglasses and hats for students with light sensitivity.
- Teach relaxation, deep breathing, and mindfulness as well as problem solving skills.
- A number of the Motor interventions below are also appropriate for sensory deficits.

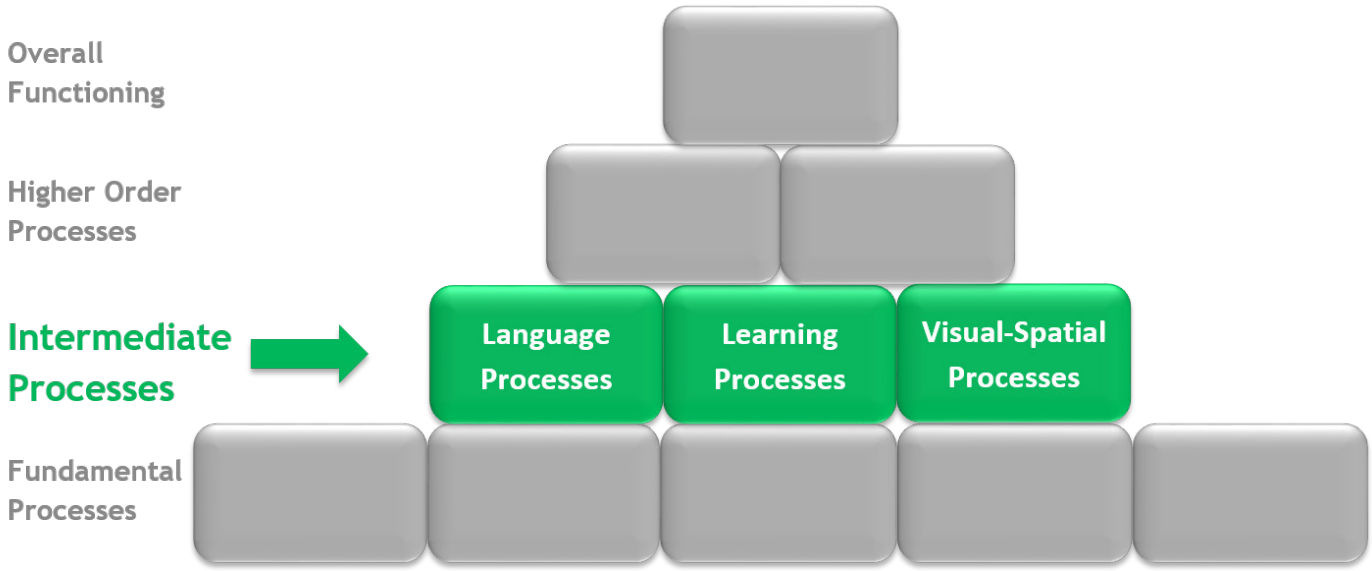
Motor

- Encourage participation in recreational and sports activities that use both sides of the body to develop motor coordination. Individual sports, such as swimming, bowling, bike riding, jogging, track and field activities, and skiing can be much easier for students with a brain injury. Among the team sports, baseball may be ideal as the child can practice individual skills and routines. Be cognizant of activities that the student enjoyed and at which they previously excelled that may now be difficult and frustrating due to new motor deficits. Parents, schools and healthcare providers should consult with each other and be in agreement with which activity might be appropriate. Contact or collision sports may be problematic for a student post-TBI due to risk of further brain injury.
- Allow the student to stand up and lean on the table when reading or lie on the floor to do work.
- Encourage heavy work activities (e.g. carrying boxes or books, carrying backpack containing weighted objects, pushing heavy objects, stacking chairs). These activities give deep pressure to the joints, help reduce sensory defensiveness, keep the child alert, and assist in the development of controlled, graded movements.
- Be sure that the student's table and chair provide optimal support to reduce the amount of energy devoted to maintaining balance. A firm seat with arm rests and table at elbow level are often optimal. Use of cube chairs.
- Use adaptive scissors, silverware, pencil grips, etc.
- Have the student warm up their hand and finger muscles before doing fine motor tasks.
- Reduce the number of problems or visual stimulation on the page/worksheet.
- Use a line ruler to assist with visual tracking.
- Student may need to transition in the hallways before or after class ends, or be provided with someone to help support them in physically navigating the crowded hallways.
- Student may need to be provided with a key for their locker instead of having to try to remember or physically maneuver a combination lock.
- Consider student's need for assistive technology evaluation.
- The following activities can help children with sensory and motor weaknesses:
  - Running and jumping.
  - Jumping on a trampoline or a hard surface.
  - Heel crushers: standing, rise to toes slowly and then crush heels into the ground.
  - Wall or chair push-ups. Wall sits: have contest to see how long student can hold his/her position.
  - Chair bike: student use chair or floor to lean back using hands for support while lifting legs and making bicycle motions in the air.
  - Animal walks: bear/crab/frog/army crawl.
  - Catching and throwing heavy balls.
  - Climbing, pulling and hanging activities.
  - Therapy swings or swinging.
- The following strategies can help with written work:
  - Break written work into chunks.
  - Reduce the amount of written work.
  - Provide multiple choice test formats.
  - Allow student to dictate first draft of written assignment rather than write.
  - Allow student to use computer or other typing devices for written work.
  - Provide student with slant board to facilitate writing.
  - Provide copy of class notes or guided notes and outlines.
  - Allow cursive or print-whichever is easier for the student.
  - Use speech-to-text technology.
  - Develop preprepared materials so student can focus on content as opposed to cutting and other fine motor tasks.
- A number of the Sensory strategies are also appropriate for motor deficits (page 32).

THE BUILDING BLOCKS OF BRAIN DEVELOPMENT (CONTINUED)

Intermediate Processes

This section will cover the changes that may be observed and the strategies for intervention that address Intermediate Processes that are needed for brain development. These Intermediate Processes are New Learning, Language and Visual-Spatial.



Intermediate Processes: New Learning

When an individual sustains a brain injury, the abilities and skills that recover most quickly and strongly are those that were securely established before the injury. One reason for this is that after something is learned, practiced, and remembered, it is stored in many different parts of the brain. When individuals try to recall the information, they have several different avenues to try, and if for some reason the usual approach fails, the information can be accessed another way.

In order for information to be initially encoded in memory, certain pathways and centers in the brain vulnerable to injury must be intact. Following brain injury, learning will be most efficient if it occurs in a multi-sensory or multi-modal fashion. This is why thematically organized curricula work best for the student with a brain injury. With repeated exposure to the same theme while engaging different skills (writing, counting, drawing, etc.) the student will rehearse newly learned information throughout the day. The student will be approaching the information from various classes in a slightly different way (language arts, math, science, art) creating multi-modal learning situations.

In some instances, a multi-modal presentation of complex new information may decrease the ability to learn by demanding too much of the brain's limited resources. This is particularly true of students who are overwhelmed and struggle with filtering out sensory information. Although not commonplace, some students may also have difficulty with processing multiple sources of information at once. These students may best learn through blocking off one sensory stream while focusing on another. For example, have the student close their eyes and focus the majority of their cognitive energy on listening to what is being said.

Receiving and processing new information to create learning is a remarkably complex neurological phenomenon. A novel academic task requires several brain areas working in concert to produce understanding. From a broad and simplistic perspective, new learning typically activates the right hemisphere of the brain. Many times, children with right hemisphere brain damage have difficulty understanding new concepts if taught by traditional techniques. Once new information is processed by the right hemisphere it is sent to other areas of the brain for deeper level comprehension. A critical neurological region necessary for comprehension is centered near the juncture of the three major lobes (angular gyrus) located at the back of the brain.

New Learning: Changes that may be Observed

- Academic testing and overall intellectual ability are often "average" with poor performance on assignments and class work.
- Verbal intellectual ability is higher than performance (nonverbal).
- Rote learning may be unaffected; students can memorize but cannot apply the information in a meaningful way.
- Skills learned in one setting do not translate to other settings or the student overgeneralizes.
- Learning is impaired and student does not remember information that has been taught.
- Does not go beyond the information given to make inferences or predictions.
- Does not put facts together to see the bigger picture.
- Can be a literal, concrete thinker.
- Capable of demonstrating skills or mastery one day but not the next.
- May appear forgetful or spacey.
- Puts a lot of effort into work but receives poor results or may not exert effort when new material is presented.
- Copies the behavior or work of others. A follower.
- Easily frustrated and overwhelmed. Possible angry outbursts and meltdowns.
- Makes things up to save face.
- Appears lazy.
- Can seem defiant.

New Learning: Strategies for Intervention

- Teach outlining and highlighting of most important concepts.
- Preview vocabulary and new concepts.
- Provide copies of guided notes and outlines.
- Allow extra time to complete tests and assignments.
- Encourage student to review what has been learned daily.
- Provide student/parents with upcoming topics, notes and materials so they can preview and reinforce concepts at home.
- Use real world examples to make new learning meaningful. Make connections between new learning and information student already knows.
- Teach through Experiential Learning with the teacher helping to guide and support the student through reflection on their experiences and their own learning.
- Gradual Release of Responsibility: "I Do" Focus Lesson; "We Do" Guided Instruction; "You Do It Together"

Collaborative Learning; "You Do It Alone" Independent Learning.

- Present concept and have the student teach others activating numerous areas of the brain.
- Use errorless learning to teach concepts (see projectlearnet.org and brainline.org). Errorless learning discourages guessing so the chance of learning or remembering the information incorrectly is reduced.
- Spiraling: introduce basic key concepts first, cover with repetition, increase degrees of complexity.
- Encourage to develop a visual picture of information they have learned or read.
- Increase learning by making emotional connections and activating the limbic system.
- Competition games may activate emotional systems that enhance learning.
- Provide multi-modal learning opportunities (visual, verbal, modeling, hands on).
- Encourage the child to read aloud when studying text. This gets the information processed by different centers of the brain without taking more time.
- Teach thematically across disciplines providing student with many opportunities to apply learning.
- Repeat directions and provide repetition of materials.
- Check for understanding by having student repeat or paraphrase what they learned.
- Present one skill or piece of information at a time. Break tasks and projects down into steps. Provide visuals of each step detailing what you want them to learn.
- Group information into familiar units or concepts.
- Allow child to master a concept prior to introducing additional new learning.
- Focus on factual and concrete information when teaching new concepts.
- If available, schedule a study hall class as another opportunity to reinforce new learning.
- Students may have slow rise time in that they do better when they have a chance to work with the materials and "warm up" to the requirements of the activity. Provide one or two practice items before beginning a test or an assignment.
- See Memory (page 30) building block for additional strategies.

Intermediate Processes: Language

Children's language abilities are still developing and an injury to this area can have a significant impact on their receptive (what we understand) and/or expressive (what we say) abilities, as well as their academic performance. Receptive language difficulties interfere with the understanding the language and communication (words and sentences) of others. Children may perform well on measures of receptive language soon after the injury, but as time passes their performance may decrease because they are not learning new concepts and vocabulary at a rate consistent with their peers (American-Speech-Language-Hearing Association). Understanding spoken language is typically associated with the left hemisphere of the brain. A small specific area of the left temporal lobe known as the Wernicke's area is vital to processing incoming language-based information. Young children typically understand what is told to them before they can express it themselves, but damage to the left side of the brain may hinder their development in language comprehension.

Expressive language skills involve a child's ability to demonstrate their own thoughts and ideas. After a brain injury, expressive language problems are often observed as difficulty finding the right word or something being "on the tip of your tongue." This is particularly evident in situations of stress, such as providing responses when called upon in the classroom. These children typically know the answer but cannot think of the word when needed. The ability to speak logically and express oneself using language involves the left hemisphere of the brain. Another specific area within the left temporal lobe known as Broca's area activates and communicates with other areas of the brain to produce speech. Damage to Broca's area, located at the middle to front side of the left hemisphere, hinders expressive language.

Pragmatics are the verbal and nonverbal rules of social language and interactions, such as distance between speakers, physical gestures, facial expressions, etc. Pragmatics can vary significantly between different cultures.

Language: Changes that may be Observed

Receptive

- Looks or acts confused by conversations, especially multi step or complex directions.
- Difficulty with problem solving.
- Delayed response or does not respond to directions.
- Asks "Huh?" frequently.
- Does not understand complex words; inferential, figurative or complicated abstract language.
- Takes longer to understand directions or what is being said.
- Difficulty following conversations; circumlocution (talks around an idea, struggles to get to the point); hard time staying on topic, sudden shifts in topic or has hard time adding new ideas.
- Difficulty in understanding sarcasm.
- Answers wrong question or gives strange answers.
- Echolalia (repeating back what someone else said).
- Delayed and/or poor reading comprehension.
- Difficulty understanding homework assignments.
- Difficulties with math word problems.
- Poor short or long term memory for conceptual and linguistic information.
- Appears inattentive; can be distractible.
- Struggles with understanding social rules.

Expressive

- Uses poor grammar or immature speech.
- Difficulty following conversations; circumlocution (talks around an idea, struggles to get to the point).
- Difficulty in understanding sarcasm.
- Lack of specific language in academic work.
- Can do well with conversational speech but struggles with expressing academic topics.
- Difficulties staying on topic. Child may make sudden shifts in topic or may have difficulty generating novel messages associated with the conversational topic.
- Trouble writing essay questions or retelling stories.
- Limited participation in class discussions.
- Appears to understand more than they can say.
- Difficulty asking and answering questions.
- Dysarthric speech (slow, slurred speech, mumbling).
- Frequently repeats the same question or idea rather than providing more or different information about a topic.
- Ruminates on topics.
- Brief responses with limited elaboration.
- Difficulty summarizing and providing salient details.
- Has difficulty with word finding or uses non-specific vocabulary (e.g., "that lady" rather than "Mrs. Smith").
- Difficulty with problem solving.
- Can be easily frustrated.

Social Pragmatics

- Difficulty understanding and negotiating social rules.
- Difficulty in greeting others, taking turns in conversation and maintaining topics.
- Sarcasm, figures of speech, jokes and humor can be confusing, misunderstood or used inappropriately.
- Struggles with reading facial cues and body language.
- Uses inappropriate eye contact and tone of voice.
- Difficulty with proprioception (knowing body in space) and proximity (personal space).
- May say too little or too much, overuse certain phrases, or demonstrate repetitiveness in speech or communicative gestures.
- Can be socially withdrawn or seen as a "follower".
- Difficulty remaining on topic.
- May appear over-emotional and over-reactive or flat and without emotional affect.
- Have little insight or awareness of how their behaviors are inappropriate or impact others.
- Difficulty in building and maintaining friendships. Doesn't seem to fit into social groups in less structured settings (recess, lunch, school hallways, etc.).
- Difficulty working in small groups in class.

Language: Strategies for Intervention

Receptive

- Give directions slowly and one at a time, using short simple sentences.
- Have child repeat or paraphrase instructions.
- Reinforce verbal concepts with visual cues; use simple graphic organizers.
- Identify targeted vocabulary and integrate throughout classroom lesson.
- Reading to the child and discussing the text provides language models and exposure to a variety of aspects of language.
- Teach listening comprehension strategies to help expand understanding of social and academic language situations.
- Teach students to advocate and ask for clarification, repetition or for information to be presented more slowly.
- Provide guided notes or outlines to fill in keywords.
- Start with concrete concepts and then introduce related abstract concepts.
- Avoid using sarcasm and figures of speech; explain the meaning of abstract or figurative language.
- Allow wait time for processing what is being said and to form own responses.
- Cue the student that what you are about to say has importance.
- Teach language memory strategies such as chunking, visual imagery and verbal rehearsal.
- Break down complex ideas into concrete examples.

Expressive

- Teach the student to rehearse silently before replying.
- Ask open ended questions and ask for elaborations.
- Allow child to dictate thoughts prior to writing; provide feedback and modeling regarding grammar form or word choice.
- Provide word banks if word finding is difficult.
- Model and encourage participation in natural conversations.
- Provide picture cues to support memory for details and sequencing information when telling or retelling a story or event.

- Teach summarization skills.
- Provide choices.
- Encourage expression through nonverbal means such as art and music.
- Frequent repetition and review of concepts to create automated responses.
- Allow plenty of time for response and do not pressure child.
- Role play potential real life conversations.
- Prepare ahead of time for classroom presentations.
- Student may benefit from highly structured "errorless learning" (e.g., use of word banks, models for written work, etc.) whereby incorrect responses are minimized to reduce frustration. (See projectlearnet.org and Prainline.org for more information on errorless learning.)

Social Pragmatics

- Use pictures, photographs, visuals and modeling to teach recognition of emotions based on facial expressions, nonverbal cues, tone of voice, etc. Help the child understand that sometimes their facial expressions do not match the emotion(s) expressed in the verbal message.
- Take advantage of naturally occurring situations to practice and reinforce social skills (e.g., greetings at the beginning of a day, requesting materials to complete a project, starting and maintaining conversations with peers during free time, etc.).
- Role play and model how to behave and communicate appropriately in common social situations.
- Use social narratives to support learning appropriate and inappropriate verbal and nonverbal behaviors in different situations.
- Ask questions such as, "What did you do first?" or "What happens next?" to help build sequences.
- Work with the student to develop a social language dictionary with words, definitions and pictures. Students can add more words as they come across ones that are confusing.
- Teach the different types of appropriate space between speakers (public, social, personal, intimate) and the distances related to each (visuals and modeling). Provide scenarios/role plays to identify what type of space is needed in each situation.
- Teach conversation starters, such as, "What is your favorite television show?" or "What did you do this summer?" to use when talking to others.
- Encourage rephrasing or revising an unclear word or sentence. Provide an appropriate revision by asking, "Did you mean ...?".
- Teach social problem solving skills of problem identification, generating possible solutions, determining the best solution, implementing the solution, and evaluating the effectiveness of the solution. Provide opportunities to practice these skills in realistic environments whenever possible.
- Provide detailed and direct feedback on social skill development to assist the child in gaining insight into appropriate social interactions.
- Develop friendship groups.
- Consider strengths and areas of growth when placing the student in work groups or pairs.
- See Curriculum Resources (see page 49) for available intervention programs/materials.

