

# Traumatic Brain Injury - Draft

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Also called Brain Injury, Head Injury, Acquired Brain Injury, Closed Head Injury,

## *Description of the Disability*

Traumatic Brain Injury (TBI) is brain damage caused by a severe blow to the head. Although technically there does not have to be an actual "blow" (just a rapid acceleration or deceleration), usually the person hits his or her head in some way. Typically the injury is widespread and affects different parts of the brain to different extents. The specific pattern of injury (and the functional issues it causes) varies from person to person. Typical symptoms include memory problems, reduced impulse control, reduced self-awareness, reduced social skills, fatigue, and difficulty with change. However, because of the extreme variation in specific brain damage and the subtle ways these affect nearly every aspect of the body, TBI has one of the most diverse list of possible symptoms of any disability. A person with a TBI may have significant functional changes or little or no loss of function. Even those with no obvious loss of function may experience subtle changes in behavior, thought, and personality that cause significant problems with work and family life.

There are several overlapping terms for brain injuries. An "Acquired Brain Injury" is one that is neither degenerative nor congenital but is caused by a specific event. A TBI is an acquired brain injury caused by a blow to the head (or "trauma"). Falls, violence, and motor vehicle accidents are the most common causes of TBI. Other types of acquired brain injury include those caused by strokes, cardiac arrest, tumors, infection, near drowning, and exposure to certain toxins. All of these can cause anoxia (loss of oxygen to the brain) and may result in injury to the brain.

There are two basic types of head injury: Closed Head Injury (CHI) and Open Head Injury (OHI). An Open Head Injury is a visible injury in which the skull is opened, which, among other things, exposes the brain to possible infection or further injury. A gunshot wound in which the bullet penetrates the skull is an example. A Closed Head Injury does not produce an opening in the skull. It is usually caused by the rapid acceleration and/or deceleration of the head (including a blow to the head), which causes the brain to be whipped back and forth.

A further classification is Diffuse versus Focal Head Injuries. Diffuse Head Injuries may be mild or severe and may result in more diverse overall deficits in attention, emotions, learning, memory, thought processes, and abstract thinking. Focal injuries, which are limited to one area of the brain, tend to cause very specific deficits. However, even a focal injury may have secondary effects that cause additional damage.

Most of these classifications are more useful for medical treatment than for describing functional outcomes. They are usually not very helpful for identifying support needs for employment or independent living.

## What Happens When the Brain is Injured?

Because the brain is basically "floating" in fluid inside the rigid skull, when it gets shoved suddenly it may bounce back and forth inside the skull. This can damage both the side of the brain that was hit as well as the opposite side of the brain - sometimes called a "coup and contra

coup injury." This means that a person may acquire a TBI even if their head has not actually hit an object but has just been shaken hard. The movement of the brain inside the skull can also cause the nerve fibers, nerve connections, and blood vessels in the brain to stretch and tear. This damage occurs at a microscopic level and often will not show up on brain scans. Other possible damage comes from a skull feature called the Clinoid Process - two thin tabs or wings of bone that extend into the brain from just behind the eyes. They are there to help support the brain, but when the brain starts to slide around from a sudden blow they can slice and tear the Temporal Lobe of the brain. This part of the brain is associated with memory, emotion, and language processing - which are some of the most common functional issues for people with TBI. These complex secondary effects from the brain's movement in the skull mean that the direction and strength of the initial force does not tell you very much about the final seriousness of the TBI.

In response to a head injury (or any injury), the body sends various agents to protect and repair the tissues involved. Unfortunately, in the brain this causes swelling (edema) and with a closed head injury there is no room for the brain to expand. Instead, the swelling squeezes the brain tissues and damages them even more. Bleeding inside the skull can also increase the pressure and can interrupt the blood flow to other parts of the brain, causing hypoxia or anoxia (too little oxygen) in those parts and creating more damage. In addition, the blood itself can injure the brain tissues when it is no longer contained and filtered by the walls of the blood vessels.

### Comas

Some (but not all) people who experience a TBI slip into a coma after the event. The coma may last days, weeks, months, or longer, and is often a natural part of the healing process. People in a coma can show many different levels of "non-purposeful" movement and responses to their surroundings depending on the level of the coma, sometimes even seeming to be "awake" to friends and family while still actually in a light coma. Physicians use several scales to judge, record, and track these levels of coma. Unfortunately, neither the depth nor length of the coma are a good indicator of the long-term severity of the TBI and what deficits it will cause. People who experience very short comas may or may not have more significant functional issues than people who experienced very long comas.

Sometimes physicians categorize brain injuries as Mild, Moderate, or Severe based on how long the person was in a coma and how much their mental status changed immediately afterward. This system is not usually very informative about functional implications for the person, but it is useful to know what the categories mean if you see them.

