Pediatric Traumatic Brain Injury Intervention

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It is estimated that more than one million children sustain closed head injuries every year in the U.S., which is the most common type of traumatic brain injury (TBI) in children and adolescents. Executive functioning, memory, attention, strategic learning, pragmatics, linguistic skills, and psychomotor skills have all been found to be lasting deficits present in children who have acquired a TBI (Catroppa & Anderson, 2009). Children who have sustained a TBI required vastly different services than adults who have received similar injury. Brain injury acquired during a child's development results in fragmented cognitive growth and development that may become more apparent as the child matures in age (Galvin & Mandalis, 2009). When determining the most effective rehabilitation approach and implementing intervention strategies for specific deficits it is crucial to understand and recognize the challenges associated with deficits that interrupt developmental stages (Blosser & DePompei, 2003).

Considerations

Developmental Issues

It is imperative to consider the child’s age and developmental level when planning treatment. Understanding how the injury affects current abilities and the impact it may have on functioning as the child continues to mature in age and developmental stages will help create a solid foundation in which effective therapy can be built upon. Without tailoring each treatment plan to meet the individual child’s needs based on current developmental level, materials and activities may be unsuccessful when implemented. Furthermore, treatment outcomes for speech, language, and social interactions should not exceed the capability range of like-aged peers. Namely, preschoolers might engage in pretend play with dolls or cars, elementary-aged children may play hide-and-seek or card games where language skills are more complex and adolescent interventions should involve real-world situations that challenge their language and executive functioning skills (Blosser & DePompei, 2003).
Socialization Issues

A principal use of language for children and adolescents is building social skills. Those who have sustained TBIs often have limited access to social environments and communicative partners. In order to facilitate social development, frequent and repeated experiences in a variety of different environments is necessary (Blosser & DePompei, 2003). Blosser and DePompei (2003) suggest three components of social routine to be the focus of therapy for children: interaction with other children for regular play and routines, encourage contact and initiation, and challenge a child to communicate for a variety of functional reasons. Similarly, pragmatic language intervention for adolescents is very important for developing skills related to job maintenance, and peer and social relationships. Any therapy involving social interactions should aim to development communication skills through maintaining involvement in functional communication environments with a variety of partners (Blosser & DePompei, 2003).

Approaches to Intervention

The goal of any intervention practice is to achieve the best possible outcome for the individual who has sustained an injury. Mazaux and Richer suggest three specific phases present in any intervention model: sensory stimulation is provided, rehabilitation of impaired processes and compensation for those where full recovery is unattainable, and facilitation of skills useful for community participation. Based on the intervention model used, these phases include restitution, restoration of damaged function, and substitution, functional compensation, components. Despite the intervention approach, it is essential to understand the importance the client’s support system plays in the intervention process. Functional communication outcomes are heightened when the focus is family collaboration and multidisciplinary intervention (Catroppa & Anderson, 2009).

Family-Centered Intervention
Developed from the family-centered care (FCC) concept that recognizes family members as full partners of health care professionals in the assessment, planning, and intervention processes, family-centered intervention acknowledges that the client’s family members have a right to make decisions throughout the intervention process based on their expertise of the client. Successful collaboration between professionals and family members increase functional outcomes, improve goal and therapy planning, and also increase client and family satisfaction. In 1996, a team compiled of professionals and families developed the criteria for pediatric family-centered rehabilitation programs (PFCRPs). Eight essential elements were identified as the foundation of FCC. These elements include: constant family support, collaboration between family and professional that is facilitated through every level of care, respected diversity of families, strengths and coping strategies of the family are identified and honored, unbiased and thorough information is continually presented to the family, family support is encouraged, the needs of the client and the client’s family are acknowledged and included in the rehabilitation plan, and programs are identified to the family to provide financial and emotional support when needed. Subsequently, with these eight guidelines providing the basis of family-centered intervention, the meaningful partnership between family and professionals is contrived where all individuals are collaborating and predominately working towards one goal: facilitating the right intervention for that specific client to improve and be successful (Hostler, 1999).