Intermediate Processes: Visual-Spatial

Visual-spatial processing involves the ability to generate, retain, retrieve and transform well-structured visual images. Visual-spatial skills include, but are not limited to, copying figures, constructing block designs, navigating a physical space, handwriting, making sense of charts and graphs, and facial discrimination. After a brain injury, the visual-spatial abilities are often more impacted than verbal abilities and tend to remain at lower levels after recovery (Semrud-Clikeman, 2001). Speed of visual processing and visual-motor skills have also been found to be sensitive to brain injuries (D'Amato, Fletcher-Janzen & Reynolds, 2005).

Visual-spatial processes are largely associated with the occipital lobe located at the back of the brain. The occipital lobe functions by dividing visual information and sending it either to the lower left part of the brain (temporal lobe) or to an upper part called the parietal lobe. Visual information that can be identified with a word (the "what") is the domain of the occipital-temporal region, while visual information that is related to location (the "where") falls within the domain of the occipital-parietal region. Damage to the back and left side of the brain can degrade a person's ability to process images of known objects and injury to the back and upper regions of the brain may cause problems with spatial and location tasks.

Visual-Spatial: Changes that may be Observed

- Difficulties with organizing materials.
- Reading difficulties. Complains that "it all blends together."
- Difficulties with organizing written work and handwriting.
- Difficulties with mathematics/geometry.
- Difficulties with understanding numbers and pictorial representations such as charts, maps and graphs.
- Depth and distance perception difficulties.
- Spatial perception and orientation difficulties. Proprioceptive challenges (knowing one's body in space).
- Difficulties with visualizing mental maps. Gets lost easily.
- Difficulties understanding up-down, near-far and other spatial concepts.
- Difficulties with mental rotation and object construction.
- Can experience frustration due to not understanding visual materials and expectations.
- Appears overwhelmed.
- Difficulties reading social cues and facial expressions.
- Increased headaches during visual tasks and sensitivity to light.
- Appears clumsy.

Visual-Spatial: Strategies for Intervention

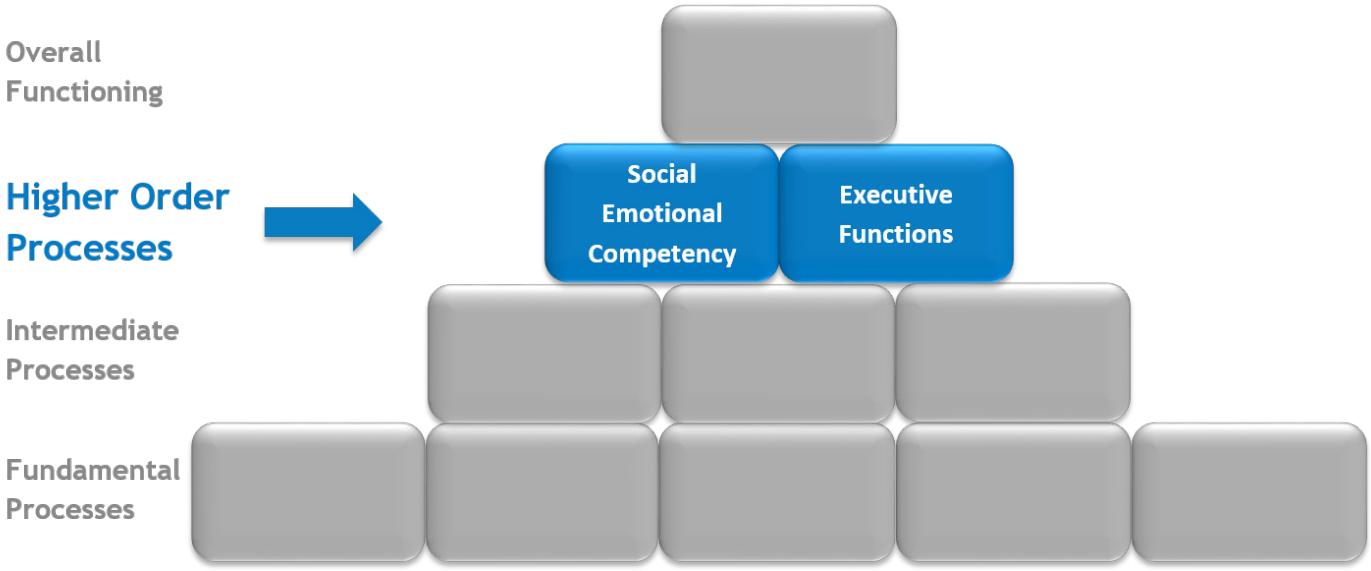
- Verbal focus on learning.
- Provide precise and clear verbal content and directions.
- Frequent checks for understanding.
- Consider how the visual presentation of information (e.g. worksheets) needs to be modified.
- Highlight the visual information where student needs to focus.
- Visual planners (webs, diagrams) may be too confusing.
- Enlarge written materials.
- Use a ruler to stay on track reading across a page.
- Reduce the amount of written work.
- Provide support in aligning math problems, such as using graph paper.
- Provide support in organizing writing from left to right and organizing/expressing thoughts.
- Teach verbal strategies to interpret visual information such as maps, charts and graphs.
- Reduce clutter on student's desk.
- Consider social skills group.

THE BUILDING BLOCKS OF BRAIN DEVELOPMENT (CONTINUED)

Higher Order Processes

This section will cover the changes that may be observed and the strategies for intervention for the Higher Order Process of Social/Emotional Competency, and Executive Functions. The Executive Functions building block includes: Initiation, Planning, Organization Skills, Mental Flexibility and Problem Solving.

In addition this section will also discuss the proper use of Functional Behavior Assessments and Behavior Intervention Plan.



Higher Order Processes: Executive Function: Initiation

Initiation involves a person's ability to begin tasks independently and within a timely manner. It may appear that the student is uninterested, unmotivated or oppositional, when in reality the issue is difficulty knowing how to begin. Once started, most children will be able to continue until the task is completed while others may become stuck as the demands of the task change. Difficulties with initiation can also be associated with organizational issues, memory difficulties, or depression. Issues with initiation can also be observed in social situations where the child is willing but unsure how to join activities or begin conversations.

Since the frontal regions of the brain are largely responsible for action and movement, it is not surprising these same areas are responsible for initiation. It is also not surprising that because emotions help start actions, the deeper emotional centers of the brain are implicated in initiation as well. The specific part of the brain that acts as a neurological communication cable between the frontal area and the emotional area is called the cingulate gyrus. Damage to the frontal areas, the cingulate gyrus, and deeper brain structures may cause initiation and emotional problems.

Initiation Changes that may be Observed

- Difficulties with starting school work and other tasks independently.
- Can state what they are supposed to do but does not begin.
- Requires constant cuing and reminders even on the most routine of tasks.
- Does not complete homework or seatwork.
- Turns in poor quality work or incomplete work.
- Difficulties managing long-range projects.
- Does not shift or transition at the same time or as easily as peers.
- Can appear lazy, aloof, spacey and/or unmotivated.
- Can appear resistant.
- Is seen as a follower.
- Can seem introverted or passive.
- Rarely expresses spontaneous opinions or desires.
- Often gets overlooked because they do not cause problems in the classroom.
- Does not make plans to get together with friends.
- Lagging in independent living skills.
- Seeks out adults for social interaction.

Initiation: Strategies for Intervention

- Provide assistance with getting started on school tasks. Have child visualize the first thing to do, verbalize that step to the adult, then start step and carry on throughout the completion of the task.
- Provide more frequent check-ins to ensure student is completing work and to provide "jump-starts" as demands of the task change.
- Use of contingency-based (if, then) interventions centering on video games.
- Seat next to a positive peer to help them get started or if they get stuck as the task changes.
- Teach to observe others to identify what to do next.
- Provide a written routine with an outline of tasks and time frame.
- Break large projects or tasks into smaller steps.
- Help student develop planning skills.
- Teach organization strategies: checklists, graphic organizer or a series of pictures indicating steps needed in task.
- Develop and teach routines at home and school until they are well-learned. Continue the use of cues if needed to support student in getting started on tasks.
- Use visual imagery to practice the steps of the activity prior to initiation.
- Have them write down what time they are going to start each homework assignment in their planner.
- Teach self-advocacy skills: "Can you help me get started?" or "Could you help me at this time?".
- Provide lunch groups or support building relationships if initiation is interfering.
- Younger children may need adult support initiating play with others, through the use of verbal clues, gentle physical prompts, or by the adult joining the play and supporting the child joining.
- See Planning (page 44) and Organization (page 45) building blocks for additional strategies.

Executive Function: Planning

Planning involves identifying and executing the steps necessary for finishing a task or accomplishing a goal. Planning includes determining the amount of time required for each step, prioritizing information to decide upon where to focus, and choosing which resources will be needed to successfully complete a task. A key concept of planning is being able to engage in future thinking. Students with planning issues may approach tasks impulsively which can lead to difficulties completing the steps of a process or producing a disorganized or irrelevant result to an assignment (Meltzer, 2007).

As students develop, the cognitive demands of planning increase significantly. Planning in young children may involve completing simple one- or two-step activities, but the expectation of solving long-term projects and essays increases by the time they reach middle school. The planning involved in larger projects can be overwhelming for students with a brain injury because they are unable to break down the steps or figure out the amount of time needed to complete each step. Planning is a future-oriented process requiring forethought, estimation and problem solving. The upper frontal lobe is intimately tied to planning, similar to the same neurological structures involved with regulation, organization, and problem solving.

Planning: Changes that may be Observed

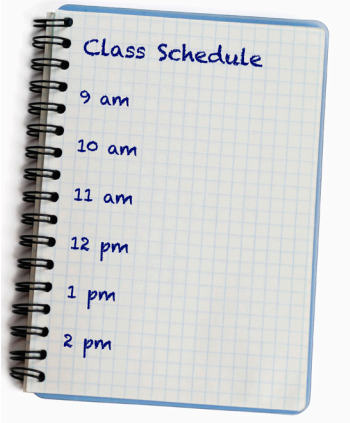
- Difficulties with problem solving and identifying the steps needed to complete a task.
- Rigidity of thinking. Does not see more than one way to complete a task.
- Doesn't brainstorm.
- Difficulties organizing thoughts in writing or organizing the steps necessary to complete math problems.
- Struggles with doing more than one activity or task at a time.
- Difficulties completing assignments, especially long-term or larger assignments.
- Disorganization of materials.
- Gives up if their first attempt does not work.
- Difficulties getting started or impulsively jumping in and has a disorganized and/or incomplete result.
- Often late and unprepared for class.
- Difficulties with time management.
- Difficulties with sequential tasks.
- Difficulties making plans with friends.

Planning: Strategies for Intervention

- Teach the student how to develop a step-by-step guide for problem solving: identify the problem, consider relevant information, list and evaluate possible solutions, create and evaluate a plan of action.
- Provide step-by-step visual directions and instructions.
- Provide student with planning sheets (see Dawson & Guare, 2010, Executive Skills in Children and Adolescents for a variety of different examples).
- Teach the use of graphic organizers and other planning strategies to organize thoughts.
- Model appropriate planning by verbalizing your own step-by-step process as you complete a task.
- Help child break down each step necessary to complete the task:
  - Have student first visualize and then verbalize each step.
  - If child appears stuck, verbalize "What should you do first?" or "What happens next?"
  - After task is completed, evaluate whether each step was effective and how much time each step actually took. Identify what went well, what didn't and what needs to be done differently.
  - Break down large or long-term projects into clear steps. Help child through this process.
  - Help the child identify each step and estimate how long each one will take. Start with when the project is due and work backwards to determine when each step needs to be completed.
  - Help the student identify materials and resources needed for each step.
  - Write down steps on planning worksheet or calendar.
  - Check planning worksheet or calendar every day to see that steps are being completed.
- Teach time management and prioritization.
- Use a smart-phone to set reminders and alarms or other time management strategies such as Sarah Ward's "The Working Clock." Sarah Ward Strategies on the Cognitive Connections website.
- Teach how to develop short- and long-term goals.
- Develop and practice schedules and routines when possible. Plan ahead and prepare student for changes in these routines.
- Provide a written or picture schedule. Prepare the student ahead of time if schedule is changed and make the changes on their written or picture schedule.
- Support student with connecting new information to what they already know.
- Help student with planning social time with friends and/or free time.
- See Organization (page 45) and Reasoning, Problem Solving and Judgment (page 48) building blocks for additional strategies.

Executive Function: Organization Skills

Difficulty organizing behavior or thoughts is one of the most common results of a brain injury. Why then is a student's ability to organize his or her thinking rarely assessed in school-based evaluations? Cognitive assessments and other tests often present information to the student that is already organized. However, real-life situations are rarely this organized and structured. Organizational skills can also be impacted by difficulties in memory, attention and language.



Students who struggle paying attention to the most important features of their environment or logically organizing and planning their behavior often have grave difficulty behaving reasonably in situations that do not provide external support and structure. When a young child (under the age of 3) experiences a brain injury, the result typically is a severe disruption in the ability to organize incoming information and behave in a manner that is planned and sensible. Older children and adolescents who sustain a brain injury also demonstrate deficits in organizational abilities, but these difficulties show up in more subtle aspects of their behavior and academic achievement.

The upper frontal region of the brain (behind the forehead) controls the planning and organization of thoughts and activities. The ability to sequence and translate thoughts in a logical fashion to organize a person's environment involves communication between the frontal cortex and left hemisphere of the brain. Damage to the front and/or left hemisphere of the brain may cause disorganized thinking and difficulty putting materials into order.

Organization Skills: Changes that may be Observed

In Young Children 0 to 4 Years

- Difficulty with transitions.
- Outbursts or tantrums over a change in activity or during unstructured times.
- Difficulty changing activities or dealing with unexpected changes in the routine.
- Impulsive and/or aggressive behavior, particularly in new, complex or unpredictable settings.
- Inability to change thinking based on new information.

In Older Children and Adolescents

- Disorganized.
- Inability to do two things at once or pay attention to several things at once.
- Difficulties with multi-step activities.
- Completes tasks out of order.
- Difficulties answering open-ended questions.
- Does not do well with independent learning activities and has difficulties getting started on tasks.
- Struggles with taking notes in class. Notes may be illegible, undecipherable or simply not very helpful.
- Written work appears sloppy, dashed-out and poorly organized on the page.
- Difficulty following through with long-range assignments.
- Difficulty entering assignments into planner.
- Homework is incomplete or not turned in.
- Difficulties listening to and learning from lectures in class.
- Difficulties following or participating in classroom discussions.
- Difficulty learning new information and understanding abstract information.
- Struggles with seeing the big picture.
- Appears forgetful and loses things easily. Disorganized backpack, school supplies, etc.
- Spaces out or daydreams in class.
- Seems confused.
- Conversations may be disjointed.
- Difficulties with transitions or changes in routine.
- Does not apply learned information to new situations.
- Poor social judgment and can be a "follower." Copies the behavior of others and requires more adult supervision.
- Easily frustrated.

Organizational Skills: Strategies for Intervention

To help a student who does not have normal ability to organize information independently, parents and teachers must provide more structure than is ordinarily necessary for a student their age. Increasing structure can include any of the following:

- Establish a daily routine as much as possible. Particularly for young students, the ability to anticipate what is going to happen will help them better organize their behavior.
- Teach the student how to develop a step-by-step guide for problem solving by identifying the problem, considering relevant information, listing and evaluating possible

solutions, creating a plan of action, and evaluating that plan of action.