- Mild - Usually indicates a brief loss of consciousness or none at all. The person's is dazed or confused after the accident, but not "out cold." Impairments may be temporary and many people recover within one year, but some people experience significant, permanent functional impairments from a "mild" brain injury.
- Moderate - Loss of consciousness from a few minutes to a few hours. The person is often confused for days or weeks. There are usually some physical, cognitive and behavioral impairments that last for months or may be permanent.
- Severe - Prolonged unconsciousness or coma may last for days, weeks, months, or longer. Recovery and functional impairments are uncertain. Some individuals recover from a

“severe” brain injury with little or no functional change while others experience very serious changes.

When a person is in a coma after a TBI, the level and duration of the coma can reliably predict the medical severity and outcome of the brain injury, but not the long-term cognitive and functional outcomes. Physicians use the Glasgow Coma Scale to record the level of consciousness a person is experiencing in coma. The scale gives physicians a way to monitor changes in a person’s condition over time and predict how long "recovery" might take. Physicians use the Rancho Los Amigos Scale to assess a person’s behavior as they go through medical rehabilitation prior to release from the hospital. This scale only applies to the first weeks and months after an injury and does not apply to later progress. In general, neither the Glasgow or Rancho Los Amigos scale are very helpful to VR counselors and independent living specialists.

### Undocumented TBIs

Some people can effectively have a TBI without ever having a dramatic, significant head trauma. Small acquired brain injuries from periodic “mild” blows to the head are cumulative and over time can "add up" to a TBI. Because the mild blows do not seem serious at the time, the person may never seek medical treatment. Many individuals with an undocumented TBI come to Vocational Rehabilitation with a diagnosis of a Learning Disorder or describing other subtle cognitive / attention issues related to a mild trauma. If you suspect someone has this type of injury, ask them questions about childhood injuries and other times they have “bumped” their head. You also may consider getting a neuropsychological exam for them.

## ***Typical Consequences of a TBI***

**Emotional and Personality Changes:** Both the direct injury to the brain's structure and the person's psychological reaction to the TBI can affect a person's personality. The person may become emotionally unstable, have a low tolerance for frustration, have sudden outbursts of anger, or show inappropriate social behavior (including sexual behavior). Anxiety, depression, and loss of self-esteem are also common. Some people may appear rigid or self-centered. Others may seem inappropriately emotional or outgoing. They may have difficulty reading social cues from others or empathizing with others. All of these issues can seriously effect relationships at work, home, and in the community. One author described it as having the original person destroyed and a new person constructed from pieces of the original. Friends, coworkers, and family may have difficulty relating to the “new” person who emerges.

Sometimes therapists treat these emotional and personality changes as a mental illness or personality disorder, especially if the person has an undocumented TBI. In these situations, a counselor or physician may have treated the person with psychoactive drugs (see entry on Personality Disorders), but found that the person's responses to the drugs were unusual and unpredictable. By changing the chemistry and functioning of the brain in subtle ways, a TBI can change the way a person reacts to psychoactive drugs.

**Cognitive Changes:** People with a TBI often have problems with concentration, memory, abstract reasoning, problem-solving, and adapting to changes in routines. Many other challenges are possible depending on the specific details of how the person's brain was injured.

**Limited Self-Awareness:** People with a TBI may not understand or be aware of their situation. Many deny they have any deficits, especially immediately after acquiring the TBI. They may refuse treatment/therapy or try to return to pre-injury activities before it is safe to do so. Or they may not be able to recognize if they are behaving inappropriately in some situations. It is important to realize that the person is not just being “difficult” or using denial as a defense mechanism - limited self-awareness is a direct result of the TBI. The injury can change their self-perception to the point that they do not see deficits and in-appropriate behavior that are very obvious to other people.

**Disinhibition:** People with a TBI may have a tendency to act on their impulses without thinking about the consequences - in other words, they cannot “inhibit” themselves very well. This can cause problems with social behavior (including conflicts and sexual behavior), with drugs and alcohol, with finances, with job responsibilities, or with dangerous recreational activities. As with limited self-awareness, these problems are not an attempt to be “difficult” or self-destructive - they are a direct result of the damage to the decision-making functions of the person’s brain. Some of these problems can put the person at increased risk for additional TBIs.

**Speech and Language:** People with a TBI may have difficulty expressing themselves with words (called “**aphasia**”) or understanding speech. They may have trouble remembering the names of certain kinds of objects, difficulty pronouncing words, or difficulty putting words in order in their mind. They also may have changes in the tone or quality of their voice because of coordination problems with the muscles we use to speak.

