Chapter 13
Neuropsychological Deficits in Children With Traumatic Brain Injury

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ABSTRACT

Traumatic brain injury (TBI) is a common neurological condition resulting from an external force, blunt or penetrating, applied to the skull, which can cause temporary or permanent impairments in brain function. Additionally, TBI is the most common cause of disability and death in childhood. Studies indicate that children under the age of seven face a significantly higher risk of injuries necessitating urgent hospitalization compared to older children. Secondary lesions develop as a consequence of primary injuries, often emerging days after the initial trauma due to extensive cellular damage. These lesions include cerebral edema, ischemia, and metabolic dysfunctions, which exacerbate the initial damage and can have long-term implications for neurodevelopment. Social training, family therapy and speech therapy are also applied to to help children. This chapter aims to analyze the neuropsychological impact of TBI in children, focusing on mechanisms, diagnostic tools, and therapeutic approaches.

INTRODUCTION

Traumatic brain injury (TBI) is a common neurological condition resulting from an external force (blunt or penetrating) applied to the skull, which can cause temporary or permanent impairments in brain function. Additionally, TBI is the most common cause of disability and death in childhood (Darby

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& Walsh, 2007). Studies indicate that children under the age of seven face a significantly higher risk of injuries necessitating urgent hospitalization compared to older children. Regarding individuals in adulthood the age groups that are more likely to experience a traumatic brain injury are these of 18-35 and over 65 years old. The first group is a at risk of a car accident or other risky sports while the elderly people face mobility and balance difficulties.

Therefore, understanding the progression of brain damage is critical, not only for advancing scientific knowledge but also for explaining neuropsychological deficits in TBI patients, which often involve areas of the brain unaffected by the primary injury site. Brain injuries are divided into primary and secondary. In particular, primary lesions are a result of the size of the wound and are responsible for the symptoms in the early stages of the injury. These include scalp injuries, skull fractures and brain injuries (Darby & Walsh, 2007).

Secondary lesions develop as a consequence of primary injuries, often emerging days after the initial trauma due to extensive cellular damage. These lesions include cerebral edema, ischemia, and metabolic dysfunctions, which exacerbate the initial damage and can have long-term implications for neurodevelopment. Secondary lesions may result from pituitary dysfunction, hyperpyrexia, infections, persistent elevation of blood pressure, metabolic disorders, cerebral edema, traumatic epilepsy, and neurological disorders such as cranial nerve entrapment. The developmental stage in which the individual is, is crucial for the outcome of the TBI. Generally, the younger the individual is, the more likely it is for the developing brain to overcome the TBI thanks to its plasticity. Although the developing brain is also highly vulnerable to injuries which can lead to long term impairments because of the brain's immature stage. However, the traumatic brain injuries in adults and children can occur in a different kind of neuropsychological functions such as behavioral, emotional and cognitive function. According to the Glasgow Coma Scale (GCS), they are three levels of traumatic brain injury: 1) Mild, 2) Moderate and 3) Severe (Pavlovic, Pekic, Stojanovic, & Popovic, 2019).

When traumatic brain injury occurs in early childhood, neuropsychological and psychosocial functions, as well as children's performance appear later deficit. The increased susceptibility to diffuse brain attack and the effects caused by brain damage on later development seem to be factors responsible for this decline in children's functionality. As a result, children affected by traumatic brain injuries in early childhood are among the people at increased risk for damage to neuropsychological and adaptive functions during their lifetime. Even in cases where the skull has not been fractured, the brain can show a variety of damages. In terms of cognitive function, specifically in children, can be observed deficits in memory, attention and executive function, for example solving problems, organizing etc.

These deficits can cause problems in everyday life of and academic performance in these children. At the same time, there are impairments on language skills including understanding and producing of speech. In the field of emotional disorders, children with traumatic brain injuries may experience feelings of anxiety, depression or aggressiveness. (Pavlovic, Pekic, Stojanovic, & Popovic, 2019). However, it is often observed that they face problems in the frequent and sudden changes of mood and emotions, which in turn affect not only the psychological but also the cognitive function of children. Furthermore, apart from the emotional and cognitive functions, behaviour is also affected. Especially, they have personality changes as they can be more argumentative, apathetic, or even impulsive.

In order to organize the life of individuals TBI and help them, diagnosis is needed. Assessment of TBI is done with help of tools as Glasgow Coma Scale (GCS) which is about consciousness and Galveston Orientation and Amnesia Test (GOAT). The results of these assessments are helpful to define the severity of TBI (which is not stable) on first place. There are other tools and practices that are used to