- Use picture schedules, planners, checklists, or electronic organizers to help them organize their day and prepare for transitions.
- Use a check-in/check-out system to ensure that the student has assignments and materials.
- Use classroom websites so student is able to access missing notes or assignments as well as prepare for and complete upcoming projects or assessments on time.
- Allow student to scan and email completed assignments to the teacher.
- Help the student break down long-term and larger projects. Start with the due date and then work backwards to determine when the smaller steps need to be completed. Mark those dates in their planner or on a calendar. Set reminders on a smartphone if available.
- Identify a counselor, teacher, or paraprofessional at school who can work with the student on a regular basis so that assignments can be completed and turned in on time.
- Help the student develop and learn organizational strategies that work for them and can be supported between home and school (e.g., homework folder, color coded class system, morning and afternoon classroom binders, written or visual checklists of everything needed for each class or to take home). Put a sticky note on the homework folder with the exact time or class the student needs to turn in each assignment.
- Use organizational checklists (see Dawson & Guare, 2010, Executive Skills in Children and Adolescents for a variety of examples).
- Require the use of spiral or composition notebooks to avoid the loss of information on loose leaf paper.
- Use a "zipper" folder with sections labeled work "to do" or "to turn in" for each subject.
- Establish a notebook or email routine for school-home communication.
- Provide student/parents with upcoming topics, notes and materials so they can preview and reinforce concepts at home. Include a list of required projects and assignments as well as the due dates.
- Provide time and support with organizing binder, cubby, desk and locker. Develop a locker checklist (include pictures if needed) of what student needs to take with them for each class.
- Use multiple small storage bins, labeled with words or a picture of the contents.
- Teach time management skills to help the child determine how much time an activity, assignment, or part of an assignment will take to complete.
- Provide step-by-step instructions and present information in small, concise, concrete segments.
- Provide a copy of guided classroom notes or outlines.
- Use graphic organizers and teach students to prepare written work by using a series of drafts by listing main ideas and using an outline to elaborate on each.
- Teach the student to highlight text and make an outline of the important information.
- Teach the child to answer the who/what/when/where/why and how questions while reading a paragraph. How does this impact me or the world?
- Cue child as to what information is important and needs their full attention.
- Preferential seating near the area of instruction or next to a positive peer who can help with understanding of instructions and content.
- Follow the SPELL IT OUT rule to increase structure and organization for the child.
  - **S**implify the task
  - **P**arts - Break it down
  - **E**nlarge it
  - **L**ayout - Does the page allow space for working out the problem?
  - **L**ink skills that are already mastered
  - **I**dentify the relevant concepts
  - **T**each a strategy
  - **O**ne skill at a time
  - **U**nderline and highlight
  - **T**ell the student what to look for
- Provide an extra set of textbooks for use at home.
- At home, teach child how to check and organize backpack and/or binder every night. Prepare everything the child will need the next day and put it by the front door. Use a checklist for organizing morning routine and materials.
- Teach the child what to expect and how to behave in each setting. If they are struggling with appropriate behaviors, prepare the student before entering and provide continued verbal reminders of what behavior is expected of them in that setting.
- Prepare student for changes in routine. Let them know what to expect and how to behave.
- Provide the student with choices of identified activities they can complete during unstructured times to reduce the likelihood of impulsive, aggressive, or unsafe behaviors.
- Remember that the student is likely to be more defiant, irritable, and resistant when confused or tired. At such times, provide more structure and fewer choices.
- See Planning (page 44) and Inhibition (page 27) building blocks for additional strategies.

Executive Function: Mental Flexibility

Mental flexibility is the ability to easily shift from one idea, train of thought, activity or way of looking at things to another (Dise-Lewis, Calvery, & Lewis, 2002). Mental flexibility also involves being able to change the approach to problem solving as the task changes or being able to successfully transition from one task to another. As part of the process, one needs to be able to consider new information as well as feedback from mistakes and setbacks (Dawson & Guare, 2004). Mental flexibility allows us to adapt to changing conditions and unfamiliar or unexpected situations (Meltzer, 2010). Mental flexibility also enables us to understand the perspective of others.

Controlling the thoughts and actions of the brain falls under the function of the frontal lobe. Although there are different brain areas that also help with initiation, organization, planning and flexibility, these four "executive functions" are primarily regulated by the upper brain areas located behind the forehead. Individuals with damage to the frontal lobe may become more rigid in their thinking and less adaptable to change.

Mental Flexibility: Changes that may be Observed

- Rigid and/or concrete thinking. Difficulties with abstract thought.
- Difficulties with transitions or with deviating from a schedule.
- Struggles with thinking on his/her feet.
- Perseveration. Gets stuck on one train of thought.
- Difficulty with feedback and doesn't appear to learn from mistakes.
- Resistant to try new things.
- Difficulties coming up with solutions.
- Struggles with switching tasks or activities.
- Difficulties following directions or doing what was asked.
- Appears stubborn and/or argumentative.
- Emotional meltdowns.
- Difficulties making friends and can appear socially awkward.
- Appears to lack empathy and has difficulties seeing others' points of view.

Mental Flexibility: Strategies for Intervention

- Develop and practice schedules and routines when possible.
  - Plan ahead and prepare student for changes in these routines.
  - Use written or picture schedule. Prepare student ahead of time if schedule is changed and update their written or picture schedule accordingly.
  - Rehearse or do a dry run of unfamiliar situations or schedules.
- Warnings and timers can be helpful tools to prepare for transitions.
- Plan for situations that require mental flexibility and avoid introducing too much novelty at once.
- Teach student how to analyze directions, break down problems, self-check and self-correct.
- Allow for previewing of class notes or materials.
- If the student's writing skills allow, a guided self-reflection journaling activity can provide an opportunity to reflect on how he/she was able to be mentally flexible in certain scenarios.
- Break tasks down into smaller steps. Make sure directions are clear and concrete.
- Provide choices of two appropriate options.
- Evaluate assignments, worksheets and tests to see if there are too many shifts in the type of questions the student is required to complete. Reduce the different types of questions required, chunk the same type of questions together, or help support the student as the task demands change.
- Use social narratives to help teach solutions or coping strategies to different situations.
- Structure social skills groups to help identify, practice and learn more flexible coping and problem solving strategies.
- Help student understand why strategies used in one setting or for one task may not work for another (and why some strategies can work in multiple situations). Role-play situations ahead of time to help generate more than one outcome or potential solution.
- Help student understand the importance of listening to different perspectives and points of view.
- Use games to build mental flexibility. See Harvard University's Center on the Developing Child website for their *Activities Guide: Enhancing and Practicing Executive Function Skills with Children from Infancy to Adolescence.*
- Teach "Stop and Think" executive functioning skills and relaxation or coping strategies (e.g., taking deep breaths, calming self-talk, leaving the situation until calm, etc.).
- Teach coping strategies, belly breathing, mindfulness, meditation, and relaxation techniques.
- See Curriculum Resources (page 49) for available intervention programs/materials.
- See Reasoning, Problem Solving and Judgment (page 48) and Inhibition (page 27) building blocks for additional strategies.
- See Social/Emotional Competency (page 50).

Executive Function: Reasoning, Problem-Solving and Judgment

Reasoning is the use of deliberate and controlled mental operations to solve novel and on-the-spot problems (www.cokidswithbraininjury.com). Reasoning involves the consideration of evidence and drawing of conclusions based on the exploration of all possibilities, consideration of positive and negative outcomes and combining knowledge from past experiences (Savage & Wolcott, 1994). Reasoning is the foundation for problem solving and ultimately overall intelligence (D'Amato, Fletcher-Janzen, & Reynolds, 2005).

Many aspects of reasoning are similar to the process of new learning (see "New Learning" in this Chapter). Higher order reasoning involves the effective integration and processes of the entire cerebral (brain) structure. Since the frontal cortex is considered the "manager" of the brain, it is typically needed for reasoning as it orchestrates how information is processed. Other specific areas that are needed for deep thinking are the middle left temporal lobe and the occipital-temporal-parietal juncture (the junction of the three lobes located in the back of the brain).

The frontal lobes are typically associated with changes in function of these skills. However, it is impossible to isolate problems in this area of the brain when a number of other capacities (e.g. comprehension and memory) contribute to frontal lobe function. Reasoning, problem solving, and judgment affect the student's behavior, social skills and academic abilities. Safety may be a particular concern when the above factors are not present because the student may place himself or others in potentially dangerous situations.

Reasoning, Problem-Solving and Judgment Changes that may be Observed

- Concrete thinking. Difficulties with abstract information and language, such as figures of speech, metaphors or sarcasm.
- Difficulties generalizing strategies to new situations. Failure to see a relationship between settings or overgeneralizes a strategy thinking it can apply to all settings.
- Difficulty in learning from experience. Connections between past experiences and current situation are missing. Lacks insight or "common sense."
- Appears to comprehend material and master rote learning but has difficulty answering open-ended questions, making generalizations, or formulating rules. Does not see the bigger picture.
- Does well with true/false and multiple choice but not essay tests.
- Difficulty identifying essential information or drawing conclusions such as solving word problems in math.
- Does not ask for help.
- Doesn't follow through with requests to complete tasks.
- Denies post-injury deficits and rejects offered support.
- Argues with adults or peers and can appear oppositional, stubborn, or depressed.
- Acts without considering the consequences and has difficulty accepting the perspective of others.
- Makes poor or unsafe social judgments (e.g., promiscuity, drugs) and tends to be a follower.
- Behavior or language not suitable to the situation.
- Does not think well on his/her feet.
- Reacts adversely to changes in routine or unexpected problems.
- When faced with an unexpected situation, may respond by becoming upset.

Reasoning, Problem-Solving and Judgment: Strategies for Intervention

- Teach the student how to develop a step-by-step guide for problem solving by identifying the problem, considering relevant information, listing and evaluating possible solutions, creating a plan of action, and evaluating the plan of action. With this structure in place, an adult can guide the student through open-ended questions of "why" and "how."
- When problem solving, allow the student to choose one of at least two alternative solutions that you have reviewed. The goal is for them to eventually develop their own possible alternative solutions.
- Consider Positive Behavior Supports, such as "Collaborative Problem Solving."
- Success may be found using inquiry-based and cooperative learning.
- Teach the use of self-monitoring questions, such as "What else could I do?"
- Present information in a concrete

and concise manner. Avoid puns, sarcasm, and double meanings.

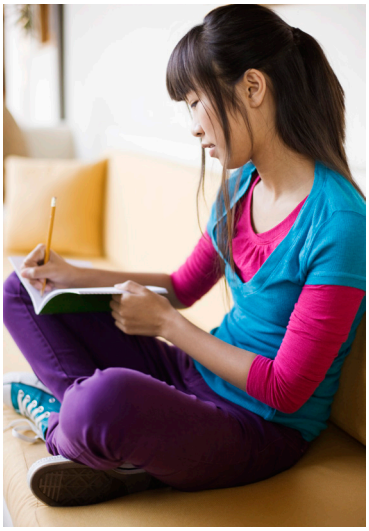
- Check for understanding and the need for assistance.
- Give consistent, neutral feedback.
- Break tasks into smaller and shorter segments.
- Provide scaffolding for challenging concepts and assignments.
- Use graphic organizers to show relationships.
- Provide copy of guided notes or outlines with most important points highlighted.
- Use multiple choice tests instead of essay format.
- Connect information to past knowledge/experiences (spiraling) and find other ways to make content meaningful or contextualized for the child.
- Teach generalization and application across concepts and settings.
- Discuss, plan and prepare student for changes in routine.
- Teach the child what to expect and how to behave in each setting. If they are struggling with appropriate behavior in a setting, prepare them ahead of time and keep providing verbal reminders of the expected behavior.
- Provide the student with choices of identified activities that they can complete during unstructured times to reduce impulsive, aggressive, or unsafe behaviors.
- Remember that the student is likely to be more defiant, irritable, and resistant when confused or tired. At such times, provide more structure and fewer choices.
- Be clear on expectations and consequences of risk taking behaviors (sex, drugs, alcohol, etc.).
- Have discussions about real-life situations: explore pros and cons and alternatives.
- Help the student identify cues from the environment (responses or actions of others) to use as a guide for their behavior.
- Foster friendships with positive role models.
- Teach problem-solving and social skills.
- Use games to build reasoning abilities - See Harvard University's Center on the Developing Child website for their Activities Guide: Enhancing and Practicing Executive Function Skills with Children from Infancy to Adolescence.
- Teach "Stop and Think" executive functioning skills and relaxation or coping strategies (e.g., taking deep breaths, calming self-talk, mindfulness, leaving the situation until calm, etc.).
- See Curriculum Resources below for available intervention programs/materials.
- See Mental Flexibility (page 47) and Inhibition (page 27) building blocks for additional strategies.
- See Social/Emotional Competency (page 50).

Curriculum Resources

The following is a list of additional resources that can be used to help build social and emotional competency and improve executive functioning skills. While the programs below are provided as available resources, it should be noted that none are explicitly endorsed by the Colorado Department of Education or the authors of this manual.

- *The Alert Program: How Does Your Engine Run?*
- *BrainWise: 10 Wise Ways to Stop and Think*
- *The Incredible 5-Point Scale*
- *The Incredible Years*
- *In Focus: Improving Social and Emotional Intelligence One Day at a Time*
- *Kindness in the Classroom: Random Acts of Kindness Foundation*
- *MindUp*
- Relaxation/Mindfulness apps (e.g. Headspace, Calm, Settle Your Glitter, Breathing Bubbles, etc.)
- *RULER*-Yale Center for Emotional Intelligence
- Sarah Ward strategies such as *STOP and Read the Room, Job Talk, Working Clock and Get Ready, Do Done*. These strategies can be found on the Cognitive Connections website.
- *SecondStep: Skills for Social and Academic Success*
- *Stop & Think Social Skills Program (Project ACHIEVE)*
- *Superflex: A Superhero Social Thinking Curriculum*
- *You are a Social Detective-Explaining Social Thinking to Kids*
- *The WhyTry Program*
- *Zones of Regulation: A Framework to Foster Self-Regulation & Emotional Control*
- *Kidspiration*

For additional resources see Colorado Kids with Brain Injury.



Higher Order Processes: Social/Emotional Competency

This Section Allows the Reader to:

- Understand that the function of social-emotional behavior is often a skill deficit as opposed to willful disobedience. Behavior is often difficult to understand and can easily be misidentified.
- Learn to use a Functional Behavior Assessment (FBA) to detect the skill deficit area and create a Behavior Intervention Plan (BIP) to know how/when to apply the intervention.

Emotions, Social Skills And Behavior:

Changes in emotions, social skills and behavior are common following brain injury. These changes may be organic, a response to the alterations brought about by the injury, or both. Behavior changes occur across environments and can be triggered by minor events. Impulse control is frequently reduced with injury to the brain. Failing at tasks that were once automatic or dealing an overwhelming environment (e.g. over-stimulating or too fast paced) can add to a student's frustration. Depression can develop after injury due to chemical changes in the brain, side effects from medication, or possibly an emotional reaction to the changes taking place in the student's life, such as a loss of friends and activities, academic difficulties, and career goal disruption. Changes in cognition contribute to difficulties regulating emotions, behavior, and social skills. Injury to the brain may substantially alter the ability to assess a problem or find a solution. The inability to think in a more flexible manner often makes a student seem argumentative or unmotivated. If the brain injury impacts the student's ability to use feedback and consequences to make better behavioral choices, the environment may then need to be altered to promote change through errorless learning.

Whether the student is in school, at home, transitioning to employment or out in the community, emotional control and social skills can determine success in life. Particular priority must be given to help children with brain injury have successful and proficient social-emotional interactions.

Emotions, Social Skills and Behavior Changes That may be Observed

- Immaturity.
- Performs poorly in complex, unpredictable or stressful situations (playground, PE, etc.).
- Misbehavior.
- Rapid mood changes.
- Emotional expressions out of proportion to the situation (response to changes in activity).
- Impulsive laughing, crying or anger.
- Interruptions.
- Easily agitated, upset or loses control.
- Demanding, seeks attention.
- Inability to grasp concepts of behavior norms.
- Limited insight into own abilities and behavior. Denies problems, externalizes blame.
- Inability to correct behavior after feedback.
- Inappropriate social or sexual comments or action.
- Argumentative.
- Says or does the first thing that comes to mind.
- Inability to pick up on social cues.
- Unpleasant eating habits.
- Takes dangerous risks.
- Fearlessness.
- Avoidance or refusal to participate in discussion or activity.
- Withdrawal from activities or other interactions.
- Flat, passive or unmotivated.
- Disregard for clothing or hygiene.
- Appearance of depression or anxiety.
- Repeatedly does or says one thing.
- Has few or no friends.
- Has difficulty seeing other points of view.
- Misinterpretation of actions or intent of others.
- Discusses suicide.

Interventions For Younger Students

- Give clear and simple directions.
- Avoid time-outs (the student is not likely to independently regroup or calm down).
- Label the emotion and direct the student to show the acceptable behavior.

Interventions For Older Students

- Teach and employ strategies rather than offering assistance.
- Discuss and practice age-appropriate behaviors in real-life situations.
- Create structured social activities (e.g. school/community friendship group focused on the student).
- Assume limited ability to generalize from one setting to another.

Emotions, Social Skills and Behavior: Strategies for Intervention

- Identify the origin of the difficulty to the student.
- Assess the age of the exhibited behavior and select suitable strategies.
- Build on existing strengths.
- Build on peer feedback and modeling (the student may be more receptive).
- Minimize verbalizations and logical explanations.
- Maximize hands-on demonstrations.
- Create organized desk, cubby and locker areas.
- Reduce environmental and situational triggers (changes in routine, structure, noise, clutter, activity, fatigue, frequent transitions, etc.).
- Create predictable and consistent routines.
- Gradually reduce structure and determine "comfort zone".
- Prepare the student for transitions or changes in routine.
- Be flexible about expectations.
- Build on sharing in one-on-one, small group and full class setting.
- Reward positive behavior.
- Discuss and practice what is expected prior to events.
- Teach skills to master new routines and activities.
- Contact community programs for adaptive, integrated recreation for youth with disabilities.
- Find or start a support group for youth with brain injuries.
- Seek medical/psychological consultation regarding depression/suicide.
- Designate a case manager or counselor with whom the student can talk (a diary may help focus on challenges and successes).
- Develop a team of parents, teachers and support staff (have a game plan and meet weekly/monthly/as needed). Focus on the student's strengths and needs rather than disabilities and deficits.
- Teach from the student's strongest learning modality.
- Incorporate breaks from the setting to regroup, calm and rest.
- Suggest and model alternate words and actions.
- Use a buddy, especially during unstructured activities like recess or lunch.
- Build awareness of how language and behavior affects others.
- Educate and involve all adults and peers.
- Give the student a choice between two or three things rather than many.
- Help the student identify what is wrong and generate possible solutions.
- Offer positive ways to express feelings (discussion is not always productive or possible).
- Change the activity or subject to something positive.
- See Inhibition (page 27), Language Social Pragmatics (page 38), and Reasoning (page 48) for additional strategies.