**Direct and Indirect Intervention**

Over the years, both direct and indirect interventions have been implemented to help individuals recover after sustaining a traumatic brain injury. Direct approaches to rehabilitation focus on treatments that alleviate secondary damage using techniques such as hypothermia and pharmacology. In previous research, direct approaches were shown to improve recovery of attention, cognition, mathematics, problem-solving, and self-monitoring. Conversely, indirect interventions work to compensate for deficits by utilizing the individual’s strengths. After these cognitive strengths have
been identified, they are used to alter behavior to compensate for cognitive deficits to help minimize the functional impairment. Ideally, these compensatory strategies will encourage functional participation and communication (Catroppa & Anderson, 2009).

**Behavioral Interventions**

Behavioral interventions attempt to overcome deficits present after a brain injury by focusing on behavioral strategies utilized by both client and clinician. Behaviors are assessed, identified, and then utilized to develop skills effective for achievement of goals. Cueing, modeling, reinforcement, token economy, and charting progress are some behavior strategies used by the clinician to shape desired behavior from a child. Self-monitoring is a skill taught to facilitate active participation from a child in modifying their own behavior. Many intervention approaches take advantage of behavior strategies to reform or correct undesirable behaviors (Catroppa & Anderson, 2009).

**Positive, Everyday Routines**

Using Luria and Vygotsky’s theories of cognitive development as a foundation, this intervention strategy suggests positive, everyday routines be the focus of individuals, children and adults, who have acquired a brain injury. Luria and Vygotsky believe cognitive processes are initially developed through interactions between a child and an adult and then are internalized by the child. Comparatively, children learn at a rapid rate when working with a higher level thinker, especially when involving tasks that hold the child’s attention. It is therefore suggested that children and adults be paired with more mature thinkers to help facilitate recovery and learning when cognitive recovery is challenged. Similarly to any rehabilitation model, successful intervention requires collaboration between professionals, teachers, community members, and family, as well as, scaffolding of assistance. This model emphasizes the importance of using functional routines throughout the day with “everyday others,” such as family members, teachers, aids, and coaches. “Everyday others” are those present in the child’s life daily and facilitate long term support (Willmuth, 1999).
Proactive Intervention

Proactive intervention is a rehabilitation approach that stresses functional outcomes instead of deficit-oriented outcomes. This model focuses on the child and their family, and involves therapy which encompasses functional outcomes across many different environments with various communicational partners. Functional participation at school, home, and within the community is facilitated through treatment continually carried out through interactions in real-life environments and situations by individuals who would regularly interact with that child. Intervention implemented in quite, sterile environments seem the least successful in generalizing skills to contextual interactions. This strategy suggests the most effective treatment involves common communication partners in real-world environments. Moreover, this strategy recognizes the importance of interdisciplinary collaboration and also of respecting the family’s needs and concerns (Blosser & DePompei, 2003).

Specific Processes Targeted with Intervention

Common areas of deficit in children who have acquired TBIs are cognitive communication, language, executive functioning, speech, and swallowing. Many traditional therapy techniques are effective in treating these deficits in children with TBIs.

Cognitive Communication

Reasonable and successful intervention planning considers functional outcomes to increase participation in different environments with various communication partners. Functional, effective treatment for cognitive communication deficits focus on the development of four major outcomes: participation in learning, development of employability skills, understanding social skills needed for successful communication in a variety of different contexts, and the development of independent living skills. Goals should facilitate successful communication and integration across contexts and partners (Blosser & DePompei, 2003).
Memory. Working memory, a function controlled by vulnerable frontal regions of the brain, is the ability to process informational input and utilize the information to execute a relevant task or attain to the immediate environment. Memory, as well as, executive functioning, attention, and cognitive deficits all attribute to disruptions of new learning. Many pediatric TBI interventions include memory targets; however, there are few indications as to the most successful interventions. Baddeley & Hitch’s Working Memory Model can be applied to the development of language-based skills by acknowledging the association between components of working memory, phonological loop and central executive, and vocabulary, reading, and spelling (Mandalis, Kinsella, Ong, & Anderson, 2007).

Dysphagia

Occasionally, children will have difficulties with feeding and swallowing after a TBI. A dysphagia evaluation is done whenever children demonstrate motor speech disorders or there is evidence of swallowing difficulties. It is important to recognize the presence of additional factors affecting feeding and swallowing such as inattention, lessened cognition, inhibition, physiological issues, and a decreased ability to follow directions. These factors and many more could potentially be influencing the child’s ability to chew and swallow. Specific dysphagia intervention can only be done by an individual with significant training in this specialized area of expertise (Blosser & DePompei, 2003).