**Memory:** In addition to some amnesia of events before and after the accident, a person with a TBI may have ongoing problems with memory. These can include difficulties retrieving information they have in memory and difficulties storing new information in memory (both short term and long term memory). This can lead to problems with learning, keeping to a schedule, staying on task, or following directions.

**Clumsiness:** A person with a TBI may experience weakness or paralysis in some parts of their body, difficulty with coordination and balance (“**ataxia**”), decreased endurance, and abnormal muscle tone and stiffness. They may have trouble “programming” motor movements in advance or learning new physical skills. The difficulty with coordination and balance is especially significant because it can put the person at increased risk of additional TBIs.

**Preceptual Sensitivity Changes:** Many people with a TBI report either an increase or decrease in sensitivity to sounds, light, smells, or touch. One common problem is difficulty concentrating under fluorescent lights because of increased sensitivity to the flicker of the lights. In addition, some people with a TBI have difficulty perceiving the location of their body parts (for example, think for a moment about where your feet are right now without looking at them, or your elbows). This can lead to some difficulty with coordination and dexterity.

**Regulatory Deficits:** A person with a TBI may experience changes in the autonomic (unconscious) control of basic body functions. This can result in difficulty with body temperature, bowel and bladder functions, swallowing, and sleep patterns, among other things. The person may have difficulty concentrating for long periods of time, or grow tired quickly from physical or mental activity. See the handbook entry on Chronic Fatigue for functional implications of low endurance.

**Seizures:** It is very common for a person with a TBI to develop a seizure disorder. The seizure disorder may develop immediately after the injury or only months or years later. See the handbook entry on Seizure Disorders to learn more about the types of seizures and their functional implications.

**Substance abuse** is common among people with a significant TBI. In some cases the person may have had a substance abuse issue prior to the TBI (which may have contributed to the accident causing the TBI). In addition, decreased impulse control (see disinhibition, above) makes the person more likely to develop substance abuse. See the entry on Substance Abuse for more information.

### Possible Coexisting Disabilities

- Seizure Disorder
- Spinal Cord Injury
- Substance Abuse
- Learning Disorder
- Depression

### ***Incidence Statistics***

- Approximately 5.3 million Americans live with disabilities resulting from a TBI
- People over 75 have the highest rate of TBI due to falls
- Every 21 seconds, a person in the U.S. sustains a TBI
- More than 50,000 people die from TBI each year
- Men are nearly twice as likely to experience a TBI than women
- 10% of those surviving a TBI need long-term care
- About 1/3 of those surviving a TBI have moderate disabilities for the rest of their lives.
- 70% of those admitted to the hospital for a TBI have alcohol in their blood and over 50% are considered legally intoxicated.

## ***Common Treatments, Medications, and Side Effects***

Once a person has medically "recovered" from their TBI, treatment is usually focused on controlling any symptoms (such as those described above) that may have developed. Many people who have experienced a TBI also develop a seizure disorder afterward and take medication to control the seizures. The person may also be taking medications for anxiety or depression. Because the brain is so crucial to all aspects of body function, in some ways it is difficult to think of a symptom that could NOT be caused by a TBI, so many other treatments are possible.

Ongoing rehabilitation for someone with a TBI may include occupational therapy, physical therapy, neuropsychological therapy, speech therapy, and counseling. Family and community support are also important aspects of rehabilitation. All of the people providing these services may be valuable sources of information about the person's specific functional abilities.

## ***Possible Functional Issues***

- Cognitive difficulties
- Difficulty learning or problem solving
- Difficulty with memory
- Difficulty dealing with change
- Difficulty reading social cues and interpreting social situations
- Difficulty controlling impulses
- Reduced dexterity and coordination
- Reduced endurance
- Difficulty speaking or understanding language
- Increased or decreased sensitivity to light, smells, tastes, or touch
- Difficulty organizing and scheduling
- Difficulty concentrating for long periods
- Difficulty understanding and remembering instructions
- Motivation to work and socialize is usually not affected

## ***Initial Interview Considerations***

### Initial Questions

- How has the TBI changed their life?
- How has their personality changed since the TBI?
- What cognitive changes, if any, have they noticed?