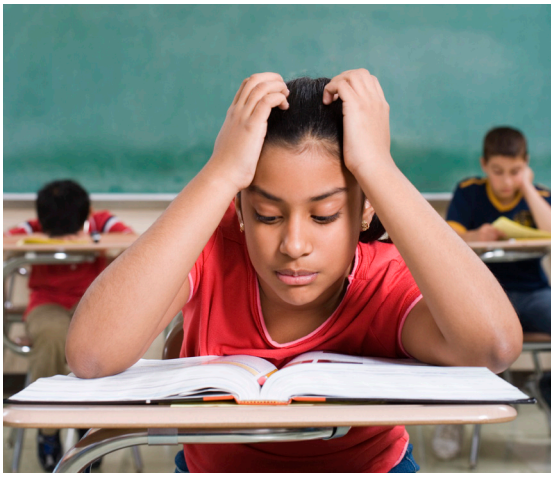
Function of the Behavior

Functional analysis is a way to break down and examine the individual components of an activity. Understanding the "function" or reason for behavior helps the school team know how to intervene when necessary, reinforce positive actions, and change disruptive or dysfunctional behavior. Conducting a functional analysis of a student with a brain injury (or any student, with or without disability) determines where in the process of an activity (beginning, maintaining or completing) a breakdown occurs, and where in the learning chain are the student's weak links.

Social-emotional competence is the awareness of social issues and one's emotional status. Behavioral self-regulation, self-control and self-monitoring are part of this domain. A student with a brain injury may have a skill deficit in one or more of the other building blocks, but their struggle often expresses itself behaviorally, socially or emotionally. As a result, the student with a brain injury may be labeled "bad" or "poorly behaved" when in reality he/she lacks the underlying skills necessary to demonstrate more appropriate behavior. How to make a student with a brain injury do more of X or less of Y is usually the most common reason for consultation. Often behind the request for consultation is the underlying assumption that the student with the brain injury is "willfully" engaging in bad behavior.

When attempting to understand why a student is not learning or behaving like other students, the teacher needs to become a detective. What is causing the student to struggle? To act out?

On the surface the student may:



- Get failing grades on papers and tests.
- Angrily refuse to do work, throw materials on the floor.
- Refuse to turn in work.
- Fail to pay attention to teacher directions or class lectures.

When working with a student who has a brain injury it is important to understand how to analyze the tasks the student is being asked to perform. As with all students with a disability, it is best to start from the premise that there may be a skill deficit that results in the manifestation of the behavior. It is not helpful to start with the assumption that the student has the ability to do the task but is simply refusing to perform on cue. For example, if a student with a brain injury refuses to do work when asked, we first might wonder:

- Does the student understand the directions? (Or is it a receptive language skill deficit or possible lapse in attention?)
- Does the student know how to do the work being requested? (Or is it possibly a learning/memory skill deficit?)
- Does the student have the materials needed to do the work? (Or is it a lack of supplies or possibly poor organization or initiation skills?)
- If the student cannot do the work, does he/she have the skills to appropriately ask the teacher to explain the material again? (Or is it possibly an expressive language skill deficit?)

A student with a brain injury may have any combination of skill deficits that could result in the external manifestation of behavior. It is the job of the teacher to figure out which deficits are most likely at play and create a plan to address the issues in order for the student to eventually produce the requested work.

Students with brain injury often appear to have characteristics similar to those identified as having learning disabilities, attention deficit disorder, emotional/behavioral disorders or sensory over-stimulation disorders (e.g., spectrum disorders). It is crucial that teachers become skilled at identifying the result of a brain injury in order to avoid misdiagnosing the student. Try to understand where the student's ability to complete an activity is breaking down and help identify steps that will help them be more successful. There are no easy "cookie cutter" solutions for students with brain injury. Some interventions effective for learning disabilities, ADHD, or emotional/behavioral difficulties may work for students with brain injury, but not when applied with a broad brush. Professionals may find that a particular action to increase attention in students with ADHD can be effective for brain injury, but the student's skill deficit must be identified carefully in order to strategically apply the correct intervention.

Once the function of the behavior has been determined, the appropriate intervention can be applied with fidelity, progress monitored, and adjustments made until the student can produce the desired result (changed learning or behavior). The task analysis of understanding behavior is called the Functional Behavior Assessment (FBA). The intervention plan for addressing the skill deficit is called the Behavior Intervention Plan (BIP).

Functional Behavior Assessment (FBA)

When attempting to understand the function behind any behavior, the "detective" must study the stimulus immediately before and the consequences (positive or negative) immediately after for clues. The goal of a Functional Behavior Assessment (FBA) is to determine what is initiating the behavior and why is it being allowed to persist.

STEP 1:

Before rushing to a conclusion, teachers and paraprofessionals should take a day or two to study the student's behavioral patterns. The following table outlines the "ABC's" of conducting a Functional Behavior Assessment.

Antecedent	Behavior of concern	Consequence
▶ What happens immediately before the behavior? ▶ When does this happen? ▶ Where does this happen?	▶ The child with brain injury (or any other disability) is doing too much X or not enough Y.	▶ What happens immediately after the behavior? ▶ Is there some type of "reward" that increases X or "consequence" that seems to decrease Y?

Focus on B first

While "ABC" is a helpful way to remember the first step of an FBA, it is important to note that the assessor should focus on the **B** (behavior) before the **A** (antecedent) and **C** (consequence). Begin by simply noting the student's behaviors:

- Johnny puts head down on desk and will not do work.
- Asked again to do work, he refuses, begins to yell, and throw papers.
- Johnny is taken out of the room and into the hallway to calm down.
- When Johnny cannot calm down he is taken to the special education room.
- Continue to note behaviors for a day or two before feeling the need to "fix" behaviors.

STEP 2:

During Step 2 the assessor can begin to figure out the pattern of behavior by making note of **A** and **C**.

- The **A** will help you focus the assessment of the **function** of the behavior.
- The **C** will help you understand the **stimulus** in the **environment** that is either creating the undesired behavior or keeping the desired one from existing.

A	**Antecedents: This happens in math class around 10:15 AM every day.**
B	**Behavior: Johnny puts head down on desk and will not do work.**
C	**Consequences: Paraprofessional goes over to Johnny and asks him to get started on work.**

Antecedent	Behavior	Consequence
Hypotheses: ▶ Is Johnny tired (mental fatigue)? ▶ Does he understand the directions to the work (receptive language deficit)? ▶ Was he paying attention when it was taught (attention deficit)? ▶ Did he learn the lesson but could not convert it into meaningful content (new learning/working memory deficit)? ▶ Did he learn the lesson but forgot it (long-term memory deficit/ memory consolidation deficit)? ▶ Does he know the work but can't get started (initiation or organization skill deficit)? ▶ Does he have the language necessary to let the teacher know he does not know how to start/do the work (expressive language deficit)? ▶ Does he have the social competence to be in this classroom (social skill deficit)?	▶ Asked again to do work, Johnny refuses, begins to yell, and throws papers. ▶ He is taken out of the room and into the hallway to calm down. ▶ When he cannot calm down, he is taken to the special education room.	▶ Paraprofessional starts to help Johnny get out his work and start working. ▶ As Johnny gets louder, the paraprofessional gets louder. ▶ Paraprofessional asks Johnny to leave the classroom and calm down in the hall.

STEP 3:

During Step 3 the assessor will analyze the potential "function" of the behavior (focusing on **A**) and decide how the consequences (good or bad) are affecting the outcome (focusing on **C**).

Antecedent	B	Consequence
Hypotheses: ▶ Is Johnny over tired (mental fatigue)? ▶ Does Johnny not understand the directions to the work (receptive language deficit)? ▶ Was Johnny paying attention when it was taught (attention deficit)? ▶ Did Johnny learn it but could not convert it into new learning (new learning/working memory deficit)? ▶ Did Johnny learn it but forget it (long –term memory deficit/memory consolidation deficit)? ▶ Does Johnny know how to do the work but he can't get himself started (initiation or organization skill deficit)? ▶ Does Johnny have the skills to let the teacher know he does not know how to do the work (expressive language deficit)? ▶ Does Johnny have the social competence to be in this classroom (social skill deficit)?		▶ Paraprofessional goes to Johnny and asks him to get started on work. ▶ Paraprofessional starts to help Johnny get out his work and start working. ▶ As Johnny gets louder, the para-professional gets louder. ▶ Paraprofessional asks Johnny to leave the classroom and calm down in the hall.

Figuring out which hypothesis is the primary function of the behavior allows you to pick and apply the most effective intervention. Before rushing to "fix" the problem, there can never be an over-emphasis on figuring out the function of the behavior. If the function of the behavior is incorrect, the intervention will be ineffective.

Antecedent	B	Consequence
End result of A column: ▶ Based upon your data, what is your best guess about which ONE hypothesis fits? ▶ Does this problem happen always at 10:15 AM? Perhaps it is mental fatigue. ▶ Does problem happen every time Johnny hears new directions from this particular teacher? Perhaps it is a receptive language problem. ▶ Does problem happen only in math? Perhaps new math concepts are not being consolidated into his new or long-term memory. ▶ Does this problem happen in all classes? Perhaps it is inattention. ▶ Does this problem only happen in this class? Perhaps it is a social issue. ▶ What if it is a combination or two or more issues? It is best to try and figure out the number one probable function of the problem behavior. However, it would not at all be unlikely for there to be a number of skill deficits contributing to any one problem behavior.		**End result of C column:** ▶ Johnny is removed from the math class. What if Johnny: ▷ Does not like math? ▷ Does not know what to do in math? ▷ Does not know how to ask for help in math? ▷ Does not want to be in the social environment of the math class? Johnny has now been negatively reinforced (the elimination of a negative stimuli that serves to increase problematic behavior) by being removed from class and returned to the special education classroom where he may feel more emotionally, behaviorally and socially competent. Regardless of which hypotheses fits best, Johnny has successfully removed himself from what feels like a negative situation. His behavior is exquisitely adaptive. It is functional for him even though it may be dysfunctional, annoying, or disruptive to the adults/teachers.

The Behavior Intervention Plan (BIP)

The Behavior Intervention Plan (BIP) is the road map to changing the behavior. While the behavior is functional for Johnny in the short run it will not serve him well over time. If Johnny's behavior continues he will struggle to learn math, fail to keep pace with his peers, strain relationships with his teachers and begin (or perpetuate) a negative perception of himself.

The BIP is focused on *teaching*. It requires:

- Identification of the problem behavior (the dysfunctional behavior in the eyes of the adult), including baseline data.
- Understanding of the potential skill deficit underlying the behavior. This will determine which intervention needs to be put in place (e.g. which skill needs to be taught).
- Identification of the replacement behavior (the more functional behavior in the eyes of the adult).
- A plan to teach the replacement behavior. This includes a way to objectively measure presence/growth of the replacement behavior or absence/decline of problem behavior.
- A plan for who/what/when/where and how often the replacement behavior will be taught.
- A reasonable time frame to monitor the presence/increase of the replacement behavior or the absence/decrease of the problem behavior.
- A way to objectively and genuinely assess the effectiveness of the teaching plan, revisit the original hypothesis, revise the plan if needed and adjust the teaching.

Replacement behavior	Who/When	Progress Monitor
We want Johnny to do work in math when asked so we will teach him to: ▶ Listen carefully to the teacher during instructions.		
For attention: teach skills that sharpen his ability to focus.	For attention: Special education teacher and paraprofessional teach Stop/Relax/Think (SRT) skills to promote better focus: 3 times per week.	For attention: Track Johnny's ability to use the SRT skills to pay better attention to directions.
For receptive language: check for comprehension of instructions before starting work.	For receptive language: Paraprofessional can discreetly check in with Johnny before starting the task. Have Johnny repeat the instructions as he understood them and correct distortions in his understanding. Teach this skill: Daily. (An environmental accommodation may be that the teacher and paraprofessional do some pre-teaching of the math material.)	For receptive language: Track Johnny's ability to appropriately utilize the check-in from paraprofessional.
▶ Teach Johnny to raise his hand and ask for clarification. Johnny needs to experience reward by being successful academically and socially in the math class. He needs to experience reward by staying in math class.	Teacher and paraprofessional teach Johnny to raise his hand and appropriately ask for clarification via role play. Teach this skill: 3 times per week.	Track number of times Johnny can appropriately raise his hand and ask for clarification. Track the decline in number of times that Johnny refuses to do work and is removed from the classroom.

If Johnny's behavior of concern is refusing to do work/having classroom meltdowns, and it occurs every day in math class at 10:15 AM, let's suppose our best hypothesis of function is the following:

- Johnny cannot understand the directions because the teacher moves too quickly (a combination of inattention/receptive language issues and slowed processing speed), and/or
- Johnny is not comfortable asking the teacher for clarification in front of the class (a combination of expressive language deficit and social embarrassment).

If we hypothesize a different function of Johnny's behavior, the entire BIP would change drastically. His behavior of concern remains refusing to do work/having classroom meltdowns and it still occurs every day in math class at 10:15 AM. Let's suppose an alternative hypothesis of function:

- Johnny is exhausted by 10:15 AM (mental fatigue). This is not a skill deficit but a physical symptom that needs to be addressed with an environmental adjustment.
- A solution could be to allow Johnny to take a scheduled rest break at 10:00 AM.

Setting Events:

Setting events refers to internal factors that can affect a student's attention, motivation, mood, or comfort that ultimately disrupts their ability to learn. The events are often unknown to the student occurring on a subconscious, unrecognizable level. As a result, these types of events often remain unknown to the adults observing the student's external behavior as well.

Examples of setting events:

- Hunger
- Fatigue
- Medication reactions
- Pain
- Seizures
- Gastrointestinal Problems
- Metabolic Problems
- Sensory overload
- Allergies

These physiological responses are quite common in students with brain injuries, spectrum disorders, and developmental disabilities. They may feel acute discomfort "in their skin" but struggle with the ability to label or express their pain. These students may be so distracted by their internal state that they are either unavailable for learning or compelled to express their discomfort through external acts of behavior.

When assisting the student with a brain injury, adults must be hyper-vigilant to the fact that some internal processes may indeed be setting off behavior or disrupting learning. The most exquisitely designed BIP will not be effective if the student is having absence seizures numerous times throughout day. A BIP will not be effective if the student is having gastrointestinal discomfort from food allergies or metabolic concerns. With many young (pre-language) or nonverbal students who cannot recognize or articulate setting events, a staffing team will rarely have direct confirmation of an event and may have to guess about its impact on behavior or learning. If you are confident you have accounted for the function of the behavior and designed a well-crafted BIP, yet the student's response is still quite inconsistent or unexplainable, the next step would be to consider all possible setting events. You would then go back and reassess other "functions" potentially underlying the behavior and revise the BIP accordingly.

Many educators will immediately determine the function of the behavior to be control, power, or to gain attention. This determination effectively places blame and responsibility on the student. Remember, it is best to begin with the premise that the student has a skill deficit not an assumption that they are trying to gain control, power or the attention of others.

Behavior Intervention Plan vs. Behavior Contract

One of the most common mistakes in working with students with disabilities is the misunderstanding and misuse of behavior contracts. A behavior contract is exactly that – a contract. Two parties, with informed consent, enter into an agreement of their own free will, accepting parameters and consequences. A contract assumes equal power in the relationship, the ability of both sides to make sound decisions based upon total disclosure of information, and the fulfillment of terms negotiated in the deal.

A common mistake teachers make when assessing students with brain injury is confusing BIPs with behavior contracts. For example, a behavior specialist is called in to consult on a case of challenging behavior. The teacher explains that she has tried everything at her disposal to get the student to change behavior (e.g. sticker charts, recess restrictions, etc.) but nothing seems to work. What the teacher fails to realize is that tools such as sticker charts are *behavior contracts*, not Behavior Intervention Plans. **The difference is that a behavior contract rewards or punishes behavior assumed to be present and willful, whereas a**

BIP is a plan to teach a behavior assumed to be missing (a skill deficit).

Consequence-based programs assume the student has the ability to stop or start a behavior but is choosing to display or withhold the behavior the teacher is trying to adjust. Teachers and parents are often left feeling frustrated when the student's behavior doesn't change because they don't realize the function of the behavior is actually a building block deficit. A student cannot perform more or less of a skill that they never learned and mastered. Therefore, rewarding or punishing the student for failing to behave in a way that requires a skill never learned is not only ineffective but cruel.

Using Behavior Contracts

When a school team is certain that the behavior in question is NOT a skill deficit but is in fact a choice, then a behavior contract is appropriate. In this circumstance, the staff/parent must be 100 percent sure that the student has the behavior in his/her repertoire and is making a choice to risk a reward or consequence by engaging in the inappropriate activity. Every student, whether affected by a brain injury or not, should have the opportunity to "test the limits" occasionally. Seeing how far one can get away with an oppositional behavior, without getting caught, is a natural part of growing up. Students with disabilities need and want to have typical experiences as well.

Additionally, when new behaviors are being taught, behavior contracts can be another way to strengthen and reinforce the new skill with rewards. In this context it is appropriate to intermittently reward a student for new behaviors being learned and demonstrated. In these cases, a sticker chart can strengthen skills being taught on the BIP to develop desired behavior that can eventually be generalized to multiple environments.