Motor Speech Disorders

Motor speech disorders, a common aliment post childhood TBI, involve disrupting the planning or execution of speech production. Apraxia, dysarthria, phonation, respiration, and articulation disorders are examples of speech motor disorders than can present themselves. When these types of disorders are present, traditional interventions are usually successful, which can include thermal stimulation, compensation for phonation, respiration, and resonation, and oral motor exercises (Blosser & DePompei, 2003).
**Dysarthria.** Dysarthria, a speech motor disorder involving paresis or paralysis of the oral mechanism, is a commonly reported result of sustaining a TBI. This deficit, like many other communication disorders, can have a lasting negative impact on the child’s social and academic development. Specific areas of intervention may include prosody, velopharyngeal function, laryngeal function, and articulation function (Cahill, Murhoch, & Theodoros, 2001).

**Language**

Language deficits can occur in children following a TBI and can range from mild to severe. Receptive, expressive, and pragmatic skills should be assessed and considered when developing intervention goals and activities. Vocabulary recognition and direction following are two examples of receptive language interventions. Expressive language abilities can be worked on through writing, story retelling, and participation in conversational speech, whereas turn taking and requesting are examples of pragmatic intervention activities. Many traditional language interventions are successful with this population (Blosser & DePompei, 2003).

**Executive Functioning**

The frontal lobe, one of the last regions of the brain to fully develop, is particularly vulnerable to damage caused by traumatic brain injuries. Due to this development interruption to the frontal lobe and other regions of the brain caused by an acquired brain injury, it is critical to recognize early emerging deficits and to also look for more subtle, delayed deficits (Giza, Kolb, Harris, Asarnow, & Prins, 2009).

Pediatric intervention literature illustrates the significance the environment has on recovery outcomes. Complex and enriched environments may foster rehabilitation of brain function and structure. In animal studies done examining the effects of enriched environments on animals who have sustained brain injury through trauma or stroke, improved functional outcomes were found. Additionally, there appeared to be a difference between the developing brain and the developed, adult
Frontal lobes in the developing brain had more spontaneous functional recovery than in the adult brain, even given the enriched environments. In connecting these findings to the human population, we notice the significant role the environment plays in pediatric intervention, especially in regards to executive functioning (Giza, Kolb, Harris, Asarnow, & Prins, 2009).

**Alternative and Augmentative Communication**

Alternative and augmentative communication may be used with a child who has acquired brain injury as a means of facilitating immediate communication and participation. Due to the nature of TBIs, many children have difficulties recovering verbal communication skills depending on the severity of the damage. Using multimodal communication, such as a communication device, can help alleviate communication stress on a child, especially during the early stages of rehabilitation. Communication devices, while not used to replace verbal communication, can supplement verbal expression by facilitating communication when the child cannot physically produce intelligible speech (Blosser & DePompei, 2003).

**Environmental Modification and Support**

Interventions that include environmental modification and support stress the importance of utilizing resources that provide emotional, educational, and financial support to the child’s support system including their family, friends, school, and community (Anderson & Catroppa, 2009). Families of children who have acquired a traumatic brain injury may have various needs ranging from advocacy to behavioral family therapy. Additionally, attention must be given to careful delivery of those services, so as to not overwhelm or scare the family (Conoley & Sheridan, 1996). Moreover, environmental modification and support emphasize the importance of multidisciplinary collaboration across rehabilitation facilities, the school, and community programs. It is important to acknowledge that different contexts may need variants of goals; not every goal is appropriate for every environment (Catroppa & Anderson, 2009).
Conclusions and Future Study

Children who sustain traumatic brain injuries have unique concerns and strengths to consider, especially when compared to adults with similar injuries. When working with childhood TBI patients, it is imperative to recognize the impairments that can occur immediately or emerge as the child matures in development. There are many different intervention strategies that can be implemented to help TBI recovery; however, the important concept to remember, regardless of the specific strategy used, is successful interventions include functional outcomes in real-world environments and communicative interactions.

Despite the statistical information proclaiming a strong presence of TBI in children, very little research is available explaining deficits and specific, successful intervention strategies. Cahill et al. (2001) suggest one reason for the absent research is the presumption that physiological impairment in children is similar to that of adults. However, we know that the child brain is still developing at the time of the incident, making the ramifications of deficit vastly different than those associated with adult brain injury. In the future, more emphasis needs to be placed on research involving successful identification and effective therapy strategies specific to childhood traumatic brain injury.

References