- What changes in the person have their friends and family told them about?
- How has the TBI affected their ability to work?
- How often do they have trouble figuring out what people "really" mean (social signals) or figuring out what is going on in a social situation?
- Has anyone ever told them they were being sexually inappropriate? If so, what led to that situation?
- Has anyone ever told them they were being too aggressive?
- How often do they feel overwhelmed or overloaded if a lot of things are going on around them?
- How well do they feel they have adjusted to their life post-TBI? Are they still adjusting to the changes?
- How has the TBI affected their relationships with friends and family? Have any important relationships ended because of it? (Gets at possible adjustment issues)
- What are their normal drinking or drug use habits?
- What drugs or alcohol have they used in the last few days?
- Has anyone ever told them they have a problem with drugs or alcohol?
- What legal troubles have they had, if any? Have they ever been arrested or stopped by a police officer? (gets at possible aggression and impulsivity issues)
- How often do they get into fights with others? How serious are the fights? Are the fights physical or verbal?
- What situations cause them the most frustration or difficulty?
- What techniques have they found useful for managing their own behavior or problems?
- How often do they have trouble speaking - finding the right words or just getting the words out?
- How often do they have trouble understanding what other people are saying?
- How often do they get confused when someone is giving them instructions?
- How often do they have trouble remembering things?
- How hard is it for them to concentrate on something for more than a few minutes?
- What kinds of things make it especially difficult for them to concentrate?
- Do they ever have problems concentrating under fluorescent lights?
- How hard is it for them to stay on a schedule?
- What kind of planner/scheduler do they use, if any?
- How much trouble do they have with clumsiness or lack of coordination?
- How hard is it for them to get around town?
- Have they had more than one TBI?

- How is their endurance? Do they get tired more quickly than before the TBI?
- When was the last time they had a seizure?
- Is the person able to drive a car?
- What hobbies do they have?
- What do they like to do on weekends?
- What was the most difficult thing to adjust to about their life after the TBI?

### Initial Observations

- How does the person interact with you? Are they easily frustrated or confused by instructions or descriptions of the VR process? Do they show flexibility?
- Is the person able to express his or her needs?
- Does the person observe social boundaries?
- How is the person's coordination? Do they seem clumsy? How well can they handle small objects like a pencil and paper?
- How clear is the person's speech?

### Interview Accommodations (if any)

- Turn off any florescent lights and use incandescent lights or daylight (the hum and flicker of florescent lights can be especially distracting to people with a TBI)
- Give them written directions to the office, and possibly a map
- Have help available for interpreting and filling out forms
- Give them a written summary of the conversation
- Clearly spell out goals and expectations for both the long term and short term
- Give them a written list of any tasks they agreed to do (getting additional records, contacting other resources, etc.) or deadlines they need to meet

### ***Possible Accommodations and Assistive Technology***

- A quiet, uncluttered workspace to minimize distractions
- Breaking large jobs into smaller tasks
- Calendars, daily “to do” lists
- Computerized reminders, such as calendars or e-mail reminders
- Personal Digital Assistants (PDAs) with programmed reminders and alarms
- A co-worker or “mentor” to help make strategic decisions about organizing work and setting goals

- Extra time and support in dealing with changes in the environment, work flow, or supervision
- A tape recorder for personal reminders
- Written checklists
- Job coaching
- A workspace away from centers of activity or people walking by
- Face desk away from door to reduce distractions if many people are walking by
- Frequent breaks

### ***Career Planning Issues***

- People with a TBI are often well suited to jobs involving consistent routines with just a few social interactions. These can include complex tasks such as laboratory procedures or computer data entry. They may need supports to initially learn the complex tasks and may need work aids and some extra time at first until the tasks become routinized for them.
- Careers with frequent changes of routine, change of job tasks, or change in work environment may be challenging, but not impossible.
- Career advancement (promotions, transfer to a central office, etc.) can be stressful for a person with a TBI. They may need additional VR services at those times to help them adjust to large changes in their routine, environment, or responsibilities.
- Avoid careers with work cultures that promote substance use/abuse - such as theater work, restaurant work. People with TBI can have reduced inhibitions in addition to depression or anxiety, putting them at risk for substance abuse in such a work culture.
- Identify possible trigger factors for unacceptable social behaviors (if any) - certain situations, perhaps, or certain kinds of conversations. Consider if any of those trigger factors could be changed or contained, or if additional training might help the person identify when the behaviors are acceptable or unacceptable. Also consider if there are employment situations that are less formal, in which those behaviors might not be as unacceptable.

### ***Emerging Issues***

- Public awareness
- Extension of state health services
- Early intervention

### ***Additional Information Resources***

- Job Accommodations Network- has resources on dealing with seizure disorders in employment - [www.jan.wvu.edu/media/Epilepsy.html](http://www.jan.wvu.edu/media/Epilepsy.html).
- Brain Injury Association of America- [www.biausa.org](http://www.biausa.org)
- Traumatic Brain Injury Survival Guide- [www.tbiguide.com](http://www.tbiguide.com)
- TBI MO - resources from RCEP7 in Missouri- [www.tbimo.org](http://www.tbimo.org)

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