Understanding the subtle differences between a behavior contract and a BIP is how an educator/parent can use both methods to their benefit.

- Teach the desirable (replacement) behavior.
- Reward the desirable behavior (via tangible or intangible reinforcements) when it appears.
- Further reward desirable behavior when generalized into different environments.
- Wean rewards when the behavior has become intrinsically motivated.

Reward strategies can play an integral role in helping shape desirable behavior in all students, not just those with brain injury or disabilities.

Antecedent Management vs. Consequence-Based Management

Determining what a student needs to learn to succeed at school is the premise of antecedent management.

The goal is to help the student and staff understand the benefits of increasing the frequency of desired behavior while minimizing the undesirable behavior. In antecedent management, more time and effort is spent on the "front end" (setting up the environment for success) rather than the "back end" (levying consequences for bad behavior). With all students, especially those with disabilities, antecedent management is the most positive way to set up learning and behavior environments. Antecedent management enables the adult to teach the child by working together on the underlying skill deficit while encouraging the student to be successful. The strategy creates a positive interaction between adult and child by focusing on the positive experience of success as opposed to the consequence of failure.

Consequence-based management assumes the student has learned the desired behavior but chooses to keep it hidden. As a result, the adult in the relationship must then provide a reward to increase the desired behavior or a consequence to decrease the undesirable behavior. In this type of management, there is little instruction on the front end typically creating more negative interactions on the back-end when "bad" behavior warrants a consequence. Whenever possible, it is best to use antecedent management instead of consequence-based management with all students, especially those with suspected skill deficits.

It is often said that a student with a brain injury/disability CANNOT learn from consequences. This is not entirely true. All living/learning creatures can learn from consequences. However, when working with students with building block deficits, it is more effective to use antecedent management and to teach the missing skill than use consequence based management.

FACTORS SPECIFIC TO BRAIN INJURY

There are additional factors specific to brain injury that may be evident in a student's general learning or behavioral difficulties or across one or more specific building blocks.

Unevenness

A hallmark of a brain injury on a child's performance is unevenness in abilities across different settings, over time, and through different content areas. The majority of people are consistent across settings, time, and skill domains, so the extreme variability in a child with a brain injury can be highly confusing to family, teachers, and friends. It is not unusual for a student with a brain injury to have performance on cognitive measures ranging from below the 1st percentile to the 95th percentile. This large variability means that certain types of performance will come easily and automatic for the student while other areas are labored or highly unsuccessful.

The pattern of strengths and deficits may not appear sensible or logical given what we know about the normal development of cognitive and academic skills. A student may be above grade-level in some areas (e.g. knowledge of facts) but behave like a child several years younger in other areas (e.g. social skills). This unevenness can also be observed in a student who is able to perform a task one day but is unable to complete the same task on a different day. Due to this wide variability, students are often misidentified as being unmotivated, disinterested, or not working hard enough.

Unevenness in cognitive and learning profiles is often revealed on testing performed by school personnel. Examiners need to consider if there is wide scatter either within or across subtests. Keep in mind that unevenness in performance may also be related to fatigue, medical issues or as a side effect and/or change in medications. For additional information on assessing abilities within the various building blocks see the Colorado Kids - Brain Injury Resource Network, Building Blocks of Brain Development web page.

Unevenness: Changes that may be Observed

- Failure in certain school subjects with success in others.
- Good performance on tests but poor performance on homework or classwork. Or vice versa.
- Inconsistent classroom participation or performance across days or through the course of one day (e.g. strong in the AM but weak in the PM).
- Student seems involved and motivated in one class but not another.
- Lack of common sense or failure to generalize.
- Teachers cannot reach a consensus about the best ways to assist the student in school.
- Student is not succeeding at a level expected based on their intellectual ability.
- Student is frustrated by and/or resistant to certain situations or classes.

Unevenness: Strategies for Intervention

- Multidisciplinary assessment of the child's cognitive abilities. Building level teams can determine possible assessments for the various building blocks at Colorado Kids with Brain Injury. If needed, ask your school psychologist, contact the brain injury team or BrainSTEPS team within your district or consult with individuals in the private community who have expertise in pediatric brain injury.
- Parents and school staff should work together to better understand the student's profile and discover ways to both build upon strengths and work around areas of challenge.
- Educate student about his/her own areas of personal strength and weakness. Students often become distressed and frustrated by their inability to perform.
- Develop a good mixture of non-academic subjects and focus on the student's cognitive strengths.
- Use hands-on activities to supplement written material or lectures.
- Create multi-modal learning opportunities to enhance the student's access to information.
- Encourage the child to read aloud when studying text. This gets the information processed by different centers of the brain without taking more time.
- Refer to areas of cognitive weakness in this manual for suggested interventions and accommodations.
- Address medical and fatigue issues.

Fatigue/Endurance

Fatigue and endurance issues occur in several ways following a brain injury. The primary source of lethargy or weariness is cognitive fatigue as a direct result of disrupted pathways in the brain described in previous chapters. Once axons in the brain are broken or stretched, immense effort is required to complete even the most simple of functions. Changes in sensory and motor skills, for which the student is constantly compensating, are common. Thinking, movement, and speech may take longer and be less accurate. In addition, the brain tires much more quickly and is less able to process the stimulation of what is heard, seen and felt. Students with a brain injury may experience cognitive fatigue many years after their initial injury.

Experiencing other physical components of fatigue, such as headaches, are common after brain injury as well. The student's endurance in physical activities may be seriously reduced including pain in other areas of the body. The injury can cause changes in brain chemistry leading to disruptions in the student's sleep/wake cycle and sleep patterns. There may be side effects to current or new medications of which school staff may not be aware. All of these can contribute to increased levels of fatigue that may improve but can persist in some cases indefinitely.

Fatigue can impact the student's ability to attend or perform the most familiar of tasks making adequate rest, regular breaks, and modifying the workload especially important. The student may have difficulty self-monitoring their level of fatigue before it has become severe. Ignoring or inadequately treating fatigue may lead to a downward spiral for the student.

Fatigue/Endurance Changes that may be Observed

- Appears to be spacey or daydreaming.
- Complains of feeling like they are in a fog.
- Reports feeling "just not themselves."
- Displays slower performance on tasks. May display low processing speed scores in cognitive assessments.
- Reports having headaches or other pains.
- Demonstrates poorer memory than usual.
- Displays symptoms of fatigue (yawns, dozes, etc.) or illness (pale, listless, etc.).
- Participates in disruptive behaviors or is unusually emotional.
- Shows unevenness in performance.
- Appears clumsy.

Fatigue/Endurance: Strategies for Intervention

- Reduce cognitive overload by providing academic accommodations and supports.
- Keep track of observed symptoms, such as poor posture, excessive fidgeting, glassy/vacant stares, etc. Discuss these with the student and parents.
- Send to health clinic if student complains of headaches and other pain. Communicate this information with parents.
- Incorporate brief breaks throughout the day to rest or quiet the brain. Depending on needs of the student, this may be able to occur in classroom or they may need to go to a quiet, darkened environment.
- Break and rest time does not mean silent reading or screen time. These activities are still cognitively taxing on the brain. Break time also does not mean sitting out of recess, physical education, or other exploratory classes. Break time involves resting the brain and the body.
- Be aware of the student's need for a break. The student might not always realize they are fatigued or they might try to push themselves too far. It is better to be proactive in providing a break, then reactive to an overly fatigued child.
- Consider whether the length of the school day needs to be shortened. Schedule their day when they have the most energy and ability to focus.
- If the student is at school for a full day, schedule academic and more cognitively challenging classes at times when the student has the most energy.
- Reduce or modify workload expectations and assignment requirements. Focus on the most important learning opportunities and excuse the student from the other assignments and assessments.
- Break down directions, assignments and projects into one or two steps at a time. Provide these steps visually and at the student's desk.
- Allow additional time to complete assignments and tests. Consider if tests need to be eliminated and the number of assignments reduced.
- Offer headphones, earmuffs, earplugs or allow the student to wear a hoodie over their head.
- Reduce stimulation in the environment as much as possible (sound, movement, bright light, clutter or number of objects around their desk).
- Build quiet activity and slower pace times into the curriculum.
- Assess sleep patterns, as well as evening and weekend activities and responsibilities with the student and their parents.
- Assure that the student is well hydrated and eating protein-rich meals and snacks (it has been found that protein with each meal is valuable in preventing swings in energy levels). Bananas and almonds (if no allergies) have been identified as good brain foods (nasponline.com, 2010).

Transitions

Transitions are periods of time in which children with brain injuries, regardless of their cognitive strength and weakness profile, may struggle and need additional support. Young children are expected to transition from activity-to-activity within the classroom setting several times a day. Secondary students also have the additional demands of transitioning from classroom-to-classroom. The transition that occurs at the end and beginning of every school year must also be addressed with a plan put into place.

Activity-to-Activity Transitions

Current teaching practices often incorporate rapid transitions in the classroom setting to keep the attention of all students. Unfortunately, students with brain injury often struggle with these changes from one activity to the next. Having a student with a brain injury in a classroom does not mean teachers can no longer implement this style of instruction. A few accommodations for the student with brain injury can make the difference between the frustration of learning difficulties and facilitating their academic success.

Activity-to-Activity Transitions: Issues that may be Observed

- A student's processing may be slowed due to the injury which creates difficulties in transitioning from one activity to another.
- Transitions may be overwhelming to the student with a brain injury and may cause them to overreact to auditory and visual input.
- Fatigue can be an issue particularly if there are rapid transitions with few or no breaks between activities.
- When doing in-class activities which are active in nature, the student may have difficulty filtering out noises (e.g., other students talking).

Activity-to-Activity Transitions: Strategies for Intervention

- Provide a visual or picture schedule. Break down what will be occurring within the class with approximate time frames.
- Prepare the student for a change in tasks and allow enough time to finish their current activity before the next begins.
- Allow enough time for the student to put materials needed for one activity away and get out materials for the next.
- As much as possible, prepare student ahead of time for the presence of a substitute (guest) teacher.

Class-to-Class Transitions

Transitioning from class to class may become more problematic as the student with a brain injury moves through the various grade levels. When students are in middle and senior high school, they usually change classes at a minimum of every 45 to 90 minutes. Not only does the subject matter change, the student must also figure out a new set of rules, expectations, organizational structures and unique teaching styles of several different teachers. Additionally, they must negotiate their locker and find their way around a potentially confusing maze of hallways and students to locate their next classroom. It is important to note that as early as second and third grade students may be changing classrooms and teachers up to three to four times per day.

Class-to-Class Transitions: Issues that may be Observed

- Processing speed delays can impact the student's ability to transition between subjects.

- Getting to the next class within a barrage of external stimuli, such as noise and congestion in hallways, may be overwhelming.
- May be late to class due physical difficulties using their locker or not having enough time to navigate long distances through crowded hallways.
- May experience difficulty remembering a particular teacher's expectations.
- Struggle with teachers giving several instructions at once (e.g. "Take out your homework assignments and turn to chapter 3, page 150.").
- Difficulty remembering to bring all of the necessary items to the appropriate class.

Class-to-Class Transitions: Strategies for Intervention

- Picture or visual schedules for each class (make sure lunch, recess and other non-classroom activities are included on the schedule).
- Prepare student ahead of time for changes in the regular schedule (e.g. assembly days).
- Prepare student for the end of class and allow enough time to finish their current project and pack up for their next class.
- Accommodate or reduce warm-up activities to minimize difficulties transitioning from task to task and from class-to-class.
- Allow the student extra time between classes to retrieve materials from their locker and avoid crowded, loud hallways during transitions.
- Create a checklist of all necessary materials for each class so that the student does not forget. Checklists may need to include pictures of all the items required for class.
- Create a checklist of all subjects with a brief description of expectations for each teacher so there is something in writing to which the student can refer.
- Provide or allow student to leave materials in each of their classes.
- Work with the student to create an organizational system that works for him/her.

Grade-to-Grade Transitions

"Every September I feel like we have to start over again. Things that helped my child in school last year have to be worked out again." Parent (Wolcott, Lash, Pearson, 2000)

The above quote exemplifies the struggle parents and students with a brain injury face when transitioning from grade level-to-grade level and from school to school. Although a special education IEP or 504 plan may be in place, it often does not translate into functional, hands-on interventions which may assist the student with day-to-day activities. Communication and teamwork are essential in creating a supportive and effective learning environment before the student even steps foot into a new classroom or school.

Grade-to-Grade Transitions: Issues that may be Observed

- Limited communication from one teacher to the next, especially as the student reaches the secondary level or transitions to a new building.
- Limited time or resources for teachers to become educated in working with students who have a brain injury.
- As students move through the grade levels, they may struggle with increased academic challenges and cognitive demands.
- The increasing of responsibilities from grade to grade may be beyond the capabilities of the student with a brain injury.

Grade-to-Grade Transitions: Strategies for Intervention

- Hold a transition meeting every time the student moves on to the next grade level. Make sure the student, parent(s), current and future teachers, IEP or 504 case manager and IEP-related service providers are involved.
- Hold frequent review and planning meetings. Any IEP or 504 plan needs to be functional and flexible.
- Consider the teacher(s) who would be a good match for meeting the needs of the student. If the student requires a great deal of structure, schedule with a teacher that meets those needs.
- Before school starts, have the student meet their teacher(s), tour the school, run through their schedule, and practice opening their locker.
- Provide parents with information ahead of time about the structure of the school day. Provide a bell schedule so they can prepare their child.
- Provide parents with classroom expectations ahead of time so they can prepare their child.

Secondary Transitions

Federal regulations included in the Individuals with Disabilities Education Act (IDEA, 2004) and No Child Left Behind (NCLB) mandate that services must be available to all students who are eligible for Special Education.

For example, transition planning must begin no later than the first IEP to be in effect when the child turns 16 (or younger if deemed appropriate) and must include measurable postsecondary goals (PSGs). The plan should facilitate post-school activities including education, vocational training, employment, adult services, independent living, and community participation, if appropriate. Transition planning, services and activities should be approached as a multi-year process provided through the age of 21, as appropriate. The students (young adults) and their parents play an important role in the planning process. Based on assessment data, students identify measurable PSGs in the areas of career/employment, education and training, and independent living. The PSGs are the foundational components of the planning process. Many resources about the federal legal requirements are available at the U. S. Department of Education IDEA website.

For many students who have sustained a brain injury, this period presents a new set of cognitive, social, emotional, and academic challenges. Successful transition from high school to a postsecondary institution, vocational school or work environment requires executive functioning skills such as task initiation, reasoning, problem solving and sustained focus/attention that may be impaired as a result of a student's brain injury (see the Building Blocks of Brain Development earlier in this chapter).

Secondary Transitions: Strategies for Intervention

- Hold frequent review and planning meetings with the student's meaningful involvement.
- Use the transition process as a way to truly understand the student's strengths and weaknesses, as outlined by past formal testing, informal assessments, observations and teacher reports. In order for transition planning to be successful, the plan should include realistic expectations for the student.
- Ensure the mastery of technology/tools to assist with organization, planning and initiation.
- Use the transition process to get connected with available programs and appropriate agencies in the community (e.g. School-to-Work Alliance Program, Division of Vocational Rehabilitation, School to Career, etc.).
- Develop and build self-awareness and self-advocacy skills. Practice across various settings.
- Enroll in a postsecondary course while in high school (dual enrollment), if available. This allows the student to ease into this type of setting and to determine specific supports needed in the new environment.
- Create and practice a plan for how to address challenges when in the community. Identify mentors, friends, family members or neighbors who can offer support.

CHAPTER SUMMARY POINTS:

- The recommendations in this chapter are suggestions to help support students with brain injuries in the classroom and home settings.
- The Building Blocks of Brain Development is a helpful framework to guide the team for assessment planning and for identifying and individualizing interventions. The web-based resource Colorado Kids with Brain Injury outlines common effects of a brain injury and provides tools to assist district personnel in conducting school-based neuroeducational assessments and interventions. By using this website, many professionals are able to provide functional school-based cognitive assessments detailing the effects of the brain injury.
- A team approach is needed to ensure the most effective interventions are being provided to meet the individualized and unique needs of each student. A team approach is highly recommended even if a 504 or special education plan is not in place. Parents and school staff should consider including the school psychologist and social worker, and depending on the areas of need, also a speech language pathologist, occupational therapist and/or physical therapist to help with intervention planning. If the school district has a brain injury team or BrainSTEPS Team, explore whether or not the team's involvement would be appropriate or beneficial. The goal of any team, no matter who is involved, is to focus on supporting the student in recovery and being successful in the home, school and community.
- When working with students with building blocks deficits, it is more effective to use antecedent management & to teach the missing skill than use consequence based management.
- There are additional factors specific to brain injury that may be evident in a student's general learning or behavioral difficulties or across or more specific building blocks.

It is best practice to assume that underneath the behavior of a student with a brain injury is a skill deficit that needs to be carefully assessed and replaced with a more adaptive skill. When a comprehensive Functional Behavior Assessment has led to a successful Behavior Intervention Plan, the resulting, more adaptive behavior should be generalized to various settings. In order to strengthen the newly-learned replacement behavior, a behavior contract (e.g., sticker chart) can then be used to reward the new skill. This external reinforcement will hopefully give way to the internal good feeling of success and become an intrinsic reward.

- If a school team finds that they are having to excessively reward the desirable behavior to keep it in place, go back and review if 1) the replacement skill was truly learned; 2) the replacement skill was generalized to other settings; or 3) the process is being affected by setting events.
- If a school team is 100 percent sure that a new replacement skill has been learned but the student occasionally chooses to not use it, a one-time consequence may be given. This should be considered typical behavior of trying to test the limits.
- If a school team finds that they are having to excessively give consequences to a student for not practicing a newly learned replacement behavior, the team needs to go back and review if 1) the replacement skill was truly learned; 2) the newly learned replacement skill has been generalized to various settings, or 3) the newly learned replacement skill is being affected by setting events.

Heavy reliance on reward or consequence is a red flag that should trigger the school team to consider the presence of a skill deficit and the need for a FBA and BIP.

When doing an FBA/BIP:

- Assume that beneath the undesirable behavior is a skill deficit.
- Know your ABC's: Take time to study the antecedents (A) that lead to the behavior (B) and result in consequences (C) – circumstances that maintain the undesirable behavior or prevent the desirable behavior.
- Do an analysis of the behavior (Functional Behavior Assessment- FBA).
- From that analysis, figure out the function of the undesirable behavior.
- Design an intervention plan that teaches a more adaptive replacement behavior (Behavior Intervention Plan- BIP).
- Strengthen the desirable behavior with successive approximations and intermittent rewards.
- Generalize the behavior to other settings.
- Wean tangible rewards when the replacement behavior is strongly established.
- If you find you have to use rewards excessively, it is likely that the desired behavior has not yet been adequately taught or there is a setting event that prevents the appropriate use of the behavior. Go back to your ABC's. Reassess your FBA and BIP.
- Use consequences sparingly. If you find you have to use consequences frequently, this too indicates that the desired behavior has not yet been adequately taught or there is a setting event that prevents the appropriate use of the behavior. Again, go back to your ABC's. Reassess your FBA and BIP.

CHAPTER 4

BRAIN INJURY IDENTIFICATION AND SUPPORTS IN SCHOOLS

This Chapter Allows the Reader to:

- Understand the types of brain injuries.
- Understand the types of supports that schools may provide students with brain injury.
- Understand the evaluation process and criteria for special education and other intervention plans to support students with brain injury.

School Re-Entry

Regardless of severity, school personnel need to watch for possible negative effects of a brain injury as soon as they become aware of the student's situation. Staff should determine whether that student can access the curriculum and/or has any health-related needs at school.

Brain injury often results in diverse impairments that may be either temporary or permanent. The functional results of a brain injury fall on a continuum that ranges from partial to total disability. Students with preexisting conditions, maladaptive behaviors, and/or other disabilities may see their conditions intensify after sustaining a brain injury.

The following key factors are recommended for school personnel as they create effective support plans for students with brain injuries:

- Multidisciplinary decision-making.
- Parent involvement.
- Frequent reviews.
- Planning for every transition (see Transitions section in Chapter 3 for more information).
- Involving personnel from all involved agencies.
- Identification of a point person.
- School brain injury team involvement (many school districts/BOCES in Colorado have a BrainSTEPS Team).

KEY CONCEPTS:

The CDE Concussion Management Guidelines provide in-depth support and guidance to school districts as they work toward being in compliance with SB 11-040. These guidelines are located at the CDE Health and Wellness Brain Injury website.

Implications for Schools

The dysfunctions and difficulties resulting from various types of brain injuries are often challenging for school staff to detect or properly identify. School districts may not have adequately trained personnel or processes in place for recognizing these students or properly supporting their educational needs. Research indicates that students with brain injuries sometimes need special provisions, supports, and special services (Dettmer, Glang, Ettel and McAvoy, 2013).

As more students with mild to moderate brain injuries are identified, school districts must adapt and change to meet their needs. By a wide margin, concussions are the most common type of brain injury in schools today. As a result, Colorado lawmakers passed legislation (Senate Bill 11-040) raising the level of awareness and concern of brain injuries and the impact of concussion on student populations.

Each school district should review their procedures to ensure there are protocols in place to meet the needs of all students with brain injuries. An effective district policy should cover all types of brain injury ranging from mild traumatic (mTBI or concussion) to severe. Furthermore, school districts are encouraged to formulate brain injury teams to create, review, and monitor effective processes that support students with brain injuries. For more information about developing a BrainSTEPS Team, go the Colorado Department of Education BrainSTEPS Colorado web page.

District Level

School districts should develop policies and procedures for responding to the various categories of needs that may follow a brain injury. When assessing the adequacy of these procedures, a district should consider the following:

- Develop brain injury expertise (or a team) from educational, health, and support services who can serve as a resource to the student, family, and teachers.
- Provide awareness training for all teachers and administrators about brain injuries and the impact on the educational process.
- Be prepared to provide assistance and resources for families in crisis as well as those who need long-term support.
- Determine the physical accessibility of school buildings for individuals in wheelchairs and those with limited ability to ambulate.
- Provide leadership and consultation for building level teams.
- Provide assessment assistance to building teams that help identify students' needs and provide accurate identification for special education services.

Building Level Implications

- Create a building level brain injury team that consults with school staff to create support plans for students with brain injuries.
- Assign a case manager or point person to the student as soon as possible after the brain injury occurs (prior to returning to school is best).
- Develop collaborative relationships with the parents, students, all agencies and health care providers involved. Secure releases of information so agencies can adequately communicate and coordinate.
- Utilize a multidisciplinary team (or brain injury team), assess the student's current level of functioning and environmental constraints, and identify the needs of the student. The team may need to determine if a special education referral is appropriate.
- Make the necessary adjustments to the schedule and the environment to accommodate the needs of the student.
- If special education services have been approved, make the necessary accommodations and modifications so students with brain injury can access the curriculum.
- Determine what the student needs to meet district graduation requirements, if in high school, and create a concrete plan.
- Provide specific training for staff and teachers regarding the student's identified needs.

Types of Brain Injury

The various causes of head trauma influence how brain injuries are classified. For example, a child's brain injury caused by a stroke is classified as a non-traumatic brain injury. Regardless of cause or classification, the interventions that professionals utilize to support students with brain injury are generally the same used for most struggling students.

Despite the similar supports and interventions employed for the various types of neurological difficulties, there are reasons why schools must note the type of brain injury a student has incurred. These reasons are especially important when special education services are being considered because there are specific ways each type of brain injury is defined and categorized on the Individualized Education Program (IEP).

Acquired Brain Injury (ABI): Any insult to the brain after birth is considered an "acquired" brain injury (ABI). Generally speaking, a child is born with a typically developed brain when an incident happens that compromises its function and future development.

There are two types of **acquired brain injuries**:

- **Traumatic Brain Injuries (TBI)**: caused by an external force, such as a bump, blow or jolt to the head or body, or a penetrating head injury that disrupts the normal function of the brain (e.g., a gunshot wound). Not all blows or jolts to the head result in a TBI. The severity of a TBI may range from mild (causing a brief change in mental status, including concussion) to severe (long-term changes in brain function). The most common types of incidents that cause moderate to severe TBIs are falls and motor vehicle accidents.
- **Non-Traumatic Brain Injury (nTBI)**: caused by an internal incident. This type of brain injury may be caused by such things as infection, a brain tumor, stroke, lack of oxygen or blood flow, or the introduction of a toxin that causes damage (e.g., inhalant).

Congenital Brain Impact: This takes place before birth, in utero, or during the birthing process. Congenital brain impact can result from a lack of blood flow or oxygen, exposure to substances (alcohol, drugs – prescription, legal or illicit), infection, or other insults to the developing brain before birth.

KEY CONCEPTS:

While all TBIs are acquired brain injuries, not all acquired brain injuries are TBIs.

Special Education

The Individuals with Disabilities Education Act (IDEA) consists of four parts to ensure that students with a disability are provided with Free Appropriate Public Education (FAPE). Children and youth (ages 3 through 21) with disabilities receive special education and related services under Part B of IDEA. Its four parts are:

- Part A – General Provisions
- Part B – Assistance for Education of All Children with Disabilities
- Part C – Infants and Toddlers with Disabilities
- Part D – National Activities to Improve Education of Children with Disabilities

For school-aged children with disabilities (including preschoolers), Part B is the foundation upon which special education and related services rest.

A student must meet strict criterion in order to qualify for special education services from IDEA. Each student that qualifies for services is identified within a specific category of disability (e.g. Specific Learning Disability [SLD], Other Health Impaired [OHI], Intellectual Disability [ID], Traumatic Brain Injury [TBI], etc.). An IEP is a legal document that explicitly states the needs of the student and the special educational services that the child will receive. The IEP is developed by a team that includes the child's parents and school staff.

Colorado's IEP Procedural Guidance highlights the general evaluation process as per IDEA:

- The Multidisciplinary Team is charged with the responsibility of reviewing existing relevant data and determining the specific assessments, if any, that are needed to evaluate the individual needs of the child.
- The composition of the Multidisciplinary Team will vary depending upon the nature of the child's present problems and other relevant factors.
- The evaluation process begins with a review of existing data related to the child's performance and results of any screening that is conducted as a part of the general education program.
- The evaluation must be sufficient to appropriately identify all of the child's special education and related services needs.
- The evaluation should include those areas not commonly linked to the disability category but identified as concerns.
- As a result of the new process, teams will be required to plan the evaluation needs deliberately and collaboratively.

Source: Colorado Department of Education, IEP Procedural Guidance: Exceptional Student Services Unit-Technical Assistance (rev 07/17/15), http://www.cde.state.co.us/cdesped/iep_resources

Special Education & Traumatic Brain Injury

According to IDEA, a child (aged 3 through 21) with a disability is eligible if he or she has a qualifying condition and, by reason thereof, is unable to receive reasonable educational benefit from general education without additional supports. There are many qualifying conditions or disability categories in Colorado as defined by the Exceptional Children's Educational Act (ECEA) that closely align with the disability categories described in IDEA. Traumatic Brain Injury is one of these categories. As stated earlier, definitions are an important aspect of the special education determination process.

To be eligible as a child with a TBI, there must be evidence of **BOTH** the following criteria:

- Either medical documentation of a TBI or a significant history of one or more TBIs reported by a reliable and credible source and/or corroborated by numerous reports.
- The child displays educational impact most probably and plausibly related to the TBI.

A study found that 42% of people who indicate they had incurred a TBI as defined by the Centers for Disease Control and Prevention (CDC) did not seek medical attention (Corrigan & Bogner, 2007). Best practice indicates the establishment of TBI through medical documentation via hospital records and/or from a doctor or clinician who has knowledge of the CDC's requirements for TBI. Individuals who have experienced moderate to severe TBI are more likely to seek medical attention and therefore have the documentation. There are circumstances, however, that sometimes make medical documentation difficult to obtain. Perhaps the injury occurred many years ago or in a different country or state; maybe it was initially viewed as mild and no medical advice was sought. While CDE encourages school districts to first and foremost attempt to establish the presence of a TBI via medical documentation, sometimes it is not possible because such documentation does not exist.

When medical documentation either cannot be obtained or the individual never sought medical attention, the following elements will help school personnel to establish a credible history of TBI. The "gold standard for determining prior TBI is self/parent report as determined by a structured or in-depth interview" (Corrigan & Bogner, 2007).

- A **comprehensive health history** is an important aspect of the structured, in-depth interview. This health history would include multiple questions about brain/head injuries and/or neurological concerns.
- This interview would be led by a **skilled interviewer** with knowledge of brain injury, the acute and latent symptoms across physical, cognitive, emotional, and social skill areas. The interviewer may need to ask pointed questions multiple times and in a variety of ways to establish the details of the TBI(s).
- There needs to be a **reported incident** (or multiple incidents) as well as ongoing symptoms or behaviors that persist beyond the incident (Corrigan & Bogner, 2007).
- Details of the incident(s) should be **clear and consistent**. The description of the injury should not vary widely from report to report or from reporter to reporter (if there are multiple reporters of the same incident). If there are multiple incidents, the details of each should be tracked and documented. For example:
  - Where, when, how, the injury occurred?
  - What types of medical interventions were sought at the time of injury, later, or through the recovery process?
  - Are the details medically plausible, etc.?

- The interviewer should create a comparison between the child's functioning **levels pre-injury versus post-injury**. Have there been physical changes (sleeping, headaches, fatigue, etc.) and how long were they present? Has there been skill regression since the injury? Has there been a change in the student's personality? Social skills? Executive function skills? Behavioral skills? Emotional regulation skills?
- The interviewer has **knowledge of the terminology** used in describing brain injury. In addition to mild, moderate, and severe classifications, terms like "scalp laceration" and "head injury" may or may not yield an actual brain injury. Interviewers must be able to identify the presence of symptoms associated with brain injury.

Finally, a screen or in-depth interview is not enough to determine a TBI. These tools are simply to "screen" for potential TBI. If a screen or in-depth interview suggests there has been a credible history of TBI, a thorough assessment/evaluation is suggested (Corrigan & Bogner, 2007). If the in-depth interview yields a very strong case of significant and credible history, CDE recommends confirming this assessment with the Brain Check Survey. This tool, developed and validated through Colorado State University, provides a more specific screen of the TBI. The Brain Check Survey can be downloaded from Colorado State University's Life Outcomes After Brain Injury Research Program website and given directly to the parent/caretaker for written completion. If the Brain Check Survey also confirms the presence of TBI earlier assumption of credible history is then confirmed. The completed Brain Check Survey is then added to the student's file.

Once the TBI has been determined to have been sustained either through medical documentation or credible history, the second prong of the special education criteria must be established: The child must display educational impact most probably and plausibly related to the TBI. One or more of the following areas must prevent the child from receiving reasonable educational benefit from general education:

- A limited ability to sustain attention and/or poor memory skills, including but not limited to, difficulty retaining short-term memory, long-term memory, working memory and incidental memory.
- An inefficiency in processing, including but not limited to, a processing speed deficit and/or mental fatigue.
- Deficits in sensory-motor skills that affect either one, or both, visual or auditory processing, and may include gross motor and/or fine motor deficits.
- Delays in acquisition of information including new learning and visual-spatial processing.
- Difficulty with language skills, including but not limited to, receptive language, expressive language, and social pragmatics.
- Deficits in behavior regulation, including but not limited to, impulsivity, poor judgment, ineffective reasoning and mental inflexibility.
- Problems in cognitive executive functioning, including but not limited to, difficulty with planning, organization and/or initiation of thinking and working skills.
- Delays in adaptive living skills, including but not limited to, difficulty with activities of daily living (ADL).
- Delays in academic skills, including but not limited to, reading, writing, and math delays that cannot be explained by any other disability. They may also demonstrate an extremely uneven pattern in cognitive and achievement testing, work production, and academic growth.

The above criterion is reflected in the Building Blocks of Brain Development as noted in Chapter 3. An important consideration for TBI is that functional impairments might not appear until well after the injury. It is important, therefore, to document a probable TBI in the student's record to ensure that a complete record is accessible if symptoms manifest in the future.

Special Education Evaluation and Helpful Resources for Assessment

There are no specifically mandated assessments required during the special education evaluation process. In the state of Colorado, a website entitled Colorado Kids with Brain Injury has been developed to help educators navigate the areas of data collection and assessment for each building block area (as seen in Chapters 3) and criterion noted above. This site provides a myriad of tools for multidisciplinary teams. The Building Blocks of Brain Development is a framework (seen in Chapter 3) created to explore the brain processes most commonly impacted following a brain injury. It is a helpful framework to guide the team for assessment planning and for identifying and individualizing interventions. Colorado Kids with Brain Injury, Building Blocks of Brain Development is a web-based resource that outlines common effects of a brain injury and provides tools to assist district personnel in conducting school-based neuroeducational assessments and interventions. By using this website, many professionals are able to provide functional school-based cognitive assessments detailing the effects of the brain injury.

KEY CONCEPTS:

Learning or behavioral problems may not appear right away. These are called "latent effects" of a brain injury. The school team needs to ensure all brain injuries are documented in the student's record in case functional impairments later develop.

The suggested neuroeducational assessments can be utilized by school personnel so parents don't have to obtain an often problematic and expensive neuropsychological assessment from an outside source. The website also provides intervention strategies pertaining to each building block and a flow chart directing school staff through critical decision points. Another helpful tool for teams is the Neurocognitive Evaluation Form (NEF) (see Appendix E). The NEF is useful to gather qualitative data on a particular student's functioning and to prioritize areas for targeted assessments.

Special Education Category Considerations for Other Types of Brain Injury

By definition, non-traumatic types of brain injury cannot be considered within the TBI special education category on an IEP. For example, a student with a non-traumatic acquired brain injury or congenital brain impact must meet the criteria within a different category in order to receive special education services. Students with a non-traumatic acquired brain injury or congenital type of brain impact may meet the criteria for a different special education categories such as: Other Health Impaired (OHI), Specific Learning Disability (SLD), Intellectual Disability (ID), or Multiple Disabilities (MD). The known history of a brain injury should be included in the narrative parts of the IEP.

Regardless of the cause of the brain injury, the interventions can be similar since the areas of need are shared. However, teams should tailor their interventions to support areas of identified need for the student (e.g. memory, attention, and reasoning). We encourage the use of this manual to guide the IEP team when assessing the Building Blocks of Brain Development and crafting educational interventions for all types of brain injury.

Section 504

A student who does not need specially designed instruction through an IEP, but may need adaptations to the curriculum, environment, or accommodations in order to be successful within the general education arena, may be eligible for a 504 plan. The process of developing a 504 plan is a function of the general education staff with consultation from appropriate personnel (e.g., teachers, administrators, special education and/or related services personnel), who know the student and/or have expertise in addressing the disability or areas of student need. A 504 is a specific legal plan that outlines an explicit process for providing the student with accommodations. The area of brain injury is broad and can have many areas of needed supports. As educators, we must ensure that 504 plans are written to contain specific needs and how those needs will be addressed in the classroom or school environment.

The term "504 plan" stems from Section 504 of the Rehabilitation Act of 1973 that guarantees specific rights in federally-funded programs and activities to people who qualify as having a disability. Section 504 states: "No otherwise qualified individual with a disability in the United States…shall, solely by reason of her or his disability, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance…" It requires that school

districts provide a free appropriate public education (FAPE) to qualified students in their jurisdictions. To be protected under Section 504, a student must be determined to have:

- A physical or mental impairment that substantially limits one or more major life activities, or
- A record of such an impairment or be regarded as having such an impairment (34 C.F.R. 104.3(j)(1)).

Section 504 begins with the evaluation process. Once a student is identified as being eligible, a decision must be made regarding the type of services the student needs. Public elementary and secondary schools must employ procedural safeguards regarding the identification, evaluation, or educational placement of persons who, because of disability, need or are believed to need special instruction or related service. (29 U.S.C. § 794).

A student with a 504 plan may continue to need academic and/or workplace accommodations after high school. Even though a Transition Plan is not required for students with a 504 plan, the success of the student with a TBI after high school can be enhanced if school personnel take the time to work with the students and their family regarding appropriate accommodations. Regardless of the extent of the brain injury, early identification with ensuing assessment, identification of needs, and appropriate interventions and transition planning are major factors in facilitating the successful integration into school and the community while ensuring the academic success of students who have sustained a brain injury.

Source: www2.ed.gov/about/offices/list/ocr/504faq.html.

The oversight of Section 504 is provided by the Office for Civil Rights (OCR) in the U.S. Department of Education. For more information or training on Section 504, you may contact the Denver Office (covering Arizona, Colorado, New Mexico, Utah, Wyoming) at 303-844-5695 or OCR.Denver@ed.gov.

CHAPTER SUMMARY POINTS:

In Colorado, and nationally, the data suggests that we are grossly under-identifying students with brain injury and therefore, those students are not getting the needed supports or services in the school setting. The learning and behavioral needs for students who have sustained a brain injury can be difficult to identify and address, especially if their brain injury has not been communicated, recognized or documented.

- There are key factors associated with school re-entry to be considered for any student returning to school having sustained a brain injury of any severity.
- The Building Blocks of Brain Development is a framework (seen in Chapter 3, and available at Colorado Kids – Brain Injury Resource Network) that was developed to help educators navigate the areas of data collection and assessment for Section 504 or special education eligibility determination.
- The special education category of TBI and associated criteria aligns with the Building Blocks of Brain Development framework.
- School personnel must be familiar with the types of brain injury in order to appropriately align special education categories.
  - Acquired: Traumatic Brain Injury – TBI special education category
  - Acquired: Non-Traumatic Brain Injury – Other Health Impaired (OHI), or other, more appropriate special education category
  - Congenital Brain Impact – Other Health Impaired (OHI) special education category

APPENDICES

Appendix A: Identification Flow Chart

Appendix B: Traumatic Brain Injury Eligibility

Appendix C: Initial Health History

Appendix D: Brain Check Survey

Appendix E : Neurocognitive Evaluation Form

Appendix A: Identification Flow Chart

1) Report of a Brain Injury:
a. with medical documentation
OR
b. with credible history

+

2) Educational impacts most probably and plausibly related to the TBI and prevents the child from receiving reasonable educational benefit from general education

If 1a or 1b is present but 2 is not present --- the school team may support the student outside of IDEA services (e.g., informal services, IHP, RTI, MTSS, PBIS, 504).

If 2 is present but 1a or 1b is not present --- the school team may consider IDEA services for the student under a special education category other than TBI.

1a OR 1b AND 2 MUST be present to pursue evaluation for TBI Educational Identification.

Documentation of Brain Injury

Medical documentation as evidenced by:

Health History Form

Brain Check Survey

Medical records (Parent/Guardian collects and shares with school) See Medical Documentation (page 75)

School to Parent/Guardian structured interview: See Educational Identification Significant History (page 75)

OR

Significant history of one or more TBI's reported by a reliable and credible source and corroborated by numerous reporters as evidenced by:

Health History Form

Brain Check Survey

All forms are downloadable on COKidswithbraininjury.com

+

2) Educational impacts most probably and plausibly related to the TBI and prevents the child from receiving reasonable educational benefit from general education

As evidenced by:

- Limited ability to sustain attention
- Poor memory skills
- An inefficiency in processing
- Deficits in sensory-motor skills
- Delays in acquisition of new learning
- Delays in acquisition of visual-spatial processing
- Difficulty with language skills
- Deficits in behavior regulation including: impulsivity
- Poor judgment
- Ineffective reasoning
- Mental inflexibility
- Poor planning
- Poor organization
- Poor initiation
- Delays in ADL's
- Delays in academic skills

Utilize the Neurocognitive Evaluation Form (NEF) to identify skill deficit area(s) for further assessment

See Building Blocks of Brain Development for Assessment Suggestions: COKidswithbraininjury.com

Appendix B: Traumatic Brain Injury Eligibility

Traumatic Brain Injury (TBI)

Establishing Eligibility

The Colorado Department of Education (CDE) is committed to supporting students with brain injury and their families. We recognize that the inability to obtain medical documentation for students whose special education eligibility is being determined has led to mis- and under-identification of children with TBI in the state of Colorado. Depending on the situation, it can be difficult or impossible to obtain medical documentation of a brain injury. A study found that 42% of persons who indicate they had incurred a TBI as defined by the Centers for Disease Control and Prevention (CDC) did not seek medical attention (Corrigan & Bogner, 2007). In response, CDE has incorporated an educational identification process for special education eligibility through establishing a significant history of TBI.

The definition of TBI:

A child with a Traumatic Brain Injury (TBI) has an acquired injury to the brain caused by an external physical force resulting in total or partial functional disability or psychosocial impairment, or both. This impairment adversely affects the child's ability to receive reasonable educational benefit from general education. A qualifying Traumatic Brain Injury is an open or closed head injury resulting in impairments in one or more areas, such as cognition, language, memory, attention, reasoning, abstract thinking, judgment, problem-solving, sensory/perceptual/motor abilities, psychosocial behavior, physical functions, information processing, and speech. The term "traumatic brain injury" under this rule does not apply to brain injuries that are congenital or degenerative, or to brain injuries induced by birth trauma. ECEA 2.08(10)

Elements of Eligibility

There are two important elements to the eligibility criteria that MUST be met for qualification:

1. Evidence of TBI (established through medical documentation or educational identification)
2. A display of educational impact most probably and plausibly related to the TBI.

Evidence of TBI: Medical Documentation & Educational Identification

Medical Documentation: Best practice is to document a traumatic brain injury via medical documentation or hospital records from a doctor who has knowledge of the Centers for Disease Control and Prevention (CDC) requirements for TBI.

When medical documentation either cannot be obtained or when the individual did not seek medical attention, the following elements and considerations will help school personnel when collecting evidence for these criteria to establish a significant and credible history of TBI.

Educational Identification/Significant History: Reported incident(s) of one or more traumatic brain injuries **reported by a reliable and credible source and/or corroborated by numerous reporters**.

There must be a reported incident (or multiple incidents of TBI) as well as ongoing symptoms/ behaviors that persist beyond the incident (Corrigan & Bogner, 2007).

- In determining whether an incident occurred, certain questions should be asked in specific ways. (Have you ever hurt your head or neck in a car or bike accident? Have you ever been hospitalized or treated in an emergency room following an injury to your head or neck? Have you ever been in a fight or have been hit so hard that you were dazed or had a gap in memory? Have you ever been knocked out?) *Note: losing consciousness is not necessary for TBI to occur.
- Details of the incident should be clear and consistent. The description of the injury should not vary widely from report to report, or from reporter to reporter (if there are multiple reporters of the same incident).
- If there are multiple brain injuries, specifics about each incident and injury should be well-detailed and consistent.

Comprehensive Health & Family History

The "gold standard for determining a significant history of TBI is a self/parent report as determined by a structured or in-depth interview" (Corrigan & Bogner, 2007).

- Gathering a comprehensive health and family history requires an in-depth interview format. A comprehensive health history form may serve as a template by which a school nurse, social worker or psychologist can interview and ask questions of a student, parent or caretaker. A school district may choose to use their own district health and family history interview form as long as there are multiple questions about brain/head injuries and/or neurological concerns. CDE has developed a form for use: www.cde.state.co.us/healthandwellness/snh_specialeducation.
- It is recommended that a face-to-face approach is followed to ensure an in-depth interview with appropriate follow up questions. A health history form is not intended to be given to a student or parent/caretaker for independent completion and return.
- Establishing a significant and credible history requires a skilled interviewer with knowledge of acute, short-term and long-term symptoms associated with TBI. For each incident, questions should include: Where, when, and how the injury occurred? What types of medical interventions were sought at the time of injury, later, or through the recovery process? (Obtain contact information and releases for health care providers.) Are the details medically plausible? A consult with the school nurse may be helpful. **Be aware of assumptions – for example, the report of a "scalp laceration" or "head injury" does not automatically designate a "brain injury."*
- Multiple interviewers (psychologist, social worker, nurse) are utilized to ask similar questions to multiple interviewees (mom, dad, student, sibling, and/or grandparent) about an incident. This information is shared with the team to determine clear and corroborated accounts of each incident.
- Screening and structured interviews need to incorporate more than two areas of impact related to TBI (Corrigan & Bogner, 2007). The interviewer should be familiar with the acute symptoms related to TBI at the time of the injury. These symptoms may include, but are not limited to:
  - Physical symptoms (headaches, nausea, dizziness or balance issues, neck pain, noise or light sensitivities).
  - Cognitive symptoms (memory, processing speed, attention or concentration).
  - Emotional symptoms (unable to regulate emotions or inhibit impulses, easily overwhelmed).
  - Sleep/fatigue symptoms.
  - Social skill deficit symptoms (depression or anxiety, loss of friends, easily agitated, makes inappropriate comments, disregard for clothing or hygiene).

The interviewer should also be familiar with symptoms that later emerge, develop, or morph. These are often related to ongoing, chronic physical conditions (headaches) or to behaviors that look like learning, behavior, and/or emotional issues, social skill deficits, and executive function deficits.

- The interviewer should drill down into a comparison between the student's PRE-injury versus POST-injury status.
  - Are there changes in all/some areas?
  - Has there been skill regression since the injury?
  - Has there been a change in the student's personality? Learning skills? Social skills? Executive function skills? Behavioral skills?

Confirmation of History

If the team agrees that the comprehensive health and family history interview yields an indication of significant and credible history, CDE recommends confirming this finding with the Brain Check Survey. This survey, developed and validated through Colorado State University, provides a more specific screen of the TBI. The Brain Check Survey is located online at Colorado State University's Life Outcomes After Brain Injury Research Program website and can be downloaded and given directly to the parent/caretaker for written completion.

The Brain Check Survey can be used qualitatively for data collection. There is a scoring component. However, a cut-off of eight only indicates positive screen for brain injury, does not equate with eligibility determination. Confirmation of significant and credible history alone is not enough to meet the eligibility requirements for special education determination; educational impact is also necessary (see Display of Educational Impact section below.)

Display of Educational Impact

If medical documentation and/or a screen or in-depth interview suggests there has been a TBI, a full and comprehensive evaluation is required to determine whether there is educational impact most probably and plausibly related to the traumatic brain injury. A screen or in-depth interview is not enough to determine TBI and its impact on education.

Appendix B: Traumatic Brain Injury Eligibility

Educational impact means that the impairment adversely affects the child's performance and the ability to receive reasonable benefit from general education. Due to the broad definition of "educational performance," the impairment must adversely affect the child even if he/she has not failed or been retained in a course or grade and is advancing from grade to grade. Educational performance may include areas such as academics, social interactions or the ability to build and maintain friendships, behavior regulation, accessing the physical surroundings, etc.

An important consideration for TBI is that symptoms might not appear until well after the injury. It is important to document a probable TBI in the student's record to ensure that a complete record is accessible if symptoms manifest in the future. IEP teams must gather current functioning data across the domain areas identified in the criteria (see below) to determine educational impact.

The Traumatic Brain Injury, as described above, prevents the child from receiving reasonable educational benefit from general education as evidenced by one or more of the following criteria: (check those that apply) ECEA 2.08(10)(b)		
☐ Yes	☐ No	A limited ability to sustain attention and/or poor memory skills, including but not limited to difficulty retaining short-term memory, long-term memory, working memory and incidental memory.
☐ Yes	☐ No	An inefficiency in processing, including but not limited to a processing speed deficit and/or mental fatigue.
☐ Yes	☐ No	Deficits in sensory-motor skills that affect either one, or both, visual or auditory processing, and may include gross motor and/or fine motor deficits.
☐ Yes	☐ No	Delays in acquisition of information including new learning and visual-spatial processing.
☐ Yes	☐ No	Difficulty with language skills, including but not limited to receptive language, expressive language and social pragmatics.
☐ Yes	☐ No	Deficits in behavior regulation, including but not limited to impulsivity, poor judgment, ineffective reasoning and mental inflexibility.
☐ Yes	☐ No	Problems in cognitive executive functioning, including but not limited to difficulty with planning, organization and/or initiation of thinking and working skills.
☐ Yes	☐ No	Delays in adaptive living skills, including but not limited to difficulty with activities of daily living (ADL).
☐ Yes	☐ No	Delays in academic skills, including but not limited to reading, writing, and math delays that cannot be explained by any other disability. They may also demonstrate an extremely uneven pattern in cognitive and achievement testing, work production and academic growth.

School teams may want to access the web-based Building Blocks of Brain Development framework on the Colorado Kids with Brain Injury website for a collection of formal and informal, school-based assessments intended for collecting data in each of these areas.

For more information and to download the Brain Injury in Children and Youth: A Manual for Educators, go to: www.cde.state.co.us/cdesped/sd-tbi.asp *or* www.cokidswithbraininjury.com

Appendix C: Initial Health History

Initial Health History

Student/child name:	DOB:

IDENTIFYING INFORMATION				
Age:	Sex:	Grade:	School:	
ADDRESS:				
This form is completed by:		Relationship to Child:		
Reason for assessment:				
Mother's Phone: Home:		Work:	Cell:	e-mail:
Father's Phone: Home:		Work:	Cell:	e-mail:
Child lives with: Both Parents	Mother	Father	Other (explain)	
My child has the following health care coverage: Medicaid		CHP+	Private	None
Child's Primary Health Care Provider:			Phone:	
Date of last physical:		Date of Last Visit:	Reason for visit:	
Child' Dentist:		Date of Last Dental exam:		

PREGNANCY AND BIRTH		
Month into pregnancy that medical care began:	Length of pregnancy:	
Were there any medications taken while pregnant?	Explain:	
Were there any complications with pregnancy? No Yes Explain:		
Were there any complications with labor and delivery? No Yes Explain:		
Length of labor:	Birth Weight:	APGAR scores:
Explain any health issues at birth:		
Did baby require extra stay in hospital? No Yes Explain:		

DEVELOPMENTAL HISTORY	Yes	No	Comments
Did your child crawl by 9 months?			
Did your child walk by 18 months?			
Did your child say words by 15 months?			
Was your child toilet trained by 3½ years?			
Were there problems with balance coordination?			
Were there problems with fine motor skills? (buttons, handwriting, picking up)			
Do you have other concerns about your child's development? (If yes, explain)			

ILLNESSES, HOSPITALIZATIONS, SURGERIES, AND/OR ACCIDENTS
Major Illnesses:
Hospitalization/Surgeries:
Accidents/Injuries:

Body System History (Explain if "yes")	Yes	No	Comments
Teeth: Any Dental concerns?			
Ears: Any known hearing problems?			
Do you have concerns about your child's hearing?			
History of chronic ear infections? (PE tubes? Last infection?)			
Eyes: Does your child have problems seeing?			
Does your child wear glasses? Contacts? Date of last exam?			
Name of Eye Specialist if has one:			

Appendix C: Initial Health History

Initial Health History

Student/child name:	DOB:

Body System History (Explain if "yes")	Yes	No	Comments
Cardiac: Does your child have any heart problems?			
Does your child fatigue easily or have poor endurance?			
Respiratory: Does your child have any breathing problems?			
Is he/she prone to upper respiratory infections?			
Does your child have asthma?			
Gastrointestinal and Urinary: Does child have any problems going to the bathroom?			
Bedwetting problems?			
Constipation problems?			
Difficult to train?			
Does your child have dietary/food needs or concerns?			
Do you have concerns about your child's weight?			
Does your child have frequent stomach aches?			
Skeletal and Muscular: Any broken bones? If yes, when, which bone(s)			
Does your child have any physical disabilities?			
Are there any restrictions for activity?			
Neurological: Has your child ever had a seizure?			
Does your child have frequent headaches?			
Has your child ever had a head injury or concussion?			
After injury: Dizziness? Memory problems? Headaches? Fatigue?			
Did your child see a physician? Yes No Hospitalized? Yes No			
Does your child have sleeping/bedtime concerns?			
Goes to bed school nights at _____ Gets up at _____			
TV in bedroom? Yes No Computer in bedroom? Yes No			
Does your child snore? Yes No			
Does your child have a limited attention span?			
Do you think your child is distractible?			
Is your student impulsive?			
Do you have concerns about your child's behavior or emotional status?			
Allergies: Does your child have medication allergies?			
Food allergies?			
Insect allergies? (bee, wasp sting)			
Environmental allergies?			
Is your child seeing an allergist? (who/when)			
Medications: Child currently taking medications? (prescription or over-the-counter)			
If yes, list medications, dose, and time taken			

HEALTHY LIFESTYLE			
Does your child eat 5 fruits or vegetables a day?			
Does your child limit TV or computer use to 2 hours per day outside of school?			
Does your child get 1 hour of physical activity every day?			
Does your child limit intake of sweet drinks? (sodas, juice, etc.)			

Signature of person completing this form_____ Date: _____
Interpreter (if applicable): _____ Date: _____
Reviewed by Nurse: _____ Date: _____

Form located at [CDE Health & Wellness, School Nursing and Health - Special Education web page]

Colorado State University
Department of Occupational Therapy
Life Outcomes after Brain Injury (LOBI) Research Program

Brain Check Survey

Available for use at: http://www.lobi.chhs.colostate.edu/index.aspx

To be filled out by the parent/guardian

Student/ Family Information

Today's Date: ___/___/___ Child's Name: _____ Child's Age: _____

Child's Date of Birth: ___/___/___ Child's Gender: ☐ Male ☐ Female

*Please answer the following questions about **YOURSELF:***
Are you the student's (circle all that apply)?

☐ Mother ☐ Father ☐ Foster Parent ☐ Other (ex: stepmother) please describe:_____

Your Name (printed): _____ Your Signature: _____

Contact information: Email _____ Phone _____

Injuries or Illnesses

Injury or Illness	Age	Outcomes
Please check all that apply		
☐ **Blow to Head** (From sports, playing, biking, falling, getting hit by an object, etc.)	At what age? ____	*Check all that apply:* ☐ Concussion ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Whiplash**	At what age? ____	*Check all that apply:* ☐ Loss of consciousness, *for how long?_____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem

Appendix D: Brain Check Survey

Injury or Illness *Please check all that apply*	Age	Outcomes
☐ **Car accident** (resulting in any degree of injury or lack of injury)	At what age? ____	*Check all that apply*: ☐ Concussion ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Assault/Violence** (child abuse, fights, firearm injury)	At what age? ____	*Check all that apply:* ☐ Concussion ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Sustained High Fever**	At what age? ____	*Check all that apply:* ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Brain Tumor**	At what age? ____	*Check all that apply:* ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Anoxia** (definition: lack of oxygen; caused by such events as a near-drowning experience or suffocating experience)	At what age? ____	*Check all that apply:* ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Meningitis**	At what age? ____	*Check all that apply:* ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Encephalitis**	At what age? ____	*Check all that apply*: ☐Loss of consciousness, *for how long? _____ ☐Coma, *for how long? _____ ☐Confusion or altered mental state ☐Missed school ☐ Resulted in no problem

Appendix D: Brain Check Survey

Injury or Illness	Age	Outcomes
Please check all that apply		
☐ **Seizures** (example: epilepsy)	At what age? ____	*Check all that apply:* ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Overdose of** Drugs or alcohol, or inappropriate use of prescription drugs or over- the-counter medication?	At what age? ____	*Check all that apply*: ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Other:** _____ _____	At what age? ____	*Check all that apply*: ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem
☐ **Other:** _____ _____	At what age? ____	*Check all that apply:* ☐ Loss of consciousness, *for how long? _____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state ☐ Missed school ☐ Resulted in no problem

Has your child ever been to the emergency department? ☐ *Yes* ☐ *No*
If YES, at what age?_____ Please explain:

Appendix D: Brain Check Survey

Behaviors that can affect learning						
Please tell us about your child's learning styles and behaviors.						
Learning Style or Behavior	**Circle the number on the scale which best describes your child:**					
	No Problem					**Extreme Problem**
Coping with change or transitions	1	2	3	4	5	6
Maintaining family and friend relationships	1	2	3	4	5	6
Letting go of one activity to attend to another	1	2	3	4	5	6
Reaction to simple problems	1	2	3	4	5	6
Waiting for his or her turn in a game	1	2	3	4	5	6
Learns from past mistakes or behavior	1	2	3	4	5	6
Thinks before speaking or acting	1	2	3	4	5	6
Listens without interrupting others often	1	2	3	4	5	6
Handles a change in plans	1	2	3	4	5	6
Demonstrates good judgment	1	2	3	4	5	6

Cognitive processes that can affect learning						
Please tell us about your child's learning styles.						
Learning Style or Cognitive Processes	**Circle the number on the scale which best describes your child:**					
	No Problem					**Extreme Problem**
Focusing and maintaining attention	1	2	3	4	5	6
Getting started on activities, tasks, chores, homework and the like, on his or her own	1	2	3	4	5	6
Monitoring own progress on homework, assignments, chores, and the like	1	2	3	4	5	6
Solving everyday problems (example: thinking of different options when something is not working for him/her.)	1	2	3	4	5	6
Learns new things easily	1	2	3	4	5	6
Remembers lists	1	2	3	4	5	6
Remembers day-to-day events	1	2	3	4	5	6

Appendix D: Brain Check Survey

Symptoms- Part 1						
If your child has experienced any of the following symptoms, rank the severity of those symptoms. Please check all that apply:						
Symptom	**Circle the number on the scale which best describes your child:**					
	No Problem					**Extreme Problem**
Headaches and/or Migraines (sudden, not responsive to medications, can last for more than a day)	1	2	3	4	5	6
Blank staring/Day dreaming	1	2	3	4	5	6
Dizziness	1	2	3	4	5	6
Change in vision (blurred vision, double vision, depth perception)	1	2	3	4	5	6
Fatigue (tires easily, is often tired)	1	2	3	4	5	6
Light sensitivity (can be easily upset by bright or strobe lights)	1	2	3	4	5	6

Symptoms- Part 2						
If your child has experienced any of the following symptoms, rank the severity of those symptoms. Please check all that apply:						
Symptom	**Circle the number on the scale which best describes your child:**					
	No Problem					**Extreme Problem**
Loss of muscle coordination (can look like awkward movements, problems with balance, slowed reactions, uncoordinated running and catching)	1	2	3	4	5	6
Blackouts/ Fainting	1	2	3	4	5	6
Confusion	1	2	3	4	5	6
Seizures	1	2	3	4	5	6
Slurred speech	1	2	3	4	5	6
Has trouble finding the “right” word when talking	1	2	3	4	5	6

Neurocognitive Evaluation Form

The *Neurocognitive Evaluation Form (NEF)* is a tool created by Peter Thompson, Ph.D. and Nicole Crawford, Ph.D., two school psychologists with brain injury expertise in Colorado. The NEF is not a stand-alone tool and is intended to augment other assessments and resources that are employed during a student evaluation. Unlike standardized assessments, the NEF provides necessary qualitative data that utilizes structured and verifiable observations by staff who work with the student.

The NEF may be used in a variety of ways by school staff that know the student of concern. The following points are common uses for the NEF:

- Information from the NEF can be shared with school staff to increase their knowledge of cognitive areas that are highly sensitive to brain injury and may manifest in the classroom setting.
- To detect specific areas of weakness or dysfunction that may form the basis for further targeted assessment.
- To gather evaluation data and add to the body of evidence on a particular student.
- To provide a way to gauge severity of deficits and prioritize/determine areas for intervention.

Usage and Considerations

There are many external variables, or antecedents, that need to be carefully considered when gathering information about students and their behavior at school. Several factors can influence student cognition, emotions and behaviors within a school day. Due to the myriad of external and situational factors, we must look at multiple data points, across time and settings, to develop an accurate picture of student functioning. The qualitative data gathered are critical to staff about when interventions are most likely to be effective. It is also recommended that staff consider situational and learning environmental factors when assessing student behavior, in general, over a period of days, weeks, or months to assist in a more accurate and appropriate evaluation approach.

Situational examples include:

- Hungry/missed breakfast.
- Upset about a fight between mom and dad that happened recently.
- Anxious about a test that day or getting back a score from a quiz taken earlier.
- Excited about an outing that is planned for that evening or weekend.
- Was smiled at by someone he/she likes.

Learning environment considerations include:

- Consistent routines in place.
- Student desks appropriately spaced.
- Lighting too bright or dim.
- Distractions minimized (noise from outside, a window overlooking the playground, etc.).
- Interactions respectful and supportive.
- Age-appropriate behavioral expectations are posted and followed.
- Environment is organized and orderly (floor space, wall space, etc.).
- Environment is engaging and motivating.

Neurocognitive Evaluation Form (NEF)

Rank the student on several areas of functioning as compared to the student's peers or classmates of the same age. A ranking of Green is considered an ability commonly observed in most (70%) students of similar age and is not an area of primary concern. A ranking of Yellow is an observed ability area where the student struggles but can perform the task intermittently. A ranking of Red is an ability rarely or never observed and signals a major area of concern. **Areas ranked Red or Yellow are domains that may be targeted for further assessment.**

Date: _____ **Rater's Name/Title:** _____

Student Name: _____ **Student's Age and Grade:** _____

Class Observed: _____ **Time of Day and Day of Week:** _____

ATTENTION 3 SUBTYPES	Less Positive			More Positive	
SELECTIVE/FOCUSED	**Significantly Below Average**	**Slightly Below Average**	**Average**	**Slightly Above Average**	**Significantly Above Average**
Focuses on teacher					
Attends to detail of task					
Orients to speaker/staff					
Focuses without daydreaming					
Looks at board					
Responds to questions with on-topic answers					
Resists subtle classroom distractions (noise, lights)					
SUSTAINED	**Significantly Below Average**	**Slightly Below Average**	**Average**	**Slightly Above Average**	**Significantly Above Average**
Focuses for age appropriate periods of time					
Completes in-class assignments					
Loses train of thought when talking or writing					
Loses place when working on tasks or when reading					

Appendix E: Neurocognitive Evaluation Form

ATTENTION (CONTINUED)	Less Positive			More Positive	
SHIFTING/DIVIDED	**Significantly Below Average**	**Slightly Below Average**	**Average**	**Slightly Above Average**	**Significantly Above Average**
Can appropriately attend to more than one task at a time					
Switches from activity to activity appropriately					
OTHER	**Significantly Below Average**	**Slightly Below Average**	**Average**	**Slightly Above Average**	**Significantly Above Average**
Overall attention capacity					
Energy level when performing long academic tasks/tests					
Organized thoughts (analyze writing samples)					
Controls impulses					
Avoids verbal Interruptions					

Other relevant observational notes for Attention:

Appendix E: Neurocognitive Evaluation Form

MEMORY	Less Positive			More Positive	
SHORT TERM MEMORY (When student appears to be paying attention rant the following)	**Significantly Below Average**	**Slightly Below Average**	**Average**	**Slightly Above Average**	**Significantly Above Average**
Can repeat simple information that was just presented					
Can copy from board without frequently looking up					
Asks for statements to be repeated					
Can complete simple 2-step requests or problems					
Follows directions correctly					
Can repeat/explain simple activities previously learned on same day					
WORKING MEMORY	**Significantly Below Average**	**Slightly Below Average**	**Average**	**Slightly Above Average**	**Significantly Above Average**
Completes thought process in writing assignments					
Summarizes story/text (names characters, setting, details)					
Multi-tasks with accuracy					
Completes multi-step problems, especially in math/ science					
Picks up where left off					
Takes notes while listening to teacher					
Can write down assignments while being told the assignment					
Writes notes from the board while listening to instruction					

Appendix E: Neurocognitive Evaluation Form

MEMORY (CONTINUED)	Less Positive			More Positive	
LONG TERM MEMORY	**Significantly Below Average**	**Slightly Below Average**	**Average**	**Slightly Above Average**	**Significantly Above Average**
Explains previously learned material/facts 30 minutes or more after instruction					
Recalls school events from previous week					
Remembers where classroom materials are stored					
Remembers school routines					
Remembers most vocabulary words learned a week earlier					
Draws/ recognizes previously learned pictures or diagrams					
OTHER	**Significantly Below Average**	**Slightly Below Average**	**Average**	**Slightly Above Average**	**Significantly Above Average**
Auditory Sequential Memory: short term memory-repeats back 4 words in order (>8 years old)					
Working Memory: repeats back 3 given numbers and words in reverse order (> 8 years old)					
Visual: student can name 3 pictures / objects that are exposed for 5 to 6 seconds (>8 years old)					

Other relevant observational notes for Memory:

Appendix E: Neurocognitive Evaluation Form

PROCESSING SPEED	Less Positive			More Positive	
PROCESSING SPEED	**Significantly Below Average**	**Slightly Below Average**	**Average**	**Slightly Above Average**	**Significantly Above Average**
Responds to verbal directions/ questions quickly					
Keeps pace with most of class					
Slow reading (control for comprehension)					
Completes tests/tasks on time					
Quickly finishes timed tasks accurately					
Recalls simple information quickly					
Writing or drawing speed					
Speech rate					
Speed of physical movement					
Sometimes seems confused after simple information is provided not due to attention or memory					

Other relevant observational notes for Processing Speed:

Appendix E: Neurocognitive Evaluation Form

EXECUTIVE FUNCTIONS	Less Positive			More Positive	
PLANNING, ORGANIZATION, COMPREHENSION, FLEXIBILITY	**Significantly Below Average**	**Slightly Below Average**	**Average**	**Slightly Above Average**	**Significantly Above Average**
Organization of materials					
Organization of thoughts in writing/speech					
Shifts appropriately from subject to subject					
Is able to keep and utilize planner or schedule					
Transitions well to different activities					
Breaks down steps into smaller tasks					
Ease at which learns new concepts (Comprehension)					
Ease at which understands simple stories or concepts (Comprehension)					
Explains plans to meet an assignment, task, deadline, or activity					
After a short assigned problem, can explain logic used in problem solving					
When engaged in problem solving task, uses feedback to help in the process (monitors progress)					
Can quickly adjust to changes in routine (Degree of Flexibility)					
Keeps track of place when working on task or reading					
Moves beyond concrete or rigid approach to task					

Appendix E: Neurocognitive Evaluation Form

EXECUTIVE FUNCTIONS (CONTINUED)	Less Positive			More Positive	
EXECUTIVE FUNCTIONS RELATED BEHAVIOR	**Significantly Below Average**	**Slightly Below Average**	**Average**	**Slightly Above Average**	**Significantly Above Average**
Motivation					
Controls Impulsivity					
Common sense/judgment					
Perspective taking/empathy (consider age appropriateness)					
Follows rules					
Overall attention					
Emotional/behavioral regulation					
Concept formation/idea generation					
On-topic reciprocal dialog					
Able to predict consequences of behaviors					
Can self-monitor and self-correct					
Initiates tasks without prompts					
Time management (e.g. keeps schedules/dates)					

Other relevant observational notes for Executive Function:

Appendix E: Neurocognitive Evaluation Form

SENSORY/TACTILE/ VISUAL/MOTOR	Less Positive			More Positive	
SENSORIMOTOR	**Significantly Below Average**	**Slightly Below Average**	**Average**	**Slightly Above Average**	**Significantly Above Average**
Posture					
Walking/running					
Fine motor (pencil grip/writing) Picking up small pieces					
Gross motor					
Balance/muscle tone					
Touches each finger separately					
Mimics simple body movements (hand gestures, knock and taps)					
Traces or copies figures					
Identifies simple objects placed in hand with eyes closed					
Identifies simple objects placed in hand with eyes closed					
Clumsy, awkward, unusual movements					
VISUAL-SPATIAL / PERCEPTUAL	**Significantly Below Average**	**Slightly Below Average**	**Average**	**Slightly Above Average**	**Significantly Above Average**
Skills puzzles/blocks					
Understands Right vs. Left and Up vs. Down					
Ignores one side of paper while writing or drawing/ coloring					
Grossly distorted drawings that are directly copied					
Difficulty using graphs, maps, charts and illustrations					
Lots of scratch outs/white outs					

Appendix E: Neurocognitive Evaluation Form

SENSORY/TACTILE/ VISUAL/MOTOR	Less Positive			More Positive	
TACTILE/AUDITORY/VISUAL	Significantly Below Average	Slightly Below Average	Average	Slightly Above Average	Significantly Above Average
Light Sensitivity					
Noise Sensitivity					
Touch Sensitivity					
Color Blindness					
Hearing (e.g. responds to names)					
Sees details/writing on board from back of room					
Sensitive to temperature					
Complains of numbness or odd sensations					

Other relevant observational notes for Sensory:

Appendix E: Neurocognitive Evaluation Form

COGNITIVE FATIGUE	Less Positive			More Positive	
COGNITIVE FATIGUE	**Significantly Below Average**	**Slightly Below Average**	**Average**	**Slightly Above Average**	**Significantly Above Average**
Can complete all tasks throughout the school day					
Word retrieval and speech consistent throughout day					
Controls attention capacity throughout day					
Controls energy level throughout day					
Controls behavior and emotions after moderately difficult test/task					
Physical stamina after long tasks					

Mark the following areas YES or NO	**Yes (Problem area)**	**No (Not a problem area)**
States feeling a "fog" or feeling "sluggish"		
Sensitive to lights/noise after moderate exposure		
Stares blankly at times		
Consistently states feeling tired/sleepy		
Energy level is consistent throughout day as compared to peers		

Other relevant observational notes for Cognitive Fatigue:

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